PROJECT MANUAL

FOR:

Bond Projects, Phase 1b

at

Millbrook Middle School
Millbrook High School

MILLBROOK SCHOOL DISTRICT
TOWN OF WASHINGTON, DUTCHESS COUNTY

NYSED NUMBERS:

13-22-01-04-0-008-017
13-22-01-04-0-031-005

B.B.S. PROJECT NUMBER:

25-273

DATE:

October 26, 2026

BBS

ARCHITECTS
LANDSCAPE ARCHITECTS
ENGINEERS

244 EAST MAIN STREET
PATCHOGUE
NEW YORK 11772
T. 631.475.0349
F. 631.475.0361

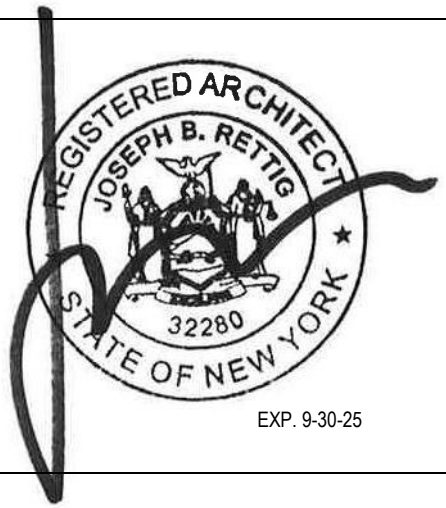
100 GREAT OAKS BLVD. SUITE 115
ALBANY
NEW YORK 12205
T. 518.621.7650
F. 518.621.7655

www.BBSARCHITECTURE.COM

ARCHITECT'S CERTIFICATION

THE UNDERSIGNED CERTIFIES THAT TO THE BEST OF HIS KNOWLEDGE, INFORMATION, AND BELIEF, THE PLANS AND SPECIFICATIONS ARE IN ACCORDANCE WITH THE APPLICABLE REQUIREMENTS OF THE NEW YORK STATE UNIFORM FIRE PREVENTION AND BUILDING CODE, THE NEW YORK STATE ENERGY CONSERVATION CONSTRUCTION CODE, THE CONSTRUCTION STANDARDS OF THE EDUCATION DEPARTMENT, NEW YORK STATE DEPARTMENT OF LABOR RULE 56, EPA AND AHERA REQUIREMENTS.

Joseph B. Rettig, A.I.A. Lic. No. 032280



EXP. 9-30-25

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PROJECT DIRECTORY

Architects/Engineers:	Richard Senior Akram Fares BBS Architects, Landscape Architects and Engineers, P.C. 244 East Main Street Patchogue, NY 11772 (631) 475-0349
Superintendent of Schools:	Caroline Hernandez Pidala 43 Alden Place Millbrook, NY 12545 (845) 677-4200
Assistant Superintendent for Business:	Elliot Garcia 43 Alden Place Millbrook, NY 12545 (845) 677-4200
Construction Manager:	Luis Rodriguez Thomas Chesser The Palombo Group 22 Noxon Street Poughkeepsie, NY 12601 (845) 868-1239

Invitation to Bidders

BOARD OF EDUCATION
Millbrook Central School District

PUBLIC NOTICE is hereby given for separate sealed bids for: Bond Projects Phase 1b at Millbrook Middle School and Millbrook High school. Bids will be received by the School District, on November 24, 2026 at 3:00pm in the Administration Offices, 43 Alden Place, Millbrook, NY 12545, and at said time and place publicly opened and read aloud.

Beginning October 26, 2026 at 9:00am, the Contract Documents may be examined at the Office of the Architect, BBS Architects, Landscape Architects and Engineers, P.C., 244 East Main Street, Patchogue New York, (631-475-0349). Complete digital sets of Contract Documents may be obtained online as a download for a non-refundable fee of One-Hundred ($100.00) Dollars at the following website: bbs.biddyhq.com. Optionally, in lieu of digital copies, hard copies may be obtained through Biddy c/o Lohrius Blueprint, 226 Newtown Road, Plainview, NY 11803 (516-465-2880) upon a deposit of One-Hundred ($100.00) Dollars for each complete set. Checks for deposits shall be made payable to the MILLBROOK CENTRAL SCHOOL DISTRICT and may be uncertified. All bid addenda will be transmitted to registered plan holders via email and will be available at the above referenced websites. Any bidder requiring documents to be shipped shall make arrangements with the printer and pay for all packaging and shipping costs. Plan holders who have obtained hard copies of the bid documents will need to make the determination if hard copies of the addenda are required for their use, and coordinate directly with the printer for hard copies of addenda to be issued. There will be no charge for registered plan holders to obtain hard copies of the bid addenda. The bid deposit for hard copies will be returned upon receipt of plans and specifications, in good condition, within thirty days after bid date, except for the lowest responsible bidder, whose check will be forfeited upon the award of the contract.

A pre-bid site walk through is scheduled for November 6, 2026 at 3:00pm at the Millbrook Middle School located at 43 Alden Place, Millbrook, NY 12545.

The Contract will be awarded to the lowest responsible bidder or the proposals will be rejected within 45 days of the date of opening proposals. Bids shall be subject, however, to the discretionary right reserved by the School District to waive any informalities, accept or reject any alternatives, reject any proposals and to advertise for new proposals, if in its opinion the best interest of the School District will thereby be promoted.

Each bidder may not withdraw his bid within 45 days after the formal opening thereof. A bidder may withdraw his bid only in writing and prior to the bid opening date.

By Order of:
The Board of Education
Millbrook Central School District

Dated: October 19, 2026

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1. DOCUMENTS (ISSUANCE AND RESTRICTIONS)

A. Bid documents may be examined at the applicable office of the Architect, BBS Architects, Landscape Architects & Engineers, P.C., 244 East Main Street, Patchogue, New York or 100 Great Oaks Boulevard, Albany, New York between the hours of 9 a.m. and 4 p.m. daily except Saturdays, Sundays, and holidays.

B. A deposit, refundable in accordance with the Invitation to Bidders, is required for each set of Bid Documents.

C. Bid documents are comprised of all bid-related documents including, but not limited to, the Invitation to Bidders, Instructions to Bidders, Supplementary Information to Bidders, if any, Bid Proposal Forms, Addenda issued prior to the bid date, and the Contract Documents. Contract Documents consist of the form of Agreement between the Owner and the Contractor, other documents enumerated in the Agreement between the Owner and the Contractor (“the Agreement”), Conditions of the Contract (General, Supplementary and other conditions or provisions), Drawings, Specifications and all addenda issued prior to execution of the Contract and modifications issued after execution of the Contract.

2. QUALIFICATIONS OF BIDDERS

A Bidder must present information and/or documentation proving that:

A. It has the financial capability to produce and execute the project within the time periods specified;

B. It possesses a minimum of five years continuous experience as a firm doing business under the same name, engaged principally as a contractor for the Work proposed.

C. It has completed at least five similar projects, listing type and scope of work, names and addresses of owners and dates of Contract completion (the Owner has the right to verify the documentation as well as examine other aspects of the Bidder's work record);

D. It can provide tabulation of equipment and facilities at its disposal to do the proposed Work;

E. It has a current bonding capacity to accommodate proposed Work

F. It has the experienced staff and technical organization necessary for the Project;

G. It maintains an office with full-time employees in a commercial space;

H. It intends to complete at least 25 percent of the Work with its own forces (General Conditions, Mobilization, etc. will not count toward the 25 percent;

I. It is not currently involved in bankruptcy proceedings;

J. It is licensed to perform the Work it is bidding on in the jurisdiction the Work will take place; and

K. It has the insurance required by the Contract Documents to protect the Owner or is able to obtain the required insurance.

L. The Bidder must provide a complete Schedule of Values on an AIA form G703. This Schedule must be revised and resubmitted until satisfactory to the Architect. All project phases, activities and work items must be broken out individually with lines for both labor and materials. In addition to this and to the required retainage, the Schedule of Values must be structured with the following values:

General Conditions:	5% of overall contract value
Bonds and Insurance:	4% of overall contract value
Submittals:	1% of overall contract value
Punch List:	3% of overall contract value
Closeout and O&M Manual:	1% of overall contract value
Project Record Documents:	1% of overall contract value

M. The Bidder is required to complete and submit the “Statement/Proof of Bidder’s Qualifications” form contained herein.

N. It is assumed that in preparing this bid, the Bidder has already compiled this information, and that it is being made available for reference with completing this package. All information contained above must be submitted to the Architect prior to award of the Contract. Failure to provide this information may result in disqualification of the Bidder.

3. COMPLIANCE WITH APPLICABLE LAWS AND REGULATIONS

A. Bidder must comply with applicable federal, state, and local laws as well as all ordinances, rules, and regulations affecting the Work.

B. The provisions of General Municipal Law, Section 103A, as it relates to refusal to testify or sign a waiver of immunity against prosecution and the submittal of bids and transactions with the State of New York, or a political subdivision thereof, governs work under this contract.

C. Wage rates as determined by the New York State Department of Labor pursuant to the labor laws of the State of New York apply to all Work under this Contract.

D. In accordance with the requirements of General Municipal Law § 103-g, the Bidder is required to include with its bid either (1) the "Certification of Compliance with the Iran Divestment Act" or in the case where the bidder is unable to make such certification, (2) the form entitled "Declaration of Bidder's Inability to Provide Certification of Compliance with the Iran Divestment Act."

E. In accordance with the requirements of Section 220-i of the New York Labor Law, all contractors and sub-contractors submitting bids or performing construction work on public work projects or private projects covered by Article 8 of the Labor Law are required to register with the New York State Department of Labor (NYSDOL) under Labor Law Section 220-i. The Bidder is required to include with its bid "Labor Law Section 220-i Certification" and include a copy of the Certificate(s) of Registration issued by the Commissioner of the Department of Labor for the bidder and each of its sub-contractors.

4. SINGLE PRIME CONTRACTS

A. Where the project cost does not exceed $1,000,000 and the Owner has decided to solicit bids from one general contractor, the Bidder must submit with its bid a separate sealed list that names each subcontractor that the Bidder will use to perform Work on the Contract, and the agreed-upon amount to be paid to each, for: (A) plumbing and gas fitting; (B) steam heating, hot water heating, ventilating and air condition apparatus and (C) electric wiring and standard illuminating fixtures.

B. After the low bid is announced, the sealed list of subcontractors submitted with the low bid will be opened and the names of the subcontractors will be announced, and thereafter any change of subcontractor or agreed-upon amount to be paid to each will require the approval of the Owner, upon a showing presented to the Owner of legitimate construction need for the change, which will be open to public inspection. Legitimate construction need includes, but is not limited to, a change in project specifications, a change in material costs, a change to subcontractor status as determined pursuant to New York Labor Law § 222(2)(e), or the subcontractor has become otherwise unwilling, unable or unavailable to perform the subcontract. The sealed list of subcontractors submitted by all other bidders will be returned to them unopened after the Contract award.

5. EXAMINATION OF DOCUMENTS AND SITE

A. Bidder must visit sites of proposed Work and be fully familiarized with conditions as they exist, as well as the character of the operations to be carried on under the proposed Contract.

B. Bidder must make all necessary on-site investigations so as to understand facilities, difficulties, and restrictions attending the execution of the Work including access to and conditions of the Work sites and properties.

C. A Bidder will be presumed to have visited the site prior to submission of a proposal and to have familiarized itself with surface and subsurface conditions, existing structures and any and all conditions that may in any way affect the Work. Failure to have so acted will in no way relieve a Bidder from its obligation to perform the proposed Work for the consideration set forth in its bid.

D. At the time of the opening of bids, each Bidder will be presumed to have read and to be thoroughly familiar with the Drawings and Contract Documents, including all addenda. The failure or omission of any Bidder to receive or examine any form, instrument or document will in no waive relieve any Bidder from its obligation to perform the proposed Work for the consideration set forth in its bid.

E. If, prior to the submission of its bid, a Bidder fails to notify the Architect in writing of the existence of any condition, ambiguity, inconsistency or error in any of the Contract Documents, or to a conflict between provisions in any Contract Document and provisions of applicable laws, regulations, ordinances, or codes, its bid will be conclusively presumed to have been based upon the

interpretation of the ambiguity or inconsistency, or the directions correcting the error or conflict which may subsequently be given by the Architect.

6. AMBIGUITIES, INTERPRETATIONS, AND ADDENDA

A. No oral interpretations, instructions, or explanations of the Bid Documents will be given prior to the opening of the bids. Discrepancies, ambiguities, or doubts as to the intent of a Bid Document should be communicated to the Architect in writing for interpretation.

B. Interpretations of, clarifications of, amendments to or corrections to the Bid Documents will be made in writing in the form of addenda forwarded to each person to whom or each entity to which Bid Documents have been issued and will become part of the Bid Documents. Each Bidder must acknowledge receipt on the Bid Proposal Forms. Replies issued in any other manner will not be binding. The Architect will not be responsible for oral clarifications.

7. PRE-BID CONFERENCE

A. When indicated in the Invitation to Bidders, a pre-bid conference will be held, at which time the Architect will have a representative available to respond to questions regarding the Bid Documents.

B. Addenda clarifying pertinent questions or concerns raised at the pre-bid conference, requiring modification of the Bid Documents, will be issued for the record and become part of the Bid Documents.

C. Notice as to the time and place of the pre-bid conference is stated in the Invitation to Bidders.

8. BASIS OF BID – PERFORMANCE AND QUALITY STANDARDS

A. GENERAL: To establish performance and quality standards for the products, materials, and equipment required in the Work, the Contract Documents detail performance criteria, or specify two or more items or materials which are presumed to be equal. This method of establishing a level of quality is not intended to exclude products that are equivalent in quality, performance, appearance, and function to those specified.

B. EQUIVALENTS: The Bidder may propose to use in the Work an equivalent item in lieu of that specified with NO CHANGE to the Bid Amount. The Bidder, proposing to utilize this equivalent procedure, must provide a detailed descriptive submission of the proposed material, equipment, or method being offered as equal to those specified, including an explanation of all deviations from the product specified in the Contract Documents. The Bidder is responsible to prove equality and, in that regard, must supply all additional information requested by the Architect, as well as pay for any required testing to support these claims. Further, the Architect is to be the sole judge of product equivalency for the purpose intended, considering equality, workmanship, aesthetics, services, maintenance, economy, and reliability of operation.

If the Bidder has used equivalents as the basis of the bid, the “Proposed Equivalent Form”, which is included in the Project Manual following the Bid Proposal Form, must be submitted as an attachment to the Bid Form or within 72 hours after the bid or prior to the award of the Contract. This form may be reproduced, if necessary, for a full listing of equivalents to be considered. This does not exclude the Bidder from submitting equivalents after the award of Contract. The intent of this process is that, if the Bidder is already aware of an equivalency submission, the risk of acceptance can be reduced by verifying equivalency and, therefore, the bid price prior to award. The risk of whether proposed equivalents are accepted is borne by the Bidder.

If an equivalent is accepted, the Bidder must coordinate the installation of the equivalent and make all associated changes required. The Bidder also waives any claim for additional cost or contract time associated with the equivalent which becomes apparent before, during, or after installation.

The Bidder agrees to bear any and all additional costs to all other contractors or subcontractors which are caused by the incorporation of the equivalent.

C. SUBSTITUTIONS: For consideration by the Owner, the Bidder may propose to use in the Work substitute items in lieu of those specified, which do not meet the project performance and quality criteria, and can be furnished and installed at a reduced cost (credit) to the Owner with no impact on the Work being done by others.

1. Proposed substitutions must be submitted with the bid or within 72 hours after the bid or prior to the award of the Contract, on the Proposed Substitution Form, which is in the Project Manual following the Proposed Equivalent Form. The Bidder must list any and all deviations from the Contract Documents as well as the corresponding credit amount to be deducted from the Base Bid Proposal if the substitution is accepted by the Owner. This does not exclude the Bidder from submitting a substitution for consideration after the award of the Contract.

2. Substitutions cannot be used as the basis of the bid, they must be listed separately and will be evaluated on a case by case basis. All base bid amounts must be based on the specified materials or acceptable equivalents.

3. In no way will the proposed substitutions influence the successful bidder selection process. Substitutions may not be used to arrive at the lowest qualified bid amount.

4. If a substitution is accepted, the Bidder must coordinate the installation of the substitute and make all associated changes required. The Bidder also waives any claim for additional cost or contract time associated with the substitute which becomes apparent before, during, or after installation. The Bidder agrees to bear any and all additional costs to all other contractors or subcontractors which are caused by the incorporation of the substitution.

9. PREPARATION, IDENTIFICATION, AND SUBMISSION OF PROPOSAL

A. Bidders must submit triplicate copies of the Bid Proposal Forms (one marked 'Official Tender' and others marked 'Copy'), properly signed and completed in every respect pursuant to these Instructions to Bidders, in an opaque, sealed envelope plainly and prominently marked:

"Sealed Bid for (Project Name) _____

Bid Date _____, 20___, by (Name/Address of Bidder)."

B. Attached to the Bid Proposal Forms envelope, Bidders must submit Bid Security pursuant to Paragraph 10 of these Instructions to Bidders.

C. All bids shall be held for a period of forty-five (45) days after their receipt and opening, during which time the Owner has the right to enter into a contract, and the bid securities of the three (3) lowest responsible bidders shall be held until the execution of the Contract.

D. The Owner reserves the right to reject any or all bids proposals and to waive any or all informalities, defects or irregularities in the bid proposals. The Owner reserves the right to make partial awards based on low bids for each item or may select to award on total low bid.

E. Once the Bid Proposal Forms have been submitted in the sealed envelope, there can be no alterations or amendments; external markings or separate supplementary information will, in no way, affect the sealed bid information. Any necessary adjustment to the proposal must be made prior to its submission and be part of the enclosed sealed bid.

F. All costs in connection with preparation and submission of bid proposals shall be borne by the Bidders.

G. A Bidder must submit promptly, upon request of the Owner or Architect, documentary evidence as to its financial, technical, and practical ability to carry out the Work.

H. A Bidder may withdraw its bid, either in person or by telegraphic or written request, at any time prior to the scheduled closing time for the receipt of bids. Negligence on the part of the Bidder in preparing its bid confers no right for the withdrawal of the bid after it has been opened.

10. BID SECURITY

A. Each bid must be accompanied by bid security of not less than five percent (5%) of the amount of the bid (including base bids and alternates), which may be a certified check, cashier's check, bank draft, or bid bond executed by a Surety Company authorized to do business in the State of New York and made payable to the Owner.

1. Bid Security must be submitted in a separate sealed envelope clearly identifying the company and project as well as the name and address of the Surety Company.

2. Each bond must be accompanied by a Power of Attorney, giving names of Attorneys-in-fact, and the extent of their bonding authority. All bonds must be countersigned by a resident Agent and with a Surety Company or Corporation meeting the following qualifications:

a. Surety must be licensed to do business in the State of New York.

b. Surety must be listed on the current U.S. Treasury Department Circular 570 entitled "Companies Holding Certificates of Authority" from the Secretary of the Treasury under the Act of Congress approved July 30, 1974 (6 U.S.C., Sec. 6-13), as Acceptable Sureties on Federal Bonds.

c. The Surety must be rated as equal to "A-" or better as to "Policy Holder Ratings" by "Best's Key Rating Guide."

d. The bonding limit for each Bidder cannot exceed the amount listed on the above referenced U.S. Treasury Department List for the Surety issuing the bond.

e. All Surety companies are subject to approval and may be rejected by the Owner without cause, in the same manner that bids may be rejected.

f. In the event any of the requirements outlined herein are not complied with, the Owner will have the right to reject the bid.

B. Bid security will be returned to all except the three lowest bidders, after formal analysis and evaluation of bids. No bid will be held beyond the 45-day period stipulated above.

C. Remaining bid security will be returned to bidders after Owner and the successful bidder have executed the Agreement and the Owner has received and approved performance and payment bonds.

D. If the Agreement has not been executed within the specified period of time after the bid opening, the bid security of any Bidder will be returned upon its request, provided it has not been notified of acceptance of its bid prior to the date of its request.

11. RECEIPT AND OPENING OF BIDS

A. Bids will be received up to the time and at the location indicated for the opening in the Invitation to Bidders, after which they will be visibly opened and read aloud, and the contents made known to

all interested parties present. Each Bidder assumes the risk of any delay in the mail or in handling of mail by employees of the Owner or others.

12. MODIFICATION OR WITHDRAWAL OF PROPOSAL

A. Bid may not be modified after it has been deposited with Owner.

B. Bid may not be withdrawn after time set for receipt of bids.

C. Withdrawn bid may not be resubmitted.

D. Bid withdrawn after opening of bids will result in forfeiture of bid security.

13. DISQUALIFICATION OF PROPOSAL

A. The Bidder acknowledges the right of the Owner to reject any or all bids. The Owner reserves the right to reject any or all bids proposals and to waive any or all informalities, defects or irregularities in the bid proposals.

B. Bid may be disqualified and rejected under any or all of the following conditions:

1. If the Bidder fails to furnish the required bid security, or to submit data required by the Contract Documents, or if the Bid is in any way incomplete or irregular.
2. If the Bid has not been deposited at the designated location prior to the date and time for receipt as indicated in the Invitation to Bidders and these Instructions to Bidders.
3. If there is reason to believe that a Bidder has submitted more than one bid for the same project.
4. If there is reason to believe that collusion exists among Bidders.
5. A Bidder's failure to establish to Owner's satisfaction:

    a. Proof of ownership, control, or ability to procure necessary plant and equipment to commence the Work at the time prescribed and thereafter prosecute and complete at the rate, or within the time specified.
    b. That Bidder is not already obligated by prior commitment to other work as to likely delay start, prosecution, or completion of the Work required by the Contract Documents.
    c. That Bidder proposes to use reliable and responsible subcontractors or suppliers.

14. AWARD OF CONTRACT

A. The Contract will be awarded to the lowest qualified responsible Bidder, provided its bid is reasonable and it is in the best interest of the Owner to accept.

B. Owner may determine the lowest bid by adding one base bid to other base bid(s) and/or by adding to or deducting from those base bid(s), additive or deduct alternates, or substitutions, if any, which the Owner elects to accept after the opening of bids.

C. The Owner reserves the right to make partial awards based on low bids for each item or may select to award on total low bid.

15. EXECUTION OF AGREEMENT

A. The Agreement will be prepared by Owner.

B. The Agreement must be executed in triplicate within ten calendar days after notification of award at which time the successful contractor must deliver to the Owner all the necessary counterparts of the Agreement in the form set forth in the Bid and Contract Documents.

C. Performance and payment bonds must be submitted in the form of A.I.A. Document A312, covering performance as well as labor and material payment and extended for the period of time stipulated in Article 11 of the General and/or Supplementary General Conditions, "Bonds and Insurance". An executed bond must be issued by a surety company licensed in New York State.

D. At the time of execution of the Agreement and prior to the start of construction operations, the successful bidder must furnish documentation in the form and amounts required by the provisions of the Contract Documents that set forth the insurance requirements.

E. The successful bidder must submit Schedule of Values, as per A.I.A. Form G702A and provide breakdown of costs.

F. The successful Bidder, upon its failure or refusal to execute and deliver the required documentation, including but not limited to the Agreement and required bonds and proof of insurance within ten calendar days after the Bidder received notice of the acceptance of its bid, will forfeit to the Owner, as liquidated damages for such failure or refusal, the security deposited with its bid.

16. TAXES AND PERMITS

A. Material purchased for use in the construction of buildings owned by the Owner are exempt from Federal excise and State sales taxes when the materials are incorporated into and become part of the completed improvement.

B. Materials, appliances, tools, equipment, or fuel costs which do not become part of the completed improvement will be subject to all applicable taxes.

C. The Owner is not subject to Federal Tax on transportation of property.

D. Local Building Permit will not be required.

E. Exemption certificates will be furnished by Owner for purchases of materials where material is to be incorporated into Work, upon receipt of a copy of the supplier's invoice showing items, net prices, and federal excise tax separately.

17. SUBCONTRACTOR'S LISTING

A. For multiple prime contracts, a listing of all subcontractors and major material suppliers (including address, telephone number, and name of individual to contact) whose services are proposed to be employed on the project must be submitted within 15 calendar days after signing of the Agreement.

18. TIME OF COMPLETION

A. Bidder shall agree to the Construction Manager’s schedule, contained in specification section 011200 – Multiple Contract Summary.

B. Restrictions, if any, applicable to construction activities in the Owner’s facilities as a result of State, Federal or Local orders, laws, regulations or rules, and the duration of any such restrictions, the Owner may modify the construction schedule, including the anticipated start date, set forth in the Contract/Bid Documents. By submitting a bid, the Bidder consents to any such schedule modification and further acknowledges and agrees that there shall be no additional compensation for schedule modifications caused directly or indirectly by such restrictions. The Bidder further acknowledges and agrees that the sole remedy for any schedule modifications or delays caused directly or indirectly by such restrictions shall be an extension of time, to be determined in the sole discretion of the Owner.

19. CONDITIONS OF WORK OPERATIONS

A. Work under the Contract must be executed and pursued without interruption of or interference with the Owner's operations.

B. Work operations, access to buildings, and extent of movement of personnel within buildings must be coordinated with and limited by Owner.

C. Contractor must notify Owner in writing at least 24 hours in advance to advise of intended Work operations to be scheduled and receive approval prior to starting Work.

20. REQUIRED BID INFORMATION

A. In addition to any other information/documentation required by these Instructions to Bidders or other Bid Documents, the following information/documentation must be submitted with each bid to be considered a complete and responsive bid. Failure to include any required document in the bid submission may lead to disqualification or rejection of a bid, at the sole discretion of the Owner.

1. Bid Proposal Form
2. Proposed Equivalent Form
3. Proposed Substitution Form
4. List of Subcontractors – Provide in a sealed envelope along with bid. (If a Single Prime Contract - See Paragraph 4(A) of these Instructions to Bidders).
5. Iran Divestment Act Forms (Certification of Compliance or Declaration of Inability), signed and notarized.
6. Statement of Bidder's Qualifications
7. Sexual Harassment Prevention Certification
8. Labor Law Section 220-i Certification and NYS DOL Certificates of Contractor Registration
9. Bid Bond/Security
10. Information/documentation required by Paragraph 2 of these Instructions for Bidders and the Statement/Proof of Bidder's Qualifications Form.

END OF SECTION

INFORMATION AVAILABLE TO BIDDERS

BBS Architects, Landscape Architects & Engineers, P.C. (BBS), accepts no responsibility for information contained within the items listed below that have been provided by others.

Any questions concerning information contained within these items shall be forwarded via the standard Request for Information process. BBS will forward these Requests for response by the appropriate party.

A. Roof Asbestos Sampling and Analysis – Prepared by CT Male Associates, 50 Century Hill Drive, Latham, NY 12110. Document follows this section.

B. Asbestos Sampling and Analysis – Prepared by CT Male Associates, 50 Century Hill Drive, Latham, NY 12110. Document follows this section.

C. Multiple Contract Summary – Prepared by the Palombo Group, 22 Noxon Street, Poughkeepsie, NY 12601. Document follows this section.

END OF SECTION

C.T. MALE ASSOCIATES
Engineering, Surveying, Architecture, Landscape Architecture & Geology D.P.C.

50 Century Hill Drive, Latham, NY 12110
518.786.7400 FAX 518.786.7299 www.ctmale.com

November 11, 2025

Mr. Elliot Garcia
Assistant Superintendent for Business and Personnel
Millbrook CSD
43 Alden Place
Millbrook, NY 12545
elliot.garcia@millbrookcsd.org

Re: ***Asbestos Containing Materials Sampling & Laboratory Analysis***
Roof - Millbrook Middle School – 43 Alden Place
Village of Millbrook, Dutchess County, New York
C.T. Male Project# 24.4217

Mr. Garcia:

C.T. Male Associates Engineering, Surveying, Architecture, Landscape Architecture & Geology D.P.C. (C.T. Male) has performed asbestos containing materials sampling and laboratory analysis of materials suspected to contain asbestos associated with Millbrook Middle School, located at 43 Alden Place in Millbrook, NY. This report is limited to materials associated with the roof. The following are the analysis results (laboratory results are attached).

Sample #	Location	Material	Results
102825MS01	Roof - Core 1	Caulk on Wall	No Asbestos Detected
102825MS02	Roof - Core 1	Caulk on Wall	No Asbestos Detected
102825MS03	Roof - Core 1	Membrane	No Asbestos Detected
102825MS04	Roof - Core 1	Membrane	No Asbestos Detected
102825MS05	Roof - Core 1	Iso Paper	No Asbestos Detected
102825MS06	Roof - Core 1	Iso Paper	No Asbestos Detected
102825MS07	Roof - Core 2	Iso Paper	No Asbestos Detected
102825MS08	Roof - Core 2	Iso Paper	No Asbestos Detected
102825MS09	Roof - Core 2	Asphalt (top)	No Asbestos Detected
102825MS10	Roof - Core 2	Asphalt (top)	No Asbestos Detected
102825MS11	Roof - Core 2	Asphalt Patch (roof)	No Asbestos Detected
102825MS12	Roof - Core 2	Asphalt Patch (roof)	No Asbestos Detected
102825MS13	Roof - Core 2	Asphalt Patch (hatch)	No Asbestos Detected
102825MS14	Roof - Core 2	Asphalt Patch (hatch)	No Asbestos Detected
102825MS15	Roof - Core 3	Fiberboard	No Asbestos Detected
102825MS16	Roof - Core 3	Fiberboard	No Asbestos Detected
102825MS17	Roof - Core 3	Asphalt (top)	No Asbestos Detected
102825MS18	Roof - Core 3	Asphalt (top)	No Asbestos Detected
102825MS19	Roof - Inside	Gypsum Deck	No Asbestos Detected
102825MS20	Roof - Inside	Gypsum Deck	No Asbestos Detected

Sample #	Location	Material	Results
102825MS21	Roof - Inside	Felt on Gypsum Deck	No Asbestos Detected
102825MS22	Roof - Inside	Felt on Gypsum Deck	No Asbestos Detected
102825MS23	Roof - Inside	Roof Drain	3.0% Chrysotile
102825MS24	Roof - Inside	Roof Drain	Not Analyzed/Pos. Stop
102825MS25	Roof - Inside	Roof Drain	Not Analyzed/Pos. Stop
102825MS26	Roof - Inside	Roof Drain Cladding	No Asbestos Detected
102825MS27	Roof - Inside	Roof Drain Cladding	No Asbestos Detected
102825MS28	Roof - Ramp	Asphalt Patch	No Asbestos Detected
102825MS29	Roof - Ramp	Asphalt Patch	No Asbestos Detected

Conclusions

Bulk samples of materials suspected of containing asbestos were sampled per NYSDOL Code Rule 56. Samples were analyzed by a NYS ELAP approved laboratory to determine asbestoform type and content. Materials containing asbestos content of more than 1% shall be identified as asbestos containing. Based upon observations and the sample results, the roof drain is asbestos containing.

Do not hesitate to contact me at (518) 786-7480 or m.sawyer@ctmale.com should you have any questions regarding this report or need further information.

Sincerely,

C.T. MALE ASSOCIATES

Gered M. Burns
Industrial Hygienist
NYSDOL License # 25-61CSS-SHAB (Inspector and Designer)
Reviewed and Approved By:

Michael F. Sawyer
Managing Industrial Hygienist
NYSDOL License # 25-61XHJ-SHAB (Inspector and Designer)

Attachments

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

C.T. Male Associates Engineering, Surveying, Architecture, Landscape Architecture & Geology, D.P.C.
50 Century Hill Drive, Latham, NY, 12110

License Number: 29050
License Class: RESTRICTED
Date of Issue: 02/10/2025
Expiration Date: 02/28/2026
Duly Authorized Representative: Daniel Reilly

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

STATE OF NEW YORK - DEPARTMENT OF LABOR
ASBESTOS CERTIFICATE

N.Y.S



MICHAEL F SAWYER
CLASS(EXPIRES)
I PD (09/26) C ATEC (09/26)
H PM (09/26) D INSP (09/26)

CERT# 25-61XHJ-SHAB
DMV# 437658014

MUST BE CARRIED ON ASBESTOS PROJECTS

STATE OF NEW YORK - DEPARTMENT OF LABOR
ASBESTOS CERTIFICATE

N.Y.S



GERED BURNS
CLASS(EXPIRES)
C ATEC (09/26) D INSP (09/26)
H PM (09/26) I PD (09/26)
G SUPR (09/25)

CERT# 25-61CSS-SHAB
DMV# 708500810

MUST BE CARRIED ON ASBESTOS PROJECTS

NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER

Expires 12:01 AM April 01, 2026
Issued April 01, 2025

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MRS. TEILAH ALVIS
RESPONSE LABS
828 WASHINGTON AVE.
ALBANY, NY 12203

NY Lab Id No: 11917

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
Asbestos in Non-Friable Material-PLM	Item 198.6 of Manual (NOB by PLM)

Serial No.: 70683

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

AmeriSci New York
117 EAST 30TH ST.
NEW YORK, NY 10016
TEL: (212) 679-8600 • FAX: (212) 679-3114

PLM Bulk Asbestos Report

C. T. Male Associates
Attn: Michael Sawyer
50 Century Hill Drive
P.O. Box 727
Latham, NY 12110

Date Received 11/3/2025 **AmeriSci Job #** 225111090
Date Examined 11/07/25 **P.O. #**
ELAP # 11480 **Page** 1 **of** 5
RE: 24.4217; Millbrook CSD; Millbrook, NY

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos	Notes
102825MS01 1	225111090-01	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by Ivan H. Reyes on 11/07/25	*1*
Location: Middle School Roof Core 1 - Caulk On Wall **Analyst Description:** Black, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 6.9%				
102825MS02 1	225111090-02	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by Ivan H. Reyes on 11/07/25	*1*
Location: Middle School Roof Core 1 - Caulk On Wall **Analyst Description:** Black, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 19%				
102825MS03 2	225111090-03	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by Ivan H. Reyes on 11/07/25	*1*
Location: Middle School Roof Core 1 - Membrane **Analyst Description:** Black, Homogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Fibrous glass Trace, Non-fibrous 22%				
102825MS04 2	225111090-04	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by Ivan H. Reyes on 11/07/25	*1*
Location: Middle School Roof Core 1 - Membrane **Analyst Description:** Black, Homogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Fibrous glass Trace, Non-fibrous 26%				
102825MS05 3	225111090-05	***No***	NAD (by NYS ELAP 198.1) by Ivan H. Reyes on 11/07/25	
Location: Middle School Roof Core 1 - ISO Paper **Analyst Description:** Brown, Homogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose 90%, Fibrous glass 5.0%, Non-fibrous 5.0%				
102825MS06 3	225111090-06	***No***	NAD (by NYS ELAP 198.1) by Ivan H. Reyes on 11/07/25	
Location: Middle School Roof Core 1 - ISO Paper **Analyst Description:** Brown, Homogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose 90%, Fibrous glass 5.0%, Non-fibrous 5.0%				

See Reporting notes on last page

PLM Bulk Asbestos Report

24.4217; Millbrook CSD; Millbrook, NY

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos	Notes
102825MS07 4 **Location:** Middle School Roof Core 2 - ISO Paper **Analyst Description:** Black, Homogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Fibrous glass Trace, Non-fibrous 30%	225111090-07	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by Ivan H. Reyes on 11/07/25	*1*
102825MS08 4 **Location:** Middle School Roof Core 2 - ISO Paper **Analyst Description:** Black, Homogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Fibrous glass Trace, Non-fibrous 22%	225111090-08	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by Ivan H. Reyes on 11/07/25	*1*
102825MS09 5 **Location:** Middle School Roof Core 2 - Asphalt (Top) **Analyst Description:** Black, Homogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Fibrous glass Trace, Non-fibrous 35%	225111090-09	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by Ivan H. Reyes on 11/07/25	*1*
102825MS10 5 **Location:** Middle School Roof Core 2 - Asphalt (Top) **Analyst Description:** Black, Homogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Fibrous glass Trace, Non-fibrous 32%	225111090-10	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by Ivan H. Reyes on 11/07/25	*1*
102825MS11 6 **Location:** Middle School Roof Core 2 - Asphalt Patch (Roof) **Analyst Description:** Black, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 9.5%	225111090-11	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by Ivan H. Reyes on 11/07/25	*1*
102825MS12 6 **Location:** Middle School Roof Core 2 - Asphalt Patch (Roof) **Analyst Description:** Black, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 56%	225111090-12	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by Ivan H. Reyes on 11/07/25	*1*
102825MS13 6 **Location:** Middle School Roof Core 2 - Asphalt Patch (Hatch) **Analyst Description:** Black, Homogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 23%	225111090-13	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by Ivan H. Reyes on 11/07/25	*1*

See Reporting notes on last page

PLM Bulk Asbestos Report

24.4217; Millbrook CSD; Millbrook, NY

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos	Notes
102825MS14 6	225111090-14	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by Ivan H. Reyes on 11/07/25	*1*
Location: Middle School Roof Core 2 - Asphalt Patch (Hatch) **Analyst Description:** Black, Homogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 24%				
102825MS15 7	225111090-15	***No***	NAD (by NYS ELAP 198.1) by Ivan H. Reyes on 11/07/25	
Location: Middle School Roof Core 3 - Fiberboard **Analyst Description:** Brown, Homogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose 95%, Non-fibrous 5.0%				
102825MS16 7	225111090-16	***No***	NAD (by NYS ELAP 198.1) by Ivan H. Reyes on 11/07/25	
Location: Middle School Roof Core 3 - Fiberboard **Analyst Description:** Brown, Homogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose 95%, Non-fibrous 5.0%				
102825MS17 8	225111090-17	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by Ivan H. Reyes on 11/07/25	*1*
Location: Middle School Roof Core 3 - Asphalt (Top) **Analyst Description:** Black, Homogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Fibrous glass Trace, Non-fibrous 36%				
102825MS18 8	225111090-18	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by Ivan H. Reyes on 11/07/25	*1*
Location: Middle School Roof Core 3 - Asphalt (Top) **Analyst Description:** Black, Homogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Fibrous glass Trace, Non-fibrous 33%				
102825MS19 9	225111090-19	***No***	NAD (by NYS ELAP 198.1) by Ivan H. Reyes on 11/07/25	
Location: Middle School Roof Inside - Gypsum Deck **Analyst Description:** Off-White, Homogeneous, Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Cellulose 3.0%, Non-fibrous 97%				
102825MS20 9	225111090-20	***No***	NAD (by NYS ELAP 198.1) by Ivan H. Reyes on 11/07/25	
Location: Middle School Roof Inside - Gypsum Deck **Analyst Description:** Off-White, Homogeneous, Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Cellulose 4.0%, Non-fibrous 96%				

See Reporting notes on last page

PLM Bulk Asbestos Report

24.4217; Millbrook CSD; Millbrook, NY

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos	Notes
102825MS21 10	225111090-21	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by Ivan H. Reyes on 11/07/25	*1*
Location: Middle School Roof Inside - Felt On Gypsum Deck **Analyst Description:** Black, Homogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Fibrous glass Trace, Non-fibrous 21%				
102825MS22 10	225111090-22	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by Ivan H. Reyes on 11/07/25	*1*
Location: Middle School Roof Inside - Felt On Gypsum Deck **Analyst Description:** Black, Homogeneous, Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Fibrous glass Trace, Non-fibrous 42%				
102825MS23 12	225111090-23	***Yes***	3.0% (EPA 600/M4-82-020) by Ivan H. Reyes on 11/07/25	
Location: Middle School Roof Inside - Roof Drain **Analyst Description:** Gray, Homogeneous, Fibrous, Bulk Material **Asbestos Types:** Chrysotile 3.0% **Other Material:** Cellulose Trace, Fibrous glass 35%, Non-fibrous 62%				
102825MS24 12	225111090-24		NA/PS	
Location: Middle School Roof Inside - Roof Drain **Analyst Description:** Bulk Material **Asbestos Types:** **Other Material:**				
102825MS25 12	225111090-25		NA/PS	
Location: Middle School Roof Inside - Roof Drain **Analyst Description:** Bulk Material **Asbestos Types:** **Other Material:**				
102825MS26 13	225111090-26	***No***	NAD (by NYS ELAP 198.1) by Ivan H. Reyes on 11/07/25	
Location: Middle School Roof Inside - Roof Drain Drain Cladding **Analyst Description:** Off-White, Homogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose 90%, Non-fibrous 10%				
102825MS27 13	225111090-27	***No***	NAD (by NYS ELAP 198.1) by Ivan H. Reyes on 11/07/25	
Location: Middle School Roof Inside - Roof Drain Drain Cladding **Analyst Description:** Off-White, Homogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose 90%, Non-fibrous 10%				

See Reporting notes on last page

PLM Bulk Asbestos Report

24.4217; Millbrook CSD; Millbrook, NY

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos	Notes
102825MS28 14	225111090-28	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by Ivan H. Reyes on 11/07/25	*1*
Location: Middle School Roof Ramp - Asphalt Patch **Analyst Description:** Gray, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 53%				
102825MS29 14	225111090-29	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by Ivan H. Reyes on 11/07/25	*1*
Location: Middle School Roof Ramp - Asphalt Patch **Analyst Description:** Gray, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 76%				
102825MS30	225111090-30		NA	
Location: Middle School Roof Core 2 - Sample Not Submitted **Analyst Description:** Bulk Material **Asbestos Types:** **Other Material:**				

Reporting Notes:

(1) NAD results by NYS 198.6 are inconclusive and are not considered non-ACM

Analyzed by: Ivan H. Reyes
Date: 11/7/2025

Reviewed by: Marik Peysakhov

*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 Motic, Model BA310 Pol Scope, Microscope, Serial #: 1190000538, 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_____

Table I
Summary of Bulk Asbestos Analysis Results by NYS ELAP 198.4

24.4217; Millbrook CSD; Millbrook, NY

AmeriSci Sample #	Client Sample#	HG Area	NOB Sample Weight (gram)	NOB Heat Sensitive Organic %	NOB Acid Soluble Inorganic %	NOB Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
01	102825MS01	1	0.150	52.6	40.5	6.9	NAD	NAD
Location: Middle School Roof Core 1 - Caulk On Wall								
02	102825MS02	1	0.258	40.3	40.6	19.0	NAD	NAD
Location: Middle School Roof Core 1 - Caulk On Wall								
03	102825MS03	2	0.151	67.2	10.6	22.2	NAD	NAD
Location: Middle School Roof Core 1 - Membrane								
04	102825MS04	2	0.114	71.4	1.8	26.9	NAD	NAD
Location: Middle School Roof Core 1 - Membrane								
05	102825MS05	3	----	----	----	----	NAD	NA
Location: Middle School Roof Core 1 - ISO Paper								
06	102825MS06	3	----	----	----	----	NAD	NA
Location: Middle School Roof Core 1 - ISO Paper								
07	102825MS07	4	0.523	52.0	17.9	30.1	NAD	NAD
Location: Middle School Roof Core 2 - ISO Paper								
08	102825MS08	4	0.235	52.7	24.5	22.8	NAD	NAD
Location: Middle School Roof Core 2 - ISO Paper								
09	102825MS09	5	0.430	44.6	20.3	35.1	NAD	NAD
Location: Middle School Roof Core 2 - Asphalt (Top)								
10	102825MS10	5	0.424	49.6	18.4	32.0	NAD	NAD
Location: Middle School Roof Core 2 - Asphalt (Top)								
11	102825MS11	6	0.216	88.2	2.3	9.5	NAD	NAD
Location: Middle School Roof Core 2 - Asphalt Patch (Roof)								
12	102825MS12	6	0.342	34.3	9.2	56.5	NAD	NAD
Location: Middle School Roof Core 2 - Asphalt Patch (Roof)								
13	102825MS13	6	0.387	49.3	27.6	23.1	NAD	NAD
Location: Middle School Roof Core 2 - Asphalt Patch (Hatch)								
14	102825MS14	6	0.376	51.4	24.7	24.0	NAD	NAD
Location: Middle School Roof Core 2 - Asphalt Patch (Hatch)								
15	102825MS15	7	----	----	----	----	NAD	NA
Location: Middle School Roof Core 3 - Fiberboard								
16	102825MS16	7	----	----	----	----	NAD	NA
Location: Middle School Roof Core 3 - Fiberboard								

See Reporting notes on last page

Table I
Summary of Bulk Asbestos Analysis Results by NYS ELAP 198.4

24.4217; Millbrook CSD; Millbrook, NY

AmeriSci Sample #	Client Sample#	HG Area	NOB Sample Weight (gram)	NOB Heat Sensitive Organic %	NOB Acid Soluble Inorganic %	NOB Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
17	102825MS17	8	0.460	45.8	18.2	36.0	NAD	NAD
Location: Middle School Roof Core 3 - Asphalt (Top)								
18	102825MS18	8	0.377	46.2	19.9	33.8	NAD	NAD
Location: Middle School Roof Core 3 - Asphalt (Top)								
19	102825MS19	9	----	----	----	----	NAD	NA
Location: Middle School Roof Inside - Gypsum Deck								
20	102825MS20	9	----	----	----	----	NAD	NA
Location: Middle School Roof Inside - Gypsum Deck								
21	102825MS21	10	0.112	50.4	28.5	21.1	NAD	NAD
Location: Middle School Roof Inside - Felt On Gypsum Deck								
22	102825MS22	10	0.171	15.1	42.4	42.5	NAD	NAD
Location: Middle School Roof Inside - Felt On Gypsum Deck								
23	102825MS23	12	----	----	----	----	Chrysotile 3.0	NA
Location: Middle School Roof Inside - Roof Drain								
24	102825MS24	12	----	----	----	----	NA/PS	NA
Location: Middle School Roof Inside - Roof Drain								
25	102825MS25	12	----	----	----	----	NA/PS	NA
Location: Middle School Roof Inside - Roof Drain								
26	102825MS26	13	----	----	----	----	NAD	NA
Location: Middle School Roof Inside - Roof Drain Drain Cladding								
27	102825MS27	13	----	----	----	----	NAD	NA
Location: Middle School Roof Inside - Roof Drain Drain Cladding								
28	102825MS28	14	0.235	39.6	6.9	53.5	NAD	NAD
Location: Middle School Roof Ramp - Asphalt Patch								
29	102825MS29	14	0.170	22.0	1.2	76.7	NAD	NAD
Location: Middle School Roof Ramp - Asphalt Patch								
30	102825MS30		----	----	----	----	NA	NA
Location: Middle School Roof Core 2 - Sample Not Submitted								

See Reporting notes on last page

Table I
Summary of Bulk Asbestos Analysis Results by NYS ELAP 198.4

24.4217; Millbrook CSD; Millbrook, NY

AmeriSci Sample #	Client Sample#	HG Area	NOB Sample Weight (gram)	NOB Heat Sensitive Organic %	NOB Acid Soluble Inorganic %	NOB Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM

Analyzed by: Marik Peysakhov
Date: 11/8/2025

Reviewed by: Marik Peysakhov

**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).

Relinquished By:	**Date/Time:** 10/28/25
Received By: J. Werchich	**Date/Time:** 11/3/25 9:50
Relinquished By:	**Date/Time:**
Received By:	**Date/Time:**

AMERI SCI

BULK SAMPLE SHEET

117 EAST 30TH STREET
NEW YORK, NY 10016
TOLL FREE (800) 705-5227
Fax (212) 679-3114

Company: C.T. Male Associates

AMERISCI JOB #: #225111090

Project Name: Millbrook CSD

Street Address: 50 Century Hill Drive

Project Address: Millbrook, NY

Client Project #: 24.4217

City: Latham **State:** New York **Zip:** 12110

Project Manager: MFS

Phone: 518-786-7400

Analysis: . _PLM Only ___TEM Only __X_ NY ELAP PLM/TEM (268.1/268.6/268.4)
___ ASTM Dust (Microvac) ___ ASTM Dust (Wipe) ___ Other (describe in comments)

E-Mail: m.sawyer@ctmale.com

TAT:Rush ___,12Hr_ _,24 Hr_ _,48 Hr ___,72 Hr _,5D X __ **Mat'l Type:** _X Bulk ___Air ___ Water

Results to: Mike Sawyer

Sampled By: MFS

Date Sampled: 10/28/25

Special Instructions or Comments:
(Check)

Positive Stop?

Yes_X_ No ____

Field ID #	Sample Location			Sample Description/Material Type (for dust= size of surface area sampled)	Homogenous Area (HA #)
102825MS01	Milddle School	Roof	Core 1	Caulk on Wall	1
102825MS02	Milddle School	Roof	Core 1	Caulk on Wall	1
102825MS03	Milddle School	Roof	Core 1	Membrane	2
102825MS04	Milddle School	Roof	Core 1	Membrane	2
102825MS05	Milddle School	Roof	Core 1	ISO Paper	3
102825MS06	Milddle School	Roof	Core 1	ISO Paper	3
102825MS07	Milddle School	Roof	Core 2	ISO Paper	4
102825MS08	Milddle School	Roof	Core 2	ISO Paper	4
102825MS09	Milddle School	Roof	Core 2	Asphalt (top)	5
102825MS10	Milddle School	Roof	Core 2	Asphalt (top)	5
102825MS11	Milddle School	Roof	Core 2	Asphalt Patch (roof)	6
102825MS12	Milddle School	Roof	Core 2	Asphalt Patch (roof)	6
102825MS13	Milddle School	Roof	Core 2	Asphalt Patch (Hatch)	6
102825MS14	Milddle School	Roof	Core 2	Asphalt Patch (Hatch)	6
102825MS15	Milddle School	Roof	Core 3	Fiberboard	7
102825MS16	Milddle School	Roof	Core 3	Fiberboard	7
102825MS17	Milddle School	Roof	Core 3	Asphalt (top)	8
102825MS17	Milddle School	Roof	Core 3	Asphalt (top)	8

Relinquished By:	**Date/Time:** 10/28/25
Received By: J. Nerstich	**Date/Time:** 11/3/25 9:50
Relinquished By:	**Date/Time:**
Received By:	**Date/Time:**

AMERI SCI

BULK SAMPLE SHEET

117 EAST 30TH STREET
NEW YORK, NY 10016
TOLL FREE (800) 705-5227
Fax (212) 679-3114

Company: C.T. Male Associates

AMERISCI JOB #: #225111090

Project Name: Millbrook CSD

Street Address: 50 Century Hill Drive

Project Address: Millbrook, NY

Client Project #: 24.4217

City: Latham **State:** New York **Zip:** 12110

Project Manager: MFS

Phone: 518-786-7400

Analysis: . _PLM Only ___TEM Only __X_ NY ELAP PLM/TEM (268.1/268.6/268.4)
___ ASTM Dust (Microvac) ___ ASTM Dust (Wipe) ___ Other (describe in comments)

E-Mail: m.sawyer@ctmale.com

TAT:Rush ___,12Hr_ _,24 Hr_ _,48 Hr ___,72 Hr _,5D X __ **Mat'l Type:** _X Bulk ___Air ___ Water

Results to: Mike Sawyer

Sampled By: MFS

Date Sampled: 10/28/25

Special Instructions or Comments:
(Check)

Positive Stop?
Yes_X_ No ____

Field ID #	Sample Location			Sample Description/Material Type (for dust= size of surface area sampled)	Homogenous Area (HA #)
102825MS19	Milddle School	Roof	Inside	Gypsum Deck	9
102825MS20	Milddle School	Roof	Inside	Gypsum Deck	9
102825MS21	Milddle School	Roof	Inside	Felt on Gypsum Deck	10
102825MS22	Milddle School	Roof	Inside	Felt on Gypsum Deck	10
102825MS23	Milddle School	Roof	Inside	Roof Drain	12
102825MS24	Milddle School	Roof	Inside	Roof Drain	12
102825MS25	Milddle School	Roof	Inside	Roof Drain	12
102825MS26	Milddle School	Roof	Inside	Roof Drain Cladding	13
102825MS27	Milddle School	Roof	Inside	Roof Drain Cladding	13
102825MS28	Milddle School	Roof	Ramp	Asphalt Patch	14
102825MS29	Milddle School	Roof	Ramp	Asphalt Patch	14
102825MS30	Milddle School	Roof	Core 2		

C.T. MALE ASSOCIATES
Engineering, Surveying, Architecture, Landscape Architecture & Geology D.P.C.

50 Century Hill Drive, Latham, NY 12110
518.786.7400 FAX 518.786.7299 www.ctmale.com

December 2, 2025

Mr. Elliot Garcia
Assistant Superintendent for Business and Personnel
Millbrook CSD
43 Alden Place
Millbrook, NY 12545
elliot.garcia@millbrookcsd.org

Re: ***Asbestos Containing Materials Sampling & Laboratory Analysis***
Connectors - Millbrook Middle School – 43 Alden Place
Village of Millbrook, Dutchess County, New York
C.T. Male Project# 24.4217

Mr. Garcia:

C.T. Male Associates Engineering, Surveying, Architecture, Landscape Architecture & Geology D.P.C. (C.T. Male) has performed asbestos containing materials sampling and laboratory analysis of materials suspected to contain asbestos associated with Millbrook Middle School, located at 43 Alden Place in Millbrook, NY. This report is limited to materials associated with the roof. The following are the analysis results (laboratory results are attached).

Sample #	Location	Material	Results
110425MS01	Lower Corridor - Throughout	Mastic	No Asbestos Detected
110425MS02	Lower Corridor - Throughout	Mastic	No Asbestos Detected
110425MS03	Lower Corridor - Throughout	1'x1' Floor Tile (beige)	No Asbestos Detected
110425MS04	Lower Corridor - Throughout	1'x1' Floor Tile (beige)	No Asbestos Detected
110425MS05	Lower Corridor - Throughout	Mastic	<1.0% Chrysotile
110425MS06	Lower Corridor - Throughout	Mastic	Chrysotile Trace
110425MS07	Lower Corridor - Throughout	1'x1' Floor Tile (blue)	No Asbestos Detected
110425MS08	Lower Corridor - Throughout	1'x1' Floor Tile (blue)	No Asbestos Detected
110425MS09	Lower Corridor - Throughout	Interior Caulk	No Asbestos Detected
110425MS10	Lower Corridor - Throughout	Interior Caulk	No Asbestos Detected
110425MS11	Lower Corridor - Throughout	Exterior Caulk	No Asbestos Detected
110425MS12	Lower Corridor - Throughout	Exterior Caulk	No Asbestos Detected
110425MS13	Lower Corridor - Throughout	Exterior Glazing	No Asbestos Detected
110425MS14	Lower Corridor - Throughout	Exterior Glazing	No Asbestos Detected
110425MS15	Lower Corridor - Throughout	Interior Glazing	Chrysotile Trace
110425MS16	Lower Corridor - Throughout	Interior Glazing	Chrysotile Trace
110425MS17	Lower Corridor - Throughout	Cove Base	No Asbestos Detected
110425MS18	Lower Corridor - Throughout	Cove Base	No Asbestos Detected
110425MS19	Lower Corridor - Throughout	Cove Base Adhesive	Chrysotile Trace
110425MS20	Lower Corridor - Throughout	Cove Base Adhesive	No Asbestos Detected

Conclusions

Bulk samples of materials suspected of containing asbestos were sampled per NYSDOL Code Rule 56. Samples were analyzed by a NYS ELAP approved laboratory to determine asbestoform type and content. Materials containing asbestos content of more than 1% shall be identified as asbestos containing. Based upon observations and the sample results, there is 9x9 floor tile and associated mastic in some areas of the upper and lower connectors See attached plan for approximate locations. No asbestos containing materials were located in the tunnels under the connectors.

Do not hesitate to contact me at (518) 786-7480 or m.sawyer@ctmale.com should you have any questions regarding this report or need further information.

Sincerely,

C.T. MALE ASSOCIATES

Gered M. Burns
Industrial Hygienist
NYSDOL License # 25-61CSS-SHAB (Inspector and Designer)
Reviewed and Approved By:

Michael F. Sawyer
Managing Industrial Hygienist
NYSDOL License # 25-61XHJ-SHAB (Inspector and Designer)

Attachments

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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

C.T. Male Associates Engineering, Surveying, Architecture, Landscape Architecture & Geology, D.P.C.
50 Century Hill Drive, Latham, NY, 12110

License Number: 29050
License Class: RESTRICTED
Date of Issue: 02/10/2025
Expiration Date: 02/28/2026
Duly Authorized Representative: Daniel Reilly

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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

STATE OF NEW YORK - DEPARTMENT OF LABOR
ASBESTOS CERTIFICATE

N.Y.S



MICHAEL F SAWYER
CLASS(EXPIRES)
I PD (09/26) C ATEC (09/26)
H PM (09/26) D INSP (09/26)

CERT# 25-61XHJ-SHAB
DMV# 437658014

MUST BE CARRIED ON ASBESTOS PROJECTS

STATE OF NEW YORK - DEPARTMENT OF LABOR
ASBESTOS CERTIFICATE

N.Y.S



GERED BURNS
CLASS(EXPIRES)
C ATEC (09/26) D INSP (09/26)
H PM (09/26) I PD (09/26)
G SUPR (09/25)

CERT# 25-61CSS-SHAB
DMV# 708500810

MUST BE CARRIED ON ASBESTOS PROJECTS

AmeriSci New York
117 EAST 30TH ST.
NEW YORK, NY 10016
TEL: (212) 679-8600 • FAX: (212) 679-3114

PLM Bulk Asbestos Report

C. T. Male Associates
Attn: Michael Sawyer
50 Century Hill Drive
P.O. Box 727
Latham, NY 12110

Date Received 11/19/2025 **AmeriSci Job #** 225112439
Date Examined 11/24/25 **P.O. #**
ELAP # 11480 **Page** 1 **of** 4
RE: 24.4217; Millbrook CSD; Millbrook, NY

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos	Notes
110425MS01 1	225112439-01	***Yes***	2.5% (NOB by NYS ELAP 198.6) by Valeriu Voicu on 11/24/25	
Location: Middle School Lower Connector Throughout - Mastic **Analyst Description:** Black, Heterogeneous, Fibrous, Bulk Material **Asbestos Types:** Chrysotile 2.5% **Other Material:** Non-fibrous 31%				
110425MS02 1	225112439-02		NA/PS	
Location: Middle School Lower Connector Throughout - Mastic **Analyst Description:** Bulk Material **Asbestos Types:** **Other Material:**				
110425MS03 2	225112439-03	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by Valeriu Voicu on 11/24/25	*1*
Location: Middle School Lower Connector Throughout - 1'x1' Floor Tile (Beige) **Analyst Description:** Beige/Brown, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 22%				
110425MS04 2	225112439-04	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by Valeriu Voicu on 11/24/25	*1*
Location: Middle School Lower Connector Throughout - 1'x1' Floor Tile (Beige) **Analyst Description:** Beige/Brown, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 20%				
110425MS05 3	225112439-05	***Yes***	Inconclusive - Trace Chrysotile detected at 1% or less (NOB by EPA 600/M4-82-020) by Valeriu Voicu on 11/24/25	*2*
Location: Middle School Lower Connector Throughout - Mastic **Analyst Description:** Black/Brown, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** Chrysotile <0.3 % pc **Other Material:** Non-fibrous 24%				

See Reporting notes on last page

PLM Bulk Asbestos Report

24.4217; Millbrook CSD; Millbrook, NY

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos	Notes
110425MS06 3	225112439-06	***Yes***	Inconclusive - Trace Chrysotile detected at 1% or less (NOB by EPA 600/M4-82-020) by Valeriu Voicu on 11/24/25	*2*
Location: Middle School Lower Connector Throughout - Mastic **Analyst Description:** Black/Brown, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** Chrysotile <0.3 % pc **Other Material:** Non-fibrous 36%				
110425MS07 4	225112439-07	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by Valeriu Voicu on 11/24/25	*1*
Location: Middle School Lower Connector Throughout - 1'x1' Floor Tile (Blue) **Analyst Description:** Lt. Blue, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 9.0%				
110425MS08 4	225112439-08	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by Valeriu Voicu on 11/24/25	*1*
Location: Middle School Lower Connector Throughout - 1'x1' Floor Tile (Blue) **Analyst Description:** Lt. Blue, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 2.0%				
110425MS09 5	225112439-09	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by Valeriu Voicu on 11/24/25	*1*
Location: Middle School Lower Connector Throughout - Interior Caulk **Analyst Description:** Silver/Gray, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 26%				
110425MS10 5	225112439-10	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by Valeriu Voicu on 11/24/25	*1*
Location: Middle School Lower Connector Throughout - Interior Caulk **Analyst Description:** Silver/Gray, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 33%				
110425MS11 6	225112439-11	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by Valeriu Voicu on 11/24/25	*1*
Location: Middle School Lower Connector Throughout - Exterior Caulk **Analyst Description:** Gray, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 41%				
110425MS12 6	225112439-12	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by Valeriu Voicu on 11/24/25	*1*
Location: Middle School Lower Connector Throughout - Exterior Caulk **Analyst Description:** Gray, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 40%				

See Reporting notes on last page

PLM Bulk Asbestos Report

24.4217; Millbrook CSD; Millbrook, NY

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos	Notes
110425MS13 7	225112439-13	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by Valeriu Voicu on 11/24/25	*1*
Location: Middle School Lower Connector Throughout - Exterior Glazing **Analyst Description:** Gray, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Fibrous Talc Trace, Non-fibrous 3.8%				
110425MS14 7	225112439-14	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by Valeriu Voicu on 11/24/25	*1*
Location: Middle School Lower Connector Throughout - Exterior Glazing **Analyst Description:** Gray, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Fibrous Talc Trace, Non-fibrous 8.9%				
110425MS15 8	225112439-15	***Yes***	Inconclusive - Trace Chrysotile detected at 1% or less (NOB by EPA 600/M4-82-020) by Valeriu Voicu on 11/24/25	*2*
Location: Middle School Lower Connector Throughout - Interior Glazing **Analyst Description:** Gray, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** Chrysotile <0.3 % pc **Other Material:** Non-fibrous 1.2%				
110425MS16 8	225112439-16	***Yes***	Inconclusive - Trace Chrysotile detected at 1% or less (NOB by EPA 600/M4-82-020) by Valeriu Voicu on 11/24/25	*2*
Location: Middle School Lower Connector Throughout - Interior Glazing **Analyst Description:** Gray, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** Chrysotile <0.3 % pc **Other Material:** Non-fibrous 31%				
110425MS17 9	225112439-17	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by Valeriu Voicu on 11/24/25	*1*
Location: Middle School Lower Connector Throughout - Cove Base **Analyst Description:** Black, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 2.4%				
110425MS18 9	225112439-18	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by Valeriu Voicu on 11/24/25	*1*
Location: Middle School Lower Connector Throughout - Cove Base **Analyst Description:** Black, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 3.0%				
110425MS19 10	225112439-19	***Yes***	Inconclusive - Trace Chrysotile detected at 1% or less (NOB by EPA 600/M4-82-020) by Valeriu Voicu on 11/24/25	*2*
Location: Middle School Lower Connector Throughout - Cove Base Adhesive **Analyst Description:** Brown/Black, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** Chrysotile <0.3 % pc **Other Material:** Non-fibrous 13%				

See Reporting notes on last page

PLM Bulk Asbestos Report

24.4217; Millbrook CSD; Millbrook, NY

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos	Notes
110425MS2010	225112439-20	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by Valeriu Voicu on 11/24/25	*1*

Location: Middle School Lower Connector Throughout - Cove Base Adhesive
Analyst Description: Tan/Blue, Heterogeneous, Non-Fibrous, Bulk Material
Asbestos Types:
Other Material: Non-fibrous 22%

Reporting Notes:

(1) NAD results by NYS 198.6 are inconclusive and are not considered non-ACM

(2) Trace <1% results by NYS 198.6 are inconclusive and are not considered non-ACM

Analyzed by: Valeriu Voicu
Date: 11/24/2025

Reviewed by: Marik Peysakhov

*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

Client Name: C. T. Male Associates

Table I
Summary of Bulk Asbestos Analysis Results by NYS ELAP 198.4

24.4217; Millbrook CSD; Millbrook, NY

AmeriSci Sample #	Client Sample#	HG Area	NOB Sample Weight (gram)	NOB Heat Sensitive Organic %	NOB Acid Soluble Inorganic %	NOB Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
01	110425MS01	1	0.307	43.3	23.2	31.0	Chrysotile 2.5	NA
Location: Middle School Lower Connector Throughout - Mastic								
02	110425MS02	1	0.171	48.9	19.2	31.9	NA/PS	NA
Location: Middle School Lower Connector Throughout - Mastic								
03	110425MS03	2	0.412	20.4	56.8	22.7	NAD	NAD
Location: Middle School Lower Connector Throughout - 1'x1' Floor Tile (Beige)								
04	110425MS04	2	0.300	20.3	59.5	20.2	NAD	NAD
Location: Middle School Lower Connector Throughout - 1'x1' Floor Tile (Beige)								
05	110425MS05	3	0.519	12.6	62.6	24.6	Chrysotile <0.3	Chrysotile <1.0
Location: Middle School Lower Connector Throughout - Mastic								
06	110425MS06	3	0.291	16.6	47.3	36.0	Chrysotile <0.3	Chrysotile Trace
Location: Middle School Lower Connector Throughout - Mastic								
07	110425MS07	4	0.365	14.7	76.3	9.0	NAD	NAD
Location: Middle School Lower Connector Throughout - 1'x1' Floor Tile (Blue)								
08	110425MS08	4	0.257	13.5	84.5	2.0	NAD	NAD
Location: Middle School Lower Connector Throughout - 1'x1' Floor Tile (Blue)								
09	110425MS09	5	0.248	59.5	13.9	26.6	NAD	NAD
Location: Middle School Lower Connector Throughout - Interior Caulk								
10	110425MS10	5	0.292	57.3	9.7	33.0	NAD	NAD
Location: Middle School Lower Connector Throughout - Interior Caulk								
11	110425MS11	6	0.431	47.6	11.3	41.1	NAD	NAD
Location: Middle School Lower Connector Throughout - Exterior Caulk								
12	110425MS12	6	0.391	46.1	13.1	40.8	NAD	NAD
Location: Middle School Lower Connector Throughout - Exterior Caulk								
13	110425MS13	7	0.349	7.5	88.7	3.8	NAD	NAD
Location: Middle School Lower Connector Throughout - Exterior Glazing								
14	110425MS14	7	0.464	8.4	82.7	8.9	NAD	NAD
Location: Middle School Lower Connector Throughout - Exterior Glazing								
15	110425MS15	8	0.511	12.3	86.5	1.1	Chrysotile <0.3	Chrysotile Trace
Location: Middle School Lower Connector Throughout - Interior Glazing								
16	110425MS16	8	0.758	8.4	60.1	31.4	Chrysotile <0.3	Chrysotile Trace
Location: Middle School Lower Connector Throughout - Interior Glazing								

See Reporting notes on last page

Table I
Summary of Bulk Asbestos Analysis Results by NYS ELAP 198.4

24.4217; Millbrook CSD; Millbrook, NY

AmeriSci Sample #	Client Sample#	HG Area	NOB Sample Weight (gram)	NOB Heat Sensitive Organic %	NOB Acid Soluble Inorganic %	NOB Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
17	110425MS17	9	0.316	30.6	67.1	2.4	NAD	NAD
Location:	Middle School Lower Connector Throughout - Cove Base							
18	110425MS18	9	0.423	30.4	66.6	3.0	NAD	NAD
Location:	Middle School Lower Connector Throughout - Cove Base							
19	110425MS19	10	0.301	39.3	47.6	13.0	Chrysotile <0.3	Chrysotile Trace
Location:	Middle School Lower Connector Throughout - Cove Base Adhesive							
20	110425MS20	10	0.357	61.3	16.3	22.3	NAD	NAD
Location:	Middle School Lower Connector Throughout - Cove Base Adhesive							

Analyzed by: Marik Peysakhov
Date: 11/24/2025



Reviewed by: Marik Peysakhov



**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).

Relinquished By: _____ Date/Time: 11/17/25

Received By: _____ Date/Time: 11/19/25 1030

Relinquished By: _____ Date/Time: _____

Received By: _____ Date/Time: _____

AMERI SCI

BULK SAMPLE SHEET

117 EAST 30TH STREET
NEW YORK, NY 10016
TOLL FREE (800) 705-5227
Fax (212) 679-3114

AMERISCI JOB#: #225112439

Company: C.T. Male Associates

Project Name: Millbrook CSD

Street Address: 50 Century Hill Drive

Project Address: Millbrook, NY

Client Project #: 24.4217

City: Latham **State:** New York **Zip:** 12110

Project Manager: MFS

Phone: 518-786-7400

Analysis: . _PLM Only ___TEM Only __X_ NY ELAP PLM/TEM (268.1/268.6/268.4)
___ ASTM Dust (Microvac) ___ ASTM Dust (Wipe) ___ Other (describe in comments)

E-Mail: m.sawyer@ctmale.com

TAT:Rush ___,12Hr_ _,24 Hr_ _,48 Hr ___,72 Hr _,5D X __ **Mat'l Type: _X Bulk ___Air ___Water**

Results to: Mike Sawyer

Sampled By: MFS

Date Sampled: 11/17/25

Special Instructions or Comments:

Positive Stop? (Check)

Yes_X_ No ____

Field ID #	Sample Location			Sample Description/Material Type (for dust= size of surface area sampled)	Homogenous Area (HA #)
110425MS01	Middle School	Lower Connector	Throughout	Mastic	1
110425MS02	Middle School	Lower Connector	Throughout	Mastic	1
110425MS03	Middle School	Lower Connector	Throughout	1'x1' Floor Tile (beige)	2
110425MS04	Middle School	Lower Connector	Throughout	1'x1' Floor Tile (beige)	2
110425MS05	Middle School	Lower Connector	Throughout	Mastic	3
110425MS06	Middle School	Lower Connector	Throughout	Mastic	3
110425MS07	Middle School	Lower Connector	Throughout	1'x1' Floor Tile (blue)	4
110425MS08	Middle School	Lower Connector	Throughout	1'x1' Floor Tile (blue)	4
110425MS09	Middle School	Lower Connector	Throughout	Interior Caulk	5
110425MS10	Middle School	Lower Connector	Throughout	Interior Caulk	5
110425MS11	Middle School	Lower Connector	Throughout	Exterior Caulk	6
110425MS12	Middle School	Lower Connector	Throughout	Exterior Caulk	6
110425MS13	Middle School	Lower Connector	Throughout	Exterior Glazing	7
110425MS14	Middle School	Lower Connector	Throughout	Exterior Glazing	7
110425MS15	Middle School	Lower Connector	Throughout	Interior Glazing	8
110425MS16	Middle School	Lower Connector	Throughout	Interior Glazing	8
110425MS17	Middle School	Lower Connector	Throughout	Cove Base	9
110425MS18	Middle School	Lower Connector	Throughout	Cove Base	9
110425MS19	Middle School	Lower Connector	Throughout	Cove Base Adhesive	10
110425MS20	Middle School	Lower Connector	Throughout	Cove Base Adhesive	10

MILLBROOK CENTRAL SCHOOL DISTRICT BID PROPOSAL FORM

BOND PROJECTS PHASE 1b at MILLBROOK MIDDLE and HIGH SCHOOLS

NAME OF BIDDER: _____

BUSINESS ADDRESS: _____

TELEPHONE NUMBER: _____ **DATE OF BID:** _____

The bidder mentioned above declares and certifies:

First: That said bidder is of lawful age and the only one interested in this bid, and that no one other than said bidder has any interest herein.

Second: That this bid is made without any previous understanding, agreement, or connection with any other person, firm, or corporation making a bid for the same purpose, and is in all respects fair and without collusion or fraud.

Third: That no member of the Board of Education of the Millbrook Central School District, Town of Washington, New York, nor any officer or employee or person whose salary is payable as a whole or in part from the treasury of said Board of Education is directly or indirectly interested in this bid or in the supplies, materials, equipment, work, or services to which it relates, or in any portion of the profits thereof.

Fourth: That said bidder has carefully examined the Instruction to Bidders, schedules, and specifications prepared under the direction of the Board of Education, and will, if successful in this bid, furnish and deliver at the prices bid and within the time stated, all materials, supplies, apparatus, goods, wares, merchandise, services, or labor for which this bid is made.

Fifth: Not used.

Sixth: That the prices quoted are exclusive of all federal, state, and municipal sales and excise taxes.

Seventh: The undersigned further declares that he has received and examined the following addenda:

Addendum No. _____ Dated: _____

Addendum No. _____ Dated: _____

Addendum No. _____ Dated: _____

FOR PROPOSAL FORM TO BE VALID, ALL PAGES OF THE PROPOSAL FORM MUST BE DULY EXECUTED.

Eighth: The Bidder shall check here ____ if the bid has been based upon equivalents in lieu of any kind, type, brand, or manufacturer of material other than those named in the specifications. If checked, the Bidder shall submit the Equivalency Form in accordance with Instructions to Bidders, Paragraph 8B. This item in no way prohibits the Bidder from submitting equivalents after the award of contract.

Ninth: The undersigned further understands and agrees that he is to furnish all labor, materials, equipment, supplies, and other facilities and things necessary and required for the execution and completion of Bond Projects, Phase 1a at Millbrook Middle School in strict accordance with the contract documents:

BASE BID No. MS-1 – GENERAL CONSTRUCTION

Bidder shall state the complete price to perform all site, roofing, general construction, demolition, and abatement work at the Millbrook Middle School as shown on the drawings and specified herein.

$_____

Bid price in dollars and cents

_____

Bid price written in words

Add Alternate No. 1 to Base Bid MS-1

Bidder shall state the complete price to be added to the Base Bid to provide the areaway overflow drainage piping as shown on the drawings and specified herein.

$_____

Alternate price in dollars and cents

_____

Alternate price written in words

BASE BID No. MS-2 – MECHANICAL CONSTRUCTION

Bidder shall state the complete price to perform all mechanical work, including the installation of equipment supplied by the Owner, at the Millbrook Middle School as shown on the drawings and specified herein.

$_____

Bid price in dollars and cents

_____

Bid price written in words

BASE BID No. MS-3 – ELECTRICAL CONSTRUCTION

Bidder shall state the complete price to perform all electrical, IT, life safety, and special systems work at the Millbrook Middle School as shown on the drawings and specified herein.

$_____

Bid price in dollars and cents

_____

Bid price written in words

BASE BID No. HS-1 – SINGLE-PRIME CONTRACT

Bidder shall state the complete price to perform all work at the Millbrook High School as shown on the drawings and specified herein.

$_____

Bid price in dollars and cents

_____

Bid price written in words

UNIT PRICES

Should the contract work be increased or decreased as per the General Conditions of the Contract, Article 8, Changes in the Work, the bidder hereby agrees that the following unit price is the basis for the extra or credit. The price includes all labor, material, overhead, profit, administration, insurance, taxes, and incidental or contributory items, or cost to the contractor and/or supplier in connection therewith. The price stipulated below shall be the amount of extra or credit applied to the contract for the increase or decrease in the scope of work.

1. Abate pipe fitting TSI up to 3" dia. pipe $_____ each fitting
2. Abate pipe fitting TSI from 3" to 6" dia. pipe $_____ each fitting
3. Abate pipe TSI up to 3" dia. pipe $_____ each 10lf section
4. Abate pipe TSI from 3" to 6" dia. pipe $_____ each 10lf section
5. Abate VAT and install VCT $_____ per sf
6. Abate VAT and install VCT $_____ per 800sf classroom
7. Rock removal $_____ per CY

The Board of Education hereby reserves the right to accept or reject any item set forth individually in Paragraph Nine above. The Owner may determine the lowest bid by adding one base bid to other base bid(s) and/or by adding to or deducting from those base bid(s), additive or deduct alternates, unit prices, or substitutions, if any, which the Owner elects to accept after the opening of bids.

Tenth: **BID SECURITY**

Each bidder shall deposit with his bid a bid bond, bank draft, or certified check in the amount of not less than five percent (5%) of the Base Bid made payable to:

Board of Education, Millbrook CSD in the amount:

_____ $(_____)

AND agrees such surety shall be a measure of liquidated damages should he default in delivery of agreement.

Eleventh: **COMPLETION** (Contractor shall fill in number of days)

It is intended that the work under this contract be completed substantially within _____ consecutive calendar days after receipt of authorized letter of intent issued by the District.

Twelfth: **NON-COLLUSIVE BIDDING CERTIFICATION**
General Municipal Law, Section 103-d
(Submit with Bid Proposal Form)

A. By submission of this bid, the bidder and each person signing on behalf of the bidder certifies, and if this is a joint bid each party hereto certifies as to its own organization, under penalty of perjury that to the best of the bidder's knowledge and belief:

1. 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;

2. Unless otherwise required by law, the prices which 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

3. No attempt has been made or will be made by the bidder to induce any other person, partnership, or corporation to submit a bid for the purpose of restricting competition.

B. A bid shall not be considered for award nor shall award be made where A-1, 2, and 3 above have not been complied with provided, however, that if in any case the bidder shall so state and shall furnish with a bid a signed statement which sets forth in detail the reasons therefore, where A-1, 2, and 3 above have not been complied with, the bid shall not be considered for award nor shall any award be made unless the head of the purchasing unit of the political subdivision, public department agency, or official thereof to which the bid is made, or his designee, determines that such disclosure was not made for the purpose of restricting competition.

The fact that the 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 Paragraph A above.

C. If the bidder is a corporation, the corporation shall be deemed to have been authorized by the Board of Directors of the bidder to make the above certification and such authorization shall be deemed to include the signing and submission of the bid and the inclusion therein of the certificate as to non-collusion as the act and deed of the corporation.

(Seal of Corporation) _____
Corporate or Company Name

By: _____
Signature Title

Date: _____

Thirteenth: On acceptance of this proposal for said work, the undersigned hereby binds himself or themselves to enter into written contract with the Board of Education within ten (10) days of date of notice of award, and to comply in all respects with the provisions set forth in "Instructions for Bidders" and "General Conditions of Contract" in relation to security for the faithful performance of the terms of said contract.

IF A CORPORATION (Seal of corporation):

NAME	ADDRESS
President	
Secretary	
Treasurer	

IF A FIRM:

NAME OF MEMBERS	ADDRESS

PROPOSED EQUIVALENT FORM

Project: _____

Name of Bidder (Corporate Name): _____

Date: _____ Prime Contract For: _____

In accordance with Instructions to Bidders, Article 8, the above listed Bidder proposes the following materials, equipment, or methods for consideration by the Architect as equivalents to those specified or shown in the Contract Documents, and for incorporation into the Work at no additional cost to the Owner. The Contractor is aware of the risk of acceptance.

Project Manual Section Number and Specified Product	Proposed Equivalent

PROPOSED SUBSTITUTION FORM

The Base Bid Contract Sum proposed by the undersigned on the preceding Bid Proposal Form is based upon all items exactly as shown and described in the Contract Documents. For the Owner's consideration, the Bidder proposes the following substitute materials, equipment, or methods to be used in the work, in lieu of those specified, with a credit for cost savings to the Owner if accepted. Refer to Article 8(c) of the Instructions to Bidders.

	Specified Product and Section Number	Proposed Substitute	Credit Amount
1.	_____	_____	
	_____	_____	$_____
2.	_____	_____	
	_____	_____	$_____
3.	_____	_____	
	_____	_____	$_____

Name of Bidder (Corporate Name):_____

Date: _____ By: _____
Signature of Corporate Officer

CERTIFICATION OF COMPLIANCE WITH THE IRAN DIVESTMENT ACT

As a result of the Iran Divestment Act of 2012 (the "Act"), Chapter 1 of the 2012 Laws of New York, a new provision has been added to State Finance Law (SFL) § 165-a and New York General Municipal Law § 103-g, both effective April 12, 2012. Under the Act, the Commissioner of the Office of General Services (OGS) will be developing a list of "persons" who are engaged in "investment activities in Iran" (both are defined terms in the law) (the "Prohibited Entities List"). Pursuant to SFL § 165-a(3)(b), the initial list is expected to be issued no later than 120 days after the Act's effective date at which time it will be posted on the OGS website.

By submitting a bid in response to this solicitation or by assuming the responsibility of a Contract awarded hereunder, each Bidder/Contractor, any person signing on behalf of any Bidder/Contractor and any assignee or subcontractor and, in the case of a joint bid, each party thereto, certifies, under penalty of perjury, that once the Prohibited Entities List is posted on the OGS website, that to the best of its knowledge and belief, that each Bidder/Contractor and any subcontractor or assignee is not identified on the Prohibited Entities List created pursuant to SFL § 165-a(3)(b).

Additionally, Bidder/Contractor is advised that once the Prohibited Entities List is posted on the OGS Website, any Bidder/Contractor seeking to renew or extend a Contract or assume the responsibility of a Contract awarded in response to this solicitation must certify at the time the Contract is renewed, extended or assigned that it is not included on the Prohibited Entities List.

During the term of the Contract, should the School District receive information that a Bidder/Contractor is in violation of the above-referenced certification, the School District will offer the person or entity an opportunity to respond. If the person or entity fails to demonstrate that he/she/it has ceased engagement in the investment which is in violation of the Act within 90 days after the determination of such violation, then the School District shall take such action as may be appropriate including, but not limited to, imposing sanctions, seeking compliance, recovering damages or declaring the Bidder/Contractor in default. The School District reserves the right to reject any bid or request for assignment for a Bidder/Contractor that appears on the Prohibited Entities List prior to the award of a contract and to pursue a responsibility review with respect to any Bidder/Contractor that is awarded a contract and subsequently appears on the Prohibited Entities List.

I, _____, being duly sworn, deposes and says that he/she is

the _____ of the _____ Corporation and that

neither the Bidder/ Contractor nor any proposed subcontractor is identified on the Prohibited Entities List.

_____

SIGNED

SWORN to before me this

_____ day of _____

20____

Notary Public: _____

DECLARATION OF BIDDER'S INABILITY TO PROVIDE CERTIFICATION OF COMPLIANCE WITH THE IRAN DIVESTMENT ACT

Bidders shall complete this form if they cannot certify that the bidder /contractor or any proposed subcontractor is not identified on the Prohibited Entities List. The District reserves the right to undertake any investigation into the information provided herein or to request additional information from the bidder.

Name of the Bidder: _____

Address of Bidder: _____

Has bidder been involved in investment activities in Iran? _____
Describe the type of activities including but not limited to the amounts and the nature of the investments (*e.g*. banking, energy, real estate)_____
_____
_____
_____

If so, when did the first investment activity occur? _____

Have the investment activities ended? _____

If so, what was the date of the last investment activity?_____

If not, have the investment activities increased or expanded since April 12, 2012? _____

Has the bidder adopted, publicized, or implemented a formal plan to cease the investment activities in Iran and to refrain from engaging in any new investments in Iran?_____

If so, provide the date of the adoption of the plan by the bidder and proof of the adopted resolution, if any and a copy of the formal plan. _____

In detail, state the reasons why the bidder cannot provide the Certification of Compliance with the Iran Divestment Act below (additional pages may be attached):
_____
_____
_____
_____
_____
_____

I, _____ being duly sworn, deposes and says that he/she is the

_____ of the _____ Corporation and the foregoing

is true and accurate.

_____
SIGNED

SWORN to before me this

_____ day of _____

20____
Notary Public: _____

IRAN DIVESTMENT ACT COMPLIANCE RIDER

FOR SCHOOL DISTRICTS

The Iran Divestment Act of 2012, effective as of April 12, 2012, is codified at State Finance Law ("SFL") §165-a and General Municipal Law ("GML") §103-g. The Iran Divestment Act, with certain exceptions, prohibits municipalities, including the District, from entering into contracts with persons engaged in investment activities in the energy sector of Iran. Pursuant to the terms set forth in SFL §165-a and GML §103-g, a person engages in investment activities in the energy sector of Iran if:

(a) The person provides goods or services of twenty million dollars or more in the energy sector of Iran, including a person that provides oil or liquefied natural gas tankers, or products used to construct or maintain pipelines used to transport oil or liquefied natural gas, for the energy sector of Iran; or

(b) The person is a financial institution that extends twenty million dollars or more in credit to another person, for forty-five days or more, if that person will use the credit to provide goods or services in the energy sector in Iran and is identified on a list created pursuant to paragraph (b) of subdivision three of Section 165-a of the SFL and maintained by the Commissioner of the Office of General Services.

A bid or proposal shall not be considered for award nor shall any award be made where the bidder or proposer fails to submit a signed and verified bidder's certification.

Each bidder or proposer must certify that it is not on the list of entities engaged in investment activities in Iran created pursuant to paragraph (b) of subdivision 3 of Section 165-a of the SFL. In any case where the bidder or proposer cannot certify that it is not on such list, the bidder or proposer shall so state and shall furnish with the bid or proposal a signed statement which sets forth in detail the reasons why such statement cannot be made. The District may award a bid to a bidder who cannot make the certificate on a case by case basis if:

(1) The investment activities in Iran were made before the effective date of this section (i.e., April 12, 2012), the investment activities in Iran have not been expanded or renewed after the effective date of this section and the person has adopted, publicized and is implementing a formal plan to cease the investment activities in Iran and to refrain from engaging in any new investments in Iran; or

(2) The District makes a determination that the goods or services are necessary for the District to perform its functions and that, absent an exemption, the District would be unable to obtain the goods or services for which the contract is offered. Such determination shall be made in writing and shall be a public document.

STATEMENT OF BIDDER'S QUALIFICATIONS

1. Name of Bidder:

_____

2. Type of Business Entity:

_____

3. If the bidder is a corporation, state the date and place of incorporation of the corporation. If a partnership, state the date of organization and type of partnership. If individually owned, state the date of organization. If the form of your organization is other than those listed above, please describe.

_____

4. For how many years has the bidder done business under its present name, and how many years has your organization been in business as a contractor?

_____

5a. List the persons who are directors, officers, principals, owners, managerial employees or partners in the bidder's business.

_____

_____

5b. Under what other or former names has your organization operated?

_____

_____

6. Have any of the persons listed in Number 5 owned/operated/been shareholders in any other companies? If so, please state name of the person(s) who has owned/operated/been shareholders and name(s) of other companies:

7. Has your organization ever failed to complete any work awarded to it?

8. Has any director, officer, owner or managerial employee had any professional license suspended or revoked? If the answer to this question is yes, list the name of the individual, the professional license he/she formerly held, whether said license was revoked or suspended and the date of the revocation or suspension.

9. During the three year period preceding the submission of this bid, has the bidder been found guilty of any OSHA Violations? If the answer to this question is yes, describe the nature of the OSHA violation, an explanation of remediation or other steps taken regarding such violation(s).

10. During the five year period preceding the submission of this bid, has the bidder been charged with any claims pertaining to unlawful intimidation or discrimination against any employee by reason of race, creed, color, disability, sex or natural origin and/or violations of an employee's civil rights or equal employment opportunities? If the answer to this question is yes, list the persons making such claim against the bidder, a description of the claim, the status of the claim, and what disposition (if any) ahs been made regarding such claim.

11. During the five year period preceding the submission of this bid, has the bidder been named as a party in any lawsuit in an action involving a claim for personal injury or wrongful death arising from performance or work related to any project in which it has been engaged? If the answer to this question is yes, list all such lawsuits, the index number associated with said suit and the status of the lawsuit at the time of the submission of this bid.

12. During the five year period preceding the submission of this bid, has the bidder been the subject of an investigation and/or proceedings before the Department of Labor for alleged violations of the Labor Law as it relates to the payment of prevailing wages and/or supplemental payment requirements? If the answer to this question is yes, please list each such instance of the commencement of a Department of labor proceeding, for which project such proceeding was commenced, and the status of the proceeding at the time of the submission of this bid.

13. During the five year period preceding the bidder's submission of this bid, has the bidder been the subject of an investigation and/or proceeding before any law enforcement agency, including, but not limited to any District Attorney's Office? If the answer to this question is yes, please list each such instance, the law enforcement agency, the nature of the proceeding, the project for which such proceeding was commenced, if applicable to a project, and the status of the proceeding at the time of the submission of this bid.

14. During the five year period preceding the bidder's submission of this bid, has the bidder been the subject of proceedings involving allegations that it violated the Workers' Compensation Law including, but not limited to the failure to provide proof of worker's compensation or disability coverage and/or any lapses thereof. If the answer to this question is yes, list each such instance of violation and the status of the claimed violation at the time of the submissions of this bid.

15. Has the bidder, its officers, directors, owner and/or managerial employees been convicted of a crime or been the subject of a criminal indictment during the five years preceding the submission of this bid? If the answer to this question is yes, list the name of the individual convicted or indicated, the charge against the individual and the date of disposition of the charge.

16. During the five year period preceding the bidder's submission of this bid, has the bidder been charged with and/or found guilty of any violations of federal, state, or municipal environmental and/or health laws, codes, rules and/or regulations? If the answer to this question is yes, list the nature of the charge against the bidder, the date of the charge, and the status of the charge at the time of the submission of this bid.

17. Does the bidder have any major construction projects ongoing at the time of the submission of this bid? If the answer to this question is yes, list the projects on which the bidder is currently working, the percentage complete, and the owner, architect, contract amount and the expected date of completion of said project. State total worth of work in progress and under contract.

18. Has the bidder ever been terminated from a Project by the Owner? If the answer to this question is yes, list the projects on which the bidder was terminated, the nature of the termination (convenience, suspension, for cause), and the date of said termination.

19. Are there any other judgments, claims, arbitration proceedings or suits pending or outstanding against your organization or its officers?

_____

_____

_____

_____

Dated: By: _____
(Signature)

_____
(Print Name and Title)

Sworn to before me this

_____ day of _____, 201__.

_____
Notary Public

CERTIFICATION REGARDING WORKPLACE SEXUAL HARASSMENT/TRAINING

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 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.

If this is submitted by a corporate entity, the certification shall be deemed to have been authorized by the board of directors (or comparable entity) of the bidder, and such authorization shall be deemed to include the signing and submission of this bid and the inclusion therein of this certification as the act and deed of the corporate entity.

Name of Bidder: _____ (Print)

_____ (Signature)

_____ (Print Name)

_____ (Print Title)

Date: _____

Labor Law Section 220-i Certification

This Certification is provided pursuant to Section 220-i of the New York Labor Law, which requires contractors and subcontractors submitting bids or performing work on a covered project to be registered with the New York State Department of Labor (NYSDOL). This Certification must be completed and submitted as part of your bid proposal.

- NYSDOL Registration Number: _____
- Registration Expiration Date: _____

By signing below, the person authorized to sign on behalf of the Bidder hereby certifies, under penalty of perjury, that the Bidder and each of its subcontractors are registered with the New York State Department of Labor pursuant to Section 220-i of the New York Labor Law.

Bidder further represent that it included with this Certification, a copy of the Certificate(s) of Registration issued by the Commissioner of the Department of Labor for the Bidder and each of its subcontractor(s).

I further certify that I will provide immediate written notice to the Owner if the contractor or any subcontractor's registration becomes suspended, revoked, or expired at any point prior to or during the course of the project.

Project: _____

Signature: _____

Bidder Name: _____

Bidder Title: _____

Company Name: _____

Date: _____

AIA® Document A132® – 2019

Standard Form of Agreement Between Owner and Contractor, Construction Manager as Adviser Edition

AGREEMENT made as of the __ day of ____ in the year _____
(In words, indicate day, month, and year.)

BETWEEN the Owner:
(Name, legal status, address, and other information)

and the Contractor:
(Name, legal status, address, and other information)

for the following Project:
(Name, location, and detailed description)

The Construction Manager:
(Name, legal status, address, and other information)

The Architect:
(Name, legal status, address, and other information)

The Owner and Contractor agree as follows.

ADDITIONS AND DELETIONS:
The author of this document may have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

This document is intended to be used in conjunction with AIA Documents A232™–2019, General Conditions of the Contract for Construction, Construction Manager as Adviser Edition; B132™–2019, Standard Form of Agreement Between Owner and Architect, Construction Manager as Adviser Edition; and C132™–2019, Standard Form of Agreement Between Owner and Construction Manager as Adviser.

AIA Document A232™–2019 is adopted in this document by reference. Do not use with other general conditions unless this document is modified.

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ARTICLE 1 THE CONTRACT DOCUMENTS

The Contract Documents consist of this Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, Addenda issued prior to execution of this Agreement, other documents listed in this Agreement, the Notice to Bidders, Instructions to Bidders, sample forms, and the Contractor's bid, pricing proposals submitted by the Contract and accepted by the Owner, and Modifications issued after execution of this Agreement, all of which form the Contract, and are as fully a part of the Contract as if attached to this Agreement or repeated herein. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. An enumeration of the Contract Documents, other than Modifications, appears in Article 9. In the event of a conflict between the Contract Documents, the order of precedence shall be as follows unless otherwise specified: (1) this Agreement (including all executed Exhibits), (2) Supplementary Conditions, (3) General Conditions (A232–2019), (4) Specifications, (5) Drawings. Ambiguities or inconsistencies shall be resolved by reference to the intent and scope described in the Agreement and the Specifications, with written clarifications and Modifications taking precedence.

ARTICLE 2 THE WORK OF THIS CONTRACT

The Contractor shall fully execute the Work described in the Contract Documents, except as specifically indicated in the Contract Documents to be the responsibility of others.

ARTICLE 3 DATE OF COMMENCEMENT AND DATES OF SUBSTANTIAL COMPLETION

§ 3.1 The date of commencement of the Work shall be:
(Check one of the following boxes.)

[ ] The date of this Agreement.

[ ] A date set forth in a notice to proceed issued by the Owner.

[ ] Established as follows:

(Insert a date or a means to determine the date of commencement of the Work.)

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If a date of commencement of the Work is not selected, then the date of commencement shall be the date of this Agreement.

§ 3.2 The Contract Time shall be measured from the date of commencement of the Work. The Contractor shall not commence Work until receipt of a written Notice to Proceed issued by the Owner and evidence of all required insurance and bonds. Any mobilization or procurement prior to such written notice shall be at the Contractor's sole risk and expense.

§ 3.3 Substantial Completion of the Project or Portions Thereof

§ 3.3.1 Subject to adjustments of the Contract Time as provided in the Contract Documents, the date of Substantial Completion of the Work of all of the Contractors for the Project will be:
(Insert the date of Substantial Completion of the Work of all Contractors for the Project.)

§ 3.3.2 Subject to adjustments of the Contract Time as provided in the Contract Documents, if portions of the Work of all of the Contractors for the Project are to be completed prior to Substantial Completion of the entire Work of all of the Contractors for the Project, the Contractors shall achieve Substantial Completion of such portions by the following dates:

Portion of Work	Substantial Completion Date

§ 3.4 When the Work of this Contract, or any Portion Thereof, is Substantially Complete

§ 3.4.1 Subject to adjustments of the Contract Time as provided in the Contract Documents, the Contractor shall substantially complete the entire Work of this Contract:
(Check one of the following boxes and complete the necessary information.)

[ ] Not later than ( ) calendar days from the date of commencement of the Work.

[ ] By the following date:

§ 3.4.2 Subject to adjustments of the Contract Time as provided in the Contract Documents, if portions of the Work of this Contract are to be substantially complete prior to when the entire Work of this Contract shall be substantially complete, the Contractor shall substantially complete such portions by the following dates:

Portion of Work	Date to be substantially complete

§ 3.4.3 If the Contractor fails to substantially complete the Work of this Contract, or portions thereof, as provided in this Section 3.4, liquidated damages, if any, shall be assessed as set forth in Section 4.5. Liquidated damages shall not be construed as the exclusive remedy of the Owner, which retains all other rights and remedies at law or in equity, including actual damages.

ARTICLE 4 CONTRACT SUM

§ 4.1 The Owner shall pay the Contractor the Contract Sum in current funds for the Contractor's performance of the Contract. The Contract Sum shall be one of the following:
(Check the appropriate box.)

[ ] Stipulated Sum, in accordance with Section 4.2 below

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[ ] Cost of the Work plus the Contractor's Fee, in accordance with Section 4.3 below

[ ] Cost of the Work plus the Contractor's Fee with a Guaranteed Maximum Price, in accordance with Section 4.4 below

(Based on the selection above, complete Section 4.2, 4.3 or 4.4 below.)

§ 4.2 Stipulated Sum

§ 4.2.1 The Contract Sum shall be ($), subject to additions and deductions as provided in the Contract Documents. No payment shall be deemed to waive defects in the Work, or to constitute acceptance of Work not in full compliance with the Contract Documents.

§ 4.2.2 Alternates

§ 4.2.2.1 Alternates, if any, included in the Contract Sum:

Item	Price

§ 4.2.2.2 Subject to the conditions noted below, the following alternates may be accepted by the Owner following execution of this Agreement. Upon acceptance, the Owner shall issue a Modification to this Agreement.
(Insert below each alternate and the conditions that must be met for the Owner to accept the alternate.)

Item	Price	Conditions for Acceptance

§ 4.2.3 Allowances, if any, included in the Contract Sum:
(Identify each allowance.)

Item	Price

§ 4.2.4 Unit prices, if any:
(Identify the item and state the unit price, and quantity limitations, if any, to which the unit price will be applicable.)

Item	Units and Limitations	Price per Unit ($0.00)

§ 4.3 Cost of the Work Plus Contractor's Fee without a Guaranteed Maximum Price

§ 4.3.1 The Cost of the Work is as defined in Exhibit B, Determination of the Cost of the Work.

§ 4.3.2 The Contractor's Fee:
(State a lump sum, percentage of Cost of the Work or other provision for determining the Contractor's Fee.)

§ 4.3.3 The method of adjustment of the Contractor's Fee for changes in the Work:

§ 4.3.4 Limitations, if any, on a Subcontractor's overhead and profit for increases in the cost of its portion of the Work:

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§ 4.3.5 Rental rates for Contractor-owned equipment shall not exceed percent (%) of the standard rental rate paid at the place of the Project.

§ 4.3.6 Unit prices, if any:
(Identify the item and state the unit price and quantity limitations, if any, to which the unit price will be applicable.)

Item	Units and Limitations	Price per Unit ($0.00)

§ 4.3.7 The Contractor shall prepare and submit to the Construction Manager, within 14 days of executing this Agreement, a written Control Estimate for the Owner's review and approval. The Control Estimate shall include the items in Section B.1 of Exhibit B, Determination of the Cost of the Work.

§ 4.4 Cost of the Work Plus Contractor's Fee with a Guaranteed Maximum Price
§ 4.4.1 The Cost of the Work is as defined in Exhibit B, Determination of the Cost of the Work.

§ 4.4.2 The Contractor's Fee:
(State a lump sum, percentage of Cost of the Work or other provision for determining the Contractor's Fee.)

§ 4.4.3 The method of adjustment of the Contractor's Fee for changes in the Work:

§ 4.4.4 Limitations, if any, on a Subcontractor's overhead and profit for increases in the cost of its portion of the Work:

§ 4.4.5 Rental rates for Contractor-owned equipment shall not exceed percent (%) of the standard rental rate paid at the place of the Project.

§ 4.4.6 Unit Prices, if any:
(Identify the item and state the unit price and quantity limitations, if any, to which the unit price will be applicable.)

Item	Units and Limitations	Price per Unit ($0.00)

§ 4.4.7 Guaranteed Maximum Price
§ 4.4.7.1 The Contract Sum is guaranteed by the Contractor not to exceed ($), subject to additions and deductions by Change Order as provided in the Contract Documents. This maximum sum is referred to in the Contract Documents as the Guaranteed Maximum Price. Costs which would cause the Guaranteed Maximum Price to be exceeded shall be paid by the Contractor without reimbursement by the Owner.

§ 4.4.7.2 Alternates
§ 4.4.7.2.1 Alternates, if any, included in the Guaranteed Maximum Price:

Item	Price

§ 4.4.7.2.2 Subject to the conditions noted below, the following alternates may be accepted by the Owner following

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execution of this Agreement. Upon acceptance, the Owner shall issue a Modification to this Agreement.
(Insert below each alternate and the conditions that must be met for the Owner to accept the alternate.)

Item	Price	Conditions for Acceptance

§ 4.4.7.3 Allowances, if any, included in the Guaranteed Maximum Price:
(Identify each allowance.)

Item	Price

§ 4.4.7.4 Assumptions, if any, upon which the Guaranteed Maximum Price is based:
(Identify each assumption.)

§ 4.4.8 To the extent that the Contract Documents are anticipated to require further development, the Guaranteed Maximum Price includes the costs attributable to such further development consistent with the Contract Documents and reasonably inferable therefrom. Such further development does not include changes in scope, systems, kinds and quality of materials, finishes, or equipment, all of which, if required, shall be incorporated by Change Order.

§ 4.4.9 The Owner shall authorize preparation of revisions to the Contract Documents that incorporate the agreed-upon assumptions contained in Section 4.4.7.4. The Owner shall promptly furnish such revised Contract Documents to the Contractor. The Contractor shall notify the Owner and Architect of any inconsistencies between the agreed-upon assumptions contained in Section 4.4.7.4 and the revised Contract Documents.

§ 4.5 Liquidated damages, if any:
(Insert terms and conditions for liquidated damages, if any, to be assessed in accordance with Section 3.4.)

§ 4.6 Other:
(Insert provisions for bonus, cost savings or other incentives, if any, that might result in a change to the Contract Sum.)
No bonus or incentive shall be due unless expressly approved in writing by the Owner's Board of Education prior to performance of the related Work. The Contractor shall not be entitled to markup or overhead on Change Orders issued solely to correct errors, omissions, or non-compliant Work for which the Contractor is responsible, as documented in the Architect's, Construction Manager's or Owner's written notice.

ARTICLE 5 PAYMENTS

§ 5.1 Progress Payments

§ 5.1.1 Based upon Applications for Payment submitted to the Construction Manager by the Contractor, and Certificates for Payment issued by the Construction Manager and Architect, the Owner shall make progress payments on account of the Contract Sum, to the Contractor, as provided below and elsewhere in the Contract Documents.

§ 5.1.2 The period covered by each Application for Payment shall be one calendar month ending on the last day of the month, or as follows:

§ 5.1.3 Provided that an Application for Payment is received by the Construction Manager not later than the day of a month, the Owner shall make payment of the undisputed amount certified to the Contractor not later than

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the day of the month. If an Application for Payment is received by the Construction Manager after the application date fixed above, payment of the undisputed amount certified shall be made by the Owner not later than ( ) days after the Construction Manager receives the Application for Payment.
(Federal, state or local laws may require payment within a certain period of time.)

§ 5.1.4 Progress Payments Where the Contract Sum is Based on a Stipulated Sum

§ 5.1.4.1 Each Application for Payment shall be based on the most recent schedule of values submitted by the Contractor in accordance with the Contract Documents. The schedule of values shall allocate the entire Contract Sum among the various portions of the Work. The schedule of values shall be prepared in such form, and supported by such data to substantiate its accuracy, as the Construction Manager and Architect may require. This schedule of values shall be used as a basis for reviewing the Contractor's Applications for Payment.

§ 5.1.4.2 Applications for Payment shall show the percentage of completion of each portion of the Work as of the end of the period covered by the Application for Payment.

§ 5.1.4.3 In accordance with AIA Document A232™–2019, General Conditions of the Contract for Construction, Construction Manager as Adviser Edition, as amended, and subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

§ 5.1.4.3.1 The amount of each progress payment shall first include:

.1 That portion of the Contract Sum properly allocable to completed Work;

.2 That portion of the Contract Sum properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the completed construction, or, if approved in advance by the Owner, suitably stored off the site at a location agreed upon in writing; and

.3 That portion of Construction Change Directives that the Architect determines, in the Architect's professional judgment, to be reasonably justified.

§ 5.1.4.3.2 The amount of each progress payment shall then be reduced by:

.1 The aggregate of any amounts previously paid by the Owner;

.2 The amount, if any, for Work that remains uncorrected and for which the Architect has previously withheld a Certificate for Payment as provided in Article 9 of AIA Document A232–2019;

.3 Any amount for which the Contractor does not intend to pay a Subcontractor or material supplier, unless the Work has been performed by others the Contractor intends to pay;

.4 For Work performed or defects discovered since the last payment application, any amount for which the Architect may withhold payment, or nullify a Certificate of Payment in whole or in part, as provided in Article 9 of AIA Document A232–2019; and

.5 Retainage withheld pursuant to Section 5.1.7.

§ 5.1.5 Progress Payments Where the Contract Sum is Based on the Cost of the Work without a Guaranteed Maximum Price

§ 5.1.5.1 With each Application for Payment, the Contractor shall submit the cost control information required in Exhibit B, Determination of the Cost of the Work, along with payrolls, petty cash accounts, receipted invoices, or invoices with check vouchers attached, and any other evidence required by the Owner, Construction Manager or Architect to demonstrate that payments already made by the Contractor on account of the Cost of the Work equal or exceed progress payments already received by the Contractor, plus payrolls for the period covered by the present Application for Payment, less that portion of the payments attributable to the Contractor's Fee.

§ 5.1.5.2 Applications for Payment shall show the Cost of the Work actually incurred by the Contractor through the end of the period covered by the Application for Payment and for which the Contractor has made or intends to make actual payment prior to the next Application for Payment.

§ 5.1.5.3 In accordance with AIA Document A232-2019 and subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

§ 5.1.5.3.1 The amount of each progress payment shall first include:

.1 The Cost of the Work as described in Exhibit B, Determination of the Cost of the Work;

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.2 That portion of Construction Change Directives that the Architect determines, in the Architect's professional judgment, to be reasonably justified; and

.3 The Contractor's Fee computed upon the Cost of the Work described in the preceding Section 5.1.5.3.1.1 at the rate stated in Section 4.3.2; or if the Contractor's Fee is stated as a fixed sum in Section 4.3.2 an amount which bears the same ratio to that fixed-sum Fee as the Cost of the Work included in Section 5.1.5.3.1.1 bears to a reasonable estimate of the probable Cost of the Work upon its completion.

§ 5.1.5.3.2 The amount of each progress payment shall then be reduced by:

.1 The aggregate of any amounts previously paid by the Owner;

.2 The amount, if any, for Work that remains uncorrected and for which the Architect has previously withheld a Certificate for Payment as provided in Article 9 of AIA Document A232–2019;

.3 Any amount for which the Contractor does not intend to pay a Subcontractor or material supplier, unless the Work has been performed by others the Contractor intends to pay;

.4 For Work performed or defects discovered since the last payment application, any amount for which the Architect may withhold payment, or nullify a Certificate of Payment in whole or in part, as provided in Article 9 of AIA Document A232–2019;

.5 The shortfall, if any, indicated by the Contractor in the documentation required by Section 5.1.5.1 to substantiate prior Applications for Payment, or resulting from errors subsequently discovered by the Owner's auditors in such documentation; and

.6 Retainage withheld pursuant to Section 5.1.7.

§ 5.1.5.4 The Owner, Construction Manager and Contractor shall agree upon a mutually acceptable procedure for review and approval of payments to Subcontractors and the percentage of retainage held on Subcontracts, and the Contractor shall execute subcontracts in accordance with those agreements.

§ 5.1.5.5 In taking action on the Contractor's Applications for Payment, the Construction Manager and Architect shall be entitled to rely on the accuracy and completeness of the information furnished by the Contractor, and such action shall not be deemed to be a representation that (1) the Construction Manager and Architect have made a detailed examination, audit or arithmetic verification of the documentation submitted in accordance with Article 5 or other supporting data; (2) that the Construction Manager and Architect have made exhaustive or continuous on-site inspections; or (3) that the Construction Manager and Architect have made examinations to ascertain how or for what purposes the Contractor has used amounts previously paid on account of the Contract. Such examinations, audits and verifications, if required by the Owner, will be performed by the Owner's auditors acting in the sole interest of the Owner.

§ 5.1.5.6 Except with the Owner's prior written approval, the Contractor shall not make advance payments to suppliers for materials or equipment which have not been delivered and stored at the site.

§ 5.1.5.7 If final completion of the Work is materially delayed through no fault of the Contractor, then the Owner shall pay the Contractor any additional amounts in accordance with Article 9 of AIA Document A232-2019.

§ 5.1.6 Progress Payments Where the Contract Sum is Based on the Cost of the Work with a Guaranteed Maximum Price

§ 5.1.6.1 With each Application for Payment, the Contractor shall submit payrolls, petty cash accounts, receipted invoices or invoices with check vouchers attached, and any other evidence required by the Owner, Construction Manager or Architect to demonstrate that payments already made by the Contractor on account of the Cost of the Work equal or exceed progress payments already received by the Contractor plus payrolls for the period covered by the present Application for Payment, less that portion of the progress payments attributable to the Contractor's Fee.

§ 5.1.6.2 Each Application for Payment shall be based on the most recent schedule of values submitted by the Contractor in accordance with the Contract Documents. The schedule of values shall allocate the entire Guaranteed Maximum Price among: (1) the various portions of the Work; (2) any contingency for costs that are included in the Guaranteed Maximum Price but not otherwise allocated to another line item or included in a Change Order; and (3) the Contractor's Fee.

§ 5.1.6.2.1 The schedule of values shall be prepared in such form, and supported by such data to substantiate its accuracy, as the Construction Manager and Architect may require. This schedule of values shall be used as a basis for

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reviewing the Contractor's Applications for Payment.

§ 5.1.6.2.2 The allocation of the Guaranteed Maximum Price under this Section 5.1.6.2 shall not constitute a separate guaranteed maximum price for the Cost of the Work of each individual line item in the schedule of values.

§ 5.1.6.2.3 When the Contractor allocates costs from a contingency to another line item in the schedule of values, the Contractor shall submit supporting documentation to the Architect and Construction Manager.

§ 5.1.6.3 Applications for Payment shall show the percentage of completion of each portion of the Work as of the end of the period covered by the Application for Payment. The percentage of completion shall be the lesser of (1) the percentage of that portion of the Work which has actually been completed; or (2) the percentage obtained by dividing (a) the expense that has actually been incurred by the Contractor on account of that portion of the Work and for which the Contractor has made payment or intends to make payment prior to the next Application for Payment by (b) the share of the Guaranteed Maximum Price allocated to that portion of the Work in the schedule of values.

§ 5.1.6.4 In accordance with AIA Document A232-2019, and subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

§ 5.1.6.4.1 The amount of each progress payment shall first include:

.1 That portion of the Guaranteed Maximum Price properly allocable to completed Work as determined by multiplying the percentage of completion of each portion of the Work by the share of the Guaranteed Maximum Price allocated to that portion of the Work in the most recent schedule of values;

.2 That portion of the Guaranteed Maximum Price properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the completed construction or, if approved in writing in advance by the Owner, suitably stored off the site at a location agreed upon in writing;

.3 That portion of Construction Change Directives that the Architect determines, in the Architect's professional judgment, to be reasonably justified; and

.4 The Contractor's Fee, computed upon the Cost of the Work described in the preceding Sections 5.1.6.4.1.1 and 5.1.6.4.1.2 at the rate stated in Section 4.4.2 or, if the Contractor's Fee is stated as a fixed sum in that Section, an amount that bears the same ratio to that fixed-sum fee as the Cost of the Work included in Sections 5.1.6.4.1.1 and 5.1.6.4.1.2 bears to a reasonable estimate of the probable Cost of the Work upon its completion.

§ 5.1.6.4.2 The amount of each progress payment shall then be reduced by:

.1 The aggregate of any amounts previously paid by the Owner;

.2 The amount, if any, for Work that remains uncorrected and for which the Architect has previously withheld a Certificate for Payment as provided in Article 9 of AIA Document A232–2019;

.3 Any amount for which the Contractor does not intend to pay a Subcontractor or material supplier, unless the Work has been performed by others the Contractor intends to pay;

.4 For Work performed or defects discovered since the last payment application, any amount for which the Architect may withhold payment, or nullify a Certificate of Payment in whole or in part, as provided in Article 9 of AIA Document A232–2019;

.5 The shortfall, if any, indicated by the Contractor in the documentation required by Section 5.1.6.1 to substantiate prior Applications for Payment, or resulting from errors subsequently discovered by the Owner's auditors in such documentation; and

.6 Retainage withheld pursuant to Section 5.1.7.

§ 5.1.6.5 The Owner and the Contractor shall agree upon a mutually acceptable procedure for review and approval of payments to Subcontractors and the percentage of retainage held on Subcontracts, and the Contractor shall execute subcontracts in accordance with those agreements.

§ 5.1.6.6 In taking action on the Contractor's Applications for Payment, the Construction Manager and Architect shall be entitled to rely on the accuracy and completeness of the information furnished by the Contractor and such action shall not be deemed to be a representation that (1) the Construction Manager or Architect have made a detailed examination, audit, or arithmetic verification of the documentation submitted in accordance with Section 5.1.6.1 or other supporting data; (2) that the Construction Manager or Architect have made exhaustive or continuous on-site inspections; or (3) that the Construction Manager or Architect have made examinations to ascertain how or for what purposes the Contractor

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has used amounts previously paid on account of the Contract. Such examinations, audits, and verifications, if required by the Owner, will be performed by the Owner's auditors acting in the sole interest of the Owner.

§ 5.1.6.7 Except with the Owner's prior written approval, the Contractor shall not make advance payments to suppliers for materials or equipment which have not been delivered and stored at the site.

§ 5.1.6.8 If final completion of the Work is materially delayed through no fault of the Contractor, then the Owner shall pay the Contractor any additional amounts in accordance with Article 9 of AIA Document A232-2019.

§ 5.1.7 Retainage

§ 5.1.7.1 For each progress payment made prior to when the Work of this Contract is substantially complete, the Owner may withhold the following amount, as retainage, from the payment otherwise due:
(Insert a percentage or amount to be withheld as retainage from each Application for Payment. The amount of retainage may be limited by governing law.)

Five Percent (5%)

§ 5.1.7.1.1 The following items are not subject to retainage:
(Insert any items not subject to the withholding of retainage, such as general conditions, insurance, etc.)

§ 5.1.7.2 Reduction or limitation of retainage, if any, shall be as follows:
(If the retainage established in Section 5.1.7.1 is to be modified prior to when the entire Work of this Contract is substantially complete, including modifications for completion of portions of the Work as provided in Section 3.4.2, insert provisions for such modifications.)

Retainage may be reduced upon written approval of the Owner, based on verification that the Work is progressing satisfactorily, the Contractor is in compliance with the schedule, and no liens or claims have been filed.

§ 5.1.7.3 Except as set forth in this Section 5.1.7.3, when the Work of this Contract is substantially complete, the Contractor may submit an Application for Payment that includes the retainage withheld from prior Applications for Payment pursuant to this Section 5.1.7. The Application for Payment submitted when the Work of this Contract is substantially complete shall not include retainage as follows:
(Insert any other conditions for release of retainage when the Work of this Contract is substantially complete, or upon Substantial Completion of the Work of all Contractors on the Project or portions thereof.)

The Owner shall pay the remaining amount of the contract balance less two times the value of any remaining items to be completed and an amount necessary to satisfy any claims, liens or judgments against the Contractor which have not been suitably discharged

§5.1.8 The Owner may, at any time, withhold payment to the extent reasonably necessary to protect against defective Work, third-party claims, failure to pay Subcontractors, or evidence that the remaining Work cannot be completed for the unpaid balance.

§ 5.2 Final Payment

§ 5.2.1 Final Payment Where the Contract Sum is Based on a Stipulated Sum

§ 5.2.1.1 Final payment, constituting the entire unpaid balance of the Contract Sum, shall be made by the Owner to the Contractor when

.1 the Contractor has fully performed the Contract except for the Contractor's responsibility to correct Work as provided in Article 12 of AIA Document A232–2019, and to satisfy other requirements, if any, which extend beyond final payment;

.2 a final Certificate for Payment or Project Certificate for Payment has been issued by the Architect; and

.3 the Contractor provides satisfactory evidence of payment to all Subcontractors and suppliers, releases of liens,

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warranties, as-built drawings, and operation manuals. Acceptance of final payment shall constitute a full and final release of all claims against the Owner arising from this Contract.

§ 5.2.1.2 The Owner's final payment to the Contractor shall be made no later than 30 days after the issuance of the final Certificate for Payment or Project Certificate for Payment, or as follows:

§ 5.2.2 Final Payment Where the Contract Sum is Based on the Cost of the Work with or without a Guaranteed Maximum Price

§ 5.2.2.1 Final payment, constituting the entire unpaid balance of the Contract Sum, shall be made by the Owner to the Contractor when

.1 the Contractor has fully performed the Contract except for the Contractor's responsibility to correct Work as provided in Article 12 of AIA Document A232–2019, and to satisfy other requirements, if any, which extend beyond final payment;

.2 the Contractor has submitted a final accounting for the Cost of the Work, pursuant to Exhibit B, Determination of the Cost of the Work and a final Application for Payment; and

.3 a final Certificate for Payment or Project Certificate for Payment has been issued by the Architect in accordance with Exhibit B, Determination of the Cost of the Work.

§ 5.2.2.2 The Owner's final payment to the Contractor shall be made no later than 30 days after the issuance of the final Certificate for Payment or Project Certificate for Payment, or as follows:

§ 5.3 Payments due and unpaid under the Contract, which are not disputed, shall bear interest from the date payment is due at the rate stated below, or in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.
(Insert rate of interest agreed upon, if any.)

Interest at the rate set forth in General Municipal Law 106-b(1)(c).

ARTICLE 6 DISPUTE RESOLUTION

§ 6.1 Initial Decision Maker

The Architect will serve as Initial Decision Maker pursuant to Article 15 of AIA Document A232–2019, unless the parties appoint below another individual, not a party to this Agreement, to serve as Initial Decision Maker. Unless otherwise agreed in writing, all dispute resolution proceedings shall be conducted in the state and county in which the Project is located.
(If the parties mutually agree, insert the name, address and other contact information of the Initial Decision Maker, if other than the Architect.)

§ 6.2 Binding Dispute Resolution

For any Claim subject to, but not resolved by, mediation pursuant to Article 15 of AIA Document A232–2019, the method of binding dispute resolution shall be as follows:
(Check the appropriate box.)

[ ] Arbitration pursuant to Article 15 of AIA Document A232–2019.

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[X] Litigation in a court of competent jurisdiction in Dutchess County, New York.

[ ] Other: *(Specify)*

If the Owner and Contractor do not select a method of binding dispute resolution, or do not subsequently agree in writing to a binding dispute resolution method other than litigation, Claims will be resolved by litigation in a court of competent jurisdiction.

The Contractor shall continue performance of the Work pending resolution of any dispute, without delay, unless directed otherwise in writing by the Owner.

ARTICLE 7 TERMINATION OR SUSPENSION

§ 7.1 Where the Contract Sum is a Stipulated Sum

§ 7.1.1 The Contract may be terminated by the Owner or the Contractor as provided in Article 14 of AIA Document A232–2019, as amended.

§ 7.1.1.1 If the Contract is terminated for the Owner's convenience in accordance with Article 14 of AIA Document A232–2019, then : payment shall be limited to actual, verifiable costs incurred for Work properly performed up to the date of termination. The Contractor shall not be entitled to anticipated profit or consequential damages.

(Insert the amount of, or method for determining, the fee, if any, payable to the Contractor following a termination for the Owner's convenience.)

§ 7.1.2 The Work may be suspended by the Owner as provided in Article 14 of AIA Document A232–2019.

§ 7.2 Where the Contract Sum is Based on the Cost of the Work with or without a Guaranteed Maximum Price

§ 7.2.1 Termination

§ 7.2.1.1 The Contract may be terminated by the Owner or the Contractor as provided in Article 14 of AIA Document A232–2019.

§ 7.2.1.2 Termination by the Owner for Cause

§ 7.2.1.2.1 If the Owner terminates the Contract for cause as provided in Article 14 of AIA Document A232–2019, the Owner shall then only pay the Contractor an amount as follows:

.1 Take the Cost of the Work incurred by the Contractor to the date of termination;

.2 Add the Contractor's Fee, computed upon the Cost of the Work to the date of termination at the rate stated in Section 4.3.2 or 4.4.2, as applicable, or, if the Contractor's Fee is stated as a fixed sum in that Section, an amount that bears the same ratio to that fixed-sum Fee as the Cost of the Work at the time of termination bears to a reasonable estimate of the probable Cost of the Work upon its completion;

.3 Subtract the aggregate of previous payments made by the Owner; and

.4 Subtract the costs and damages incurred, or to be incurred, by the Owner under Article 14 of AIA Document A232–2019.

.5 Offset all costs incurred to complete or correct the Work, including reasonable legal and administrative expenses.

§ 7.2.1.2.2 When the Contract Sum is based on the Cost of the Work with a Guaranteed Maximum Price, if the Owner terminates the Contract for cause as provided in Article 14 of AIA Document A232-2019, the amount, if any, to be paid to the Contractor under Article 14 of AIA Document A232-2019 shall not cause the Guaranteed Maximum Price to be exceeded, nor shall it exceed the amount calculated in Section 7.2.1.2.1.

§ 7.2.1.2.3 The Owner shall also pay the Contractor fair compensation, either by purchase or rental at the election of the

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Owner, for any equipment owned by the Contractor that the Owner elects to retain and that is not otherwise included in the Cost of the Work under Section 7.2.1.2.1.1. To the extent that the Owner elects to take legal assignment of subcontracts and purchase orders (including rental agreements), the Contractor shall, as a condition of receiving the payments referred to in this Article 7, execute and deliver all such papers and take all such steps, including the legal assignment of such subcontracts and other contractual rights of the Contractor, as the Owner may require for the purpose of fully vesting in the Owner the rights and benefits of the Contractor under such subcontracts or purchase orders. All Subcontracts, purchase orders and rental agreements entered into by the Contractor will contain provisions allowing for assignment to the Owner as described above.

§ 7.2.1.3 Termination by the Owner for Convenience

If the Owner terminates the Contract for convenience in accordance with Article 14 of AIA Document A232–2019, then the Owner shall pay the Contractor a termination fee as follows:

(Insert the amount of or method for determining the fee, if any, payable to the Contractor following a termination for the Owner's convenience.)

§ 7.3 Suspension

The Work may be suspended by the Owner as provided in Article 14 of AIA Document A232–2019; in such case, the Contract Sum and Contract Time shall be increased as provided in Article 14 of AIA Document A232–2019, except that the term "profit" shall be understood to mean the Contractor's Fee as described in Section 4.3.2 or 4.4.2, as applicable, of this Agreement.

Upon termination or suspension, the Contractor shall immediately deliver to the Owner all drawings, records, and materials relating to the Work, whether in progress or complete.

ARTICLE 8 MISCELLANEOUS PROVISIONS

§ 8.1 Where reference is made in this Agreement to a provision of AIA Document A232–2019 or another Contract Document, the reference refers to that provision as amended or supplemented by other provisions of the Contract Documents.

§ 8.2 The Owner's representative:

(Name, address, email address, and other information)

§ 8.3 The Contractor's representative:

(Name, address, email address, and other information)

§ 8.4 Neither the Owner's nor the Contractor's representative shall be changed without ten days' prior notice to the other party.

§ 8.5 Insurance and Bonds

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§ 8.5.1 The Owner and the Contractor shall purchase and maintain insurance as set forth in AIA Document A132™–2019, Standard Form of Agreement Between Owner and Contractor, Construction Manager as Adviser Edition, Exhibit A, Insurance and Bonds, together with the Rider consisting of NYSIR's Sample Insurance Requirements for Capital Construction, and elsewhere in the Contract Documents.

§ 8.5.2 The Contractor shall provide bonds as set forth in AIA Document A132™–2019, Exhibit A, and elsewhere in the Contract Documents.

§ 8.6 Notice in electronic format, pursuant to Article 1 of AIA Document A232–2019, may be given in accordance with a building information modeling exhibit, if completed, or as otherwise set forth below:
(If other than in accordance with a building information modeling exhibit, insert requirements for delivering notice in electronic format such as name, title, and email address of the recipient and whether and how the system will be required to generate a read receipt for the transmission.)

§ 8.7 Relationship of the Parties

Where the Contract is based on the Cost of the Work plus the Contractor's Fee, with or without a Guaranteed Maximum Price, the Contractor accepts the relationship of trust and confidence established by this Agreement and covenants with the Owner to cooperate with the Architect and exercise the Contractor's skill and judgment in furthering the interests of the Owner; to furnish efficient business administration and supervision; to furnish at all times an adequate supply of workers and materials; and to perform the Work in an expeditious and economical manner consistent with the Owner's interests. The Owner agrees to furnish and approve, in a timely manner, information required by the Contractor and to make payments to the Contractor in accordance with the requirements of the Contract Documents.

§ 8.8 Other provisions:
Nothing in this Agreement shall be construed as a waiver of any immunities, defenses, or limitations of liability available to the Owner under applicable law, including but not limited to New York Education Law and General Municipal Law. All payments are contingent upon lawful appropriation and availability of public funds.

The Contractor shall comply with all applicable federal, state, and local laws, including but not limited to Labor Law §§ 200, 220, and 240; Education Law; and DASA, OSHA, and prevailing wage requirements. The Contractor shall indemnify and hold harmless the Owner from all violations or penalties arising from its failure to comply.

The Owner shall have the right to withhold payment or deduct amounts from the Contract Sum for documented material breaches of the Contract by the Contractor, including failure to maintain required insurance, materially deviating from the construction schedule, or noncompliance with applicable laws or regulations, provided the Contractor is given written notice and an opportunity to cure within the time specified in the General Conditions.

ARTICLE 9 ENUMERATION OF CONTRACT DOCUMENTS

§ 9.1 This Agreement is comprised of the following documents:

.1 AIA Document A132™–2019, Standard Form of Agreement Between Owner and Contractor, Construction Manager as Adviser Edition

.2 AIA Document A132™–2019, Exhibit A, Insurance and Bonds Exhibit, with NYSIR Rider

.3 AIA Document A232™–2019, General Conditions of the Contract for Construction, Construction Manager as Adviser Edition

.4 Building Information Modeling Exhibit, if completed:

.5 Drawings

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Number	Title	Date

.6 Specifications

Section	Title	Date	Pages

.7 Addenda, if any:

Number	Date	Pages

Portions of Addenda relating to bidding or proposal requirements are not part of the Contract Documents unless the bidding or proposal requirements are also enumerated in this Article 9.

.8 Other Exhibits:

(Check all boxes that apply and include appropriate information identifying the exhibit where required.)

[ ] AIA Document A132™–2019, Exhibit B, Determination of the Cost of the Work

[ ] AIA Document E235™–2019, Sustainable Projects Exhibit, Construction Manager as Adviser Edition, dated as indicated below:

(Insert the date of the E235-2019 incorporated into this Agreement.)

[ ] The Sustainability Plan:

Title	Date	Pages

[ ] Supplementary and other Conditions of the Contract:

Document	Title	Date	Pages

.9 Other documents, if any, listed below:

(List here any additional documents that are intended to form part of the Contract Documents. AIA Document A232–2019 provides that the advertisement or invitation to bid, Instructions to Bidders, sample forms, the Contractor's bid or proposal, portions of Addenda relating to bidding or proposal requirements, and other information furnished by the Owner in anticipation of receiving bids or proposals, are not part of the Contract Documents unless enumerated in this Agreement. Any such documents should be listed here only if intended to be part of the Contract Documents.)

Notice to Bidders, Instructions to Bidders, sample forms, and the Contractor's bid, pricing proposals submitted by the Contractor and accepted by the Owner.
Prevailing Wage Rate Schedules and respective updates.

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This Agreement is entered into as of the day and year first written above.

OWNER *(Signature)*	**CONTRACTOR** *(Signature)*
(Printed name and title)	*(Printed name and title)*



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SAMPLE INSURANCE REQUIREMENTS – CAPITAL CONSTRUCTION

1. Notwithstanding any terms, conditions or provisions, in any other writing between the parties, the contractor hereby agrees to effectuate the naming of the District/BOCES as an Additional Insured on the contractor's insurance policies, except for workers' compensation and N.Y. State Disability insurance.

2. The policy naming the District as an Additional Insured shall:

   a. Be an insurance policy from an A.M. Best A- rated or better insurer, **licensed and admitted** to conduct business in New York State. A New York licensed and admitted insurer is **required.**

   b. State that the organization's coverage shall be primary and non-contributory coverage for the District/BOCES, its Board, employees and volunteers including a waiver of subrogation in favor of the District/BOCES for all coverages including Workers Compensation.

   c. Additional insured status for General Liability coverage shall be provided by standard or other endorsements that extend coverage to the District/BOCES for on-going operations (CG 20 38 or equivalent) and products and completed operations (CG 20 37 or equivalent). The decision to accept an endorsement rests solely with the District/BOCES. A completed copy of the endorsements must be attached to the Certificate of Insurance to include General Liability, Auto Liability and Umbrella/Excess coverages. A copy of the Acord 855 Form is required to be sent for review.

3. a. The certificate of insurance must describe **all services** provided by the contractor (e.g., roofing, carpentry or plumbing) that are covered by the liability policies.

   b. At the District's/BOCES' request, the contractor shall provide a copy of the declaration page of the liability and umbrella/excess policies with a list of endorsements and forms. If requested, the contractor will provide a copy of the policy endorsements and forms.

   c. There will be no coverage restrictions and/or exclusions involving New York State Labor Law statutes or gravity related injuries.

   d. No policies containing escape clauses or exclusions contrary to the Owner's interests will be accepted.

e. A fully completed New York Construction Certificate of Liability Insurance Addendum (ACORD 855 2014/15) must be included with the certificates of insurance. For any "Yes" answers on Items G through L on this Form– additional details must be provided in writing. Policy exclusions may not be accepted.

4. The contractor agrees to indemnify the District/BOCES for applicable deductibles and self-insured retentions.

5. Minimum Required Insurance:

a. **Commercial General Liability Insurance**
$1,000,000 per Occurrence/$2,000,000 Aggregate
$2,000,000 Products and Completed Operations
$1,000,000 Personal and Advertising Injury
$100,000 Fire Damage
$10,000 Medical Expense
The general aggregate shall apply on a per-project basis. Products and completed operations coverage must remain in effect for **three years** after project completion and acceptance of the work performed.

b. **Owners Contractors Protective (OCP) Insurance**
For projects less than or equal to $1,000,000 and/or work on 1 story (10 feet) only. $1,000,000 per occurrence, $2,000,000 aggregate with the District/BOCES as the Named Insured. There will be no Additional Insureds on any OCP Policies.

For projects greater than $1,000,000 and/or work over 1 story (10 feet); $2,000,000 per occurrence, $4,000,000 aggregate with the District/BOCES as the Named Insured. There will be no Additional Insureds on any OCP Policies.

The OCP Policy must be with a NYS licensed and admitted carrier.

c. **Automobile Liability**
$1,000,000 combined single limit for owned, hired, borrowed and non-owned motor vehicles.

d. **Workers' Compensation and NYS Disability Insurance**
Statutory Workers' Compensation (C-105.2 or U-26.3); and NYS Disability Insurance (DB-120.1) for all employees [per NYS WC and Disability Laws]. Proof of coverage must be on the approved specific form, as required by the New York State Workers' Compensation Board. ACORD certificates are not acceptable.

A person seeking an exemption must file a CE-200 Form with the state. The form can be completed and submitted directly to the WC Board online.

e. **Cyber**
The contractor must carry coverage applicable to first- and third-party claims, arising from a cyber incident that could impact the district's data the contractor may have in their possession. Limits shall be the greater of those carried by the Contractor or $250,000 per incident and $250,000 in the aggregate. If coverage is on a claims-made basis, coverage must have a retroactive date no later than the date of agreement with the district/BOCES and provide coverage for two years following the date of Final Completion of the Project. **The Cyber policy must be with a NYS licensed carrier.**

f. **Builder's Risk**
Must be purchased and maintained by the Owner of the property. The limit must reflect the total completed value (all material and labor costs) and provide coverage for fire, lightning, explosion, extended coverage, vandalism, malicious mischief, windstorm, hail and/or flood. Coverage will remain in effect until the project is completed and/or the property occupied and put to its intended use.

g. **Umbrella/Excess Insurance**
$5,000,000 each Occurrence and Aggregate for general construction and no work at elevation (1 story or 10 feet) and project values less than or equal to $1,000,000.

$10,000,000 each Occurrence and Aggregate for high-risk construction, work at elevation (>1 story or 10 feet) and project values greater than $1,000,000.

Umbrella/Excess coverage shall be on a follow-form basis or provide broader coverage over the General Liability and Auto Liability coverages.

6. **Subcontractors are subject to the same terms and conditions as stated above and must submit same to the District/BOCES for approval prior to the start of any work.**

7. Contractor acknowledges that failure to obtain such insurance on behalf of the District/BOCES constitutes a material breach of contract and subjects it to liability for damages, indemnification and all other legal remedies available to the District/BOCES. The contractor is to provide the District/BOCES with a certificate of insurance, evidencing the above requirements have been met, prior to the commencement of work. The failure of

the District/BOCES to object to the contents of the certificate or the absence of same shall not be deemed a waiver of any rights held by the District/BOCES.

8. In the event the General Contractor fails to obtain the required certificates of insurance from the Subcontractor and a claim is made or suffered, the General Contractor shall indemnify, defend, and hold harmless the District/BOCES, its Board, employees and volunteers from any and all claims for which the required insurance would have provided coverage**. This indemnity obligation is in addition to any other indemnity obligation provided in the Contract.**

ADDITIONAL REQUIREMENTS ASBESTOS, LEAD ABATEMENT AND/OR HAZARDOUS MATERIALS

Asbestos/Lead Abatement/Pollution Liability Insurance
$2,000,000 per occurrence/$2,000,000 aggregate, including products and completed operations. Such insurance shall include coverage for the Contractor's operations including, but not limited to, removal, replacement, enclosure, encapsulation and/or disposal of asbestos, or any other hazardous material, along with any related pollution events, including coverage for third-party liability claims for bodily injury, property damage and clean-up costs. If a retroactive date is used, it shall pre-date the inception of the Contract.

If the Contractor is using motor vehicles for transporting hazardous materials, the Contractor shall maintain pollution liability broadened coverage (ISO Endorsement CA 9948 or CA 01 12), as well as proof of MCS 90. Coverage shall fulfill all requirements of these specifications and shall extend for a period of three (3) years following acceptance by the District/BOCES of the Certificate of Completion.

Testing Company Errors and Omission Insurance
$1,000,000 per occurrence/$2,000,000 aggregate for the testing and other professional acts of the Contractor performed under the Contract with the District/BOCES.

AIA® Document A232® – 2019

General Conditions of the Contract for Construction, *Construction Manager as Adviser Edition*

for the following PROJECT:
(Name, and location or address)

THE CONSTRUCTION MANAGER:
(Name, legal status, and address)

THE OWNER:
(Name, legal status, and address)

THE ARCHITECT:
(Name, legal status, and address)

ADDITIONS AND DELETIONS:
The author of this document may have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

This document is intended to be used in conjunction with AIA Documents A132™–2019, Standard Form of Agreement Between Owner and Contractor, Construction Manager as Adviser Edition; B132™–2019, Standard Form of Agreement Between Owner and Architect, Construction Manager as Adviser Edition; and C132™–2019, Standard Form of Agreement Between Owner and Construction Manager as Adviser.

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ARTICLE 1 GENERAL PROVISIONS

§ 1.1 Basic Definitions

§ 1.1.1 The Contract Documents. The Contract Documents are enumerated in the Agreement between the Owner and Contractor (hereinafter the Agreement), as amended, and consist of the Agreement, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, Addenda issued prior to execution of the Contract, other documents listed in the Agreement, and Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Construction Change Directive, or (4) a written order for a minor change in the Work issued by the Architect. The Contract Documents include the Notice to Bidders (Advertisement), Instructions to Bidders, Supplemental Instructions to Bidders, Executed Bid Form (including Unit Prices) and all exhibits/addenda, Executed Non-Collusive Bidding Certification, and the Bidder's Response.

§ 1.1.1.1 The Contractor acknowledges and warrants that it has closely examined all the Contract Documents, that they are suitable and sufficient to enable the Contractor to undertake and complete the Work in a timely manner for the Contract Sum, and that they include all work, whether or not shown or described, which reasonably may be inferred to be required or useful for the completion of the Work in full compliance with all applicable statutes, codes, laws, ordinances, and regulations.

§ 1.1.2 The Contract. The Contract Documents form the Contract for Construction. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. The Contract may be amended or modified only by a Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind (1) between the Contractor and the Architect or the Architect's consultants, (2) between the Owner and the Construction Manager or the Construction Manager's consultants, (3) between the Owner and the Architect or the Architect's consultants, (4) between the Contractor and the Construction Manager or the Construction Manager's consultants, (5) between the Owner and a Subcontractor or Sub-subcontractor (6) between the Construction Manager and the Architect, or (7) between any persons or entities other than the Owner and Contractor. The Construction Manager and Architect shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of their duties.

§ 1.1.3 The Work. The term "Work" means the construction and services required by the Contract Documents, whether completed or partially completed, and includes all other labor, materials, equipment, and services provided or to be provided by the Contractor to fulfill the Contractor's obligations. The Work may constitute the whole or a part of the Project. The term "Work" also includes supervision, labor, equipment, tools, materials, supplies, incidental operations and activities required by the Contract Documents or reasonably inferable by Contractor therefrom as necessary to produce the results intended by the Contract Documents, in a safe, expeditious, orderly, and workmanlike manner, and in the best manner known to each respective trade.

§ 1.1.4 The Project. The Project is the total construction of which the Work performed under the Contract Documents may be the whole or a part and which may include construction by other Contractors, and by the Owner's own forces and Separate Contractors.

§ 1.1.5 Contractors. Contractors are persons or entities, other than the Contractor or Separate Contractors, who perform Work under contracts with the Owner that are administered by the Architect and Construction Manager.

§ 1.1.6 Separate Contractors. Separate Contractors are persons or entities who perform construction under separate contracts with the Owner not administered by the Architect and Construction Manager.

§ 1.1.7 The Drawings. The Drawings are the graphic and pictorial portions of the Contract Documents showing the design, location and dimensions of the Work, generally including plans, elevations, sections, details, schedules, and diagrams.

§ 1.1.8 The Specifications. The Specifications are that portion of the Contract Documents consisting of the written requirements for materials, equipment, systems, standards and workmanship for the Work, and performance of related services.

§ 1.1.9 Instruments of Service. Instruments of Service are representations, in any medium of expression now known or

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later developed, of the tangible and intangible creative work performed by the Architect and the Architect's consultants under their respective professional services agreements. Instruments of Service may include, without limitation, studies, surveys, models, sketches, drawings, specifications, and other similar materials.

§ 1.1.10 Initial Decision Maker. The Initial Decision Maker is the person identified in the Agreement to render initial decisions on Claims in accordance with Section 15.2. The Initial Decision Maker shall not show partiality to the Owner or Contractor and shall not be liable for results of interpretations or decisions rendered in good faith.

§ 1.2 Correlation and Intent of the Contract Documents

§ 1.2.1 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complimentary, and what is required by one shall be as binding as if required by all; performance by the Contractor shall be required only to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results.

§ 1.2.1.1 The invalidity of any provision of the Contract Documents shall not invalidate the Contract or its remaining provisions. If it is determined that any provision of the Contract Documents violates any law, or is otherwise invalid or unenforceable, then that provision shall be revised to the extent necessary to make that provision legal and enforceable. In such case the Contract Documents shall be construed, to the fullest extent permitted by law, to give effect to the parties' intentions and purposes in executing the Contract.

§ 1.2.2 Organization of the Specifications into divisions, sections and articles, and arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade.

§ 1.2.3 Unless otherwise stated in the Contract Documents, words that have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings.

§ 1.3 Capitalization

Terms capitalized in these General Conditions include those that are (1) specifically defined, (2) the titles of numbered articles, or (3) the titles of other documents published by the American Institute of Architects.

§ 1.4 Interpretation

In the interest of brevity the Contract Documents frequently omit modifying words such as "all" and "any" and articles such as "the" and "an," but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement.

§ 1.5 Ownership and Use of Drawings, Specifications, and Other Instruments of Service

§ 1.5.1 The Architect and the Architect's consultants shall be deemed the authors and owners of their respective Instruments of Service, including the Drawings and Specifications, and retain all common law, statutory, and other reserved rights in their Instruments of Service, including copyrights. The Contractor, Subcontractors, sub-subcontractors, and suppliers shall not own or claim a copyright in the Instruments of Service. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with the Project is not to be construed as publication in derogation of the Architect's or Architect's consultants' reserved rights.

§ 1.5.2 The Contractor, Subcontractors, Sub-subcontractors, and suppliers are authorized to use and reproduce the Instruments of Service provided to them, subject to any protocols established pursuant to Sections 1.7 and 1.8, solely and exclusively for execution of the Work. All copies made under this authorization shall bear the copyright notice, if any, shown on the Instruments of Service. The Contractor, Subcontractors, Sub-subcontractors, and suppliers may not use the Instruments of Service on other projects or for additions to the Project outside the scope of the Work without the specific written consent of the Owner, Architect, and the Architect's consultants.

§ 1.6 Notice

§ 1.6.1 Except as otherwise provided in Section 1.6.2, where the Contract Documents require one party to notify or give notice to the other party, such notice shall be provided in writing to the designated representative of the party to whom the notice is addressed and shall be deemed to have been duly served if delivered in person, by mail, by courier, or by electronic transmission if a method for electronic transmission is set forth in the Agreement.

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§ 1.6.2 Notice of Claims as provided in Section 15.1.3 shall be provided in writing and shall be deemed to have been duly served only if delivered to the designated representative of the party to whom the notice is addressed by certified or registered mail, or by courier providing proof of delivery.

§ 1.7 Digital Data Use and Transmission

If the parties intend to transmit Instruments of Service or any other information or documentation in digital form, they shall endeavor to establish necessary protocols governing such transmissions, unless otherwise already provided in the Agreement or the Contract Documents.

§ 1.8 Building Information Models Use and Reliance

Any use of, or reliance on, all or a portion of a building information model without agreement to written protocols governing the use of, and reliance on, the information contained in the model shall be at the using or relying party's sole risk and without liability to the other party and its contractors or consultants, the authors of, or contributors to, the building information model, and each of their agents and employees.

ARTICLE 2 OWNER

§ 2.1 General

§ 2.1.1 The Owner is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Owner shall designate in writing a representative who shall have express authority to bind the Owner with respect to all matters requiring the Owner's approval or authorization, other than Change Orders affecting the Contract Sum, and excepting those matters that New York State law vests the Board of Education with the power and duty to approve or authorize.. Except as otherwise provided in Section 4.2.1, the Construction Manager and the Architect do not have such authority. The term "Owner" means the Owner or the Owner's authorized representative.

§ 2.2 Evidence of the Owner's Financial Arrangements

§ 2.2.1 Prior to commencement of the Work, and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract.

§ 2.2.2 Following commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract only if (1) the Owner fails to make payments to the Contractor as the Contract Documents require; (2) the Contractor identifies in writing a reasonable concern regarding the Owner's ability to make payment when due; or (3) a change in the Work materially changes the Contract Sum.

§ 2.2.4 Where the Owner has designated information furnished under this Section 2.2 as "confidential," the Contractor shall keep the information confidential and shall not disclose it to any other person. However, the Contractor may disclose "confidential" information, after seven (7) days' written notice to the Owner, where disclosure is required by law, including a subpoena or other form of compulsory legal process issued by a court or governmental entity, or by court or arbitrator(s) order. The Contractor may also disclose "confidential" information to its employees, consultants, sureties, Subcontractors and their employees, Sub-subcontractors, and others who need to know the content of such information solely and exclusively for the Project and who agree to maintain the confidentiality of such information.

§ 2.3 Information and Services Required of the Owner

§ 2.3.1 Except for permits and fees that are the responsibility of the Contractor under the Contract Documents, including those required under Section 3.7.1, the Owner shall secure and pay for necessary approvals, easements, assessments and charges required for construction, use or occupancy of permanent structures or for permanent changes in existing facilities. Unless otherwise provided under the Contract Documents, the Owner, assisted by the Construction Manager, shall secure and pay for the building permit from the New York State Education Department. All other permits required from local agencies required for construction shall be paid for by Contractor.

§ 2.3.2 The Owner shall retain an architect lawfully licensed to practice architecture, or an entity lawfully practicing

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architecture, in the jurisdiction where the Project is located. That person or entity is identified as the Architect in the Agreement and is referred to throughout the Contract Documents as if singular in number.

§ 2.3.3 The Owner shall retain a construction manager adviser lawfully practicing construction management in the jurisdiction where the Project is located. That person or entity is identified as the Construction Manager in the Agreement and is referred to throughout the Contract Documents as if singular in number.

§ 2.3.4 If the employment of the Construction Manager or Architect terminates, the Owner shall employ a successor construction manager or architect whose status under the Contract Documents shall be that of the Construction Manager or Architect, respectively.

§ 2.3.5 The Owner shall furnish, upon written request and as necessary to complete the Work, surveys describing physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site. The Contractor shall be entitled to rely on the accuracy of information furnished by the Owner but shall exercise proper precautions relating to the safe performance of the Work. The furnishing of such information by the Owner shall not relieve the Contractor from its duties under the Contract Documents, including those relating to inspection of the site.

§ 2.3.6 The Owner shall furnish information or services required of the Owner by the Contract Documents with reasonable promptness. The Owner shall also furnish any other information or services under the Owner's control and relevant to the Contractor's performance of the Work with reasonable promptness after receiving the Contractor's written request for such information or services.

§ 2.3.7 Unless otherwise provided in the Contract Documents, the Owner shall furnish to the Contractor one copy of the Contract Documents for purposes of making reproductions pursuant to Section 1.5.2.

§ 2.3.8 The Owner shall endeavor to forward all communications to the Contractor through the Construction Manager. Other communication shall be made as set forth in Section 4.2.6.

§ 2.4 Owner's Right to Stop the Work

If the Contractor fails to correct Work that is not in accordance with the requirements of the Contract Documents as required by Section 12.2 or repeatedly fails to carry out Work in accordance with the Contract Documents, the Owner may issue a written order to the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity, except to the extent required by Section 6.1.3.

§ 2.5 Owner's Right to Carry Out the Work

§ 2.5.1 If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a ten-day period after receipt of notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to other remedies the Owner may have, correct such default or neglect. Such action by the Owner and amounts charged to the Contractor are both subject to review by the Construction Manager and prior approval of the Architect, and the Construction Manager or Architect may, pursuant to Section 9.5.1, withhold or nullify a Certificate for Payment in whole or in part, to the extent reasonably necessary to reimburse the Owner for the reasonable cost of correcting such deficiencies, including Owner's expenses and compensation for the Construction Manager's and Architect's and their respective consultants' additional services made necessary by such default, neglect, or failure. If current and future payments are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner. If the Contractor disagrees with the actions of the Owner or the Architect, or the amounts claimed as costs to the Owner, the Contractor may file a Claim pursuant to Article 15.

§ 2.5.2 The rights stated in this Article 2 and elsewhere in the Contract Documents are cumulative and not in limitation of any rights of the Owner or Contractor (1) granted in the Contract Documents; (2) law; or (3) in equity.

§ 2.5.3 In no event shall the Owner have control over, charge of, or any responsibility for construction means, methods, techniques, sequences, or procedures or for safety precautions and programs in connection with the Work. The Owner assumes no responsibility for liability for the safety of the Project site. The Contractor shall be solely responsible for

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providing a safe place for the performance of the Work; provided that the Owner shall be responsible for, and the Contractor shall upon discovery notify the Owner in writing of, any unsafe condition created by the Owner.

ARTICLE 3 CONTRACTOR

§ 3.1 General

§ 3.1.1 The Contractor is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Contractor shall be lawfully licensed, if required in the jurisdiction where the Project is located. The Contractor shall designate in writing a representative who shall have express authority to bind the Contractor with respect to all matters under this Contract. The term "Contractor" means the Contractor or the Contractor's authorized representative.

§ 3.1.2 The Contractor shall perform the Work in accordance with the Contract Documents.

§ 3.1.3 The Contractor shall not be relieved of its obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Construction Manager or Architect in their administration of the Contract, or by tests, inspections or approvals required or performed by persons or entities other than the Contractor.

§ 3.2 Review of Contract Documents and Field Conditions by Contractor

§ 3.2.1 Execution of the Contract by the Contractor is a representation that the Contractor has visited the site, become generally familiar with local conditions under which the Work is to be performed, and correlated personal observations with requirements of the Contract Documents.

The Contractor shall rely on its own knowledge and its review and interpretation of the Contract Documents and data provided in entering into the Contract and not the representations of the Owner or other persons. The Contractor acknowledges that quantities provided in the Contract Documents are estimates only and Contractor shall not seek additional compensation or adjustment in price based on a variation in actual quantities.

Prior to execution of the Contract, the Contractor and each Subcontractor shall evaluate and satisfy themselves as to the conditions and limitations under which the Work is to be performed, including, without limitation, (i) the location, condition, layout, and nature of the Project site and surrounding areas, (ii) generally prevailing climatic conditions, (iii) anticipated labor supply and costs, and (iv) availability and cost of materials, tools, and equipment.

The location of existing features shown on plans is intended for general information only. The Contractor, alone, is responsible for accurate determination of the location of all structures and shall not be entitled to any extra payment for discrepancies between the work as shown in the Contract Documents and existing conditions.

The locations, depths and data as to underground conditions have been obtained from records, surface indications and data furnished by others. Information furnished is solely for the convenience of the Contractor without any warranty, expressed or implied as to its accuracy or completeness. The Contractor shall verify all existing conditions prior to commencing the Work. The Contractor shall make no claim against the Owner or Architect with respect to the accuracy or completeness of such information if the conditions found after commencement of the Work are different from those as indicated.

The Contractor shall be solely responsible for the conditions which develop during construction and in the event any structure is dislocated, or over strained, or damaged so as to affect its usefulness, the Contractor shall correct or repair any dislocations, over strains or damages caused.

The Contractor is responsible for restorations and/or repair of utilities, private property, buildings, pavement, walkways, roads, etc. damaged by its activities during the performance of its Work.

The Contractor shall assume full responsibility for accuracy of measurements obtained at the site. No extra compensation will be allowed because of differences between actual measurements and dimensions indicated on the Drawings, nor for Contractor's failure to coordinate work with actual field measurements.

§ 3.2.2 Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.3.5, shall take field measurements of any existing conditions

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related to that portion of the Work, and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Construction Manager and Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information submitted to the Construction Manager in such form as the Construction Manager and Architect may require. It is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents.

§ 3.2.3 The Contractor is not required to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, but the Contractor shall promptly report to the Construction Manager and Architect any nonconformity discovered by or made known to the Contractor as a request for information submitted to Construction Manager in such form as the Construction Manager and Architect may require.

§ 3.2.4 If the Contractor believes that additional cost or time is involved because of clarifications or instructions the Architect issues in response to the Contractor's notices or requests for information pursuant to Sections 3.2.2 or 3.2.3, the Contractor shall submit Claims as provided in Article 15. If the Contractor fails to perform the obligations of Sections 3.2.2 or 3.2.3, the Contractor shall pay such costs and damages to the Owner, subject to section 15.1.7, as would have been avoided if the Contractor had performed such obligations. If the Contractor performs those obligations, the Contractor shall not be liable to the Owner or Architect for damages resulting from errors, inconsistencies or omissions in the Contract Documents, for differences between field measurements or conditions and the Contract Documents, or for nonconformities of the Contract Documents to applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities.

§ 3.3 Supervision and Construction Procedures

§ 3.3.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for, and have control over, construction means, methods, techniques, sequences, and procedures, and for coordinating all portions of the Work under the Contract. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences, or procedures, the Contractor shall evaluate the jobsite safety thereof and shall be solely responsible for the jobsite safety of such means, methods, techniques, sequences, or procedures. If the Contractor determines that such means, methods, techniques, sequences or procedures may not be safe, the Contractor shall give timely written notice to the Owner, the Construction Manager, and the Architect, and shall propose alternative means, methods, techniques, sequences, or procedures. The Architect shall evaluate the proposed alternative solely for conformance with the design intent for the completed construction. The Construction Manager shall review the proposed alternative for sequencing, constructability, and coordination impacts on the other Contractors. Unless the Architect or the Construction Manager objects to the Contractor's proposed alternative, the Contractor shall perform the Work using its alternative means, methods, techniques, sequences, or procedures.

§ 3.3.2 The Contractor shall be responsible to the Owner for acts and omissions of the Contractor's employees, Subcontractors and their agents and employees, and other persons or entities performing portions of the Work for, or on behalf of, the Contractor or any of its Subcontractors.

§ 3.3.3 The Contractor shall be responsible for inspection of portions of the Project already performed to determine that such portions are in proper condition to receive subsequent Work.

§ 3.4 Labor and Materials

§ 3.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

§ 3.4.2 Except in the case of minor changes in the Work approved by the Architect in accordance with Section 3.12.8 or ordered by the Architect in accordance with Section 7.4, the Contractor may make substitutions only with the written consent of the Owner, after evaluation by the Architect, in consultation with the Construction Manager, and in

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accordance with a Change Order or Construction Change Directive.

§ 3.4.3 The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Work. The Contractor shall not permit employment of unfit persons or persons not properly skilled in tasks assigned to them.

§ 3.5 Warranty

§ 3.5.1 The Contractor warrants to the Owner, Construction Manager, and Architect that materials and equipment furnished under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. The Contractor further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects, except for those inherent in the quality of the Work the Contract Documents require or permit. Work, materials, or equipment not conforming to these requirements may be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by abuse, alterations to the Work not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. If required by the Construction Manager or Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

§ 3.5.2 All material, equipment, or other special warranties required by the Contract Documents shall be issued in the name of the Owner, or shall be transferable to the Owner, and shall commence in accordance with Section 9.8.4.

§ 3.6 Taxes

Owner is exempt from payment of New York State, and Local Sales and Compensation Use Taxes on all supplies and materials incorporated into and becoming an integral component part of the structures, buildings, or real property pursuant to this Contract. Such taxes are therefore not to be included in the Contractor's bid or Contract Sum. Owner shall deliver to Contractor the appropriate exemption certificate required to be supplied by the Owner, and Contractor and its Subcontractors and materialmen shall be solely responsible for obtaining and delivering any and all exemption or other certificates and for furnishing a Contractor Exempt Purchase Certificate or other appropriate certificates to all persons, firms, or corporations from whom they purchase supplies, materials, and equipment for the performance of the Work.

§ 3.7 Permits, Fees, Notices, and Compliance with Laws

§ 3.7.1 Unless otherwise provided in the Contract Documents, the Owner, assisted by the Construction Manager, shall secure and pay for the building permit. The Contractor shall secure and pay for other permits, fees, licenses, and inspections by government agencies necessary for proper execution and completion of the Work that are customarily secured after execution of the Contract and legally required at the time bids are received or negotiations concluded. The Contractor shall promptly deliver copies of such documents to the Owner.

If in connection with the Project, the Owner has obtained certain permits, licenses or agreements for the Project, the owner will furnish copies of these documents to the Contractor. It is the Contractor's responsibility to comply with any conditions or limitations placed on the Project by these permits. The Contractor shall fully cooperate with the Owner in meeting the permit requirements and accommodations of regulatory inspections / directives.

§ 3.7.2 The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities applicable to performance of the Work. If the Contractor fails to give such notices as applicable to the performance of the Work, the Contractor shall be liable for and shall indemnify and hold harmless the Owner against any and all resulting fines, penalties, judgments or damages, including reasonable attorney fees, imposed on or incurred by the parties indemnified, as a result of such failures by the Contractor.

§ 3.7.3 If the Contractor performs Work knowing it to be contrary to applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, the Contractor shall assume appropriate responsibility for such Work and shall bear the costs attributable to correction.

§ 3.7.4 Concealed or Unknown Conditions. If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2)

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unknown physical conditions of an unusual nature that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall promptly provide notice to the Owner, Construction Manager, and the Architect before conditions are disturbed and in no event later than 14 days after first observance of the conditions. The Architect and Construction Manager will promptly investigate such conditions and, if the Architect, in consultation with the Construction Manager, determines that they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend that an equitable adjustment be made in the Contract Sum or Contract Time, or both. If the Architect, in consultation with the Construction Manager, determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall promptly notify in writing the Owner, Construction Manager, and Contractor, stating the reasons. If the Owner or Contractor disputes the Architect's determination or recommendation, either party may submit a Claim as provided in Article 15.

§ 3.7.5 If, in the course of the Work, the Contractor encounters human remains or recognizes the existence of burial markers, archaeological sites or wetlands not indicated in the Contract Documents, the Contractor shall immediately suspend any operations that would affect them and shall notify the Owner, Construction Manager, and Architect. Upon receipt of such notice, the Owner shall promptly take any action necessary to obtain governmental authorization required to resume the operations. The Contractor shall continue to suspend such operations until otherwise instructed by the Owner but shall continue with all other operations that do not affect those remains or features. Requests for adjustments in the Contract Sum and Contract Time arising from the existence of such remains or features may be made as provided in Article 15.

§ 3.7.6 Upon completion of the Work, the Contractor shall deliver to the Architect original copies of all required final certificates of inspection, the Certificate of Occupancy, and any other documents evidencing that inspections required by authorities having jurisdiction over the Work have been performed.

§ 3.8 Allowances

§ 3.8.1 The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. Items covered by allowances shall be supplied for such amounts and by such persons or entities as the Owner may direct, but the Contractor shall not be required to employ persons or entities to whom the Contractor has reasonable objection.

§ 3.8.2 Unless otherwise provided in the Contract Documents:

- **.1** allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;
- **.2** Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit, and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum but not in the allowances; and
- **.3** whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs and the allowances under Section 3.8.2.1 and (2) changes in Contractor's costs under Section 3.8.2.2.

§ 3.8.3 Materials and equipment under an allowance shall be selected by the Owner with reasonable promptness.

§ 3.9 Superintendent

§ 3.9.1 The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project site during performance of the Work. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor.

The Contractor's superintendent shall not be removed from this Project until the Project punch list has been completed and the Project has been accepted by the Owner. Unless approved otherwise by the Owner in advance, the Contractor's superintendent shall be assigned solely to this Project and shall not perform any duties or superintendence on any other Project until completion of this Project.

§ 3.9.2 The Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect, through the Construction Manager, of the name and qualifications of a proposed superintendent. Within 14 days of receipt of the

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information, the Construction Manager may notify the Contractor, stating whether the Owner, the Construction Manager, or the Architect (1) has reasonable objection to the proposed superintendent or (2) require additional time for review. Failure of the Construction Manager to provide notice within the 14-day period shall constitute notice of no reasonable objection.

§ 3.9.3 The Contractor shall not employ a proposed superintendent to whom the Owner, Construction Manager, or Architect has made reasonable and timely objection. The Contractor shall not change the superintendent without the Owner's written consent, which shall not unreasonably be withheld or delayed.

§ 3.10 Contractor's Construction and Submittal Schedules

§ 3.10.1 The Contractor, promptly after being awarded the Contract, shall submit for the Owner's and Architect's information, and the Construction Manager's use in developing the Project schedule, a Contractor's construction schedule for the Work. The schedule shall contain detail appropriate for the Project, including (1) the date of commencement of the Work, interim schedule milestone dates, and the date of Substantial Completion; (2) an apportionment of the Work by construction activity; and (3) the time required for completion of each portion of the Work. The schedule shall provide for the orderly progression of the Work to completion and shall not exceed time limits current under the Contract Documents. The schedule shall be revised at appropriate intervals as required by the conditions of the Work and Project. The Contractor shall cooperate with the Construction Manager in scheduling and performing the Contractor's Work to avoid conflict with, and as to cause no delay in, the work or activities of other Contractors, or the construction or operations of the Owner's own forces or Separate Contractors.

§ 3.10.2 The Contractor, promptly after being awarded the Contract and thereafter as necessary to maintain a current submittal schedule, shall submit a submittal schedule for the Construction Manager's and Architect's approval. The Architect and Construction Manager's approval shall not be unreasonably delayed or withheld. The submittal schedule shall (1) be coordinated with the Contractor's construction schedule, and (2) allow the Construction Manager and Architect reasonable time to review submittals. If the Contractor fails to submit a submittal schedule, or fails to provide submittals in accordance with the approved submittal schedule, the Contractor shall not be entitled to any increase in Contract Sum or extension of Contract Time based on the time required for review of submittals.

§ 3.10.3 The Contractor shall participate with other Contractors, the Construction Manager, and the Owner in reviewing and coordinating all schedules for incorporation into the Project schedule that is prepared by the Construction Manager. The Contractor shall make revisions to the construction schedule and submittal schedule as deemed necessary by the Construction Manager to conform to the Project schedule.

§ 3.10.4 The Contractor shall perform the Work in general accordance with the most recent schedules submitted to the Owner, Construction Manager, and Architect, and incorporated into the approved Project schedule.

§ 3.11 Documents and Samples at the Site

The Contractor shall make available, at the Project site, the Contract Documents, including Change Orders, Construction Change Directives, and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and the approved Shop Drawings, Product Data, Samples, and similar required submittals. These shall be in electronic form or paper copy, available to the Construction Manager, Architect, and Owner, and delivered to the Construction Manager for submittal to the Owner upon completion of the Work as a record of the Work as constructed.

§ 3.12 Shop Drawings, Product Data, and Samples

§ 3.12.1 Shop Drawings are drawings, diagrams, schedules, and other data specially prepared for the Work by the Contractor or a Subcontractor, Sub-subcontractor, manufacturer, supplier, or distributor to illustrate some portion of the Work.

§ 3.12.2 Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams, and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work.

§ 3.12.3 Samples are physical examples that illustrate materials, equipment, or workmanship, and establish standards by which the Work will be judged.

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§ 3.12.4 Shop Drawings, Product Data, Samples, and similar submittals are not Contract Documents. Their purpose is to demonstrate how the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents for those portions of the Work for which the Contract Documents require submittals. Review by the Architect and Construction Manager is subject to the limitations of Sections 4.2.10 through 4.2.12. Informational submittals upon which the Construction Manager and Architect are not expected to take responsive action may be so identified in the Contract Documents. Submittals that are not required by the Contract Documents may be returned by the Construction Manager or Architect without action.

§ 3.12.5 The Contractor shall review for compliance with the Contract Documents, approve, and submit to the Construction Manager, Shop Drawings, Product Data, Samples, and similar submittals required by the Contract Documents, in accordance with the Project submittal schedule approved by the Construction Manager and Architect or, in the absence of an approved Project submittal schedule, with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of other Contractors, Separate Contractors, or the Owner's own forces. The Contractor shall cooperate with the Construction Manager in the coordination of the Contractor's Shop Drawings, Product Data, Samples, and similar submittals with related documents submitted by other Contractors.

§ 3.12.6 By submitting Shop Drawings, Product Data, Samples, and similar submittals, the Contractor represents to the Owner, Construction Manager, and Architect, that the Contractor has (1) reviewed and approved them, (2) determined and verified materials, field measurements and field construction criteria related thereto, or will do so, and (3) checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

§ 3.12.7 The Contractor shall perform no portion of the Work for which the Contract Documents require submittal and review of Shop Drawings, Product Data, Samples, or similar submittals, until the respective submittal has been reviewed and approved by the Architect.

§ 3.12.8 The Work shall be in accordance with approved submittals except that the Contractor shall not be relieved of responsibility for deviations from the requirements of the Contract Documents by the Architect's approval of Shop Drawings, Product Data, Samples, or similar submittals, unless the Contractor has specifically notified the Construction Manager and Architect of such deviation at the time of submittal and (1) the Architect has given written approval to the specific deviation as a minor change in the Work, or (2) a Change Order or Construction Change Directive has been issued authorizing the deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples, or similar submittals, by the Architect's approval thereof.

§ 3.12.9 The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples, or similar submittals, to revisions other than those requested by the Construction Manager and Architect on previous submittals. In the absence of such notice, the Architect's approval of a resubmission shall not apply to such revisions.

§ 3.12.10 The Contractor shall not be required to provide professional services that constitute the practice of architecture or engineering unless such services are specifically required by the Contract Documents for a portion of the Work or unless the Contractor needs to provide such services in order to carry out the Contractor's responsibilities for construction means, methods, techniques, sequences, and procedures. The Contractor shall not be required to provide professional services in violation of applicable law.

§ 3.12.10.1 If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect will specify all performance and design criteria that such services must satisfy. The Contractor shall be entitled to rely upon the adequacy and accuracy of the performance and design criteria provided in the Contract Documents. The Contractor shall cause such services or certifications to be provided by an appropriately licensed design professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings, and other submittals prepared by such professional. Shop Drawings, and other submittals related to the Work, designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to the Architect. The Owner, the Architect, and the Construction Manager shall be entitled to rely upon the adequacy and accuracy of the services, certifications, and approvals performed or provided by such design professionals, provided the Owner and Architect have specified to the Contractor the performance and design criteria that such services must satisfy. Pursuant to this Section 3.12.10, the Architect will review and approve or take other appropriate action on

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submittals only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Construction Manager shall review submittals for sequencing, constructability, and coordination impacts on other Contractors.

§ 3.12.10.2 If the Contract Documents require the Contractor's design professional to certify that the Work has been performed in accordance with the design criteria, the Contractor shall furnish such certifications to the Construction Manager and Architect at the time and in the form specified by the Architect.

§ 3.13 Use of Site

§ 3.13.1 The Contractor shall confine operations at the site to areas permitted by applicable laws, statutes, ordinances, codes, rules and regulations, lawful orders of public authorities, and the Contract Documents and shall not unreasonably encumber the site with materials or equipment. Due to the site constraints, only materials and equipment that are to be used in the Work shall be brought to and stored on the Project site by the Contractor. The Contractor shall not permit any workers to use existing facilities at the Project site, including, without limitation, lavatories, entrances and parking areas other than those designated and approved by the Owner.

§ 3.13.2 The Contractor shall coordinate the Contractor's operations with, and secure the approval of, the Construction Manager before using any portion of the site.

§ 3.13.3 The Contractor shall be responsible for enforcing the Owner's security and access policies and procedures and the following rules of conduct for its personnel and those of its subcontractors, sub-subcontractors, and suppliers at the Project site, and the Owner's Project Representative shall provide interpretations should a question arise if the rules of conduct are being adequately enforced by the Contractor:

.1 No smoking, vaping or use of tobacco products.
.2 No drinking of alcoholic beverages or use of controlled substances.
.3 No working, or presence on site, under the influence of alcoholic beverages or controlled substances.
.4 No use of indecent language or display of indecent images, publications or terms.
.5 No use of radios or other entertainment devices.
.6 No horseplay or dangerous behavior.
.7 No firearms or other weapons.
.8 No communications with staff or students.

§ 3.14 Cutting and Patching

§ 3.14.1 The Contractor shall be responsible for cutting, fitting, or patching required to complete the Work or to make its parts fit together properly. All areas requiring cutting, fitting, or patching shall be restored to the condition existing prior to the cutting, fitting, or patching, unless otherwise required by the Contract Documents.

§ 3.14.2 The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner, Separate Contractors, or of other Contractors by cutting, patching, or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter construction by the Owner, Separate Contractors, or by other Contractors except with written consent of the Construction Manager, Owner, and such other Contractors or Separate Contractors. Consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold, from the Separate Contractors, other Contractors, or the Owner, its consent to cutting or otherwise altering the Work.

§ 3.15 Cleaning Up

§ 3.15.1 The Contractor shall keep the premises and surrounding area free from accumulation of waste materials and rubbish caused by operations under the Contract. At completion of the Work, the Contractor shall remove waste materials, rubbish, the Contractor's tools, construction equipment, machinery, and surplus materials from and about the Project.

§ 3.15.2 If the Contractor fails to clean up as provided in the Contract Documents, the Owner, or Construction Manager with the Owner's approval, may do so and the Owner shall be entitled to reimbursement from the Contractor.

§ 3.16 Access to Work

The Contractor shall provide the Owner, Construction Manager, and Architect with access to the Work in preparation

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and progress wherever located.

§ 3.17 Royalties, Patents and Copyrights

The Contractor shall pay all royalties and license fees. The Contractor shall defend suits or claims for infringement of copyrights and patent rights and shall hold the Owner, Construction Manager, and Architect harmless from loss on account thereof, but shall not be responsible for defense or loss when a particular design, process, or product of a particular manufacturer or manufacturers is required by the Contract Documents, or where the copyright violations are contained in Drawings, Specifications, or other documents prepared by the Owner, Architect, or Construction Manager. However, if an infringement of a copyright or patent is discovered by, or made known to, the Contractor, the Contractor shall be responsible for the loss unless the information is promptly furnished to the Architect through the Construction Manager.

§ 3.18 Indemnification

§ 3.18.1 To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, Construction Manager, Architect, Construction Manager's and Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), but only to the extent caused by the negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss, or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity that would otherwise exist as to a party or person described in this Section 3.18.

§ 3.18.2 In claims against any person or entity indemnified under this Section 3.18 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, the indemnification obligation under Section 3.18.1 shall not be limited by a limitation on amount or type of damages, compensation, or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefit acts, or other employee benefit acts.

ARTICLE 4 ARCHITECT AND CONSTRUCTION MANAGER

§ 4.1 General

§ 4.1.1 The Architect is the person or entity retained by the Owner pursuant to Section 2.3.2 and identified as such in the Agreement.

§ 4.1.2 The Construction Manager is the person or entity retained by the Owner pursuant to Section 2.3.3 and identified as such in the Agreement.

§ 4.1.3 Duties, responsibilities, and limitations of authority of the Construction Manager and Architect as set forth in the Contract Documents shall not be restricted, modified, or extended without written consent of the Owner, Construction Manager, Architect, and Contractor. Consent shall not be unreasonably withheld.

§ 4.2 Administration of the Contract

§ 4.2.1 The Construction Manager and Architect will provide administration of the Contract as described in the Contract Documents and will be the Owner's representatives during construction until the date the Architect issues the final Certificate for Payment. The Construction Manager and Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents.

§ 4.2.2 The Architect will visit the site at intervals appropriate to the stage of construction, or as otherwise agreed with the Owner, to become generally familiar with the progress and quality of the portion of the Work completed, and to determine in general if the Work observed is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents. However, the Architect will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. On the basis of the site visits, the Architect will keep the Owner and the Construction Manager reasonably informed about the progress and quality of the portion of the Work completed, and promptly report to the Owner and Construction Manager known deviations from the Contract Documents and defects and deficiencies observed in the Work.

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§ 4.2.2.1 The Owner is entitled to reimbursement from the Contractor for amounts paid to the Architect for site visits made necessary by the fault of the Contractor to maintain the Project Schedule or for defects and deficiencies in the Work. The Owner may see reimbursement pursuant to the procedures set forth in **§ 9.5.1.**

§ 4.2.3 The Construction Manager shall provide one or more representatives who shall be in attendance at the Project site whenever the Work is being performed. The Construction Manager will determine in general if the Work observed is being performed in accordance with the Contract Documents, will keep the Owner and Architect reasonably informed of the progress of the Work, and will promptly report to the Owner and Architect known deviations from the Contract Documents and the most recent Project schedule, and defects and deficiencies observed in the Work.

§ 4.2.4 The Construction Manager will schedule and coordinate the activities of the Contractor and other Contractors in accordance with the latest approved Project schedule.

§ 4.2.5 The Construction Manager, except to the extent required by Section 4.2.4, and Architect will not have control over, charge of, or responsibility for, the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents, and neither will be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. Neither the Construction Manager nor the Architect will have control over or charge of, or be responsible for acts or omissions of, the Contractor, Subcontractors, or their agents or employees, or of any other persons or entities performing portions of the Work.

§ 4.2.6 Communications. The Owner shall communicate with the Contractor and the Construction Manager's consultants through the Construction Manager about matters arising out of or relating to the Contract Documents. The Owner and Construction Manager shall include the Architect in all communications that relate to or affect the Architect's services or professional responsibilities. The Owner shall promptly notify the Architect of the substance of any direct communications between the Owner and the Construction Manager otherwise relating to the Project. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and suppliers shall be through the Contractor. Communications by and with other Contractors shall be through the Construction Manager. Communications by and with the Owner's own forces and Separate Contractors shall be through the Owner. The Contract Documents may specify other communication protocols.

§ 4.2.7 The Construction Manager and Architect will review and certify all Applications for Payment by the Contractor, in accordance with the provisions of Article 9.

§ 4.2.8 The Architect and Construction Manager have authority to reject Work that does not conform to the Contract Documents, and will notify each other about the rejection. Whenever the Construction Manager considers it necessary or advisable, the Construction Manager will have authority to require inspection or testing of the Work in accordance with Sections 13.4.2 and 13.4.3, upon written authorization of the Owner, whether or not the Work is fabricated, installed or completed. The foregoing authority of the Construction Manager will be subject to the provisions of Sections 4.2.18 through 4.2.20 inclusive, with respect to interpretations and decisions of the Architect. However, neither the Architect's nor the Construction Manager's authority to act under this Section 4.2.8 nor a decision made by either of them in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect or the Construction Manager to the Contractor, Subcontractors, suppliers, their agents or employees, or other persons performing any of the Work.

§ 4.2.9 Utilizing the submittal schedule provided by the Contractor, the Construction Manager shall prepare, and revise as necessary, a Project submittal schedule incorporating information from other Contractors, the Owner, Owner's consultants, Owner's Separate Contractors and vendors, governmental agencies, and participants in the Project under the management of the Construction Manager. The Project submittal schedule and any revisions shall be submitted to the Architect for approval.

§ 4.2.10 The Construction Manager will receive and promptly review for conformance with the submittal requirements of the Contract Documents, all submittals from the Contractor such as Shop Drawings, Product Data, and Samples. Where there are other Contractors, the Construction Manager will also check and coordinate the information contained within each submittal received from the Contractor and other Contractors, and transmit to the Architect those

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recommended for approval. By submitting Shop Drawings, Product Data, Samples, and similar submittals, the Construction Manager represents to the Owner and Architect that the Construction Manager has reviewed and recommended them for approval. The Construction Manager's actions will be taken in accordance with the Project submittal schedule approved by the Architect or, in the absence of an approved Project submittal schedule, with reasonable promptness while allowing sufficient time to permit adequate review by the Architect.

§ 4.2.11 The Architect will review and approve, or take other appropriate action upon, the Contractor's submittals such as Shop Drawings, Product Data, and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect's action will be taken in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness while allowing sufficient time in the Architect's professional judgment to permit adequate review. Upon the Architect's completed review, the Architect shall transmit its submittal review to the Construction Manager.

§ 4.2.12 Review of the Contractor's submittals by the Construction Manager and Architect is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Construction Manager and Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Sections 3.3, 3.5, and 3.12. The Construction Manager and Architect's review shall not constitute approval of safety precautions or of any construction means, methods, techniques, sequences, or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

§ 4.2.13 The Construction Manager will prepare Change Orders and Construction Change Directives.

§ 4.2.14 The Construction Manager and the Architect will take appropriate action on Change Orders or Construction Change Directives in accordance with Article 7, and the Architect will have authority to order minor changes in the Work as provided in Section 7.4. The Architect, in consultation with the Construction Manager, will investigate and make determinations and recommendations regarding concealed and unknown conditions as provided in Section 3.7.4.

§ 4.2.15 Utilizing the documents provided by the Contractor, the Construction Manager will maintain at the site for the Owner one copy of all Contract Documents, approved Shop Drawings, Product Data, Samples, and similar required submittals, in good order and marked currently to record all changes and selections made during construction. These will be available to the Architect and the Contractor, and will be delivered to the Owner upon completion of the Project.

§ 4.2.16 The Construction Manager will assist the Architect in conducting inspections to determine the date or dates of Substantial Completion and the date of final completion; issue Certificates of Substantial Completion in conjunction with the Architect pursuant to Section 9.8; and receive and forward to the Owner written warranties and related documents required by the Contract and assembled by the Contractor pursuant to Section 9.10. The Construction Manager will forward to the Architect a final Application and Certificate for Payment or final Project Application and Project Certificate for Payment upon the Contractor's compliance with the requirements of the Contract Documents.

§ 4.2.17 If the Owner and Architect agree, the Architect will provide one or more Project representatives to assist in carrying out the Architect's responsibilities at the site. The Owner shall notify the Construction Manager of any change in the duties, responsibilities and limitations of authority of the Project representatives.

§ 4.2.18 The Architect will interpret and decide matters concerning performance under, and requirements of, the Contract Documents on written request of the Construction Manager, Owner, or Contractor through the Construction Manager. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness.

§ 4.2.19 Interpretations and decisions of the Architect will be consistent with the intent of, and reasonably inferable from, the Contract Documents and will be in writing or in the form of drawings. When making such interpretations and decisions, the Architect will endeavor to secure faithful performance by both Owner and Contractor, will not show partiality to either, and will not be liable for results of interpretations or decisions so rendered in good faith.

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§ 4.2.20 The Architect's decisions on matters relating to aesthetic effect will be final if consistent with the intent expressed in the Contract Documents.

§ 4.2.21 The Construction Manager will receive and review requests for information from the Contractor, and forward each request for information to the Architect, with the Construction Manager's recommendation. The Architect will review and respond in writing, through the Construction Manager, to requests for information about the Contract Documents. The Construction Manager's recommendation and the Architect's response to each request will be made in writing within any time limits agreed upon or otherwise with reasonable promptness. If appropriate, the Architect will prepare and issue supplemental Drawings and Specifications in response to the requests for information.

ARTICLE 5 SUBCONTRACTORS

§ 5.1 Definitions

§ 5.1.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include other Contractors or Separate Contractors or the subcontractors of other Contractors or Separate Contractors.

§ 5.1.2 A Sub-subcontractor is a person or entity who has a direct or indirect contract with a Subcontractor to perform a portion of the Work at the site. The term "Sub-subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Sub-subcontractor or an authorized representative of the Sub-subcontractor.

§ 5.2 Award of Subcontracts and Other Contracts for Portions of the Work

§ 5.2.1 Unless otherwise stated in the Contract Documents, the Contractor, as soon as practicable after award of the Contract, shall notify the Construction Manager, for review by the Owner, Construction Manager and Architect, of the persons or entities proposed for each principal portion of the Work, including those who are to furnish materials or equipment fabricated to a special design. Within 14 days of receipt of the information, the Construction Manager may notify the Contractor whether the Owner, the Construction Manager or the Architect (1) has reasonable objection to any such proposed person or entity or, (2) requires additional time for review. Failure of the Construction Manager to provide notice within the 14-day period shall constitute notice of no reasonable objection.

The Contractor shall, prior to any work being performed, obtain and provide to the Owner and Construction Manager, a copy of the Subcontractor(s) Contractor Certificate of Registration, pursuant to New York State Department of Labor requirements.

§ 5.2.2 The Contractor shall not contract with a proposed person or entity to whom the Owner, Construction Manager or Architect has made reasonable and timely objection. The Contractor shall not be required to contract with anyone to whom the Contractor has made reasonable objection.

§ 5.2.3 If the Owner, Construction Manager or Architect has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner, Construction Manager or Architect has no reasonable objection. If the proposed but rejected Subcontractor was reasonably capable of performing the Work, the Contract Sum and Contract Time shall be increased or decreased by the difference, if any, occasioned by such change, and an appropriate Change Order shall be issued before commencement of the substitute Subcontractor's Work. However, no increase in the Contract Sum or Contract Time shall be allowed for such change unless the Contractor has acted promptly and responsively in submitting names as required.

§ 5.2.4 The Contractor shall not substitute a Subcontractor, person, or entity for one previously selected if the Owner, Construction Manager or Architect makes reasonable objection to such substitution.

§ 5.3 Subcontractual Relations

By appropriate written agreement, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities, including the responsibility for safety of the Subcontractor's Work, that the Contractor, by these Contract Documents, assumes toward the Owner, Construction Manager and Architect. Each subcontract agreement shall preserve and protect the rights of the Owner, Construction Manager and Architect under the Contract Documents with respect to the Work to be performed by the Subcontractor

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so that subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the subcontract agreement, the benefit of all rights, remedies, and redress against the Contractor that the Contractor, by the Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the subcontract agreement, copies of the Contract Documents to which the Subcontractor will be bound, and, upon written request of the Subcontractor, identify to the Subcontractor terms and conditions of the proposed subcontract agreement that may be at variance with the Contract Documents. Subcontractors will similarly make copies of applicable portions of such documents available to their respective proposed Sub-subcontractors.

§ 5.4 Contingent Assignment of Subcontracts

§ 5.4.1 Each subcontract agreement for a portion of the Work is assigned by the Contractor to the Owner, provided that

- **.1** assignment is effective only after termination of the Contract by the Owner for cause pursuant to Section 14.2 and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor; and
- **.2** assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

When the Owner accepts the assignment of a subcontract agreement, the Owner assumes the Contractor's rights and obligations under the subcontract, provided that the Owner shall not be under any obligation to compensate the Subcontractor with respect to amounts that the Owner has already paid to the Contractor for such Subcontractor's work.

§ 5.4.2 Upon such assignment, if the Work has been suspended for more than 30 days, the Subcontractor's compensation shall be equitably adjusted for increases in cost resulting from the suspension.

§ 5.4.3 Upon assignment to the Owner under this Section 5.4, the Owner may further assign the subcontract to a successor Contractor or other entity. If the Owner assigns the subcontract to a successor Contractor or other entity, the Owner shall nevertheless remain legally responsible for all of the successor Contractor's obligations under the subcontract.

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

§ 6.1 Owner's Right to Perform Construction with Own Forces and to Award Other Contracts

§ 6.1.1 The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and with Separate Contractors retained under Conditions of the Contract substantially similar to those of this Contract, including those provisions of the Conditions of the Contract related to insurance and waiver of subrogation.

§ 6.1.2 When the Owner performs construction or operations with the Owner's own forces or Separate Contractors, the Owner shall provide for coordination of such forces and Separate Contractors with the Work of the Contractor, who shall cooperate with them.

§ 6.1.3 Unless otherwise provided in the Contract Documents, when the Owner performs construction or operations related to the Project with the Owner's own forces or with Separate Contractors, the Owner or its Separate Contractors shall have the same obligations and rights that the Contractor has under the Conditions of the Contract, including, without excluding others, those stated in Article 3, this Article 6, and Articles 10, 11, and 12.

§ 6.2 Mutual Responsibility

§ 6.2.1 The Contractor shall afford the Owner's own forces, Separate Contractors, Construction Manager and other Contractors reasonable opportunity for introduction and storage of their materials and equipment and performance of their activities, and shall connect and coordinate the Contractor's construction and operations with theirs as required by the Contract Documents.

§ 6.2.2 If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner's own forces, Separate Contractors or other Contractors, the Contractor shall, prior to proceeding with that portion of the Work, promptly notify the Construction Manager and Architect in writing and in detail of apparent discrepancies or defects in the construction or operations by the Owner or Separate Contractor or other Contractors that would render it unsuitable for proper execution and results of the Contractor's Work. Failure of the Contractor to notify the Construction Manager and the Architect of apparent discrepancies or defects prior to proceeding with the Work

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shall constitute an acknowledgment that the Owner's or Separate Contractor's or other Contractors' completed or partially completed construction is fit and proper to receive the Contractor's Work. The Contractor shall not be responsible for discrepancies or defects in the construction or operations by the Owner or Separate Contractors or other Contractors that are not apparent.

§ 6.2.3 The Contractor shall reimburse the Owner for costs the Owner incurs, including costs that are payable to a Separate Contractors or to other Contractors, because of the Contractor's delays, improperly timed activities or defective construction. The Owner shall be responsible to the Contractor for costs the Contractor incurs because of delays, improperly timed activities, damage to the Work or defective construction by the Owner's own forces, Separate Contractors, or other Contractors.

§ 6.2.4 The Contractor shall promptly remedy damage that the Contractor wrongfully causes to completed or partially completed construction, or to property of the Owner, Separate Contractors, or other Contractors as provided in Section 10.2.5.

§ 6.2.5 The Owner, Separate Contractors, and other Contractors shall have the same responsibilities for cutting and patching as are described for the Contractor in Section 3.14.

§ 6.3 Owner's Right to Clean Up

If a dispute arises among the Contractor, Separate Contractors, other Contractors, and the Owner as to the responsibility under their respective contracts for maintaining the premises and surrounding area free from waste materials and rubbish, the Owner may clean up and the Construction Manager, with notice to the Architect, will allocate the cost among those responsible.

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 General

§ 7.1.1 Changes in the Work may be accomplished after execution of the Contract, and without invalidating the Contract, by Change Order, Construction Change Directive or order for a minor change in the Work, subject to the limitations stated in this Article 7 and elsewhere in the Contract Documents.

§ 7.1.2 A Change Order shall be based upon agreement among the Owner, Construction Manager, Architect and Contractor. A Construction Change Directive requires agreement by the Owner, Construction Manager and Architect and may or may not be agreed to by the Contractor. An order for a minor change in the Work may be issued by the Architect alone.

§ 7.1.3 Changes in the Work shall be performed under applicable provisions of the Contract Documents. The Contractor shall proceed promptly with changes in the Work, unless otherwise provided in the Change Order, Construction Change Directive, or order for a minor change in the Work.

§ 7.2 Change Orders

A Change Order is a written instrument prepared by the Construction Manager and signed by the Owner, Construction Manager, Architect, and Contractor, stating their agreement upon all of the following:

.1 The change in the Work;
.2 The amount of the adjustment, if any, in the Contract Sum; and
.3 The extent of the adjustment, if any, in the Contract Time.

§ 7.3 Construction Change Directives

§ 7.3.1 A Construction Change Directive is a written order prepared by the Construction Manager and signed by the Owner, Construction Manager and Architect, directing a change in the Work prior to agreement on adjustment, if any, in the Contract Sum or Contract Time, or both. The Owner may by Construction Change Directive, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions, or other revisions, the Contract Sum and Contract Time being adjusted accordingly.

§ 7.3.2 A Construction Change Directive shall be used in the absence of total agreement on the terms of a Change Order.

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§ 7.3.3 If the Construction Change Directive provides for an adjustment to the Contract Sum, the adjustment shall be based on one of the following methods:

.1 Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;

.2 Unit prices stated in the Contract Documents or subsequently agreed upon;

.3 Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or

.4 As provided in Section 7.3.4.

§ 7.3.4 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Construction Manager shall determine the adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit as set forth in the Agreement, or if no such amount is set forth in the Agreement, a reasonable amount not to exceed fifteen percent (15%). In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Construction Manager may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.4 shall be limited to the following:

.1 Costs of labor, including applicable payroll taxes, fringe benefits required by agreement or custom, workers' compensation insurance, and other employee costs approved by the Construction Manager and Architect;

.2 Costs of materials, supplies, and equipment, including cost of transportation, whether incorporated or consumed;

.3 Rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;

.4 Costs of premiums for all bonds and insurance, permit fees, and sales, use, or similar taxes, directly related to the change; and

.5 Costs of supervision and field office personnel directly attributable to the change.

§ 7.3.5 If the Contractor disagrees with the adjustment in the Contract Time, the Contractor may make a Claim in accordance with applicable provisions of Article 15.

§ 7.3.6 Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Construction Manager of the Contractor's agreement or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum or Contract Time.

§ 7.3.7 A Construction Change Directive signed by the Contractor indicates the Contractor's agreement therewith, including adjustment in Contract Sum and Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a Change Order.

§ 7.3.8 The amount of credit to be allowed by the Contractor to the Owner for a deletion or change that results in a net decrease in the Contract Sum shall be actual net cost as confirmed by the Construction Manager and Architect. When both additions and credits covering related Work or substitutions are involved in a change, the allowance for overhead and profit shall be figured on the basis of net increase, if any, with respect to that change.

§ 7.3.9 Pending final determination of the total cost of a Construction Change Directive to the Owner, the Contractor may request payment for Work completed under the Construction Change Directive in Applications for Payment. The Construction Manager and Architect will make an interim determination for purposes of monthly certification for payment for those costs and certify for payment the amount that the Construction Manager and Architect determine to be reasonably justified. The interim determination of cost shall adjust the Contract Sum on the same basis as a Change Order, subject to the right of either party to disagree and assert a Claim in accordance with Article 15.

§ 7.3.10 When the Owner and Contractor agree with a determination made by the Construction Manager and Architect concerning the adjustments in the Contract Sum and Contract Time, or otherwise reach agreement upon the adjustments, such agreement shall be effective immediately and the Construction Manager shall prepare a Change Order. Change Orders may be issued for all or any part of a Construction Change Directive.

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§ 7.4 Minor Changes in the Work

The Architect may order minor changes in the Work that are consistent with the intent of the Contract Documents and do not involve an adjustment in the Contract Sum or an extension of the Contract Time. The Architect's order for minor changes shall be in writing. If the Contractor believes that the proposed minor change in the Work will affect the Contract Sum or Contract Time, the Contractor shall notify the Construction Manager and shall not proceed to implement the change in the Work. If the Contractor performs the Work set forth in the Architect's order for a minor change without prior notice to the Construction Manager that such change will affect the Contract Sum or Contract Time, the Contractor waives any adjustment to the Contract Sum or extension of the Contract Time.

ARTICLE 8 TIME

§ 8.1 Definitions

§ 8.1.1 Unless otherwise provided, Contract Time is the period of time, including authorized adjustments, allotted in the Contract Documents for Substantial Completion of the Work.

§ 8.1.2 The date of commencement of the Work is the date established in the Agreement.

§ 8.1.3 The date of Substantial Completion is the date certified by the Architect in accordance with Section 9.8.

§ 8.1.4 The term "day" as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.

§ 8.2 Progress and Completion

§ 8.2.1 Time limits stated in the Contract Documents are of the essence of the Contract. By executing the Agreement, the Contractor confirms that the Contract Time is a reasonable period for performing the Work.

§ 8.2.2 The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, commence the Work prior to the effective date of insurance required to be furnished by the Contractor and Owner.

§ 8.2.3 The Contractor shall proceed expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time.

§ 8.3 Delays and Extensions of Time

§ 8.3.1 If the Contractor is delayed at any time in the commencement or progress of the Work by (1) an act or neglect of the Owner, Architect, Construction Manager, or an employee of any of them, or of the Owner's own forces, Separate Contractors, or other Contractors; (2) by changes ordered in the Work; (3) by labor disputes, fire, unusual delay in deliveries, unavoidable casualties, adverse weather conditions documented in accordance with Section 15.1.6.2, or other causes beyond the Contractor's control; (4) by delay authorized by the Owner pending mediation and binding dispute resolution; or (5) by other causes that the Contractor asserts and the Architect, based on the recommendation of the Construction Manager, determines justify delay, then the Contract Time shall be extended for such reasonable time as the Architect may determine.

§ 8.3.2 Claims relating to time shall be made in accordance with applicable provisions of Article 15.

§ 8.3.3 This Section 8.3 does not preclude recovery of damages for delay by either party under other provisions of the Contract Documents.

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 Contract Sum

§ 9.1.1 The Contract Sum is stated in the Agreement and, including authorized adjustments, is the total amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents.

§ 9.1.2 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed so that application of such unit prices to the actual quantities causes substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted.

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§ 9.2 Schedule of Values

Where the Contract is based on a stipulated sum or Guaranteed Maximum Price, the Contractor shall submit a schedule of values to the Construction Manager, before the first Application for Payment, allocating the entire Contract Sum to the various portions of the Work. The schedule of values shall be prepared in the form, and supported by the data to substantiate its accuracy, required by the Construction Manager and the Architect. This schedule, unless objected to by the Construction Manager or Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment. The Construction Manager shall forward to the Architect the Contractor's schedule of values. Any changes to the schedule of values shall be submitted to the Construction Manager and supported by such data to substantiate its accuracy as the Construction Manager and the Architect may require, and unless objected to by the Construction Manager or the Architect, shall be used as a basis for reviewing the Contractor's subsequent Applications for Payment.

§ 9.3 Applications for Payment

§ 9.3.1 At least fifteen days before the date established for each progress payment, the Contractor shall submit to the Construction Manager an itemized Application for Payment prepared in accordance with the schedule of values, if required under Section 9.2, for completed portions of the Work. The application shall be notarized, if required, and supported by all data substantiating the Contractor's right to payment that the Owner, Construction Manager or Architect require, such as copies of requisitions, and releases of waivers of lien from Subcontractors and suppliers, and shall reflect retainage if provided for in the Contract Documents.

§ 9.3.1.1 As provided in Section 7.3.9, such applications may include requests for payment on account of changes in the Work that have been properly authorized by Construction Change Directives, or by interim determinations of the Construction Manager and Architect, but not yet included in Change Orders.

§ 9.3.1.2 Applications for Payment shall not include requests for payment for portions of the Work for which the Contractor does not intend to pay a Subcontractor or supplier, unless such Work has been performed by others whom the Contractor intends to pay.

§ 9.3.2 Unless otherwise provided in the Contract Documents, payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work, provided the Owner has authorized such delivery and storage of materials at the site in advance. If approved in advance by the Owner, payment may similarly be made for materials and equipment suitably stored off the site at a location agreed upon in writing. The Owner reserves the right to limit payment to materials that are in short and/or critical supply and materials specifically fabricated for the project. Payment for materials and equipment stored on or off the site shall be conditioned upon compliance by the Contractor with procedures satisfactory to the Owner to establish the Owner's title to such materials and equipment or otherwise protect the Owner's interest, and shall include the costs of applicable insurance, storage, and transportation to the site, for such materials and equipment stored off the site. Such payment by the Owner for materials, equipment, fixtures and supplies stored on or off the Site shall not relieve the Contractor of its responsibility to provide reasonable protection of said materials, equipment, fixtures and supplies until there incorporation into the Work. The Owner shall have the right, at any time on reasonable notice, to inspect materials and equipment which have been stored off site in accordance with this section.

§ 9.3.3 The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all Work for which Certificates for Payment have been previously issued and payments received from the Owner shall, to the best of the Contractor's knowledge, information, and belief, be free and clear of liens, claims, security interests, or encumbrances, in favor of the Contractor, Subcontractors, suppliers, or other persons or entities that provided labor, materials and equipment relating to the Work.

§ 9.4 Certificates for Payment

§ 9.4.1 Where there is only one Contractor, the Construction Manager will, within seven days after the Construction Manager's receipt of the Contractor's Application for Payment, review the Application, certify the amount the Construction Manager determines is due the Contractor, and forward the Contractor's Application and Certificate for Payment to the Architect. Within seven days after the Architect receives the Contractor's Application for Payment from the Construction Manager, the Architect will either (1) issue to the Owner a Certificate for Payment, in the full amount of the Application for Payment, with a copy to the Construction Manager; or (2) issue to the Owner a Certificate for Payment for such amount as the Architect determines is properly due, and notify the Construction Manager and Owner

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of the Architect's reasons for withholding certification in part as provided in Section 9.5.1; or (3) withhold certification of the entire Application for Payment, and notify the Construction Manager and Owner of the Architect's reason for withholding certification in whole as provided in Section 9.5.1. The Construction Manager will promptly forward to the Contractor the Architect's notice of withholding certification.

§ 9.4.2 Where there is more than one Contractor performing portions of the Project, the Construction Manager will, within seven days after the Construction Manager receives all of the Contractors' Applications for Payment: (1) review the Applications and certify the amount the Construction Manager determines is due each of the Contractors; (2) prepare a Summary of Contractors' Applications for Payment by combining information from each Contractor's application with information from similar applications for progress payments from the other Contractors; (3) prepare a Project Application and Certificate for Payment; (4) certify the amount the Construction Manager determines is due all Contractors; and (5) forward the Summary of Contractors' Applications for Payment and Project Application and Certificate for Payment to the Architect.

§ 9.4.2.1 Within seven days after the Architect receives the Project Application and Project Certificate for Payment and the Summary of Contractors' Applications for Payment from the Construction Manager, the Architect will either (1) issue to the Owner a Project Certificate for Payment, with a copy to the Construction Manager; or (2) issue to the Owner a Project Certificate for Payment for such amount as the Architect determines is properly due, and notify the Construction Manager and Owner of the Architect's reasons for withholding certification in part as provided in Section 9.5.1; or (3) withhold certification of the entire Project Application for Payment, and notify the Construction Manager and Owner of the Architect's reason for withholding certification in whole as provided in Section 9.5.1. The Construction Manager will promptly forward the Architect's notice of withholding certification to the Contractors.

§ 9.4.3 The Construction Manager's certification of an Application for Payment or, in the case of more than one Contractor, a Project Application and Certificate for Payment, shall be based upon the Construction Manager's evaluation of the Work and the data in the Application or Applications for Payment. The Construction Manager's certification will constitute a representation that, to the best of the Construction Manager's knowledge, information, and belief, the Work has progressed to the point indicated, the quality of the Work is in accordance with the Contract Documents, and that the Contractor is, or Contractors are, entitled to payment in the amount certified.

§ 9.4.4 The Architect's issuance of a Certificate for Payment or, in the case of more than one Contractor, Project Application and Certificate for Payment, shall be based upon the Architect's evaluation of the Work, the recommendation of the Construction Manager, and data in the Application for Payment or Project Application for Payment. The Architect's certification will constitute a representation that, to the best of the Architect's knowledge, information, and belief, the Work has progressed to the point indicated, the quality of the Work is in accordance with the Contract Documents, and that the Contractor is, or Contractors are, entitled to payment in the amount certified.

§ 9.4.5 The representations made pursuant to Sections 9.4.3 and 9.4.4 are subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to results of subsequent tests and inspections, to correction of minor deviations from the Contract Documents prior to completion, and to specific qualifications expressed by the Construction Manager or Architect.

§ 9.4.6 The issuance of a Certificate for Payment or a Project Certificate for Payment will not be a representation that the Construction Manager or Architect has (1) made exhaustive or continuous on-site inspections to check the quality or quantity of the Work; (2) reviewed construction means, methods, techniques, sequences, or procedures; (3) reviewed copies of requisitions received from Subcontractors and suppliers and other data requested by the Owner to substantiate the Contractor's right to payment; or (4) made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum.

§ 9.5 Decisions to Withhold Certification

§ 9.5.1 The Construction Manager or Architect may withhold a Certificate for Payment or Project Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Construction Manager's or Architect's opinion the representations to the Owner required by Section 9.4.3 and 9.4.4 cannot be made. If the Construction Manager or Architect is unable to certify payment in the amount of the Application, the Construction Manager will notify the Contractor and Owner as provided in Section 9.4.1 and 9.4.2. If the Contractor, Construction Manager and Architect cannot agree on a revised amount, the Architect will promptly issue a Certificate for Payment or a Project Certificate for Payment for the amount for which the Architect is able to make such representations to the

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Owner. The Construction Manager or Architect may also withhold a Certificate for Payment or, because of subsequently discovered evidence, may nullify the whole or a part of a Certificate for Payment or Project Certificate for Payment previously issued, to such extent as may be necessary in the Construction Manager's or Architect's opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from the acts and omissions described in Section 3.3.2 because of

.1 defective Work not remedied;
.2 third party claims filed or reasonable evidence indicating probable filing of such claims, unless security acceptable to the Owner is provided by the Contractor;
.3 failure of the Contractor to make payments properly to Subcontractors or suppliers for labor, materials or equipment;
.4 reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;
.5 damage to the Owner or a Separate Contractor or other Contractor;
.6 reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or
.7 repeated failure to carry out the Work in accordance with the Contract Documents.
.8 any other reasonable grounds for objection or withholding as provided in the agreement or as permitted by law.

§ 9.5.2 When either party disputes the Architect's decision regarding a Certificate **for** Payment under Section 9.5.1, **in** whole **or** in part, that party may submit a Claim in accordance with Article 15.

§ 9.5.2 When the above reasons for withholding certification are removed, certification will be made for amounts previously withheld. The Owner shall not be deemed in default by reason of withholding payment while any conditions described in 9.5.1 remain.

§ 9.5.3 If the Architect or Construction Manager withholds certification for payment under Section 9.5.1, the Owner may, at its sole option, issue joint checks to the Contractor and to any Subcontractor or supplier to whom the Contractor failed to make payment for Work properly performed or material or equipment suitably delivered. If the Owner makes payments by joint check, the Owner shall notify the Architect and the Construction Manager, and both will reflect such payment on the next Certificate for Payment.

§ 9.6 Progress Payments

§ 9.6.1 After the Architect has issued a Certificate for Payment or Project Certificate for Payment, the Owner shall make payment in the manner and within the time provided in the Contract Documents, and shall so notify the Construction Manager and Architect.

§ 9.6.2 The Contractor shall pay each Subcontractor, no later than seven days after receipt of payment from the Owner, the amount to which the Subcontractor is entitled, reflecting percentages actually retained from payments to the Contractor on account of the Subcontractor's portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in a similar manner.

§ 9.6.2.1 The Contractor shall indemnify and hold the Owner harmless from laborers, mechanics and materialmen liens upon the Owner's properties or the premises upon which the work is located, arising out of the work performed or materials furnished by the Contractor or any of its Subcontractors or any material suppliers under the Contract.

§ 9.6.3 The Construction Manager will, on request, furnish to a Subcontractor, if practicable, information regarding percentages of completion or amounts applied for by the Contractor and action taken thereon by the Owner, Construction Manager and Architect on account of portions of the Work done by such Subcontractor.

§ 9.6.4 The Owner has the right to request written evidence from the Contractor that the Contractor has properly paid Subcontractors and suppliers amounts paid by the Owner to the Contractor for subcontracted Work. If the Contractor fails to furnish such evidence within seven days, the Owner shall have the right to contact Subcontractors and suppliers to ascertain whether they have been properly paid. Neither the Owner, Construction Manager nor Architect shall have an obligation to pay, or to see to the payment of money to, a Subcontractor or supplier, except as may otherwise be required by law.

§ 9.6.5 The Contractor's payments to suppliers shall be treated in a manner similar to that provided in Sections 9.6.2, 9.6.3 and 9.6.4.

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§ 9.6.6 A Certificate for Payment, a progress payment, or partial or entire use or occupancy of the Project by the Owner shall not constitute acceptance of Work not in accordance with the Contract Documents.

§ 9.6.7 Unless the Contractor provides the Owner with a payment bond in the full penal sum of the Contract Sum, payments received by the Contractor for Work properly performed by Subcontractors or provided by suppliers shall be held by the Contractor for those Subcontractors or suppliers who performed Work or furnished materials, or both, under contract with the Contractor for which payment was made by the Owner. Nothing contained herein shall require money to be placed in a separate account and not commingled with money of the Contractor, create any fiduciary liability or tort liability on the part of the Contractor for breach of trust, or entitle any person or entity to an award of punitive damages against the Contractor for breach of the requirements of this provision.

§ 9.6.8 Provided the Owner has fulfilled its payment obligations under the Contract Documents, the Contractor shall defend and indemnify the Owner from all loss, liability, damage or expense, including reasonable attorney's fees and litigation expenses, arising out of any lien claim or other claim for payment by any Subcontractor or supplier of any tier. Upon receipt of notice of a lien claim or other claim for payment, the Owner shall notify the Contractor. If approved by the applicable court, when required, the Contractor may substitute a surety bond for the property against which the lien or other claim for payment has been asserted.

§ 9.8 Substantial Completion

§ 9.8.1 Substantial Completion is the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so the Owner can occupy or utilize the Work for its intended use.

§ 9.8.2 When the Contractor considers that the Work, or a portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor shall notify the Construction Manager, and the Contractor and Construction Manager shall jointly prepare and submit to the Architect a comprehensive list of items to be completed or corrected prior to final payment. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

§ 9.8.3 Upon receipt of the list, the Architect, assisted by the Construction Manager, will make an inspection to determine whether the Work or designated portion thereof is substantially complete. If the Architect's inspection discloses any item, whether or not included on the list, which is not sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work or designated portion thereof for its intended use, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Architect. In such case, the Contractor shall then submit a request for another inspection by the Architect, assisted by the Construction Manager, to determine Substantial Completion.

.1 The Architect will perform no more than two (2) inspections to determine whether the Work or a designated portion thereof has attained Substantial Completion in accordance with the Contract Documents. The Owner is entitled to reimbursement from the Contractor for amounts paid to the Architect for any additional inspections pursuant to Section 9.5.1

§ 9.8.4 When the Architect, assisted by the Construction Manager, determines that the Work of all of the Contractors, or designated portion thereof, is substantially complete, the Construction Manager will prepare, and the Construction Manager and Architect shall execute, a Certificate of Substantial Completion that shall establish the date of Substantial Completion; establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance; and fix the time within which the Contractor shall finish all items on the list accompanying the Certificate. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion.

§ 9.8.5 The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in the Certificate. Upon such acceptance, and consent of surety if any, the Owner shall make payment of retainage applying to the Work or designated portion thereof. Such payment shall be adjusted for Work that is incomplete or not in accordance with the requirements of the Contract Documents.

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§ 9.9 Partial Occupancy or Use

§ 9.9.1 The Owner may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated by separate agreement with the Contractor, provided such occupancy or use is consented to by the insurer and authorized by public authorities having jurisdiction over the Project. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage if any, security, maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor considers a portion substantially complete, the Contractor and Construction Manager shall jointly prepare and submit a list to the Architect as provided under Section 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect after consultation with the Construction Manager.

§ 9.9.2 Immediately prior to such partial occupancy or use, the Owner, Construction Manager, Contractor, and Architect shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.

§ 9.9.3 Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.

§ 9.10 Final Completion and Final Payment

§ 9.10.1 Upon completion of the Work, the Contractor shall forward to the Construction Manager a notice that the Work is ready for final inspection and acceptance, and shall also forward to the Construction Manager a final Contractor's Application for Payment. Upon receipt, the Construction Manager shall perform an inspection to confirm the completion of Work of the Contractor. The Construction Manager shall make recommendations to the Architect when the Work of all of the Contractors is ready for final inspection, and shall then forward the Contractors' notices and Application for Payment or Project Application for Payment, to the Architect, who will promptly make such inspection. When the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Construction Manager and Architect will promptly issue a final Certificate for Payment or Project Certificate for Payment stating that to the best of their knowledge, information and belief, and on the basis of their on-site visits and inspections, the Work has been completed in accordance with the Contract Documents and that the entire balance found to be due the Contractor and noted in the final Certificate is due and payable. The Construction Manager's and Architect's final Certificate for Payment or Project Certificate for Payment will constitute a further representation that conditions listed in Section 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled.

§ 9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect through the Construction Manager (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect, (3) a written statement that the Contractor knows of no reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment (5) documentation of any special warranties, such as manufacturers' warranties or specific Subcontractor warranties, and (6), if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts and releases and waivers of liens, claims, security interests, or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien, claim, security interest, or encumbrance. If a lien, claim, security interest, or encumbrance remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging the lien, claim, security interest, or encumbrance, including all costs and reasonable attorneys' fees.

§ 9.10.3 If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the Construction Manager and Architect so confirm, the Owner shall, upon application by the Contractor and certification by the Construction Manager and Architect, and without terminating the Contract, make payment of the balance due for that portion of the Work fully

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completed, corrected, and accepted. If the remaining balance for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, and if bonds have been furnished, the written consent of the surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Architect through the Construction Manager prior to certification of such payment. Such payment shall be made under terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.

§ 9.10.4 The making of final payment shall constitute a waiver of Claims by the Owner except those arising from

- **.1** liens, Claims, security interests, or encumbrances arising out of the Contract and unsettled;
- **.2** failure of the Work to comply with the requirements of the Contract Documents;
- **.3** terms of special warranties required by the Contract Documents; or
- **.4** audits performed by the Owner, if permitted by the Contract Documents, after final payment.

§ 9.10.5 Acceptance of final payment by the Contractor, a Subcontractor, or a supplier, shall constitute a waiver of claims by that payee except those previously made in writing and identified by that payee as unsettled at the time of final Application for Payment.

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 Safety Precautions and Programs

The Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the performance of the Contract. The Contractor shall submit the Contractor's safety program to the Construction Manager for review and coordination with the safety programs of other Contractors. The Construction Manager's responsibilities for review and coordination of safety programs shall not extend to direct control over or charge of the acts or omissions of the Contractors, Subcontractors, agents or employees of the Contractors or Subcontractors, or any other persons performing portions of the Work and not directly employed by the Construction Manager.

§ 10.2 Safety of Persons and Property

§ 10.2.1 The Contractor shall take reasonable precautions for safety of, and shall provide reasonable protection to prevent damage, injury, or loss to

- **.1** employees on the Work and other persons who may be affected thereby;
- **.2** the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody, or control of the Contractor, a Subcontractor, or a Sub-subcontractor;
- **.3** other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation, or replacement in the course of construction; and
- **.4** construction or operations by the Owner, Separate Contractors, or other Contractors.

§ 10.2.2 The Contractor shall comply with, and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities, bearing on safety of persons or property or their protection from damage, injury, or loss.

§ 10.2.3 The Contractor shall implement, erect, and maintain, as required by existing conditions and performance of the Contract, reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards; promulgating safety regulations; and notifying the owners and users of adjacent sites and utilities of the safeguards.

§ 10.2.4 When use or storage of explosives or other hazardous materials or equipment or unusual methods are necessary for execution of the Work, the Contractor shall exercise utmost care and carry on such activities under supervision of properly qualified personnel.

§ 10.2.5 The Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in Sections 10.2.1.2, 10.2.1.3 and 10.2.1.4 caused in whole or in part by the Contractor, a Subcontractor, a Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible under Sections 10.2.1.2, 10.2.1.3 and 10.2.1.4. The Contractor may make a Claim for the cost to remedy the damage or loss to

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the extent such damage or loss is attributable to acts or omissions of the Owner, Construction Manager or Architect or anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Section 3.18.

§ 10.2.6 The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner, Construction Manager and Architect.

§ 10.2.7 The Contractor shall not permit any part of the construction or site to be loaded so as to cause damage or create an unsafe condition.

§ 10.2.8 Injury or Damage to Person or Property

If either party suffers injury or damage to person or property because of an act or omission of the other party, or of others for whose acts such party is legally responsible, notice of the injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding 21 days after discovery. The notice shall provide sufficient detail to enable the other party to investigate the matter.

§ 10.3 Hazardous Materials

§ 10.3.1 The Contractor is responsible for compliance with any requirements included in the Contract Documents regarding hazardous materials or substances. If the Contractor encounters a hazardous material or substance not addressed in the Contract Documents and if reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a material or substance, including but not limited to asbestos or polychlorinated biphenyl (PCB), encountered on the site by the Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and notify the Owner, Construction Manager and Architect of the condition.

§ 10.3.2 Upon receipt of the Contractor's notice, the Owner shall obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to cause it to be rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor, Construction Manager and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of the material or substance or who are to perform the task of removal or safe containment of the material or substance. The Contractor, the Construction Manager and the Architect will promptly reply to the Owner in writing stating whether or not any of them has reasonable objection to the persons or entities proposed by the Owner. If the Contractor, Construction Manager or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor, the Construction Manager and the Architect have no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. By Change Order, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable additional costs of shutdown, delay, and start-up.

§ 10.3.4 The Owner shall not be responsible under this Section 10.3 for hazardous materials or substances the Contractor brings to the site unless such materials or substances are required by the Contract Documents. The Owner shall be responsible for hazardous materials or substances required by the Contract Documents, except to the extent of the Contractor's fault or negligence in the use and handling of such materials or substances.

§ 10.3.5 The Contractor shall reimburse the Owner for the cost and expense the Owner incurs (1) for remediation of hazardous materials or substances the Contractor brings to the site and negligently handles, or (2) where the Contractor fails to perform its obligations under Section 10.3.1, except to the extent that the cost and expense are due to the Owner's fault or negligence.

§ 10.3.6 If, without negligence on the part of the Contractor, the Contractor is held liable by a government agency for the cost of remediation of a hazardous material or substance solely by reason of performing Work as required by the Contract Documents, the Owner shall reimburse the Contractor for all cost and expense thereby incurred.

§ 10.4 Emergencies

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In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury, or loss. Additional compensation or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Article 15 and Article 7.

ARTICLE 11 INSURANCE AND BONDS

§ 11.1 Contractor's Insurance and Bonds

§ 11.1.1 The Contractor shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents, including A132-2019, Exhibit A, Insurance and Bonds Exhibit, with NYSIR Rider (Insurance Requirements for Capital Projects). The Contractor shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Owner, Construction Manager and Construction Manager's consultants, and the Architect and Architect's consultants, shall be named as additional insureds under the Contractor's commercial general liability policy or as otherwise described in the Contract Documents.

§ 11.1.2 The Contractor shall provide surety bonds of the types, for such penal sums, and subject to such terms and conditions as required by the Contract Documents. The Contractor shall purchase and maintain the required bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.
§ 11.1.3 Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the bonds or shall authorize a copy to be furnished.

§ 11.1.4 **Notice of Cancellation or Expiration of Contractor's Required Insurance.** Within not less than twenty (20) business days of the date the Contractor becomes aware of an impending or actual cancellation or expiration of any insurance required by the Contract Documents, the Contractor shall provide written notice directly to the Owner, and separately to the Construction Manager, of such impending or actual cancellation or expiration. Upon receipt of notice from the Contractor, the Owner shall, unless the lapse in coverage arises from an act or omission of the Owner, have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by the Contractor. The furnishing of notice by the Contractor shall not relieve the Contractor of any contractual obligation to provide any required coverage.

§ 11.1.5 The Contractor shall cause the commercial liability coverage required by the Contract Documents to include (1) the Owner, the Architect and the Architect's consultants as additional insureds for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's operations; and (2) the Owner as an additional insured for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's completed operations.

§ 11.1.6 INSURANCE REQUIREMENTS

Refer to A132-2019 EXHIBITA, with NYSIR Rider for Insurance Requirements. The Contract Documents expressly include the insurance requirements promulgated by the New York Schools Insurance Reciprocal (NYSIR) applicable to capital construction projects (the 'NYSIR Capital Project Insurance Requirements'), as set forth in the Rider to AIA Document A132-2019, Exhibit A. In the event of a conflict between any provision of the Contract Documents and the NYSIR Capital Project Insurance Requirements, the more stringent provision or broader protection in favor of the Owner shall apply.

§ 11.1.7 PERFORMANCE BOND AND PAYMENT BOND

Refer to A132EXHIBITA for Bond Requirements.

§ 11.2 Owner's Insurance

§ 11.2.1 The Owner shall be responsible for purchasing and maintaining the Owner's usual liability insurance.

§ 11.3 Waivers of Subrogation

§ 11.3.1 The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents, and employees, each of the other; (2) the Construction Manager and Construction Manager's consultants; (3) the Architect and Architect's consultants; (4) other Contractors and any of their subcontractors, sub-

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subcontractors, agents, and employees; and (5) Separate Contractors, if any, and any of their subcontractors, sub-subcontractors, agents, and employees, for damages caused by fire, or other causes of loss, to the extent those losses are covered by property insurance required by the Agreement or other property insurance applicable to the Project, except such rights as they have to proceeds of such insurance. The Owner or Contractor, as appropriate, shall require similar written waivers in favor of the individuals and entities identified above from the Construction Manager, Construction Manager's consultants, Architect, Architect's consultants, other Contractors, Separate Contractors, subcontractors, and sub-subcontractors. The policies of insurance purchased and maintained by each person or entity agreeing to waive claims pursuant to this Section 11.3.1 shall not prohibit this waiver of subrogation. This waiver of subrogation shall be effective as to a person or entity (1) even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, (2) even though that person or entity did not pay the insurance premium directly or indirectly, or (3) whether or not the person or entity had an insurable interest in the damaged property.

§ 11.3.2 If during the Project construction period the Owner insures properties, real or personal or both, at or adjacent to the site by property insurance under policies separate from those insuring the Project, or if after final payment property insurance is to be provided on the completed Project through a policy or policies other than those insuring the Project during the construction period, to the extent permissible by such policies, the Owner waives all rights in accordance with the terms of Section 11.3.1 for damages caused by fire or other causes of loss covered by this separate property insurance.

§ 11.4 Loss of Use, Business Interruption, and Delay in Completion Insurance

The Owner, at the Owner's option, may purchase and maintain insurance that will protect the Owner against loss of use of the Owner's property, or the inability to conduct normal operations, due to fire or other causes of loss.

§ 11.5 Adjustment and Settlement of Insured Loss

§ 11.5.1 A loss insured under the property insurance required by the Agreement shall be adjusted by the Owner as fiduciary and made payable to the Owner as fiduciary for the insureds, as their interests may appear, subject to requirements of any applicable mortgagee clause and of Section 11.5.2. The Owner shall pay the Construction Manager, Architect and Contractor their just shares of insurance proceeds received by the Owner, and by appropriate agreements the Construction Manager, Architect and Contractor shall make payments to their consultants and Subcontractors in similar manner.

§ 11.5.2 Prior to settlement of an insured loss, the Owner shall notify the Contractor of the terms of the proposed settlement as well as the proposed allocation of the insurance proceeds. The Contractor shall have 14 days from receipt of notice to object to the proposed settlement or allocation of the proceeds. If the Contractor does not object, the Owner shall settle the loss and the Contractor shall be bound by the settlement and allocation. Upon receipt, the Owner shall deposit the insurance proceeds in a separate account and make the appropriate distributions. Thereafter, if no other agreement is made or the Owner does not terminate the Contract for convenience, the Owner and Contractor shall execute a Change Order for reconstruction of the damaged or destroyed Work in the amount allocated for that purpose. If the Contractor timely objects to either the terms of the proposed settlement or the allocation of the proceeds, the Owner may proceed to settle the insured loss, and any dispute between the Owner and Contractor arising out of the settlement or allocation of the proceeds shall be resolved pursuant to Article 15. Pending resolution of any dispute, the Owner may issue a Construction Change Directive for the reconstruction of the damaged or destroyed Work.

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 Uncovering of Work

§ 12.1.1 If a portion of the Work is covered contrary to the Construction Manager's or Architect's request or to requirements specifically expressed in the Contract Documents, it must, if requested in writing by either, be uncovered for their examination and be replaced at the Contractor's expense without change in the Contract Time.

§ 12.1.2 If a portion of the Work has been covered that the Construction Manager or Architect has not specifically requested to examine prior to its being covered, the Construction Manager or Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, the Contractor shall be entitled to an equitable adjustment to the Contract Sum and Contract Time as may be appropriate. If such Work is not in accordance with the Contract Documents, the costs of uncovering the Work, and the cost of correction, shall be at the Contractor's expense.

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§ 12.2 Correction of Work

§ 12.2.1 Before Substantial Completion

The Contractor shall promptly correct Work rejected by the Construction Manager or Architect or failing to conform to the requirements of the Contract Documents, discovered before Substantial Completion, and whether or not fabricated, installed or completed. Costs of correcting such rejected Work, including additional testing and inspections, the cost of uncovering and replacement, and compensation for the Construction Manager's and Architect's services and expenses made necessary thereby, shall be at the Contractor's expense.

§ 12.2.2 After Substantial Completion

§ 12.2.2.1 In addition to the Contractor's obligations under Section 3.5, if, within one year after the date of Substantial Completion of the Work or designated portion thereof, or after the date for commencement of warranties established under Section 9.9.1, or by terms of any applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of notice from the Owner to do so, unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. During the one-year period for correction of Work, if the Owner fails to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor and to make a claim for breach of warranty. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner, Construction Manager or Architect, the Owner may correct it in accordance with Section 2.5.

§ 12.2.2.2 The one-year period for correction of Work shall be extended with respect to portions of Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual completion of that portion of the Work.

§ 12.2.2.3 The one-year period for correction of Work shall not be extended by corrective Work performed by the Contractor pursuant to this Section 12.2.

§ 12.2.3 The Contractor shall remove from the site portions of the Work that are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

§ 12.2.4 The Contractor shall bear the cost of correcting destroyed or damaged construction of the Owner, Separate Contractors, or other Contractors, whether completed or partially completed, caused by the Contractor's correction or removal of Work that is not in accordance with the requirements of the Contract Documents.

§ 12.2.5 Nothing contained in this Section 12.2 shall be construed to establish a period of limitation with respect to other obligations the Contractor has under the Contract Documents. Establishment of the one-year period for correction of Work as described in Section 12.2.2 relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

§ 12.3 Acceptance of Nonconforming Work

If the Owner prefers to accept Work that is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Sum will be reduced as appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 Governing Law

The Contract shall be governed by the law of the place where the Project is located excluding that jurisdiction's choice of law rules. The parties agree that any claim, dispute or other controversy of any nature arising out of the Contract or performance of the Work shall be commenced and maintained in New York State Supreme Court located in Dutchess County. If the parties have selected arbitration as the method of binding dispute resolution, the Federal Arbitration Act shall govern Section 15.4.

§ 13.1.1 In all operations under the Contract, the Contractor agrees that it will comply with provisions of all State and

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Federal Laws (including OSHA) and all local ordinances which may affect such operations.

§ 13.1.2 Contractor Registration Requirements

1. In compliance with section 220-i of the NY Labor Law, the Contractor must be registered with the New York State Department of Labor (DOL) before bidding on the Project.

2. The Contractor is required to submit a valid DOL certificate of registration with any bid.

3. The Contractor must ensure that any Subcontractor is registered with DOL prior to such Subcontractors commencing any work on the Project.

§ 13.2 Successors and Assigns

§ 13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns, and legal representatives to covenants, agreements, and obligations contained in the Contract Documents. Except as provided in Section 13.2.2, neither party to the Contract shall assign the Contract as a whole without written consent of the other. If either party attempts to make an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

§ 13.2.2 The Owner may, without consent of the Contractor, assign the Contract to a lender providing construction financing for the Project, if the lender assumes the Owner's rights and obligations under the Contract Documents. The Contractor shall execute all consents reasonably required to facilitate the assignment.

§ 13.3 Rights and Remedies

§ 13.3.1 Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights, and remedies otherwise imposed or available by law.

§ 13.3.2 No action or failure to act by the Owner, Construction Manager, Architect, or Contractor shall constitute a waiver of a right or duty afforded them under the Contract, nor shall such action or failure to act constitute approval of or acquiescence in a breach thereunder, except as may be specifically agreed upon in writing.

§ 13.4 Tests and Inspections

§ 13.4.1 Tests, inspections, and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules, and regulations or lawful orders of public authorities. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections, and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections, and approvals. The Contractor shall give the Construction Manager and Architect timely notice of when and where tests and inspections are to be made so that the Construction Manager and Architect may be present for such procedures. The Owner shall bear costs of tests, inspections, or approvals that do not become requirements until after bids are received or negotiations concluded. The Owner shall directly arrange and pay for tests, inspections, or approvals where building codes or applicable laws or regulations so require.

§ 13.4.2 If the Construction Manager, Architect, Owner, or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection, or approval not included under Section 13.4.1, the Construction Manager and Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection, or approval, by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Construction Manager and Architect of when and where tests and inspections are to be made so that the Construction Manager and Architect may be present for such procedures. Such costs, except as provided in Section 13.4.3, shall be at the Owner's expense.

§ 13.4.3 If procedures for testing, inspection, or approval under Sections 13.4.1 and 13.4.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure, including those of repeated procedures and compensation for the Construction Manager's and Architect's services and expenses, shall be at the Contractor's expense.

§ 13.4.4 Required certificates of testing, inspection, or approval shall, unless otherwise required by the Contract

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Documents, be secured by the Contractor and promptly delivered to the Construction Manager for transmittal to the Architect.

§ 13.4.5 If the Construction Manager or Architect is to observe tests, inspections, or approvals required by the Contract Documents, the Construction Manager or Architect will do so promptly and, where practicable, at the normal place of testing.

§ 13.4.6 Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work.

§ 13.5 Interest

Payments due and unpaid under the Contract Documents, which are not disputed by the Owner, shall bear interest from the date payment is due at the rate the parties agree upon in writing or, in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.

§ 13.6 Severability

§ 13.6.1 Should any provision of the Contract be finally determined by any court of competent jurisdiction to be invalid or unenforceable for any reason, the invalidity or unenforceability of such provision shall not affect the validity of the remaining provisions of the Contract, unless such invalidity or unenforceability would defeat an essential purpose of the Contract, in which case, the Contract shall be terminated.

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 Termination by the Contractor

§ 14.1.1 The Contractor may terminate the Contract if the Work is stopped for a period of 30 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, for any of the following reasons:

- **.1** Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped;
- **.2** An act of government, such as a declaration of national emergency, that requires all Work to be stopped; or
- **.3** Because the Construction Manager has not certified or the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents.

§ 14.1.2 The Contractor may terminate the Contract if, through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, repeated suspensions, delays, or interruptions of the entire Work by the Owner as described in Section 14.3, constitute in the aggregate more than 100 percent of the total number of days scheduled for completion, or 120 days in any 365-day period, whichever is less.

§ 14.1.3 If one of the reasons described in Section 14.1.1 or 14.1.2 exists, the Contractor may, upon thirty (30) days' written notice to the Owner, Construction Manager and Architect, following reasonable opportunity to cure, terminate the Contract and recover from the Owner payment for Work executed.

§ 14.1.4 If the Work is stopped for a period of 60 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, or their agents or employees, or any other persons performing portions of the Work because the Owner has repeatedly failed to fulfill the Owner's obligations under the Contract Documents with respect to matters important to the progress of the Work after written notice and reasonable opportunity to cure, the Contractor may, upon seven additional days' notice to the Owner, Construction Manager and Architect, terminate the Contract and recover from the Owner as provided in Section 14.1.3.

§ 14.2 Termination by the Owner for Cause

§ 14.2.1 The Owner may terminate the Contract if the Contractor

- **.1** refuses or fails to supply enough properly skilled workers or proper materials;
- **.2** fails to make payment to Subcontractors or suppliers in accordance with the respective agreements between the

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Contractor and the Subcontractors or suppliers;

.3 disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority; or

.4 otherwise is guilty of breaches of a material provision of the Contract Documents or breaches of any warranty made by the Contractor under or pursuant to the Contract Documents..

§ 14.2.2 When any of the reasons described in Section 14.2.1 exist, after consultation with the Construction Manager, and upon certification by the Architect that sufficient cause exists to justify such action, the Owner may, without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven days' notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

.1 Exclude the Contractor from the site and take possession of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;

.2 Accept assignment of subcontracts pursuant to Section 5.4; and

.3 Finish the Work by whatever reasonable method the Owner may deem expedient. Upon written request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work. The costs of finishing the Work include, without limitations, all reasonable attorneys' fees incurred by the Owner, and additional Architect/Engineering and Construction Manager costs, insurance, and additional interest because of any delay in completing the Work.

§ 14.2.3 When the Owner terminates the Contract for one of the reasons stated in Section 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished.

§ 14.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Construction Manager's and Architect's services and expenses made necessary thereby, and other damages incurred by the Owner and not expressly waived, such excess shall be paid to the Contractor. If such costs and damages exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case may be, shall, upon application, be certified by the Initial Decision Maker after consultation with the Construction Manager, and this obligation for payment shall survive termination of the Contract.

§ 14.3 Suspension by the Owner for Convenience

§ 14.3.1 The Owner may, without cause, order the Contractor in writing to suspend, delay or interrupt the Work, in whole or in part for such period of time as the Owner may determine.

§ 14.3.2 The Contract Sum and the Contract Time shall be adjusted for increases in the cost and time caused by suspension, delay, or interruption under Section 14.3.1. Adjustment of the Contract Sum shall include profit. No adjustment shall be made to the extent:

.1 that performance is, was, or would have been, so suspended, delayed, or interrupted, by another cause for which the Contractor is responsible; or

.2 that an equitable adjustment is made or denied under another provision of this Contract.

§ 14.4 Termination by the Owner for Convenience

§ 14.4.1 The Owner may, at any time, terminate the Contract for the Owner's convenience and without cause.

§ 14.4.2 Upon receipt of notice from the Owner of such termination for the Owner's convenience, the Contractor shall

.1 cease operations as directed by the Owner in the notice;

.2 take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and

.3 except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

§ 14.4.3 In case of such termination for the Owner's convenience, the Contractor shall be entitled to, and the Owner shall reimburse the Contractor for, an equitable portion of the Contractor's fee based on the portion of the Work properly completed before the effective date of termination. Contractor's entitlement to payment for all such work shall be predicated on its performance of such work in accordance with the Contract Documents as certified by the Architect and Construction Manager. Contractor shall be entitled to no other payment and waives any claim for damages.

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ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 Claims

§ 15.1.1 Definition. A Claim is a demand or assertion by one of the parties seeking, as a matter of right, payment of money, a change in the Contract Time, or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. The responsibility to substantiate Claims shall rest with the party making the Claim. This Section 15.1.1 does not require the Owner to file a Claim in order to impose liquidated damages in accordance with the Contract Documents.

§ 15.1.2 Time Limits on Claims

The Owner and Contractor shall commence all Claims and causes of action against the other and arising out of or related to the Contract, whether in contract, tort, breach of warranty or otherwise, in accordance with the requirements of the binding dispute resolution method selected in the Agreement and within the period specified by applicable law, but in any case not more than 10 years after the date of Substantial Completion of the Work. The Owner and Contractor waive all Claims and causes of action not commenced in accordance with this Section 15.1.2.

§ 15.1.3 Notice of Claims

§ 15.1.3.1 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered prior to expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party and to the Initial Decision Maker with a copy sent to the Construction Manager and Architect, if the Architect is not serving as the Initial Decision Maker. Claims by either party under this Section 15.1.3.1 shall be initiated within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later.

§ 15.1.3.2 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party. In such event, no decision by the Initial Decision Maker is required.

§ 15.1.4 Continuing Contract Performance

§ 15.1.4.1 Pending final resolution of a Claim, except as otherwise agreed in writing or as provided in Section 9.7 and Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents.

§ 15.1.4.2 The Contract Sum and Contract Time shall be adjusted in accordance with the Initial Decision Maker's decision, subject to the right of either party to proceed in accordance with this Article 15. The Architect will issue Certificates for Payment in accordance with the decision of the Initial Decision Maker.

§ 15.1.5 Claims for Additional Cost. If the Contractor wishes to make a Claim for an increase in the Contract Sum, notice as provided in Section 15.1.3 shall be given before proceeding to execute the portion of the Work that is the subject of the Claim. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4.

§ 15.1.6 Claims for Additional Time

§ 15.1.6.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, notice as provided in Section 15.1.3 shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay only one Claim is necessary.

§ 15.1.6.2 If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, could not have been reasonably anticipated and had an adverse effect on the scheduled construction.

§ 15.1.6.3 The Contractor shall not be entitled to a separate increase in the Contract Time for each one of the number of causes of delay which have concurrent or interrelated effects on the progress of the Work.

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§ 15.1.7 Waiver of Claims for Consequential Damages. The Contractor and Owner waive Claims against each other for consequential damages arising out of or relating to this Contract. This mutual waiver includes

.1 damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and

.2 damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit except anticipated profit arising directly from the Work.

This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination in accordance with Article 14. Nothing contained in this Section 15.1.7 shall be deemed to preclude assessment of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

§ 15.2 Initial Decision

§ 15.2.1 Claims, excluding those where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2 or arising under Sections 10.3, 10.4, and 11.5, shall be referred to the Initial Decision Maker for initial decision. The Architect will serve as the Initial Decision Maker, unless otherwise indicated in the Agreement. Except for those Claims excluded by this Section 15.2.1, an initial decision shall be required as a condition precedent to mediation of any Claim. If an initial decision has not been rendered within 30 days after the Claim has been referred to the Initial Decision Maker, the party asserting the Claim may demand mediation and binding dispute resolution without a decision having been rendered. Unless the Initial Decision Maker and all affected parties agree, the Initial Decision Maker will not decide disputes between the Contractor and persons or entities other than the Owner.

§ 15.2.2 The Initial Decision Maker will review Claims and within ten days of the receipt of a Claim take one or more of the following actions: (1) request additional supporting data from the claimant or a response with supporting data from the other party, (2) reject the Claim in whole or in part, (3) approve the Claim, (4) suggest a compromise, or (5) advise the parties that the Initial Decision Maker is unable to resolve the Claim if the Initial Decision Maker lacks sufficient information to evaluate the merits of the Claim or if the Initial Decision Maker concludes that, in the Initial Decision Maker's sole discretion, it would be inappropriate for the Initial Decision Maker to resolve the Claim.

§ 15.2.3 In evaluating Claims, the Initial Decision Maker may, but shall not be obligated to, consult with or seek information from either party or from persons with special knowledge or expertise who may assist the Initial Decision Maker in rendering a decision. The Initial Decision Maker may request the Owner to authorize retention of such persons at the Owner's expense.

§ 15.2.4 If the Initial Decision Maker requests a party to provide a response to a Claim or to furnish additional supporting data, such party shall respond, within ten days after receipt of the request, and shall either (1) provide a response on the requested supporting data, (2) advise the Initial Decision Maker when the response or supporting data will be furnished, or (3) advise the Initial Decision Maker that no supporting data will be furnished. Upon receipt of the response or supporting data, if any, the Initial Decision Maker will either reject or approve the Claim in whole or in part.

§ 15.2.5 The Initial Decision Maker will render an initial decision approving or rejecting the Claim, or indicating that the Initial Decision Maker is unable to resolve the Claim. This initial decision shall (1) be in writing; (2) state the reasons therefor; and (3) notify the parties, the Construction Manager, and the Architect, if the Architect is not serving as the Initial Decision Maker, of any change in the Contract Sum or Contract Time or both. The initial decision shall be final and binding on the parties but subject to mediation and, if the parties fail to resolve their dispute through mediation, to binding dispute resolution.

§ 15.2.6 Either party may file for mediation of an initial decision at any time, subject to the terms of Section 15.2.6.1.

§ 15.2.6.1 Either party may, within 30 days from the date of receipt of an initial decision, demand in writing that the other party file for mediation. If such a demand is made and the party receiving the demand fails to file for mediation within 30 days of receipt thereof, then both parties waive their rights to mediate or pursue binding dispute resolution proceedings with respect to the initial decision.

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§ 15.2.7 In the event of a Claim against the Contractor, the Owner may, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim. If the Claim relates to a possibility of a Contractor's default, the Owner may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

§ 15.2.8 If a Claim relates to or is the subject of a mechanic's lien, the party asserting such Claim may proceed in accordance with applicable law to comply with the lien notice or filing deadlines.

§ 15.3 Mediation

§ 15.3.2 The parties may endeavor to resolve their Claims by mediation which, if elected, shall be administered by the American Arbitration Association in accordance with its Construction Industry Mediation Procedures in effect on the date of the Agreement. A request for mediation shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the mediation.

§ 15.3.4 The parties shall share the mediator's fee and any filing fees equally. The mediation shall be held in the place where the Project is located, unless another location is mutually agreed upon. Agreements reached in mediation shall be enforceable as settlement agreements in any court having jurisdiction thereof.

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SUPPLEMENTARY GENERAL CONDITIONS OF THE CONTRACT

(CROSS-REFERENCE AIA DOCUMENT A232/2019)

1. List of Drawings

   The Drawings, which are the graphic and pictorial portions of the Contract Documents that show the design, location and dimension of the Work are as listed within the "List of Drawings" provided with the drawing set. All Work under this Contract shall be executed in accordance with the Contract Documents, which are typically composed of the Project Manual, Specifications and Drawings. The Contract Documents are complimentary as described in the General Conditions. The "List of Drawings" will be incorporated in the Standard Form of Agreement Between the Owner and the Contractor.

2. Provision of Documents

   A. Each Prime Contractor is entitled to five printed sets of Drawings, three Project Manuals, and three sets of all Addenda materials. The three sets are inclusive of the original set obtained for bidding purposes. These sets will be provided at the Owners expense exclusive of the original Bid Deposit, which is forfeited by the awarded contractors.

   B. Additional sets of Contract Documents will be provided to the contractors for the cost of reproduction and distribution charges. Payment is due upon receipt of the Documents.

   C. Reproducible copies of the Drawings shall be provided upon the request of the Prime Contractor and are to be provided for the cost of reproduction and distribution charges. Payment is due upon receipt of the Documents.

   D. For expediency, at the discretion of the Architect, Prime Contractors may be directed to pick up documents at the project designated printing facility. This practice will not be permitted without authorization of/and coordination by the Architect.

   E. Electronic drawing files, AutoCAD format, may be available, at the discretion of the Architect, for a cost of $25.00 per drawing. Contractors requesting this service will be required to sign a disclaimer. Request for electronic files must be made in writing to the Architects office. This request must include a specific list of drawings required in this format. In response, the architect will verify the drawings requested and will forward the disclaimer for signature. Electronic files will be released upon receipt of payment and a fully executed disclaimer form.

3. Minimum Rates of Wages

   A. In accordance with Section 220, Subdivision 3 and 220-d of the Labor Law, the Industrial Commissioner, Department of Labor, State of New York, has ascertained the prevailing rates of wages which will apply to this Project.

   B. The Prevailing Rates of Wages, which are the minimum hourly rates to be paid on this project, shall be indicated in the PW-3, PW-19, PW-202, PW-203, and PW-16 sheets enclosed.

   C. Any person or corporation that willfully pays, after entering such contract, less than established wage schedule shall be guilty of a misdemeanor and, upon conviction, shall be punished for such first offense by a fine of $500 or by imprisonment for not more than 30 days or both fined and imprisoned. A second offense carries a heavier penalty.

4. A.I.A. Documents

A. The "General Conditions of the Contract for Construction" Standard A.I.A. Form A232, 2019 edition, will become, under the Agreement, one of the Documents of the Contract and shall govern all Work under this Contract.

B. The following supplements modify the "General Conditions of the Contract for Construction," A.I.A. Document A232, 2019 Edition. Where a portion of the General Conditions is modified or deleted by these Supplementary Conditions, the unaltered portions of the General Conditions shall remain in effect.

C. **Article 1 - General Provisions**

1.1 Basic Definitions

Add the following Subparagraph to 1.1.2:

1.1.2.1 Where the term "Contract" or "Prime Contract" is used in the General Conditions, Supplementary Conditions, and other Contract Documents, it shall mean the separate Owner-Contractor Agreement between the Owner and each Prime Contractor identified in Division 01.

1.2 Correlation and Intent of the Contract Documents

Add new subparagraph 1.2.4:

In the event of conflicts or discrepancies among the Contract Documents, interpretations will be based on the following priorities.

1. Modifications issued after execution of the Agreement.

2. The Agreement Between the Owner and the Contractor.

3. Addenda, issued prior to the execution of the Agreement, with those of later dates having precedence over those of earlier dates.

4. The Supplementary Conditions, Rider to the General Conditions, Special Provisions or Requirements (if any).

5. The General Conditions of the Contract for Construction.

6. Drawings and Specifications.

After execution of the Agreement and during the course of the Work should any ambiguities, discrepancies, omissions, or apparent errors be found on the drawings or in the specifications to which the Contractor has failed to call attention prior to submitting his bid, then the intention of the Contract Documents is to be interpreted by the Architect.

The Architect's decision as to the intent shall be final, and the Contractor hereby agrees to carry out the Work in accordance with the decision of the Architect.

Until such time as an interpretation is issued, it shall be assumed that the Contractor has based his bid on providing the Work in the better quality, greater quantity, or most expensive manner, for Work complete in every detail, even though every item necessarily involved is not particularly mentioned.

If necessary, measurements are missing or Work specified or shown in the Contract Documents is obviously incorrect or impossible to execute, or figures fail to check, the Contractor shall call these facts to the attention of the Architect for interpretation as described above.

Add new subparagraph:

1.2.5 Figured Dimensions--Drawings in general are made to scale, but all Working dimensions shall be taken from the figured dimensions or by actual measurements at the job and in no case by scaling. The Contractor shall study and compare all drawings and verify all figures before laying out the Work for construction and shall be responsible for any and all errors in his Work which might have been avoided by not doing so. Whether or not an error is believed to exist, no deviation from the drawings and dimensions given thereon shall be made unless written approval of the Architect is obtained.

D. **Article 2 - Owner**

2.4 Owner's Right to Stop the Work

Delete Paragraph 2.4 in its entirety and replace with the following:

2.4 "If the Contractor fails to correct Work which is not in accordance with the requirements of Contract Documents as required by Section 12.2 or fails or refuses to provide a sufficient amount of properly supervised and coordinated labor, materials, or equipment so as to be able to complete the Work within the Contract Time or fails to remove and discharge (within ten days) any lien filed upon Owner's property by anyone claiming by, through, or under Contractor, or disregards, the instruction of the Architect, Construction Manager or Owner when based on the requirements of the Contract Documents, the Owner, by written order signed personally or by an agent so empowered by the Owner, may order the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated (as determined by the Owner or its agency); however, the right of Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right either on its behalf or for the benefit of the Contractor or any other person or entity. The Contractor shall stop work upon receipt of said order the written order described herein above may be delivered to and shall be deemed received by the Contractor in the same manner as set forth in paragraph 1.6.2."

2.5 Owner's Right to Carry Out the Work

Add the following after the end of 2.5:

If the Owner, Architect or Construction Manager (if applicable) request that any of the Prime Contractors perform additional work which is not included in the Construction Documents and which will result in either additional cost or additional time a fully executed Change Order is required.

The Contractor shall submit a proposal for the additional work. This proposal shall contain a complete itemization of the costs associated with the work inclusive of all labor and materials. All proposals for any work that the Contractor, its Subcontractors or Subcontractors of subcontractors perform in connection with the additional work shall be submitted utilizing the format contained herein below (item 7.2.3). In no event shall the total for overhead and profit on any Change Order exceed fifteen percent (15%) of the cost of the work.

1. Any proposals submitted without an itemized breakdown as indicated herein will be returned for resubmission.

2. For work performed by the Prime Contractor, fifteen percent (15%) overhead and profit is permitted for their labor and material costs.

3. Overhead can only be applied to the cost of labor and materials, including delivery.

4. Overhead and profit is not permitted on rental of equipment and machinery.

5. Equipment and machinery costs shall not include items already on site and under use for the base contract.

6. Additional bond costs shall be 2 % maximum.

7. Insurance costs fall within overhead costs.

8. Subcontractor proposals in connection with the work shall include a maximum of ten percent (10%) overhead and profit for their work.

9. The Prime Contractor is permitted five percent (5%) profit on the work of its Subcontractor as indicated in the Table at 7.2.3.

10. Under no circumstance shall the Contractor or its Subcontractors be entitled to overtime costs unless otherwise agreed and approved by the Owner. (Ref Article 8 – Time)

11. A change in the Contract sum shall only be accomplished by a written Change Order. Payments cannot be issued against a Change Order unless it has been fully executed.

12. Adjustments in time if required will be in accordance with Article 8.

Proposals for additional work shall be submitted in the following format accompanied by sufficient substantiating data to permit a proper evaluation.

	Proposed Change Order	Estimated cost
A	Prime Contractors Materials (itemized quantities & cost)	
B	Prime Contractors Labor (itemized)	
C	Subtotal (A+B)	
D	Any credit due shall be applied here	
E	Overhead 10% of Subtotal	
F	Subtotal (C+D+-E)	
G	Subcontracted work (include itemized quantities and costs and 10% max OH&P)	
H	Subtotal (F+G)	
I	Prime Contractors Profit 5%	
J	Subtotal (H+I)	
K	Equipment and Machinery Rental (itemized)	
L	Bond Costs (2% max)	
M	Total Proposed Change Order (J+K+L)	

E. **Article 3 - Contractor**

3.1 General:

Add the following Paragraph to 3.1:

3.1.4 Where the term "Prime Contractor" is used in the General Conditions, Supplementary Conditions, and other Contract Documents, it shall be interpreted in accordance with Subparagraph 6.1.2.1. of the Supplementary Conditions."

3.2 Review of Contract Documents and Field Conditions by Contractor

Delete Paragraph 3.2.2 in its entirety and replace with the following:

3.2.2 The Contractor is deemed to be a qualified expert in the systems and construction requirements of the Work of its Contract. The Contractor hereby specifically acknowledges and declares that the Contract Documents are full and complete, are sufficient to have enabled it to determine the cost of the Work and that the Drawings, the Specifications and all addenda are sufficient to enable the Contractor to construct the Work outlined therein in accordance with applicable laws, statues, building codes and regulations, and otherwise to fulfill all of its obligations under the Contract Documents. In addition, if the Contractor performs any construction activity and if it knows or should have know that any of the Contract Documents contains an error, inconsistency or omission, the Contractor shall be responsible for such performance and shall bear the costs for correction thereof.

3.3 Supervision and Construction Procedures:

Add the following Subparagraph to 3.3.1:

3.3.1.1 The Contractor shall:

1. review any specified construction or installation procedure, including those recommended by manufacturers,

2. advise the Architect:

   a. if the specified procedure deviates from good construction practice, or
   b. of any objections the Contractor may have to the procedure; and

3. propose any alternative procedure.

3.3.2 Insert the following language (noted in *italic)* in Paragraph 3.3.2: *"…and other persons or entities performing portions of the Work under a Contract or other arrangement with the Contractor."*

3.4 Labor and Materials:

Add the following Paragraphs to 3.4:

3.4.4 The Contractor shall check all materials and labor entering into the Work site and shall keep full detailed accounts thereof.

3.4.5 The Contractor acknowledges that it is the Contractor's responsibility to hire

all personnel for the proper and diligent execution of the Work and the Contractor shall maintain labor peace for the duration of the Project. In the event of a labor dispute, the Contractor shall not be entitled to any increase in the Contract schedule of the Contract Sum.

3.4.6 After the Contract has been executed, the Owner and the Architect will consider a formal request for the substitution of products in place of those specified only under the conditions set forth in the General Requirements (Division 01 of the Specifications).

3.4.7 By making requests for substitution based on Subparagraph 3.4.2 above, the Contractor:

1. represents that the Contractor has personally investigated the proposed substitute product;

2. represents that the Contractor will provide the same warranty for the substitution that the Contractor would for that specified;

3. certifies that the cost data presented is complete and includes all related costs under this Contract except the Architect's redesign costs, and waives all claims for additional costs related to the substitutions which subsequently becomes apparent;

4. will coordinate the installation of the accepted substitute, making such changes as may be required for the Work to be complete in all respects; and

5. will reimburse the Owner for additional costs from claims by other Prime Contractors resulting from incorporation of requested substitution.

3.4.8 The burden of proof of equivalence rests with the bidder. Adequate supporting information must accompany proposed equivalents. The Owner or Architect reserves the right to accept or reject proposed equivalents.

3.5 Warranty:

Add the following at the end of Subparagraph 3.5.1:

The Contractor will be responsible for and shall make good any defects due to faulty materials for two (2) years and two (2) years on labor after final payment has been made, except where sections of the Specifications call for a longer period of time.

Add The following to 3.5:

3.5.3 The burden of proof of equivalence rests with the bidder. Adequate supporting information must accompany proposed equivalents. The Owner or Architect reserves the right to accept or reject proposed equivalents.

3.6 Superintendent:

Delete paragraph 3.9.2 in its entirety and replace with the following:

3.9.2 Qualifications of Superintendent: The Contractor shall employ a Superintendent, for the duration of the Project, whose qualifications meet or exceed those listed below. Prior to employing the Superintendent, the

Contractor shall submit to the Architect the name of the proposed Superintendent and a statement attesting to his qualifications.

1. Five (5) years of experience as a Superintendent in the particular construction discipline required by the Contract.

2. Superintendent on at least two (2) construction projects equal to, or greater than, the Contract Sum for this Contract.

3. Superintendent on at least two (2) projects of similar construction types and procedures as this Project.

3.7 Shop Drawings, Product Data, and Samples:

Add the following to the end of paragraph 3.12.1:

"The shop drawings shall include fabrication, erection, layout, and setting drawings and schedules, wiring and piping diagrams; and any other information required for proper approval of or installation of all parts of the Work specified. If any modifications are required to a standard item, such modifications shall be clearly shown or noted at the time of submission of shop drawings."

Delete paragraph 3.12.2 in its entirety and substitute the following:

"Product Data are illustrations, standard schedules, performance charts, recommended installation procedures and instructions, operating and maintenance procedures, diagrams, and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work."

Add the following to the end of paragraph 3.12.5:

"All submissions shall be in accordance with Section 013300 - Submittal Procedures."

Add the following to the end of paragraph 3.12.6:

"Contractor shall be responsible for verification of field dimensions and conditions and shall furnish such information to the Architect when requested. Before Contractor proceeds with the Work in question, the Contractor should field verify all dimensions. In case of doubt about dimensions, he should notify the Architect immediately for instructions."

Add the following new Paragraphs to 3.12:

3.12.11 Samples shall be properly labeled, giving the following information as applicable:

1. Project name and location.

2. Name, finish, and composition of material.

3. Location where material is to be used.

4. When approved, samples shall be so indicated.

5. Labels shall be large enough for approval stamp.

3.12.12 Immediately after signing of the Contract by the Owner and Contractor, the

Contractor must submit to the Owner and Architect a complete list of shop drawings from all trades and specify the approximate dates on which they will be submitted for approval.

F. **Article 4 - Architect**

4.2 Administration of the Contract:

Modify 4.2.5 as follows:

Omit "…or any other persons or entities performing portions of the work," and substitute "… or any other persons or entities in a contractual relationship with the Contractor performing portions of the Work."

Add the following Subparagraphs to 4.2.6:

4.2.6.1 Any direct communications between the Owner and the Contractor that affect the performance or administration of the Contract shall be made or confirmed in writing, with copies to the Architect, and any such communications that represent a modification of the Contract requirements shall be documented appropriately.

4.2.6.2 Any communications between the Architect and the Contractor's subcontractors shall be confirmed in writing to the Contractor.

G. **Article 5 - Subcontractors**

5.2 Award of Subcontracts and Other Contracts for Portions of the Work:

Add the following Subparagraphs to 5.2.1:

5.2.1.1 Refer to Instructions to Bidders, for requirements for delivery of "Contractor's Subcontractor List" to Architect's office after receipt of bids and before award of the Contract."

5.2.1.2 Subcontractors will not be acceptable unless, when requested by the Architect, evidence is furnished that the proposed subcontractor has satisfactorily completed similar subcontracts as contemplated under this Prime Contract and has the necessary experience, personnel, equipment, plant, and financial ability to complete the subcontract in accordance with the intent of the Contract Documents.

Delete Subparagraphs 5.2.2 and 5.2.3 in their entirety and substitute the following:

5.2.2 The Contractor shall within thirty (30) days after the Award of Contract, submit for approval a complete list of all subcontractors, and any one subcontractor listed who is not acceptable to the Architect or Owner shall be replaced with an acceptable subcontractor at no change in the contract price.

5.2.3 Approval of a subcontractor may be revoked or withdrawn, if, in the opinion of the Architect, such subcontractor evidences an unwillingness or inability to perform his Work in strict accordance with the Contract Documents.

Add the following Paragraph to 5.2:

5.2.5 All subcontracts over $5,000 shall be in writing with copies of written

subcontract provided to the Owner upon request.

H. **Article 6 - Construction by Owner or By Separate Contractors**

6.1 Owner's Right to Perform Construction with Own Forces and to Award Other Contracts:

Add the following Subparagraphs to 6.1.2:

6.1.2.1 Where the term "Contractor" or "Prime Contractor" is issued in the General Conditions, Supplementary Conditions, and other Contract Documents, it shall mean the Contractor identified in Division 01 who executed each separate Owner-Contractor Agreement.

6.1.2.2 Where the term "separate contractor" is used in this Article, it shall mean other contractors performing construction or operation on the site not included in the Project.

6.1.2.3 The Contractor shall provide for coordination of his activities with the activities of each Prime Contractor. This includes, but is not limited to, the Owner's own forces or separate Contractor's employed directly by the Owner.

6.2 Mutual Responsibility:

Add the following Subparagraphs to 6.2.2:

6.2.2.1 Each Prime Contractor shall promptly correct discrepancies or defects in their Work identified by other Prime Contractors as affecting proper execution and results of the Work of the other Prime Contractor.

Add the following Subparagraph to 6.2.2:

6.2.2.2 Claims and other disputes and matters in questions between the Contractor and other Prime Contractors shall be subject to the provisions of Article 15.

Add the following new Subparagraph to 6.2.5:

6.2.5.1 All required cutting, patching, and restoring shall be neatly done by mechanics skilled in their specific trades, to the satisfaction of the Architect.

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Add the following new Subparagraphs:

6.2.76 The Contractor shall leave all Work of his trade WHOLE, PERFECT, AND COMPLETE at the final completion of the Work.

I. **Article 8 - Time**

8.2 Progress and Completion:

Add the following Subparagraph to 8.2.1

8.2.1.1 The Contractor recognizes that the Project Schedule is of critical importance to the Owner. All aspects of construction must reflect a 'time is of the essence' construction strategy. The 'Bid Schedules' serve as a guide of critical milestone dates to the Project. Failure to meet intermediate milestone dates will jeopardize the overall Project Schedule. If the Contractor's performance of

the Work evidences, to the Owner or Architect, that the completion day may be in jeopardy, this will mandate Contractor(s) to increase staff, work overtime, or use other means to recover time, at the costs of those Contractor(s) responsible for such delays. In addition, all costs due to delays in completion of the Work shall be borne by Contractor(s) responsible for delays.

Add the following Subparagraph to 8.2.2:

8.2.2.1 The Contractor shall not commence Work on the site until two certified copies of all insurance policies as indicated in Article 11, attesting that the required coverage is in force, have been received and accepted by the Owner.

Add the following Subparagraph to 8.2.3:

8.2.3.1 The Contractor shall cooperate with the Owner, Architect, Engineer, and other Contractors on the Project, making every reasonable effort to reduce the Contract Time.

8.3 Delays and Extensions of Time:

Delete Paragraph 8.3.1 and replace with the following:

8.3.1 "If the Contractor is delayed at/in its progress of the Work by one of the delays for which an extension of time is permitted and gives the Owners Representative written notice specifically describing the delay within 48 hours of its commencement, the date for the Substantial Completion of the Work will be extended by Change Order for such reasonable time as the Owner's Representative may determine. The failure to give such notice will constitute an irrevocable waiver of the Contractor's right to seek an extension for such delay. The only delays for which the Contractor will be entitled to an extension of the time for completion will be delays caused by the Architect, Construction Manager, or the Owner, physical damage to the Project over which the Contractor has no control, labor disputes beyond the control of the Contractor, and unusually severe weather conditions not reasonably anticipated (temperature, rain, or other precipitation within a range of twenty percent of normal amounts for the time of the year covered by the Agreement shall not be considered unusually severe weather conditions) or by fire, unavoidable casualties or by other causes beyond the Contractors reasonable control. Extensions of time will only be granted pursuant to the procedures for Change Orders set forth in the General Conditions. The Contractor agrees not to make claims for financial compensation for delays or acceleration in the performance of the Work resulting from acts or failure to act by the Owner, the Architect, Construction Manager, or the employees, agents, or representatives of the Owner, Construction Manager, or the Architect and agrees that such claim shall be fully compensated by an extension of time to complete the Work, regardless of when granted. Contractor delayed by Work of other Contractors shall make claims against delaying Contractor and not the Owner."

Add the following Subparagraphs to 8.3.1:

8.3.1.1 Extension of time, if requested by the Contractor, shall only be considered after the Contractor has made reasonable effort to recover the lost time.

8.3.1.2 An extension, or extensions, of time may be granted subject to the provisions of this article, but only after written application therefore by the Contractor in accordance with Paragraph 15.1.5.

8.3.1.3 An extension of time shall be only for the number of days of delay which the Architect may determine to be due solely to the causes set forth in the application for extension of time. 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 the actual period of delay as determined by the Architect.

8.3.1.4 When the Contract Time has been extended, as provided under this Paragraph 8.3, such extension of time shall not be considered as justifying extra compensation to the Contractor for administrative costs or other similar reasons.

Delete paragraph 8.3.2 and replace as follows:

8.3.2 Claims relating to time shall be made in accordance with applicable provisions of this Agreement. A copy of any Claim for extension of time shall be delivered to the Owner, the Architect and the Construction Manager, and the Contractor shall immediately take all steps reasonably possible to lessen the adverse impact of such delay to the Owner.

Delete paragraph 8.3.3 and replace as follows:

8.3.3 In no event shall the Contractor be entitled to monetary damages for delay under the Contract.

A new paragraph 8.3.4 shall be added as follows:

8.3.4 To the extent the Contractor is required to work during overtime hours, weekend, holidays or at other times which are not regularly scheduled, due to the fault of the Contractor, the Contractor shall be responsible for the costs incurred by the Owner, Architect, the Construction Manager and the others attributable to working during periods which have not been ordinarily scheduled. To the extent the Contractor elects to work during these periods to facilitate the schedule, the Owner may, at its sole option, allow the Contractor to do so without the Contractor incurring the additional costs referenced above.

J. **Article 9 - Payments and Completion**

9.2 Schedule of Values:

9.2 In the first sentence, after Construction Manager, add “and the Architect”. In the last sentence, after Construction Manager, add “and the Architect”.

9.3 Application for Payment:

9.3.1 In the second sentence, delete the words "if required."

Add the following Subparagraphs to 9.3.1:

9.3.1.3 Until final completion and acceptance of Work in accordance with Paragraph 9.10, the Owner shall pay 95 percent of the amount of each progress payment due the Contractor.

9.3.1.3.1 The application for payment shall be accompanied by the following documentation:

a. A current contractor's lien waiver.

b. Duly executed waivers of Public Improvement liens from all subcontractors and material suppliers representing satisfaction of payment of all amounts requested by the Contractor on behalf of such entities in any previous application for payment.

c. Certified Payroll for all employees of the Contractor and employees of subcontractors performing Work on the Project.

d. For contracts of $250,000 and more, all Contractors and subcontractors must attach a copy of proof of completion of the OSHA 10 course to the first Certified Payroll submitted and on each succeeding payroll where any new or additional employee is first listed.

e. Such other information which the Owner and/or the Architect request the Contractor furnish in connection with its Application for Payment.

Add the following Subparagraphs to 9.3.2:

9.3.2.1 Additionally, the Contractor must furnish the following information, where payment is requested for materials and equipment stored off the project site, as part of its Application for Payment:

1. Type of material must be specifically identified by the trade contractor.

2. Trade contractor must furnish an invoice from his supplier showing the total value of the material and/or equipment being stored off site.

3. Trade contractor must provide a Certificate of Insurance for the full value of the item plus 10 percent.

Add the following subparagraph to 9.3.3:

9.3.3.1 The Contractor shall keep the Owner and the Owner's property (including funds or payment under the Project) free from all liens and claims, legal or equitable arising out Contractor's work hereunder. If any such lien is filed with the Owner by anyone claiming by through or under the Contractor, the Contractor shall discharge the lien within 10 days of the filing thereof. The Contractor further expressly agrees to defend the Owner, at the Contractor's sole expense, against any actions, lawsuits or proceedings brought against Owner as a result of liens filed against payments due the Contractor or the Work, the site of any of the Work, the Project site and any improvements thereon, any portion of the property of the Owner. The Contractor hereby agrees to indemnify and hold Owner's harmless against any such liens or claims of lien and agrees to pay any judgment or lien resulting from any such actions, lawsuits or proceedings. The Owner agrees to release any payments withheld as a result of a duly field lien upon compliance by the Contractor with the applicable discharge or vacatur provisions of the Lien Law.

9.6 Progress Payments:

Add the following new paragraphs:

9.6.9 Unless otherwise specified in the agreement, the Owner will make payment in

account of the Contract as provided therein as follows:

Any claims, liens, and judgements referred to in this section shall pertain to the project and shall be filed in accordance with the terms or the applicable contract and/or applicable laws. In the event that the terms of payment on a public Works project, as provided in this section, are pre-empted or superseded as a result of the provision of any federal statute, regulation, or rule, paragraph shall not apply.

9.6.10 In accordance with Part I, Section 106-b, General Municipal Law, the Contractor shall periodically, in accordance with the terms of the Contract, submit to the Architect a requisition for a progress payment for the Work performed and/or materials furnished to the date of the requisition less any amount previously paid to the Contractor. The Owner shall, in accordance with the terms of the Contract, approve and promptly pay the requisition for the progress payment less an amount necessary to satisfy any claims, liens, or judgements against the Contractor which have not been suitably discharged and less any retained amount as hereafter described. The Owner shall not retain in excess of five percent (5%) but not more than ten percent (10%) of each progress payment to the Contractor provided that there are no requirements by the Owner for the Contractor to provide a Performance Bond and Labor and Material Bond in the full amount of the Contract. The Owner shall pay, upon requisition from the Contractor, for materials pertinent to the Project which have been delivered to the site or off-site by the Contractor and/or subcontractor and suitably stored and secured as required by the Owner and the Contractor, provided the Owner may limit such payment to materials in short and/or critical supply and materials specially fabricated for the Project each as defined in the Contract. When the Work or major portions thereof as contemplated by the terms of the Contract are Substantially Complete, the Contractor shall submit to the Architect a requisition for payment of the remaining amount of the Contract balance. Upon receipt of such requisition, the Owner shall approve and promptly pay the remaining amount of the Contract balance less two (2) times the values of any remaining items to be completed and an amount necessary to satisfy any claims, liens, or judgements against the Contractor which have not been suitably discharged.

9.8 Substantial Completion:

Add the following new paragraphs:

9.8.6 To the extent the Architect's Basic Services are affected by delays arising from the errors and/or omissions of Contractor(s) resulting in the Architect providing Construction Phase Services two (2) months (60 days) after the date of Substantial Completion of the Work, such Additional Services performed pursuant to this Section, which are the result of a Contractor's act(s) or omission(s), shall be the responsibility of, and may be back-charged to the Contractor by the Owner; and/or the Contractors shall pay liquidated damages.

9.10 Final Completion and Final Payment:

Add the following Subparagraphs to 9.10.1:

9.10.1.1 "In case the Contractor neglects to carry out the provisions of this clause within a reasonable time after notice, the Owner may cause all defects to be remedied and all repairs to be made without notice to the Contractor and deduct same from any amount so retained and recover the balance, if any,

from the Contractor. The order of the Architect as to the conditions of the Work constructed under this Contract, the extent of the remedies applies, and of the repairs made, and of the cost thereof, shall be binding and conclusive upon the Contractor, his assigns, and sureties.

9.10.1.2 If the Work is not accepted by the Owner after final inspection and additional time is required to complete items identified during the final inspection, the date starting the one-year correction period described in Article 12 shall be set by the Architect at his discretion, but not later than the date of the final Certificate for Payment.

9.10.1.3 If the Architect is required to perform additional final inspections because the Work fails to comply with the certifications of the Contractor identified in Division 01, the amount of compensation paid to the Architect by the Owner for additional services shall be deducted from the final payment to the Contractor.

Add the following Subparagraphs to 9.10.2:

9.10.2.1 In addition to the submittals required in Subparagraph 9.10.2 above, the Contractor shall submit separate release or waivers of liens for each subcontractor, material supplier, and others with lien rights against the property of the Owner and shall submit a list of such parties.

9.10.2.2 Submittals required above shall be made in accordance with procedures described in Division 01.

Add the following additional Clauses to Paragraph 9.10.4:

5. Claims for Indemnification;

6. Claims about which the Owner has given the Contractor written notice;

7. .Claims arising after final payment."

K. **Article 10 - Protection of Persons and Property**

10.2 Safety of Persons and Property:

Add the following Subparagraph to 10.2.2:

10.2.2.1 The Contractor acknowledges that the Labor Law of the State of New York, and regulations adopted thereunder, place upon both the Owner and the Contractor certain duties and that liability for failure to comply therewith is imposed on both the Owner and the Contractor regardless of their respective fault. The Contractor hereby agrees that, as between the Owner and the Contractor, the Contractor is solely responsible for compliance with all such laws and regulations imposed for the protection of persons performing the Contract. The Contractor shall indemnify and hold harmless the Owner of and from any and all liability for violation of such laws and regulations and shall defend any claims or actions which may be brought against the Owner as the result thereof. In the event that the Contractor shall fail to refuse to defend any such action, the Contractor shall be liable to the Owner for all Costs of the Owner in defending such claim or action and all costs of the Owner, including attorney's fee, in recovering such defense costs from the Contractor.

Add the following new Subparagraph:

10.2.9 Title to all completed or partially completed Work at the job site and to all materials delivered to and stored at said job site which are intended to become a part of the completed Work covered by the Contract, shall be in the name of the Owner. Notwithstanding the foregoing, prior to the acceptance of the completed Work by the Owner, the Contractor shall be liable for all loss of, or damage to, said completed Work, partially completed Work, materials furnished by the Contractor, and materials or equipment furnished by others, the custody of which has been given to the Contractor arising from any cause other than a cause against which the Owner herein undertakes to carry insurance. In the event of loss or damage from cause other than those against which the Owner undertakes to carry insurance, the Contractor shall replace or repair the said Work materials at his own cost and expense, to the completed satisfaction of the Owner and Architect.

Add the following Subparagraph to 10.2.9:

10.2.9.1 The Contractor causing damage to the Work of another Contractor shall be responsible for the repair and replacement of such damaged Work. Back charges shall be made when corrections are not made promptly.

10.2.9.2 The Owner reserves the right to pay the Contractor originating the back charge from monies due the Contractor who is responsible for the Work required by same and shall deduct it from the amount due the said responsible Contractor.

10.2.9.3 Contractor originating back charges will determine the amount of the back charges in accordance with Article 7, Changes in the Work, of the General Conditions of the Contract, in order to obtain the Architect's approval.

10.2.9.4 Contractors under direct Contract with the Owner will be expected to take care of back charges originating with Subcontractors under their employ under the terms and conditions as established in the General Conditions of the Contract, Article 5 and Article 6. Contractors under direct Contract with the Owner, and their Sureties, shall indemnify and save the Owner harmless from claims of this type, including paying for legal expenses necessary to remove or settle any liens or other legal claims against the Owner.

L. **Article 11 - Insurance and Bonds**

11.1 Contractor's Insurance and Bonds:

Add the following Subparagraph to 11.1.1:

11.1.1.1 Liability insurance shall include all major divisions of coverage and be on comprehensive basis including:

1. Premises Operations (including X, C, and U coverage as applicable).
2. Independent Contractor's Protective.
3. Products and Completed Operations.
4. Personal Injury Liability with Employment Exclusion deleted.

5. Contractual, including specified provisions for Contractor's obligation under Paragraph 3.18.

6. Owned, non-owned, and hired motor vehicle.

7. Broad Form Property Damage including Completed Operations.

11.1.1.2 The insurance required by Subparagraph 11.1.1 shall be written for not less than limits indicated in Division 01, Specification Section 010200 or greater as required by Law.

11.1.1.3 In addition to the Certificate of Insurance, the Contractor shall provide the Owner with copies of any endorsements subsequently issued amending coverage or limits.

11.1.1.4 The Contractor shall provide insurance coverage for portions of the Work stored off the site, in transit, and stored on the site but not incorporated into the Work as full replacement cost basis without voluntary deductible.

11.1.1.5 The Owner as fiduciary shall have the power to adjust and settle a loss with insurers unless one of the parties in interest shall object in writing within five days after occurrence of loss to the Owner's exercise of this power.

Add the following subparagraph to 11.1.2:

11.1.2.1 Bonds shall be obtained from a surety satisfactory to the Owner, licensed to do business in the state where the project is located. The amount of each bond shall be included in the Contract Sum. Each bond shall be maintained throughout the duration of the Project and shall remain in effect for a period of not less than two (2) years following final completion of the work by the Contractor.

Add the following subparagraph to 11.1.2:

11.1.2.2 The Contractor shall deliver the required bonds to the Owner prior to beginning construction activity at the site, but no later than three (3) days after execution of the Contract, on A.I.A. Document A312, Performance Bond and Payment Bond.

M. **Article 14 - Termination or Suspension of the Contract**

14.1 Termination by the Contractor:

Add the following to 14.1.1:

14.1.1.5 In accordance with Section 103-b, General Municipal Law, if any person when called to testify before a Grand Jury concerning any transaction or contract with the State of New York or a political subdivision thereof, or a public authority, or a public department, agency, or official of any of the foregoing, refuses to sign a waiver of immunity against subsequent criminal prosecution or refuses to answer any relevant questions concerning such transaction or contract; then any such person, or any firm, partnership, or corporation of which he is a member, partner, director, or official shall be disqualified for a period of five (5) years after such refusal from submitted bids to, receiving awards, or entering into any contract with, any municipal corporation or department or agency or official thereof.

If such person refuses to sign a waiver of immunity or to answer any relevant questions as aforesaid, then this Contract may be canceled or terminated by the Owner without the Owner incurring any penalty or damages by virtue of such cancellation or termination.

14.1.1.6 In accordance with Section 109, General Municipal Law, the Contractor shall not assign, transfer, convey, sublet, or otherwise dispose of the Contract for the Work herein specified, or his right, title, or interest therein, or his power to execute the Contract, to any other person or corporation without the previous consent in writing of the Board of Education.

If the Contractor, without previous written consent of the Board of Education, shall assign, transfer, convey, sublet, or otherwise dispose of the Contract for the Work specified herein, or his power to execute the Contract, to any other person or corporation, the Board of Education shall be relieved of and discharged from any and all liability and obligations growing out of the Contract to the Contractor, and to the persons or corporation to which the Contract shall have been assigned, transferred, conveyed, sublet, or otherwise disposed of, and the Contractor, and his assignees, transferees, or sublessees shall forfeit and lose all monies theretofore earned under the Contract, except so much as may be required to pay his employees.

The above provisions of this paragraph shall not hinder, prevent, or affect any assignment by the Contractor for the benefit of his creditors made pursuant to the laws of the State of New York.

N. **Article 15 – Claims and Disputes**

15.1 Claims:

Paragraph 15.1.3.1, Notice of Claims, Delete the last sentence in its entirety.

Add the following at the end of subparagraph 15.1.5:

"The Contractor's Claim shall be made in writing within 21 days after the occurrence of the event giving rise to the Claim. Failure to do so shall be an irrevocable waiver of the Claim. Regardless of other provision in the Contract Documents to the contrary, the Contractor will not be entitled to damages or additional compensation from the Owner or Architect on account of delays caused by person, except as permitted under Paragraph 14.3."

Modify Paragraph 15.1.6.1 as follows:

Delete the text after "notice" in line 2 and substitute the following text and sentence, "shall be given by the Contractor to the Architect within 7 days of its commencement. The failure to give such notice shall constitute an irrevocable waiver of the Claim.

Delete from the second sentence the following, "of cost and"

Delete the third sentence, "In the case of a continuing delay, only one Claim is necessary." in its entirety.

Add the following Subparagraphs to 15.1.6.1:

15.1.6.1.1 An application for extension of time must set forth in detail the nature of each alleged cause of delay, the dates upon which such cause of delay began and ended, the number of days attributable to each of such causes, and the

probable effect of such causes on the previously approved progress schedule.

15.1.6.1.2 Failure to strictly comply with these requirements may, at the discretion of the Owner, be deemed sufficient cause on the previously approved progress schedule.

Add the following Subparagraph to 15.1.6.2:

15.1.6.2.1 In planning his construction schedule within the agreed Contract Time, it shall be assumed that the Contractor has anticipated the amount of adverse weather conditions normal to the site of the Work for the season or seasons of the year involved. Only those weather delays attributable to other than normal weather conditions will be considered by the Architect.

Add the following paragraph to 15.1.6:

15.1.6.3 The Owner and/or Architect shall not be liable to the Contractor and/or Subcontractor for financial Claims or monetary damages of any nature caused by or arising out of delays. The sole remedy against the Owner for delays shall be the allowance of additional time for completion of the Work, the amount of which shall be subject to the Claims procedure set forth herein. Except to the extent, if any, expressly prohibited by law, the Contractor expressly agrees not to make any hereby waives any Claim for damages for delay, including, but not limited to, those resulting from increase labor or material costs; directions given or not given by the Owner, Architect, including scheduling and coordination of the Work; the Architect's preparation of drawings and specifications or review of shop drawings and requests for instruction(s); or, on account of any delay, obstruction or hinderance for any cause whatsoever by the Owner, Architect, or any other contractor on this Project, whether or not foreseeable or anticipated. The Contractor agrees that its sole right and remedy therefore shall be an extension of time if appropriate. IT IS EMPHASIZED THAT NO MONETARY RECOVERY MAY BE OBTAINED BY THE CONTRACTOR FOR DELAY AGAINST THE OWNER, CONSTRUCTION MANAGER, OR ARCHITECT BASED ON ANY REASON AND THAT THE CONTRACTOR'S SOLE REMEDY, IF APPROPRIATE, IS ADDITIONAL TIME.

Add the following subparagraphs to 15.1.8:

15.1.8.1 "The Contractor causing damage to the Work of another Contractor shall be responsible for the repair and replacement of such damaged Work. Back charges shall be made when corrections are not made promptly."

15.1.8.2 "The Owner reserves the right to pay the Contractor originating the back charge from monies due the Contractor who is responsible for the Work required by same and shall deduct it from the amount due the said responsible Contractor."

15.1.8.3 "Contractor originating back charges will determine the amount of the back charges in accordance with Article 7, Changes in the Work, of the General Conditions of the Contract, in order to obtain the Architect's approval."

15.1.8.4 "Contractors under direct Contract with the Owner will be expected to take care of back charges originating with Subcontractors under their employ under the terms and conditions as established in the General Conditions of the Contract, Article 5 and Article 6. Contractors under direct Contract with the Owner, and their Sureties, shall indemnify and save the Owner harmless from claims of

this type, including paying for legal expenses necessary to remove or settle any liens or other legal claims against the Owner."

15.2 Initial Decision:

Add to end of 15.2.1:

Add the following text at the end of the third sentence of this Subparagraph:…"provided, with respect to Claims submitted more than one year after payment is due, the decision by the Architect shall not be a condition precedent to litigation, and the Claim not need be submitted to the Architect.

Delete Paragraph 15.2.6.1 in its entirety and replace with the following:

15.2.6.1 When a written decision of the Architect states that (1) the decision is final but subject to mediation and (2) a demand for mediation of a Claim covered by such decision must be made within 30 days after the date on which the party making the demand receives the final written decision, then failure to demand mediation within said 30 days' period shall result in the Architect's decision becoming final and binding upon the Owner and Contractor. If the Architect renders a decision after mediation proceedings have been initiated, such decision may be entered as evidence, but shall not supersede mediation proceedings unless the decision is acceptable to all parties concerned.

Add the following Paragraph 15.2.9:

"Within 10 days of a written request, the Contractor will make available to the Owner or its representative books, records, or other documents in its possession or to which it has access relating to a claim and shall require its Subcontractors, regardless of tier, and materialmen to do likewise."

15.3 Mediation:

Delete the last sentence from Paragraph 15.3.2.

15.4 Arbitration:

Delete this Paragraph in its entirety.

O. **Add the following new article in its entirety**

Article 16 - Governmental Stipulations

16.1 **Non-Discrimination:**

16.1.1 The Contractor specifically agrees as required by the provisions of New York Labor Law, Section 220-e, as amended that:

1. In hiring of employees for the performance of work under this Contract or any subcontract hereunder or for the manufacture, sale or distribution of materials, equipment or supplies, hereunder, no Contractor or Subcontractor nor any person acting on behalf of such Contractor or Subcontractor, shall by reason of race, creed, color, disability, sex, or national origin, or any other characteristic protected by applicable law, discriminate against any citizen of the State of New York who is qualified and available to perform the work to which the employment relates.

2. No Contractor, Subcontractor, nor any person on his behalf shall, in any manner, discriminate against or intimidate any employee under this Contract on account of race, creed, color, disability, sex or national origin, or any other characteristic protected by applicable law.

3. There may be deducted from the amount payable to the Contractor by the Owner under this Contract, a penalty of fifty dollars ($50) for each person for each calendar day during which such a person was discriminated against in violation of the provisions of the Contract, and

4. The provisions of this section covering every Contract for or on behalf of the Owner, the State or a municipality for the manufacture or sale or distribution of materials, equipment or supplies shall be limited to operations performed within the territorial limits of the State of New York.

16.1.2 During the performance of this Contract, the Contractor agrees that it will not discriminate against any employee or applicant for employment because of age, race, creed, color, national origin, sexual orientation, military status, sex, disability, predisposing genetic characteristics, marital status or domestic violence victim status, or any other characteristic protected by applicable law, and will otherwise comply with all application non-discrimination statutes, laws, rules, regulations, policies and ordinances.

16.2 Prevailing Wages:

16.2.1 The Wage rate which can be paid to Workmen employed in the performance of the Contract shall be no less than the rates of wages as promulgated by the Department of Labor and Industry of the State for the location and duration of this project.

P. **Add the following new article in its entirety**

Article 17-Indemnification

17.1.1 The Contractor and its Subcontractors shall indemnify and hold harmless the Owner, Architect and the Construction Manager, and all their employees, agents or servants or any third parties from and against any and all claims, damages, losses, suits, obligations, fines, penalties, costs, charges and expenses, including but not limited to attorneys' fees, which may be imposed upon or incurred by or asserted against any of them by reason of any act or omission of such Contractor, or any of its Subcontractors, or any person or firm directly or indirectly employed by such Contractor, for the act(s) and/or omission(s) of any Contractor or Subcontractor in connection with the work of the Project.

17.1.2 To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, Construction Manager, the Architect, the Architect's consultants, and agents and employees of them from and against claims, damages, losses and expenses, including but not limited to, attorneys' fees arising out of or resulting from performance of its work, provided that such claim, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction, of tangible property including loss of use resulting therefrom, but only to the extent caused in whole or in

part by negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity which would otherwise exist as to a party or person described in this paragraph 16.1.2. The Contractor's indemnity obligations under this Paragraph 16.1.2 shall, but not by way of limitation, specifically include all claims and judgments which may be made against the Owner, the Construction Manager, the Architect, the Architect's consultants and agents and employees of any of them under any applicable statute, rule or regulation including the New York Statute, Occupational Safety and Hazardous Act, and the Federal Occupational Safety and Hazardous Act. In claims against any person or entity indemnified under this paragraph 16.1.2 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, the indemnification obligation under this paragraph 16.1.2 shall not be limited by a limitation on amount or type of damages, compensation or benefits payable by or for the Contractor or a Subcontractor under workers' or workmen's compensation acts, disability benefit acts or other employee benefit acts.

17.1.3 The Contractor shall indemnify and hold harmless: (1) the Owner, its consultants, employees, officers and agents; (2) the Construction Manager; and (3) the Architect and its consultants, employees, officers and agents, against any actions, lawsuits or proceedings or claims of liens brought against each or any of them as a result of liens filed against the Contractor's project funds, including all the cost and expense of said liens, and including but not limited to attorneys' fees incurred by each or any of them.

17.1.4 The Contractor shall indemnify and hold harmless the Owner, the Construction Manager, and the Architect of and from any and all liability for violation of any laws and regulations applicable to the Contractor's work and shall defend any claims or actions which may be brought against the Owner as the result thereof. In the event that the Contractor shall fail to refuse to defend any such action, the Contractor shall be liable to the Owner for all costs in defending such claim or action and all costs of the Owner, including attorney's fees, in recovering such defense costs from the Contractor.

17.1.5 The Contractor shall indemnify and hold harmless the Owner, the Construction Manager, and the Architect of and from any and all liability for claims made by third parties, including subcontractors, in connection with this Agreement and shall defend any claims or actions which may be brought against the Owner as the result thereof. In the event that the Contractor shall fail to refuse to defend any such action, the Contractor shall be liable to the Owner for all costs of the Owner in defending such claim or action and all costs of the Owner, including attorney's fees, in recovering such defense costs from the Contractor.

END OF SECTION

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Payment Bond

CONTRACTOR:
(Name, legal status and address)

SURETY:
(Name, legal status and principal place of business)

OWNER:
(Name, legal status and address)

CONSTRUCTION CONTRACT
Date:
Amount: $
Description:
(Name and location)

BOND
Date:
(Not earlier than Construction Contract Date)

Amount: $
Modifications to this Bond: ☐ None ☐ See Section 18

CONTRACTOR AS PRINCIPAL		**SURETY**	
Company:	*(Corporate Seal)*	Company:	*(Corporate Seal)*
Signature:		Signature:	
Name and Title:		Name and Title:	

(Any additional signatures appear on the last page of this Payment Bond.)

(FOR INFORMATION ONLY — Name, address and telephone)

AGENT or **BROKER:**

OWNER'S REPRESENTATIVE:
(Architect, Engineer or other party:)

ADDITIONS AND DELETIONS:
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Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

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§ 1 The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Owner to pay for labor, materials and equipment furnished for use in the performance of the Construction Contract, which is incorporated herein by reference, subject to the following terms.

§ 2 If the Contractor promptly makes payment of all sums due to Claimants, and defends, indemnifies and holds harmless the Owner from claims, demands, liens or suits by any person or entity seeking payment for labor, materials or equipment furnished for use in the performance of the Construction Contract, then the Surety and the Contractor shall have no obligation under this Bond.

§ 3 If there is no Owner Default under the Construction Contract, the Surety's obligation to the Owner under this Bond shall arise after the Owner has promptly notified the Contractor and the Surety (at the address described in Section 13) of claims, demands, liens or suits against the Owner or the Owner's property by any person or entity seeking payment for labor, materials or equipment furnished for use in the performance of the Construction Contract and tendered defense of such claims, demands, liens or suits to the Contractor and the Surety.

§ 4 When the Owner has satisfied the conditions in Section 3, the Surety shall promptly and at the Surety's expense defend, indemnify and hold harmless the Owner against a duly tendered claim, demand, lien or suit.

§ 5 The Surety's obligations to a Claimant under this Bond shall arise after the following:

§ 5.1 Claimants, who do not have a direct contract with the Contractor,

.1 have furnished a written notice of non-payment to the Contractor, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were, or equipment was, furnished or supplied or for whom the labor was done or performed, within ninety (90) days after having last performed labor or last furnished materials or equipment included in the Claim; and

.2 have sent a Claim to the Surety (at the address described in Section 13).

§ 5.2 Claimants, who are employed by or have a direct contract with the Contractor, have sent a Claim to the Surety (at the address described in Section 13).

§ 6 If a notice of non-payment required by Section 5.1.1 is given by the Owner to the Contractor, that is sufficient to satisfy a Claimant's obligation to furnish a written notice of non-payment under Section 5.1.1.

§ 7 When a Claimant has satisfied the conditions of Sections 5.1 or 5.2, whichever is applicable, the Surety shall promptly and at the Surety's expense take the following actions:

§ 7.1 Send an answer to the Claimant, with a copy to the Owner, within sixty (60) days after receipt of the Claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed; and

§ 7.2 Pay or arrange for payment of any undisputed amounts.

§ 7.3 The Surety's failure to discharge its obligations under Section 7.1 or Section 7.2 shall not be deemed to constitute a waiver of defenses the Surety or Contractor may have or acquire as to a Claim, except as to undisputed amounts for which the Surety and Claimant have reached agreement. If, however, the Surety fails to discharge its obligations under Section 7.1 or Section 7.2, the Surety shall indemnify the Claimant for the reasonable attorney's fees the Claimant incurs thereafter to recover any sums found to be due and owing to the Claimant.

§ 8 The Surety's total obligation shall not exceed the amount of this Bond, plus the amount of reasonable attorney's fees provided under Section 7.3, and the amount of this Bond shall be credited for any payments made in good faith by the Surety.

§ 9 Amounts owed by the Owner to the Contractor under the Construction Contract shall be used for the performance of the Construction Contract and to satisfy claims, if any, under any construction performance bond. By the Contractor furnishing and the Owner accepting this Bond, they agree that all funds earned by the Contractor in the performance of the Construction Contract are dedicated to satisfy obligations of the Contractor and Surety under this Bond, subject to the Owner's priority to use the funds for the completion of the work.

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§ 10 The Surety shall not be liable to the Owner, Claimants or others for obligations of the Contractor that are unrelated to the Construction Contract. The Owner shall not be liable for the payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligation to make payments to, or give notice on behalf of, Claimants or otherwise have any obligations to Claimants under this Bond.

§ 11 The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders and other obligations.

§ 12 No suit or action shall be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the state in which the project that is the subject of the Construction Contract is located or after the expiration of one year from the date (1) on which the Claimant sent a Claim to the Surety pursuant to Section 5.1.2 or 5.2, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs. If the provisions of this Paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

§ 13 Notice and Claims to the Surety, the Owner or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears. Actual receipt of notice or Claims, however accomplished, shall be sufficient compliance as of the date received.

§ 14 When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

§ 15 Upon request by any person or entity appearing to be a potential beneficiary of this Bond, the Contractor and Owner shall promptly furnish a copy of this Bond or shall permit a copy to be made.

§ 16 Definitions

§ 16.1 Claim. A written statement by the Claimant including at a minimum:

- **.1** the name of the Claimant;
- **.2** the name of the person for whom the labor was done, or materials or equipment furnished;
- **.3** a copy of the agreement or purchase order pursuant to which labor, materials or equipment was furnished for use in the performance of the Construction Contract;
- **.4** a brief description of the labor, materials or equipment furnished;
- **.5** the date on which the Claimant last performed labor or last furnished materials or equipment for use in the performance of the Construction Contract;
- **.6** the total amount earned by the Claimant for labor, materials or equipment furnished as of the date of the Claim;
- **.7** the total amount of previous payments received by the Claimant; and
- **.8** the total amount due and unpaid to the Claimant for labor, materials or equipment furnished as of the date of the Claim.

§ 16.2 Claimant. An individual or entity having a direct contract with the Contractor or with a subcontractor of the Contractor to furnish labor, materials or equipment for use in the performance of the Construction Contract. The term Claimant also includes any individual or entity that has rightfully asserted a claim under an applicable mechanic's lien or similar statute against the real property upon which the Project is located. The intent of this Bond shall be to include without limitation in the terms "labor, materials or equipment" that part of water, gas, power, light, heat, oil, gasoline, telephone service or rental equipment used in the Construction Contract, architectural and engineering services required for performance of the work of the Contractor and the Contractor's subcontractors, and all other items for which a mechanic's lien may be asserted in the jurisdiction where the labor, materials or equipment were furnished.

§ 16.3 Construction Contract. The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and all changes made to the agreement and the Contract Documents.

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§ 16.4 Owner Default. Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

§ 16.5 Contract Documents. All the documents that comprise the agreement between the Owner and Contractor.

§ 17 If this Bond is issued for an agreement between a Contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

§ 18 Modifications to this bond are as follows:

(Space is provided below for additional signatures of added parties, other than those appearing on the cover page.)

CONTRACTOR AS PRINCIPAL		**SURETY**	
Company:	*(Corporate Seal)*	Company:	*(Corporate Seal)*
Signature:	_____	Signature:	_____
Name and Title:		Name and Title:	
Address:		Address:	

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Performance Bond

CONTRACTOR:
(Name, legal status and address)

SURETY:
(Name, legal status and principal place of business)

OWNER:
(Name, legal status and address)

CONSTRUCTION CONTRACT
Date:
Amount: $
Description:
(Name and location)

BOND
Date:
(Not earlier than Construction Contract Date)

Amount: $
Modifications to this Bond: ☐ None ☐ See Section 16

CONTRACTOR AS PRINCIPAL		**SURETY**	
Company:	*(Corporate Seal)*	Company:	*(Corporate Seal)*
Signature:		Signature:	
Name and Title:		Name and Title:	

(Any additional signatures appear on the last page of this Performance Bond.)

(FOR INFORMATION ONLY — Name, address and telephone)

AGENT or **BROKER:**

OWNER'S REPRESENTATIVE:
(Architect, Engineer or other party:)

ADDITIONS AND DELETIONS:
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This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

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§ 1 The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Owner for the performance of the Construction Contract, which is incorporated herein by reference.

§ 2 If the Contractor performs the Construction Contract, the Surety and the Contractor shall have no obligation under this Bond, except when applicable to participate in a conference as provided in Section 3.

§ 3 If there is no Owner Default under the Construction Contract, the Surety's obligation under this Bond shall arise after

.1 the Owner first provides notice to the Contractor and the Surety that the Owner is considering declaring a Contractor Default. Such notice shall indicate whether the Owner is requesting a conference among the Owner, Contractor and Surety to discuss the Contractor's performance. If the Owner does not request a conference, the Surety may, within five (5) business days after receipt of the Owner's notice, request such a conference. If the Surety timely requests a conference, the Owner shall attend. Unless the Owner agrees otherwise, any conference requested under this Section 3.1 shall be held within ten (10) business days of the Surety's receipt of the Owner's notice. If the Owner, the Contractor and the Surety agree, the Contractor shall be allowed a reasonable time to perform the Construction Contract, but such an agreement shall not waive the Owner's right, if any, subsequently to declare a Contractor Default;

.2 the Owner declares a Contractor Default, terminates the Construction Contract and notifies the Surety; and

.3 the Owner has agreed to pay the Balance of the Contract Price in accordance with the terms of the Construction Contract to the Surety or to a contractor selected to perform the Construction Contract.

§ 4 Failure on the part of the Owner to comply with the notice requirement in Section 3.1 shall not constitute a failure to comply with a condition precedent to the Surety's obligations, or release the Surety from its obligations, except to the extent the Surety demonstrates actual prejudice.

§ 5 When the Owner has satisfied the conditions of Section 3, the Surety shall promptly and at the Surety's expense take one of the following actions:

§ 5.1 Arrange for the Contractor, with the consent of the Owner, to perform and complete the Construction Contract;

§ 5.2 Undertake to perform and complete the Construction Contract itself, through its agents or independent contractors;

§ 5.3 Obtain bids or negotiated proposals from qualified contractors acceptable to the Owner for a contract for performance and completion of the Construction Contract, arrange for a contract to be prepared for execution by the Owner and a contractor selected with the Owner's concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Construction Contract, and pay to the Owner the amount of damages as described in Section 7 in excess of the Balance of the Contract Price incurred by the Owner as a result of the Contractor Default; or

§ 5.4 Waive its right to perform and complete, arrange for completion, or obtain a new contractor and with reasonable promptness under the circumstances:

.1 After investigation, determine the amount for which it may be liable to the Owner and, as soon as practicable after the amount is determined, make payment to the Owner; or

.2 Deny liability in whole or in part and notify the Owner, citing the reasons for denial.

§ 6 If the Surety does not proceed as provided in Section 5 with reasonable promptness, the Surety shall be deemed to be in default on this Bond seven days after receipt of an additional written notice from the Owner to the Surety demanding that the Surety perform its obligations under this Bond, and the Owner shall be entitled to enforce any remedy available to the Owner. If the Surety proceeds as provided in Section 5.4, and the Owner refuses the payment or the Surety has denied liability, in whole or in part, without further notice the Owner shall be entitled to enforce any remedy available to the Owner.

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§ 7 If the Surety elects to act under Section 5.1, 5.2 or 5.3, then the responsibilities of the Surety to the Owner shall not be greater than those of the Contractor under the Construction Contract, and the responsibilities of the Owner to the Surety shall not be greater than those of the Owner under the Construction Contract. Subject to the commitment by the Owner to pay the Balance of the Contract Price, the Surety is obligated, without duplication, for

.1 the responsibilities of the Contractor for correction of defective work and completion of the Construction Contract;

.2 additional legal, design professional and delay costs resulting from the Contractor's Default, and resulting from the actions or failure to act of the Surety under Section 5; and

.3 liquidated damages, or if no liquidated damages are specified in the Construction Contract, actual damages caused by delayed performance or non-performance of the Contractor.

§ 8 If the Surety elects to act under Section 5.1, 5.3 or 5.4, the Surety's liability is limited to the amount of this Bond.

§ 9 The Surety shall not be liable to the Owner or others for obligations of the Contractor that are unrelated to the Construction Contract, and the Balance of the Contract Price shall not be reduced or set off on account of any such unrelated obligations. No right of action shall accrue on this Bond to any person or entity other than the Owner or its heirs, executors, administrators, successors and assigns.

§ 10 The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders and other obligations.

§ 11 Any proceeding, legal or equitable, under this Bond may be instituted in any court of competent jurisdiction in the location in which the work or part of the work is located and shall be instituted within two years after a declaration of Contractor Default or within two years after the Contractor ceased working or within two years after the Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this Paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

§ 12 Notice to the Surety, the Owner or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears.

§ 13 When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

§ 14 Definitions

§ 14.1 Balance of the Contract Price. The total amount payable by the Owner to the Contractor under the Construction Contract after all proper adjustments have been made, including allowance to the Contractor of any amounts received or to be received by the Owner in settlement of insurance or other claims for damages to which the Contractor is entitled, reduced by all valid and proper payments made to or on behalf of the Contractor under the Construction Contract.

§ 14.2 Construction Contract. The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and changes made to the agreement and the Contract Documents.

§ 14.3 Contractor Default. Failure of the Contractor, which has not been remedied or waived, to perform or otherwise to comply with a material term of the Construction Contract.

§ 14.4 Owner Default. Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

§ 14.5 Contract Documents. All the documents that comprise the agreement between the Owner and Contractor.

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§ 15 If this Bond is issued for an agreement between a Contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

§ 16 Modifications to this bond are as follows:

(Space is provided below for additional signatures of added parties, other than those appearing on the cover page.)

CONTRACTOR AS PRINCIPAL		**SURETY**	
Company:	*(Corporate Seal)*	Company:	*(Corporate Seal)*
Signature:		Signature:	
Name and Title:		Name and Title:	
Address:		Address:	

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SECTION 00 62 00.1

PAYMENT PROCEDURES

PART 1 GENERAL

1.1 SUMMARY

A. This Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.

B. Related Sections include the following:

1. Drawings and general provisions of the Contract, including General Conditions and other Division 1 Specification Sections, apply to this Section.

2. Division 01 Section “Allowances” for procedural requirements governing handling and processing of allowances.

3. Division 01 Section “Contract Modification Procedures” for administrative procedures for handling changes to the Contract.

4. Division 01 Section "Construction Progress Documentation” for administrative requirements governing preparation and submission of Contractor’s Construction Schedule and Submittal Schedule.

5. Schedule of Values Sample Form.

6. Subcontractor Billing Summary Sheet Sample Form.

7. Project Specified Partial and Final Lien Waiver Forms.

1.2 DEFINITIONS

A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.3 SCHEDULE OF VALUES

A. Schedule of Values Review Process:

1. Submit the Schedule of Values to the Construction Manager at earliest possible date but no later than fourteen (14) days before the date scheduled for submittal of draft initial Application for Payment.

2. If Schedule of Values is returned to the Contractor as “Revise and Resubmit” for failing to meet requirements stated within this section, then the review period shall be extended by another 14 days from the date of every resubmission of the Schedule of Values.

3. Schedule of Values is to be resubmitted as many times as necessary until the Schedule of Values complies with all requirements of this section as identified in responses from the Construction Manager and Architect.

4. The Schedule of Values approval shall not be utilized to determine exact cost of work or materials when calculating the costs used for processing add or deduct change orders for Changes in Work. The Construction Manager and Architect reserve the right to reevaluate all costs referenced from Schedule of Values when associated with a change prior to the cost for Changes in Work being accepted.

B. Schedule of Values Updating: Update and resubmit the Schedule of Values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum including any Back-Charge Deduct Change Orders issued by the Owner.

C. Schedule of Values Format and Content: Use the Project Manual Table of Contents as a guide to establish line items for the Schedule of Values.

1. Utilize "Schedule of Values" Blank form supplied with Project Manual. Submit Schedule of Values Submittal as **Microsoft Excel file** and **PDF Submittal** with a Submittal Coversheet.

2. Provide line-item breakdown of Contract Sum in enough detail to facilitate continued evaluation of Applications for Payments as directed by Construction Manager or Architect.

3. Each item in the Schedule of Values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.

4. Provide at least one line item for each Specification Section. When applicable, divide costs into further detailed line items as directed by Construction Manager or Architect.

5. Scheduling Phases: Where the work is separated into multiple schedule phases requiring separately phased payments, provide breakdown of Schedule of Values showing values correlated with each phase as indicated on Contract Schedule. Include prefixes on all Scheduling Phase line-item descriptions.

6. All rows need to be fully populated with data from first row to last row. No blank rows are to exist between any populated rows.

7. Costs in "Amount" column needs to be formatted to "Number" Cell Type in Excel.

8. Character limit of Schedule of Value Descriptions is 64 Characters, abbreviate descriptions as needed.

9. Multiple Buildings: When Contract Work includes work located in multiple buildings, divide Schedule of Values line items in separate groups for each building. Include building prefixes on all building line-item descriptions.

10. Include Alternates as separate items. Group items associated with Alternates by Alternate and list after Base Bid Work. Include prefixes on all alternate line-item descriptions.

11. All Line Item "Descriptions" need to be unique and may not match another line-item description.

    a. Locations, Alternates, and Scheduling Phases are to be identified uniquely within each description of each item when Locations, Alternates, or Scheduling Phases are used.

    b. Line-Item Numbers are not required to be entered in "Description" as they will be applied automatically.

12. Separate Sections of Schedule of Values by Drawing Area and Floor Level.

    a. In the description, include a location tag/prefix in the text of each work item.

    b. Separate line items by Labor and Material.

    c. Include a "-" in between each description prefix or identifier.

    d. Examples:

        1). "HS-FL1-A-Piping Install-L" = High School Floor 1 Area A Piping Install Labor.

        2). "ES-LL-D-Hardware-M" = Elementary School Lower-Level Area D Hardware Material.

        3). "HS-Insurance" = High School Insurance.

13. No $0 Amount "Separation" Line items are to be listed except for the following items:

    a. Buildings: Provide Building Prefix Tag in descriptions of all line items under each building.

    b. Add "SED" - State Education Department Number in Building Descriptions when applicable.

    c. Alternates: Provide Alternate Prefix Tag in descriptions of all line items under each Alternate.

    d. See below for Allowance, Unit Prices, and Change Order items.

    e. No other rows may be permitted to have $0 in "amount" column.

14. Include the following line items at the end of the Schedule of Values:

    a. "Remaining Balance of Allowance ("Input Original Allowance Amount") (Do not Bill)"

        1). Amount to be set to Actual Allowance Value. List multiple numbered allowance line items if applicable.

        2). To be listed at end of Schedule of Values, before "Change Orders Below".

        3). Use only when there are Allowances used on Project.

4). Substitute “Allowance” for “Unit Price” when there are Unit Prices are included on Project.

5). Indicate Allowance or Unit Price Identification Number when applicable.

b. "Change Orders Below"

1). Amount to be set to $0.

2). To be listed as last item on Schedule of Values.

D. List of Required General Condition Line Items to be included with Schedule of Values. Divide General Conditions line items between multiple buildings when required.

1). Insurance – Actual Invoice Amount.

2). Bonds – Actual Invoice Amount.

3). Mobilization – Actual Value of Mobilization Amount but not to exceed 1.5% of Contract Sum.

4). Temporary Facilities and Controls – Divide costs into sub line items as required for specific Temporary Facilities Responsibilities.

5). Submittal Schedule - Minimum of 0.25% of Contract Sum.

6). Submittals – Minimum of 1% of Contract Sum.
(a). Not to be billed until Submittal Schedule has been approved and copy of the approved Submittal Schedule (which is to be marked up with Submittal Submission Progress) is included with the Draft Application for Payment.

7). Schedule - Minimum of 1% of Contract Sum.
(a). Initial Project Schedule (25% of Schedule)
(b). Monthly Updated Schedules (50% of Schedule)
(c). Two Week Look Ahead Schedules (25% of Schedule)

8). Field Supervision – Minimum of 3% of Contract Sum.

9). Meetings - Minimum of 1% of Contract Sum.

10). Safety and Field Reports - Minimum of 1% of Contract Sum
(a). Weekly Safety Meeting Documentation required to be submitted with each Application for Payment.

11). Coordination Drawings, Modeling, and Layout – Minimum of 1% of Contract Sum.

12). HVAC Testing and Balancing: TAB (if TAB is included in Contract) Minimum of 1% of Contract Sum.
(a). Pre-TAB activities (20% of TAB)
(b). TAB Activities (40% of TAB)
(c). Final Tab Reports. (40% of TAB)

13). Equipment Start Up and Commissioning – Minimum of 1% of Contract Sum.
(a). Divide costs into subline items as required for different equipment.

14). Punchlist - Minimum of 2% of Contract Sum
(a). Not to be billed until the Substantial Completion Inspection Report is issued and Punchlist Work is being completed.

15). Final Demobilization

16). Final Cleaning (separated by phase if applicable).

17). Project Closeout – Total Value not to be less than 2% of Contract Sum.
(a). Closeout Document Table of Contents.
(b). Operation and Maintenance Package.
(c). Maintenance Material and Attic Stock Transmittals.
(d). Demonstration and Training Documentation.
(e). Warranty Package.
(f). Project Record Document Package.
(g). Physical Closeout Document Turn Over.

1.4 APPLICATIONS FOR PAYMENT

A. Each Application for Payment shall be consistent with previous applications and payments as certified by the Construction Manager, Architect and paid for by Owner.

1. The initial Application for Payment, the Application for Payment at time of Substantial Completion, and the final Application for Payment involve additional requirements.

B. Payment-Application Review Period:

1. The due date for the submission of each Draft Application for Payment is the 20th day of each month (or as designated by the Owner). The period covered by each Application for Payment is to the last day of the month of the current billing period.

2. Construction Manager will, within seven calendar days after the Construction Manager's receipt of the Contractor's Application for Payment, review the Application, certify the amount the Construction Manager determines is due to the Contractor, and forward the Contractor's Draft Application for Payment to the Architect.

3. Within seven calendar days after the Architect receives the Contractor's Draft Application for Payment from the Construction Manager, the Architect will return to the Construction Manager the Draft Application for Payment for such amount as the Architect determines is properly due. The Draft Application for Payment shall then be returned by the Construction Manager to the Contractor for the Contractor's preparation of the Contractor Signed Application for Payment.

4. Construction Manager will, within seven calendar days after the Construction Manager's receipt of the completed Contractor's Signed Application for Payment, review the Application, certify the amount the Construction Manager determines is due the Contractor, and forward the Contractor Signed Application for Payment signed by the Construction Manager to the Architect.

5. Within seven calendar days after the Architect receives the Contractor's Signed Application for Payment from the Construction Manager, the Architect will issue to

the Owner a Certificate for Payment for such amount as the Architect determines is properly due, or notify the Construction Manager and Owner in writing of the Architect's reasons for withholding certification in whole or in part as provided in Section 9.5.1. The Construction Manager will promptly forward to the Contractor the Architect's notice of withholding certification.

6. After the Architect has issued a Certificate for Payment or Project Certificate for Payment, the Owner shall make payment in the manner and within the time provided in the Contract Documents.

7. Owner Payment Period: Owner shall not be required to make payment for a minimum of 30 Calendar days from date of receipt of the Contractor, Construction Manager, and Architect signed Application for Payment. The 30-day Owner Payment period does not include the additional 7 days required for the Construction Manager to review the Contractor Signed Application for Payment, or the 7 days required for the Architect to review the Contractor Signed Application for Payment for a total of 44 Calendar Days from date of contractor submission of the accepted Contractor Signed Application for Payment.

8. Draft Applications for Payment provided by the Contractor or Contractor Signed Application for Payments returned to the Contractor as incomplete may extend this time period by the amount of time required for the Contractor to resubmit the corrected Application for Payment, as well as the additional time required for the Construction Manager and Architect to perform additional review of the corrected Application for Payment per the review periods indicated within the Contract Documents.

C. Payment-Application Forms: Use forms similar to AIA Document G702cma and AIA Document G703 Continuation Sheets as the form for Application for Payment.

D. Draft Application for Payment Requirements:

1. Include with each Draft Application for Payment:

a. Submittal Schedule for Submittal Progress Billing: When Submittal Line items are being billed, the Contractor shall include a copy of the approved Submittal Schedule updated by Contractor with Submittal Submission Progress.

1). Contractor's failure to include the updated Submittal Schedule will result in no billing allowed for any Submittal Line Items.

b. Projected Work Schedule: When work is projected to be scheduled between the date of Draft Application Submission to the end of the Billing Period, the Contractor shall include a detailed schedule of the activities that are scheduled to occur prior to the end of the billing period. Schedule shall include reference to Schedule of Value Line-item numbers.

1). Contractor's failure to include this Projected Work Schedule will result in line-item adjustments to be made in accordance with work in place as of the date of submission of the Draft Application for Payment with no future projected work to be included.

2). Contractor's failure to perform projected work by the end of the billing period may result in a rejection of the Signed Application for Payment resulting in the requirement for a revised Application for Payment to be resubmitted and reviewed prior to acceptance.

c. Stored Material Documentation: When Stored Material is being billed, the Contractor shall provide required Stored Material Documentation.

d. List of Subcontractors who performed work onsite or scheduled for the current billing period.

E. Contractor Signed Application for Payment Requirements: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Construction Manager will return incomplete applications without action.

1. Entries shall match data on the Schedule of Values.

2. Include amounts for work completed following previous Application for Payment, regardless of if payment has been received from the previous Application for Payment.

3. Include amounts of fully executed Change Orders, fully executed Allowance Authorizations, and Construction Change Directives issued prior to the last day of the construction period covered by the application.

4. Include as a **singular combined .PDF attachment** with each Signed Application for Payment, the following documents in the order shown below:

a. Updated Contractor Project Schedule with (Projected Work Schedule).

b. Updated Submittal Schedule with Status of Submittals.

c. Stored Materials Documentation for every period material is presently stored.

d. Prime Contractor Lien Waiver on Specified Lien Waiver Form.

e. Prime Contractor Certified Payroll Documentation with OSHA 10 Certification Documentation for all employees.

f. Subcontractor Billing Summary Sheet.

g. Subcontractor/Supplier Lien Waivers on Specified Lien Waiver Form.

h. Subcontractor Certified Payroll Documentation with OSHA 10 Certification Documentation for all employees.

i. Documentation of Completed Project Safety Procedures including Contractor Safety Meeting / Toolbox Talks Sign in Sheets.

F. Transmittal: Submit signed copies of each Application for Payment to the Construction Manager by an electronic method ensuring receipt within 24 hours. One copy shall be complete, including waivers of liens and similar attachments.

1. Transmit each copy with a transmittal form listing attachments and recording appropriate information related to the application, in a manner acceptable to the Architect.

G. Review of Application for Payment:

1. Applications for Payment may be rejected with no action taken if required documentation as identifying within this specification is not included with Application for Payment submission. Applications for Payment may also be rejected if requested line-item percentages are significantly incorrect with respect to the work that is completed at the date of submission.

2. Upon discovery and uncovering of either deficient work or incomplete work, line items paid in previous Applications for Payments may be reevaluated and adjusted to account for the cost to complete remaining work or correct deficient work. This adjustment may result in a negative value entered into the "Work Completed This Period" (Column E) for the associated Schedule of Values line item to reflect the actual cost withheld to complete or correct remaining work.

3. The Issuance of a Certificate for Payment will not be a representation that the Construction Manager or Architect has (1) made exhaustive or continuous on-site inspections to check the quality or quantity of the work, (2) reviewed the Contractor's construction means, methods, techniques, sequences, or procedures, (3) reviewed copies of requisitions received from Subcontractors and material suppliers and other data requested by the owner to substantiate the Contractor's right to Payment or (4) made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum.

H. Subcontractor Billing Summary Sheet: Provide with each Application for Payment a copy of the completed Subcontractor Billing Summary Sheet form as specified, listing each Subcontractor and Supplied that has supplied or performed work or is scheduled to perform work on the Project. The Contractor shall provide on the Subcontractor Billing Summary Sheet:

1. List of all Subcontractors and Suppliers including their Subcontract amounts and documentation that the aggregate sum of the remaining balances owed to Subcontractors and Suppliers does not exceed the remaining balance owed to the Prime Contractor for the current billing period.

2. Indicate whether the Subcontractor and Suppliers worked onsite in the previous billing period and current billing period.

3. Include each Subcontractor's and Supplier's Contract Amount, Sum of Payments previously received, current amount requested this period, and balance to finish of Subcontractor/Supplier Contract Sum.

4. Indicate whether Subcontractor Lien Waiver Documents and Certified Payroll Documentation is included with the attached Documents.

5. Lien Waiver Documents and Certified Payroll to be attached to the PDF Attachment included with the Signed Application for Payment.

6. Prime Contractor to sign and certify that all information of Subcontractor Billing Summary sheet is correct.

I. Lien Waivers: With each Application for Payment after the first, submit Lien Waivers from subcontractors, sub-subcontractors and suppliers for the construction period covered by the previous application.

1. Submit partial waivers on each item for the amount requested, prior to deduction for retainage, on each item.

2. When an application shows completion of an item and retainage is released for items that are complete, submit Final Unconditional Lien Waivers on specified form confirming that final payment has been made to the associated Subcontractor or Supplier.

3. The Owner reserves the right to designate which entities involved in the Work must submit waivers.

    a. Submit final Applications for Payment with or preceded by final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.

4. Waiver Forms: Submit waivers of lien on forms, and executed in a manner, acceptable to the Owner. Utilize specified Lien Waiver forms provided by Construction Manager or Architect.

5. Waiver Form Content: Each Lien Waiver shall include the following information from each subcontractor, sub-subcontractor, or supplier:

    a. Original Contract Sum.

    b. Total amount Paid to Date.

    c. Balance to Finish.

    d. List of Disputed Claims.

    e. Dated Signature by subcontractor, sub-subcontractor, or supplier.

J. Certified Payroll: Provide copies of certified payrolls (including subcontractors) that are signed, documenting compliance with prevailing wage laws.

1. In accordance with Article 8, Section 220 of the New York State Labor Law, every contractor, and subcontractor must keep original payrolls or transcripts subscribed and affirmed as true under penalty of perjury. Payrolls must be maintained for at least three years from project's date of completion. At a minimum, payrolls must show the following information for each person employed on a public work project:
    1) Name.
    2) Classification(s) in which worker was employed.
    3) Hourly wage rate(s) paid.
    4) Supplements paid or provided.
    5) Daily and weekly number of hours worked in each classification.

2. Every contractor and subcontractor shall submit, within thirty (30) days after issuance of its first payroll and every thirty (30) days thereafter, a transcript of the original payroll, subscribed and affirmed as true under penalty of perjury.

K. Stored Material Documentation:

1. When stored material is being billed, the Contractor shall provide the following:

    a. Copies of paid invoices for stored materials. Invoices shall indicate Schedule of Values line-item numbers crossed reference to the values of the invoices. Do not include Overhead and Profit on Stored Materials. Retainage shall still be withheld from Stored Material.

        1). When a stored material invoice cost applies to multiple Schedule of Values line-items, show cost distributions calculations between each line item.

        2). When multiple stored material invoices apply to an individual schedule of values line-item, show cost distribution calculations between each invoice.

    b. Certificate of Insurance to be provided to cover the Total Amount of presently stored materials (Total of Column F: Material Presently Stored).

        1). Certificate of Insurance shall indicate stored material invoices, invoices numbers and total costs covered by the insurance.

        2). If additional stored material is billed when existing material is already presently stored, update Certificate of Insurance to include the total amount of presently stored material (Total of Column F: Materials Presently Stored).

    c. Transfer of Title agreement to Owner for Stored Materials with Contractor Acknowledgement of Contractor to remain responsible for all Contractual requirements including protection of stored materials, complete installation, and providing all warranties.

    d. Photographs of Stored Material. Label Stored Materials in photos to be clearly identified and cross reference to the Invoices.

2. Stored Material Billing Procedure:

    a. Enter in column F (Materials Presently Stored) the value of the materials presently stored for which payment is sought. Recalculate the total of the column at the end of each pay period. This value covers both materials newly stored for which payment is sought and materials previously stored which are not yet incorporated into the Project. Payment by the Owner for stored materials does not result in a deduction from this column.

    b. Only as materials are incorporated into the Project is their value deducted from this column and incorporated into Column E (Work Completed this period).

3. Material Not Stored Onsite: When a significant value material line item is requested to be billed, vendor or supplier material invoices may be requested by Construction Manager/Architect to be supplied by the Contractor (regardless of if the material is considered Stored Material) to verify costs of material line items on Schedule of Values even after previous approval of Schedule of Values. Invoices may be requested to be supplied for materials stored onsite and required for materials stored offsite.

1.5 INITIAL APPLICATION FOR PAYMENT, APPLICATION FOR PAYMENT AT SUBSTANTIAL COMPLETION, AND FINAL APPLICATION FOR PAYMENT

A. Initial Application for Payment: Administrative actions and submittals, that must precede or coincide with submittal for the initial Application for Payment include the following. The initial payment application will not be processed until all of these actions and submittals have been received by the Construction Manager.

1. Approved Schedule of Values.

2. Executed Contract.

3. Approved Insurance Document Package.

4. Approved Performance and Payment Bonds.

5. Contractor's W9 Document.

6. Approved Site-Specific Safety Plan.

7. Employee List with associated OSHA Cards.

8. Approved List of Subcontractors and Suppliers (Including any qualification Documents required).

9. Contractor's Construction Project Schedule.

10. Contractor's Submittal Schedule (Including list of Closeout Submittals).

B. Application for Payment at Substantial Completion: Following the execution of the Certificate of Substantial Completion: Administrative actions and submittals, that must precede or coincide with submittal for the Application for Payment at Substantial Completion include the following. The initial payment application will not be processed until all of these actions, submittals, and documentation of these procedures being completed have been submitted by the Contractor:

1. Fully Executed Certificate of Substantial Completion Issued by the Architect or Owner and Signed by the Contractor.

2. Consent of Surety G707A when a reduction of retainage is requested.

3. Provide Documentation of completion of required procedures as indicated in "017700 – Closeout Procedures." For Substantial Completion.

4. Submit copy of Construction Manager and Architect's Substantial Completion Inspection List of Items to be completed or corrected. Supporting documents include Observation Report Action items, Construction Deficiency Report items, and any other issued Punchlist items.

    a. The Contractor is to provide cost estimates for a 3rd party Contractor to complete or correct remaining incomplete work for each individual item.

    b. Item identified as "generally incomplete" without specific locations identified are to be inspected by Contractor, and Contractor is to provide a detailed itemized list of locations that are considered incomplete. Without itemized list of incomplete locations, all locations will be considered incomplete until documentation is supplied that confirms otherwise.

    c. At the time of Substantial Completion, a value of 2 times the cost for a 3rd Party Contractor to finish remaining incomplete work items shall be withheld until the incomplete work has been completed and accepted.

    d. The Contractor proposed values for the incomplete work shall be adjusted at the discretion of the Construction Manager and Architect to determine the final amount withheld for the incomplete work.

C. Final Payment Application: Administrative actions and submittals that must be included with submittal of the final Application for Payment include the following:

1. Evidence of completion of Project Closeout Requirements.

    a. Include Transmittals of Physical Closeout Documents turn over to the Owner with approved Submittal Coversheet for Physical Closeout Documents.

    b. Transmittal for Project Record Document Package Turnover with approved Submittal Coversheet for Project Record Document Package.

    c. Transmittal for Operation and Maintenance Data Package Turnover with approved Submittal Coversheet for Operation and Maintenance Data Package.

    d. Transmittal Warranty Package Turnover with approved Submittal Coversheet for Warranty Package.

2. Evidence of completion of all Substantial Completion Inspection Report items, Construction Deficiency Report item corrections, Observation Report Action Items, and all other issued Punchlist Items.

    a. Include detailed descriptions of corrective actions taken by Contractor for each item including the date of completion of each item.

    b. Include written evidence of acceptance of corrective actions by Architect or Construction Manager.

3. Submit evidence of final, continuing insurance coverage complying with insurance requirements. Warranty Coverage shall be extended to cover Contractor Warranty period.

4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."

5. AIA Document G706A, "Contractor's Affidavit of Release of Liens."

6. AIA Document G707, "Consent of Surety to Final Payment."

7. Evidence that claims have been settled.

8. Contractor's No Asbestos Certification Letter

1.6 CONSTRUCTION DEFICIENCY REPORTS

A. Upon discovery of deficient or improperly installed work, or damage due to construction, the Architect or Construction Manager may issue a Construction Deficiency Report. The Contractor shall calculate a complete cost to correct deficient work (including removal of deficient work to allow for correction) by 3rd Party Contractor and is to be submitted by the Contractor, which shall be reviewed and adjusted by the Construction Manager and Architect.

B. A value of 2 times the cost for a 3rd Party Contractor to replace deficient work shall be withheld from the Contractor as of the issued date the Construction Deficiency Report and held until the deficient work has been completed and accepted.

1.7 RIGHT TO CURE

A. If the Contractor refuses or fails to supply enough properly skilled workers; proper materials; maintain the Construction Schedule, as amended by the Construction Manager from time to time; make prompt payment for its workers, subcontractors, sub-subcontractors or suppliers; comply with laws, ordinances, rules, regulations or orders of any public authority having jurisdiction; or otherwise fails to comply with any provision of the Contract Documents, and fails to commence and maintain satisfactory correction of such default with diligence and promptness, within three (3) Business Days after receipt of written notice from the Construction Manager, then the Owner, without prejudice to any other rights or remedies, shall have the right to any or all of the following remedies:

1. Supply such number of workers and quantity of materials, equipment and other facilities as the Construction Manager deems necessary for the completion of the Contractors Work, or any part thereof, which the Contractor has failed to complete or perform after the aforesaid notice, and charge the cost thereof to the Contractor, who shall be liable for the payment of same including reasonable markup as allowed by this Agreement.

2. Contract with one or more additional Contractors or use its own forces to perform such part of the Contractor's Work as the Construction Manager shall determine will provide the most expeditious completion of the total Work and charge the costs thereof to the Contractor.

3. Withhold payment of any moneys due the Contractor, pending corrective action to the extent required by and to the satisfaction of the Construction Manager and the Owner.

4. Charge the Contractor for all costs incurred by the Owner due to its failure to comply, delay or breach, including but not limited to, markup as allowed by this agreement, Construction Manager's Fees, Architect's Fees, attorney's fees, and

additional actual expenses incurred for supervision, equipment rental, contract solicitation, and the like.

5. In the event of any emergency affecting the health or safety of persons or property, the Construction Manager may proceed as above without notice.

1.8 BACK CHARGES

A. The Owner reserves the right to back charge a Contractor, via a Deductive Change Order, for the cost of total and complete remedy due to the failure of Contractor to comply with any provision(s) of the Contract Documents.

1. Contractor Signature of Deductive Change Order for Back Charges is not required. Deductive Change Order for Back Charges are to be considered executed to be once signed by Owner, Architect, and Construction Manager.

2. Deductive Change Orders for Back Charges are to be listed on subsequent Applications for Payment once issued.

3. If a Back Charge Deductive Change Order remains in dispute by the Contractor, then the Contractor shall follow claim procedures in General Conditions of Contract.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION 012900

AIA® Document G732™ – 2009

Application and Certificate for Payment, Construction Manager as Adviser Edition

TO OWNER:

PROJECT: Tempalte

APPLICATION NO:

DISTRIBUTION TO:
OWNER
CONSTRUCTION MANAGER
ARCHITECT
CONTRACTOR
FIELD
OTHER

PERIOD TO:

CONTRACT DATE:

PROJECT NOS: / /

FROM CONTRACTOR:

CONTRACT FOR: General Construction

VIA CONSTRUCTION MANAGER:

VIA ARCHITECT:

CONTRACTOR'S APPLICATION FOR PAYMENT

Application is made for payment, as shown below, in connection with the Contract.
AIA Document G703™, Continuation Sheet, is attached.

1. ORIGINAL CONTRACT SUM		$
2. NET CHANGES IN THE WORK		$ 0.00
3. CONTRACT SUM TO DATE *(Line 1 ± 2)*		$ 0.00
4. TOTAL COMPLETED AND STORED TO DATE *(Column G on G703)*		$
5. RETAINAGE:		
a. 0 % of Completed Work *(Column D + E on G703)*	$ 0.00	
b. 0 % of Stored Material *(Column F on G703)*	$ 0.00	
Total Retainage *(Lines 5a + 5b, or Total in Column I on G703)*		$ 0.00
6. TOTAL EARNED LESS RETAINAGE *(Line 4 minus Line 5 Total)*		$ 0.00
7. LESS PREVIOUS CERTIFICATES FOR PAYMENT *(Line 6 from prior Certificate)*		$
8. CURRENT PAYMENT DUE		$ 0.00
9. BALANCE TO FINISH, INCLUDING RETAINAGE *(Line 3 minus Line 6)*	$ 0.00	

SUMMARY OF CHANGES IN THE WORK	ADDITIONS	DEDUCTIONS
Total changes approved in previous months by Owner	$	$
Total approved this month including Construction Change Directives	$	$
TOTALS	$ 0.00	$ 0.00
NET CHANGES IN THE WORK	$ 0.00	

The undersigned Contractor certifies that to the best of the Contractor's knowledge, information and belief the Work covered by this Application for Payment has been completed in accordance with the Contract Documents, that all amounts have been paid by the Contractor for Work for which previous Certificates for Payment were issued and payments received from the Owner, and that current payment shown herein is now due.

CONTRACTOR:

By: _____ Date: _____

State of:

County of:

Subscribed and sworn to before me this day of

Notary Public:

My Commission expires:

CERTIFICATE FOR PAYMENT

In accordance with the Contract Documents, based on evaluations of the Work and the data comprising this application, the Construction Manager and Architect certify to the Owner that to the best of their knowledge, information and belief the Work has progressed as indicated, the quality of the Work is in accordance with the Contract Documents, and the Contractor is entitled to payment of the AMOUNT CERTIFIED.

AMOUNT CERTIFIED ..... $ _____

(Attach explanation if amount certified differs from the amount applied. Initial all figures on this Application and on the Continuation Sheet that are changed to conform with the amount certified.)

CONSTRUCTION MANAGER:

By: _____ Date: _____

ARCHITECT: *(NOTE: If Multiple Prime Contractors are responsible for performing portions of the Project, the Architect's Certification is not required.)*

By: _____ Date: _____

This Certificate is not negotiable. The AMOUNT CERTIFIED is payable only to the Contractor named herein. Issuance, payment and acceptance of payment are without prejudice to any rights of the Owner or Contractor under this Contract.

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AIA® Document G703™ – 1992

Continuation Sheet

AIA Document, G702™–1992, Application and Certification for Payment, or G736™–2009, Project Application and Project Certificate for Payment, Construction Manager as Adviser Edition, containing Contractor's signed certification is attached.
In tabulations below, amounts are in US dollars.
Use Column I on Contracts where variable retainage for line items may apply.

APPLICATION NO:
APPLICATION DATE:
PERIOD TO:
ARCHITECT'S PROJECT NO:

A	B	C	D	E	F	G		H	I
ITEM NO.	DESCRIPTION OF WORK	SCHEDULED VALUE	WORK COMPLETED FROM PREVIOUS APPLICATION (D + E)	WORK COMPLETED THIS PERIOD	MATERIALS PRESENTLY STORED (NOT IN D OR E)	TOTAL COMPLETED AND STORED TO DATE (D+E+F)	% (G ÷ C)	BALANCE TO FINISH (C - G)	RETAINAGE (IF VARIABLE RATE)
						0.00	0.00 %	0.00	
						0.00	0.00 %	0.00	
						0.00	0.00 %	0.00	
						0.00	0.00 %	0.00	
						0.00	0.00 %	0.00	
						0.00	0.00 %	0.00	
						0.00	0.00 %	0.00	
						0.00	0.00 %	0.00	
						0.00	0.00 %	0.00	
						0.00	0.00 %	0.00	
						0.00	0.00 %	0.00	
						0.00	0.00 %	0.00	
						0.00	0.00 %	0.00	
						0.00	0.00 %	0.00	
						0.00	0.00 %	0.00	
						0.00	0.00 %	0.00	
						0.00	0.00 %	0.00	
						0.00	0.00 %	0.00	
						0.00	0.00 %	0.00	
						0.00	0.00 %	0.00	
	GRAND TOTAL	$0.00	$0.00	$0.00	$0.00	$0.00	0.00 %	$0.00	$0.00

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AGENCY CUSTOMER ID: _____

NEW YORK CONSTRUCTION CERTIFICATE OF LIABILITY INSURANCE ADDENDUM

DATE (MM/DD/YYYY)

THIS ADDENDUM SUMMARIZES SOME OF THE POLICY PROVISIONS IN THE REFERENCED INSURANCE POLICIES AND IS ISSUED AS A MATTER OF INFORMATION ONLY; IT CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. ALL TERMS, EXCLUSIONS AND CONDITIONS IN THE ACTUAL POLICY SHOULD BE CONSULTED FOR A MORE DETAILED ANALYSIS OF COVERAGE, AS THIS ADDENDUM DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES.

AGENCY		NAMED INSURED(S)	
POLICY NUMBER	EFFECTIVE DATE	CARRIER	NAIC CODE

ADDENDUM INFORMATION **CERTIFICATE NUMBER:** **REVISION NUMBER:**

A. Insurer

☐ Admitted / authorized

☐ Excess line or free trade zone

B. General Liability (GL) policy form

☐ ISO / ISO modified

☐ Other

C. Specific operations excluded or restricted (GL policy)

☐ Location: _____

☐ Type of construction: _____

☐ Building height: _____

☐ Classifications [see attached declarations / endorsement]

☐ Designated work [see attached endorsement]

D. Additional insured endorsement (GL policy)

☐ CG 20 10 ☐ CG 20 26 ☐ CG 20 32 ☐ CG 20 33 ☐ CG 20 37 ☐ CG 20 38

☐ Other: #: _____ Title: _____

E. According to the terms of this GL policy, the additional insured has primary and noncontributory coverage

☐ Yes ☐ No and ☐ no other option is available with this insurer

F. Additional insured will receive advance notice if insurer cancels (GL policy)

☐ Yes ☐ No and ☐ no other option is available with this insurer

G. Blanket contractual liability located in the "insured contract" definition (Section V, Number 9, Item f. in the ISO CGL policy) is removed or restricted

☐ Yes and ☐ no other option is available with this insurer ☐ No changes made

H. "Insured contract" exception to the employers liability exclusion is removed or modified (GL policy)

☐ Yes and ☐ no other option is available with this insurer ☐ No changes made

I. GL policy (including endorsements) does not cover the additional insured for claims involving injury to employees of the named insured or subcontractors (not workers' compensation)

☐ Yes and ☐ no other option is available with this insurer ☐ No changes made

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J. Earth movement, excavation or explosion / collapse / underground property damage is excluded or restricted (GL policy)

☐ Yes and ☐ no other option is available with this insurer ☐ No changes made

K. Insured vs. insured suits (cross liability in the ISO CGL policy) are excluded or restricted (other than named insured vs. named insured)

☐ Yes and ☐ no other option is available with this insurer ☐ No changes made

L. Property damage to work performed by subcontractors (exception to the "damage to your work" exclusion in the ISO CGL policy) is excluded or restricted

☐ Yes and ☐ no other option is available with this insurer ☐ No changes made

M. Excess / umbrella policy is primary and non-contributory for additional insureds

☐ Yes, by specific policy provision ☐ Yes, by endorsement ☐ No and ☐ no other option is available with this insurer

_____ _____

AUTHORIZED REPRESENTATIVE SIGNATURE DATE (MM/DD/YYYY)

THIS ENDORSEMENT CHANGES THE POLICY. PLEASE READ IT CAREFULLY.

ADDITIONAL INSURED – OWNERS, LESSEES OR CONTRACTORS – COMPLETED OPERATIONS

This endorsement modifies insurance provided under the following:

COMMERCIAL GENERAL LIABILITY COVERAGE PART
PRODUCTS/COMPLETED OPERATIONS LIABILITY COVERAGE PART

SCHEDULE

Name Of Additional Insured Person(s) Or Organization(s)	Location And Description Of Completed Operations
Information required to complete this Schedule, if not shown above, will be shown in the Declarations.	

A. **Section II – Who Is An Insured** is amended to include as an additional insured the person(s) or organization(s) shown in the Schedule, but only with respect to liability for "bodily injury" or "property damage" caused, in whole or in part, by "your work" at the location designated and described in the Schedule of this endorsement performed for that additional insured and included in the "products-completed operations hazard".

However:

1. The insurance afforded to such additional insured only applies to the extent permitted by law; and
2. If coverage provided to the additional insured is required by a contract or agreement, the insurance afforded to such additional insured will not be broader than that which you are required by the contract or agreement to provide for such additional insured.

B. With respect to the insurance afforded to these additional insureds, the following is added to **Section III – Limits Of Insurance:**

If coverage provided to the additional insured is required by a contract or agreement, the most we will pay on behalf of the additional insured is the amount of insurance:

1. Required by the contract or agreement; or
2. Available under the applicable Limits of Insurance shown in the Declarations;

whichever is less.

This endorsement shall not increase the applicable Limits of Insurance shown in the Declarations.

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THIS ENDORSEMENT CHANGES THE POLICY. PLEASE READ IT CAREFULLY.

ADDITIONAL INSURED – OWNERS, LESSEES OR CONTRACTORS – AUTOMATIC STATUS FOR OTHER PARTIES WHEN REQUIRED IN WRITTEN CONSTRUCTION AGREEMENT

This endorsement modifies insurance provided under the following:

COMMERCIAL GENERAL LIABILITY COVERAGE PART

A. **Section II – Who Is An Insured** is amended to include as an additional insured:

1. Any person or organization for whom you are performing operations when you and such person or organization have agreed in writing in a contract or agreement that such person or organization be added as an additional insured on your policy; and

2. Any other person or organization you are required to add as an additional insured under the contract or agreement described in Paragraph **1.** above.

Such person(s) or organization(s) is an additional insured only with respect to liability for "bodily injury", "property damage" or "personal and advertising injury" caused, in whole or in part, by:

a. Your acts or omissions; or

b. The acts or omissions of those acting on your behalf;

in the performance of your ongoing operations for the additional insured.

However, the insurance afforded to such additional insured described above:

a. Only applies to the extent permitted by law; and

b. Will not be broader than that which you are required by the contract or agreement to provide for such additional insured.

A person's or organization's status as an additional insured under this endorsement ends when your operations for the person or organization described in Paragraph **1.** above are completed.

B. With respect to the insurance afforded to these additional insureds, the following additional exclusions apply:

This insurance does not apply to:

1. "Bodily injury", "property damage" or "personal and advertising injury" arising out of the rendering of, or the failure to render, any professional architectural, engineering or surveying services, including:

a. The preparing, approving, or failing to prepare or approve, maps, shop drawings, opinions, reports, surveys, field orders, change orders or drawings and specifications; or

b. Supervisory, inspection, architectural or engineering activities.

This exclusion applies even if the claims against any insured allege negligence or other wrongdoing in the supervision, hiring, employment, training or monitoring of others by that insured, if the "occurrence" which caused the "bodily injury" or "property damage", or the offense which caused the "personal and advertising injury", involved the rendering of, or the failure to render, any professional architectural, engineering or surveying services.

2. "Bodily injury" or "property damage" occurring after:

a. All work, including materials, parts or equipment furnished in connection with such work, on the project (other than service, maintenance or repairs) to be performed by or on behalf of the additional insured(s) at the location of the covered operations has been completed; or

SAMPLE

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b. That portion of "your work" out of which the injury or damage arises has been put to its intended use by any person or organization other than another contractor or subcontractor engaged in performing operations for a principal as a part of the same project.

C. With respect to the insurance afforded to these additional insureds, the following is added to **Section III – Limits Of Insurance:**

The most we will pay on behalf of the additional insured is the amount of insurance:

1. Required by the contract or agreement described in Paragraph **A.1.;** or

2. Available under the applicable Limits of Insurance shown in the Declarations;

whichever is less.

This endorsement shall not increase the applicable Limits of Insurance shown in the Declarations.

SAMPLE

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BBS ARCHITECTS
LANDSCAPE ARCHITECTS
ENGINEERS

FREDERICK W. SEEBA, PE, MANAGING PARTNER
LAWRENCE SALVESEN, AIA, PARTNER
KEVIN J. WALSH, AIA, PARTNER
KENNETH G. SCHUPNER, AIA, PARTNER
JOSEPH B. RETTIG, AIA, PARTNER
GARY W. SCHIEDE, AIA, PARTNER
ROGER P. SMITH, AIA, FOUNDING PRINCIPAL

Date: _____

Owner: _____

Project: _____

Contractor: _____

Dear Sir/Madam:

Reference is made to your contract with _____ for the above referenced Project. By signing below, you hereby acknowledge and agree, that for valuable consideration, the receipt of which is acknowledged, you covenant and agree that BBS Architects, Landscape Architects & Engineers PC, shall be added as an "additional insured" to your casualty and commercial liability insurance policies required under the Contract, including all primary and excess policies, limits, and terms and conditions contained therein, and further agree that an insurance certificate and endorsement confirming that this entity was added as an "additional insured" on such policies of insurance shall be provided by you prior to the commencement of work on the Project.

In addition, you further covenant and agree to hold harmless, indemnify and defend BBS Architects, Landscape Architects, and Engineers, PC to the same extent that you are required to hold harmless, indemnify and defend the Owner under the Contract, however, Contractor is not responsible for defense and indemnity for claims, demands or suits caused solely by Architect's professional negligence.

Acknowledged and agreed to by:

_____
Name

_____
Signature

_____
Contractor

Rev. 08-06-24

AIA® Document G705™ – 2001

List of Subcontractors

PROJECT: *(Name and address)*

DATE:

TO ARCHITECT: *(Name and address)*
BBS Architects, Landscape Architects & Engineers, PC
244 E Main St
Patchogue, NY 11772

ARCHITECT'S PROJECT NUMBER:

FROM CONTRACTOR: *(Name and address)*

CONTRACTOR'S PROJECT NUMBER:

(List Subcontractors and others proposed to be employed on the above Project as required by the bidding documents.)

Work/Firm Name	Address/Phone	Superintendent

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AIA® Document G706™ – 1994

Contractor's Affidavit of Payment of Debts and Claims

PROJECT: *(Name and address)*	**ARCHITECT'S PROJECT NUMBER:**	OWNER: ☐
		ARCHITECT: ☐
	CONTRACT FOR:	CONTRACTOR: ☐
TO OWNER: *(Name and address)*	**CONTRACT DATED:**	SURETY: ☐
		OTHER: ☐

STATE OF:
COUNTY OF:

The undersigned hereby certifies that, except as listed below, payment has been made in full and all obligations have otherwise been satisfied for all materials and equipment furnished, for all work, labor, and services performed, and for all known indebtedness and claims against the Contractor for damages arising in any manner in connection with the performance of the Contract referenced above for which the Owner or Owner's property might in any way be held responsible or encumbered.

EXCEPTIONS:

SUPPORTING DOCUMENTS ATTACHED HERETO:

1. Consent of Surety to Final Payment. Whenever Surety is involved, Consent of Surety is required. AIA Document G707, Consent of Surety, may be used for this purpose

Indicate Attachment ☐ Yes ☒ No

The following supporting documents should be attached hereto if required by the Owner:

1. Contractor's Release or Waiver of Liens, conditional upon receipt of final payment.

2. Separate Releases or Waivers of Liens from Subcontractors and material and equipment suppliers, to the extent required by the Owner, accompanied by a list thereof.

3. Contractor's Affidavit of Release of Liens (AIA Document G706A).

CONTRACTOR: *(Name and address)*

BY: _____
(Signature of authorized representative)

_____
(Printed name and title)

Subscribed and sworn to before me on this date:

Notary Public:
My Commission Expires:

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AIA® Document G706A™ – 1994

Contractor's Affidavit of Release of Liens

PROJECT: *(Name and address)*	**ARCHITECT'S PROJECT NUMBER:**	OWNER: ☐
		ARCHITECT: ☐
		CONTRACTOR: ☐
	CONTRACT FOR:	SURETY: ☐
TO OWNER: *(Name and address)*	**CONTRACT DATED:**	OTHER: ☐

STATE OF:
COUNTY OF:

The undersigned hereby certifies that to the best of the undersigned's knowledge, information and belief, except as listed below, the Releases or Waivers of Lien attached hereto include the Contractor, all Subcontractors, all suppliers of materials and equipment, and all performers of Work, labor or services who have or may have liens or encumbrances or the right to assert liens or encumbrances against any property of the Owner arising in any manner out of the performance of the Contract referenced above.

EXCEPTIONS:

SUPPORTING DOCUMENTS ATTACHED HERETO:

1. Contractor's Release or Waiver of Liens, conditional upon receipt of final payment.

2. Separate Releases or Waivers of Liens from Subcontractors and material and equipment suppliers, to the extent required by the Owner, accompanied by a list thereof.

CONTRACTOR: *(Name and address)*

BY:

(Signature of authorized representative)

(Printed name and title)

Subscribed and sworn to before me on this date:

Notary Public:
My Commission Expires:

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AIA® Document G707™ – 1994

Consent Of Surety to Final Payment

PROJECT: *(Name and address)*	**ARCHITECT'S PROJECT NUMBER:**	OWNER: ☐
	CONTRACT FOR:	ARCHITECT: ☐
TO OWNER: *(Name and address)*	**CONTRACT DATED:**	CONTRACTOR: ☐
		SURETY: ☐
		OTHER: ☐

In accordance with the provisions of the Contract between the Owner and the Contractor as indicated above, the
(Insert name and address of Surety)

, SURETY,

on bond of
(Insert name and address of Contractor)

, CONTRACTOR,

hereby approves of the final payment to the Contractor, and agrees that final payment to the Contractor shall not relieve the Surety of any of its obligations to
(Insert name and address of Owner)

, OWNER,

as set forth in said Surety's bond.

IN WITNESS WHEREOF, the Surety has hereunto set its hand on this date:
(Insert in writing the month followed by the numeric date and year.)

_____
(Surety)

_____
(Signature of authorized representative)

Attest:
(Seal):

_____
(Printed name and title)

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Consent of Surety to Reduction in or Partial Release of Retainage

PROJECT: *(Name and address)*	**ARCHITECT'S PROJECT NUMBER:**	OWNER: ☐
	CONTRACT FOR:	ARCHITECT: ☐
TO OWNER: *(Name and address)*	**CONTRACT DATED:**	CONTRACTOR: ☐
		SURETY: ☐
		OTHER: ☐

In accordance with the provisions of the Contract between the Owner and the Contractor as indicated above, the
(Insert name and address of Surety)

, SURETY,

on bond of
(Insert name and address of Contractor)

, CONTRACTOR,

hereby approves the reduction in or partial release of retainage to the Contractor as follows:

The Surety agrees that such reduction in or partial release of retainage to the Contractor shall not relieve the Surety of any of its obligations to
(Insert name and address of Owner)

, OWNER,

as set forth in said Surety's bond.

IN WITNESS WHEREOF, the Surety has hereunto set its hand on this date:
(Insert in writing the month followed by the numeric date and year.)

_____
(Surety)

_____
(Signature of authorized representative)

Attest:
(Seal):

_____
(Printed name and title)

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User Notes: (1332949329)

Millbrook CSD

JOSEPH RETTIG
244 East Main Street
Patchogue NY 11772

Schedule Year	2025 through 2026
Date Requested	10/06/2025
PRC#	2025012404

Location	Millbrook Middle & High School
Project ID#	25-273a
Project Type	Roofing, HVAC, Lighting, Interior Finishes

PREVAILING WAGE SCHEDULE FOR ARTICLE 8 PUBLIC WORK PROJECT

Attached is the current schedule(s) of the prevailing wage rates and prevailing hourly supplements for the project referenced above. A unique Prevailing Rate Case Number (PRC#) has been assigned to the schedule(s) for your project.

The schedule is effective from July 2025 through June 2026. All updates, corrections, posted on the 1st business day of each month, and future copies of the annual determination are available on the Department's website www.labor.ny.gov. Updated PDF copies of your schedule can be accessed by entering your assigned PRC# at the proper location on the website.

It is the responsibility of the contracting agency or its agent to annex and make part, the attached schedule, to the specifications for this project, when it is advertised for bids and /or to forward said schedules to the successful bidder(s), immediately upon receipt, in order to insure the proper payment of wages.

Please refer to the "General Provisions of Laws Covering Workers on Public Work Contracts" provided with this schedule, for the specific details relating to other responsibilities of the Department of Jurisdiction.

Upon completion or cancellation of this project, enter the required information and mail **OR** fax this form to the office shown at the bottom of this notice, **OR** fill out the electronic version via the NYSDOL website.

NOTICE OF COMPLETION / CANCELLATION OF PROJECT

Date Completed: _____ Date Cancelled: _____

Name & Title of Representative: _____

Phone: (518) 457-5589 Fax: (518) 485-1870
W. Averell Harriman State Office Campus, Bldg. 12, Room 130, Albany, NY 12240

General Provisions of Laws Covering Workers on Article 8 Public Work Contracts

Introduction

The Labor Law requires public work contractors and subcontractors to pay laborers, workers, or mechanics employed in the performance of a public work contract not less than the prevailing rate of wage and supplements (fringe benefits) in the locality where the work is performed.

Contractor Registry

Effective December 30, 2024 all contractors and subcontractors submitting bids or performing construction work on public work projects, or private projects covered by Article 8 of the Labor Law, are required to register with the New York State Department of Labor (NYSDOL) under Labor Law Section 220-i. To register, contractors and subcontractors must submit an application through NYSDOL's Contractor Registry portal which is available through the agency's Management System for Protecting Worker Rights (MPWR) https://mpwr-public.labor.ny.gov/en/login.

For additional information, please visit online.

Responsibilities of the Department of Jurisdiction

A Department of Jurisdiction (Contracting Agency) includes a state department, agency, board or commission: a county, city, town or village; a school district, board of education or board of cooperative educational services; a sewer, water, fire, improvement and other district corporation; a public benefit corporation; and a public authority awarding a public work contract.

The Department of Jurisdiction (Contracting Agency) awarding a public work contract MUST obtain a Prevailing Rate Schedule listing the hourly rates of wages and supplements due the workers to be employed on a public work project. This schedule may be obtained by completing and forwarding a "Request for wage and Supplement Information" form (PW 39) to the Bureau of Public Work. The Prevailing Rate Schedule MUST be included in the specifications for the contract to be awarded and is deemed part of the public work contract.

Upon the awarding of the contract, the law requires that the Department of Jurisdiction (Contracting Agency) furnish the following information to the Bureau: the name and address of the contractor, the date the contract was let and the approximate dollar value of the contract. To facilitate compliance with this provision of the Labor Law, a copy of the Department's "Notice of Contract Award" form (PW 16) is provided with the original Prevailing Rate Schedule.

The Department of Jurisdiction (Contracting Agency) is required to notify the Bureau of the completion or cancellation of any public work project. The Department's PW 200 form is provided for that purpose.

Both the PW 16 and PW 200 forms are available for completion online.

Hours

No laborer, worker, or mechanic in the employ of a contractor or subcontractor engaged in the performance of any public work project shall be permitted to work more than eight hours in any day or more than five days in any week, except in cases of extraordinary emergency. The contractor and the Department of Jurisdiction (Contracting Agency) may apply to the Bureau of Public Work for a dispensation permitting workers to work additional hours or days per week on a particular public work project.

Wages and Supplements

The wages and supplements to be paid and/or provided to laborers, workers, and mechanics employed on a public work project shall be not less than those listed in the current Prevailing Rate Schedule for the locality where the work is performed. If a prime contractor on a public work project has not been provided with a Prevailing Rate Schedule, the contractor must notify the Department of Jurisdiction (Contracting Agency) who in turn must request an original Prevailing Rate Schedule form the Bureau of Public Work. Requests may be submitted by: mail to NYSDOL, Bureau of Public Work, State Office Bldg. Campus, Bldg. 12, Rm. 130, Albany, NY 12226; Fax to Bureau of Public Work (518) 485-1870; or electronically at the NYSDOL website www.labor.ny.gov.

Upon receiving the original schedule, the Department of Jurisdiction (Contracting Agency) is REQUIRED to provide complete copies to all prime contractors who in turn MUST, by law, provide copies of all applicable county schedules to each subcontractor and obtain from each subcontractor, an affidavit certifying such schedules were received. If the original schedule expired, the contractor may obtain a copy of the new annual determination from the NYSDOL website www.labor.ny.gov.

The Commissioner of Labor makes an annual determination of the prevailing rates. This determination is in effect from July 1st through June 30th of the following year. The annual determination is available on the NYSDOL website

www.labor.ny.gov.

Payrolls and Payroll Records

Every contractor and subcontractor MUST keep original payrolls or transcripts subscribed and affirmed as true under penalty of perjury. As per Article 6 of the Labor law, contractors and subcontractors are required to establish, maintain, and preserve for not less than six (6) years, contemperaneous, true, and accurate payroll records. At a minimum, payrolls must show the following information for each person employed on a public work project: Name, Address, Last 4 Digits of Social Security Number, Classification(s) in which the worker was employed, Hourly wage rate(s) paid, Supplements paid or provided, and Daily and weekly number of hours worked in each classification.

The filing of payrolls to the Department of Jurisdiction is a condition of payment.Every contractor and subcontractor shall submit to the Department of Jurisdiction (Contracting Agency), within thirty (30) days after issuance of its first payroll and every thirty (30) days thereafter, a transcript of the original payrolls, subscribed and affirmed as true under penalty of perjury. The Department of Jurisdiction (Contracting Agency) shall collect, review for facial validity, and maintain such payrolls.

In addition, the Commissioner of Labor may require contractors to furnish, with ten (10) days of a request, payroll records sworn to as their validity and accuracy for public work and private work. Payroll records include, but are not limited to time cards, work description sheets, proof that supplements were provided, cancelled payroll checks and payrolls. Failure to provide the requested information within the allotted ten (10) days will result in the withholding of up to 25% of the contract, not to exceed $100,000.00. If the contractor or subcontractor does not maintain a place of business in New York State and the amount of the contract exceeds $25,000.00, payroll records and certifications must be kept on the project worksite.

The prime contractor is responsible for any underpayments of prevailing wages or supplements by any subcontractor.

All contractors or their subcontractors shall provide to their subcontractors a copy of the Prevailing Rate Schedule specified in the public work contract as well as any subsequently issued schedules. A failure to provide these schedules by a contractor or subcontractor is a violation of Article 8, Section 220-a of the Labor Law.

All subcontractors engaged by a public work project contractor or its subcontractor, upon receipt of the original schedule and any subsequently issued schedules, shall provide to such contractor a verified statement attesting that the subcontractor has received the Prevailing Rate Schedule and will pay or provide the applicable rates of wages and supplements specified therein. (See NYS Labor Laws, Article 8 . Section 220-a).

Determination of Prevailing Wage and Supplement Rate Updates Applicable to All Counties

The wages and supplements contained in the annual determination become effective July 1st whether or not the new determination has been received by a given contractor. Care should be taken to review the rates for obvious errors. Any corrections should be brought to the Department's attention immediately. It is the responsibility of the public work contractor to use the proper rates. If there is a question on the proper classification to be used, please call the district office located nearest the project. Any errors in the annual determination will be corrected and posted to the NYSDOL website on the first business day of each month. Contractors are responsible for paying these updated rates as well, retroactive to July 1st.

When you review the schedule for a particular occupation, your attention should be directed to the dates above the column of rates. These are the dates for which a given set of rates is effective. To the extent possible, the Department posts rates in its possession that cover periods of time beyond the July 1st to June 30th time frame covered by a particular annual determination. Rates that extend beyond that instant time period are informational ONLY and may be updated in future annual determinations that actually cover the then appropriate July 1st to June 30th time period.

Withholding of Payments

When a complaint is filed with the Commissioner of Labor alleging the failure of a contractor or subcontractor to pay or provide the prevailing wages or supplements, or when the Commissioner of Labor believes that unpaid wages or supplements may be due, payments on the public work contract shall be withheld from the prime contractor in a sufficient amount to satisfy the alleged unpaid wages and supplements, including interest and civil penalty, pending a final determination.

When the Bureau of Public Work finds that a contractor or subcontractor on a public work project failed to pay or provide the requisite prevailing wages or supplements, the Bureau is authorized by Sections 220-b and 235.2 of the Labor Law to so notify the financial officer of the Department of Jurisdiction (Contracting Agency) that awarded the public work contract. Such officer MUST then withhold or cause to be withheld from any payment due the prime contractor on account of such contract the amount indicated by the Bureau as sufficient to satisfy the unpaid wages and supplements, including interest and any civil penalty that may be assessed by the Commissioner of Labor. The withholding continues until there is a final determination of the underpayment by the Commissioner of Labor or by the court in the event a legal proceeding is instituted for review of the determination of the Commissioner of Labor.

The Department of Jurisdiction (Contracting Agency) shall comply with this order of the Commissioner of Labor or of the court with respect to the release of the funds so withheld.

Summary of Notice Posting Requirements

The current Prevailing Rate Schedule must be posted in a prominent and accessible place on the site of the public work project. The prevailing wage schedule must be encased in, or constructed of, materials capable of withstanding adverse weather conditions and be titled "PREVAILING RATE OF WAGES" in letters no smaller than two (2) inches by two (2) inches.

The "Public Work Project" notice must be posted at the beginning of the performance of every public work contract, on each job site.

Every employer providing workers. compensation insurance and disability benefits must post notices of such coverage in the format prescribed by the Workers. Compensation Board in a conspicuous place on the jobsite.

Every employer subject to the NYS Human Rights Law must conspicuously post at its offices, places of employment, or employment training centers, notices furnished by the State Division of Human Rights.

Employers liable for contributions under the Unemployment Insurance Law must conspicuously post on the jobsite notices furnished by the NYS Department of Labor.

Apprentices

Employees cannot be paid apprentice rates unless they are individually registered in a program registered with the NYS Commissioner of Labor. The allowable ratio of apprentices to journeyworkers in any craft classification can be no greater than the statewide building trade ratios promulgated by the Department of Labor and included with the Prevailing Rate Schedule. An employee listed on a payroll as an apprentice who is not registered as above or is performing work outside the classification of work for which the apprentice is indentured, must be paid the prevailing journeyworker's wage rate for the classification of work the employee is actually performing.

NYSDOL Labor Law, Article 8, Section 220-3, require that only apprentices individually registered with the NYS Department of Labor may be paid apprenticeship rates on a public work project. No other Federal or State Agency of office registers apprentices in New York State.

Persons wishing to verify the apprentice registration of any person must do so in writing by mail, to the NYSDOL Office of Employability Development / Apprenticeship Training, State Office Bldg. Campus, Bldg. 12, Albany, NY 12226 or by Fax to NYSDOL Apprenticeship Training (518) 457-7154. All requests for verification must include the name and social security number of the person for whom the information is requested.

The only conclusive proof of individual apprentice registration is written verification from the NYSDOL Apprenticeship Training Albany Central office. Neither Federal nor State Apprenticeship Training offices outside of Albany can provide conclusive registration information.

It should be noted that the existence of a registered apprenticeship program is not conclusive proof that any person is registered in that program. Furthermore, the existence or possession of wallet cards, identification cards, or copies of state forms is not conclusive proof of the registration of any person as an apprentice.

Interest and Penalties

In the event that an underpayment of wages and/or supplements is found:

- Interest shall be assessed at the rate then in effect as prescribed by the Superintendent of Banks pursuant to section 14-a of the Banking Law, per annum from the date of underpayment to the date restitution is made.
- A Civil Penalty may also be assessed, not to exceed 25% of the total of wages, supplements, and interest due.

Debarment

Any contractor or subcontractor and/or its successor shall be ineligible to submit a bid on or be awarded any public work contract or subcontract with any state, municipal corporation or public body for a period of five (5) years when:

- Two (2) willful determinations have been rendered against that contractor or subcontractor and/or its successor within any consecutive six (6) year period.
- There is any willful determination that involves the falsification of payroll records or the kickback of wages or supplements.

Criminal Sanctions

Willful violations of the Prevailing Wage Law (Article 8 of the Labor Law) may be a felony punishable by fine or imprisonment of up to 15 years, or both.

Discrimination

No employee or applicant for employment may be discriminated against on account of age, race, creed, color, national origin, sex, disability or marital status.

No contractor, subcontractor nor any person acting on its behalf, shall by reason of race, creed, color, disability, sex or national origin discriminate against any citizen of the State of New York who is qualified and available to perform the work to which the employment relates (NYS Labor Law, Article 8, Section 220-e(a)).

No contractor, subcontractor, nor any person acting on its behalf, shall in any manner, discriminate against or intimidate any employee on account of race, creed, color, disability, sex, or national origin (NYS Labor Law, Article 8, Section 220-e(b)).

The Human Rights Law also prohibits discrimination in employment because of age, marital status, or religion.

There may be deducted from the amount payable to the contractor under the contract a penalty of $50.00 for each calendar day during which such person was discriminated against or intimidated in violation of the provision of the contract (NYS Labor Law, Article 8, Section 220-e(c)).

The contract may be cancelled or terminated by the State or municipality. All monies due or to become due thereunder may be forfeited for a second or any subsequent violation of the terms or conditions of the anti-discrimination sections of the contract (NYS Labor Law, Article 8, Section 220-e(d)).

Every employer subject to the New York State Human Rights Law must conspicuously post at its offices, places of employment, or employment training centers notices furnished by the State Division of Human Rights.

Workers' Compensation

In accordance with Section 142 of the State Finance Law, the contractor shall maintain coverage during the life of the contract for the benefit of such employees as required by the provisions of the New York State Workers' Compensation Law.

A contractor who is awarded a public work contract must provide proof of workers' compensation coverage prior to being allowed to begin work.

The insurance policy must be issued by a company authorized to provide workers' compensation coverage in New York State. Proof of coverage must be on form C-105.2 (Certificate of Workers' Compensation Insurance) and must name this agency as a certificate holder.

If New York State coverage is added to an existing out-of-state policy, it can only be added to a policy from a company authorized to write workers' compensation coverage in this state. The coverage must be listed under item 3A of the information page.

The contractor must maintain proof that subcontractors doing work covered under this contract secured and maintained a workers' compensation policy for all employees working in New York State.

Every employer providing worker's compensation insurance and disability benefits must post notices of such coverage in the format prescribed by the Workers' Compensation Board in a conspicuous place on the jobsite.

Unemployment Insurance

Employers liable for contributions under the Unemployment Insurance Law must conspicuously post on the jobsite notices furnished by the New York State Department of Labor.

Kathy Hochul, Governor

Roberta Reardon, Commissioner

Millbrook CSD

JOSEPH RETTIG
244 East Main Street
Patchogue NY 11772

Schedule Year	2025 through 2026
Date Requested	10/06/2025
PRC#	2025012404

Location	Millbrook Middle & High School
Project ID#	25-273a
Project Type	Roofing, HVAC, Lighting, Interior Finishes

Notice of Contract Award

New York State Labor Law, Article 8, Section 220.3a requires that certain information regarding the awarding of public work contracts, be furnished to the Commissioner of Labor. One "Notice of Contract Award" (PW 16, which may be photocopied), **MUST** be completed for **EACH** prime contractor on the above referenced project.

Upon notifying the successful bidder(s) of this contract, enter the required information and mail **OR** fax this form to the office shown at the bottom of this notice, **OR** fill out the electronic version via the NYSDOL website.

Contractor Information
All information must be supplied

Federal Employer Identification Number: _____

Name: _____

Address: _____

_____

City: _____ State: _____ Zip: _____

Amount of Contract: $_____

Approximate Starting Date: ____/____/____

Approximate Completion Date: ____/____/____

Contract Type:

[ ] (01) General Construction
[ ] (02) Heating/Ventilation
[ ] (03) Electrical
[ ] (04) Plumbing
[ ] (05) Other : _____

Phone: (518) 457-5589 Fax: (518) 485-1870
W. Averell Harriman State Office Campus, Bldg. 12, Room 130, Albany, NY 12226

Social Security Numbers on Certified Payrolls:

The Department of Labor is cognizant of the concerns of the potential for misuse or inadvertent disclosure of social security numbers. Identity theft is a growing problem and we are sympathetic to contractors' concern regarding inclusion of this information on payrolls if another identifier will suffice.

For these reasons, the substitution of the use of the last four digits of the social security number on certified payrolls submitted to contracting agencies on public work projects is now acceptable to the Department of Labor. This change does not affect the Department's ability to request and receive the entire social security number from employers during its public work/ prevailing wage investigations.

Construction Industry Fair Play Act: Required Posting for Labor Law Article 25-B § 861-d

Construction industry employers must post the "Construction Industry Fair Play Act" notice in a prominent and accessible place on the job site. Failure to post the notice can result in penalties of up to $1,500 for a first offense and up to $5,000 for a second offense. The posting is included as part of this wage schedule. Additional copies may be obtained from the NYS DOL website, https://dol.ny.gov/public-work-and-prevailing-wage
If you have any questions concerning the Fair Play Act, please call the State Labor Department toll-free at 1-866-435-1499 or email us at: dol.misclassified@labor.ny.gov .

Worker Notification: (Labor Law §220, paragraph a of subdivision 3-a)

Effective June 23, 2020

This provision is an addition to the existing wage rate law, Labor Law §220, paragraph a of subdivision 3-a. It requires contractors and subcontractors to provide written notice to all laborers, workers or mechanics of the *prevailing wage and supplement rate* for their particular job classification *on each pay stub**. It also requires contractors and subcontractors to *post a notice* at the beginning of the performance of every public work contract *on each job site* that includes the telephone number and address for the Department of Labor and a statement informing laborers, workers or mechanics of their right to contact the Department of Labor if he/she is not receiving the proper prevailing rate of wages and/or supplements for his/her job classification. The required notification will be provided with each wage schedule, may be downloaded from our website *www.labor.ny.gov* or be made available upon request by contacting the Bureau of Public Work at 518-457-5589. *In the event the required information will not fit on the pay stub, an accompanying sheet or attachment of the information will suffice.

(12.20)

To all State Departments, Agency Heads and Public Benefit Corporations
IMPORTANT NOTICE REGARDING PUBLIC WORK ENFORCEMENT FUND

Budget Policy & Reporting Manual

B-610

Public Work Enforcement Fund

effective date December 7, 2005

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1. Purpose and Scope:

This Item describes the Public Work Enforcement Fund (the Fund, PWEF) and its relevance to State agencies and public benefit corporations engaged in construction or reconstruction contracts, maintenance and repair, and announces the recently-enacted increase to the percentage of the dollar value of such contracts that must be deposited into the Fund. This item also describes the roles of the following entities with respect to the Fund:

- New York State Department of Labor (DOL),
- The Office of the State of Comptroller (OSC), and
- State agencies and public benefit corporations.

2. Background and Statutory References:

DOL uses the Fund to enforce the State's Labor Law as it relates to contracts for construction or reconstruction, maintenance and repair, as defined in subdivision two of Section 220 of the Labor Law. State agencies and public benefit corporations participating in such contracts are required to make payments to the Fund.

Chapter 511 of the Laws of 1995 (as amended by Chapter 513 of the Laws of 1997, Chapter 655 of the Laws of 1999, Chapter 376 of the Laws of 2003 and Chapter 407 of the Laws of 2005) established the Fund.

3. Procedures and Agency Responsibilities:

The Fund is supported by transfers and deposits based on the value of contracts for construction and reconstruction, maintenance and repair, as defined in subdivision two of Section 220 of the Labor Law, into which all State agencies and public benefit corporations enter.

Chapter 407 of the Laws of 2005 increased the amount required to be provided to this fund to .10 of one-percent of the total cost of each such contract, to be calculated at the time agencies or public benefit corporations enter into a new contract or if a contract is amended. The provisions of this bill became effective August 2, 2005.

To all State Departments, Agency Heads and Public Benefit Corporations
IMPORTANT NOTICE REGARDING PUBLIC WORK ENFORCEMENT FUND

OSC will report to DOL on all construction-related ("D") contracts approved during the month, including contract amendments, and then DOL will bill agencies the appropriate assessment monthly. An agency may then make a determination if any of the billed contracts are exempt and so note on the bill submitted back to DOL. For any instance where an agency is unsure if a contract is or is not exempt, they can call the Bureau of Public Work at the number noted below for a determination. Payment by check or journal voucher is due to DOL within thirty days from the date of the billing. DOL will verify the amounts and forward them to OSC for processing.

For those contracts which are not approved or administered by the Comptroller, monthly reports and payments for deposit into the Public Work Enforcement Fund must be provided to the Administrative Finance Bureau at the DOL within 30 days of the end of each month or on a payment schedule mutually agreed upon with DOL.

Reports should contain the following information:

- Name and billing address of State agency or public benefit corporation;
- State agency or public benefit corporation contact and phone number;
- Name and address of contractor receiving the award;
- Contract number and effective dates;
- Contract amount and PWEF assessment charge (if contract amount has been amended, reflect increase or decrease to original contract and the adjustment in the PWEF charge); and
- Brief description of the work to be performed under each contract.

Checks and Journal Vouchers, payable to the "New York State Department of Labor" should be sent to:

Department of Labor
Administrative Finance Bureau-PWEF Unit
Building 12, Room 464
State Office Campus
Albany, NY 12226

Any questions regarding billing should be directed to NYSDOL's Administrative Finance Bureau-PWEF Unit at (518) 457-3624 and any questions regarding Public Work Contracts should be directed to the Bureau of Public Work at (518) 457-5589.

NEW YORK STATE OF OPPORTUNITY. Department of Labor

Required Notice under Article 25-B of the Labor Law

Attention All Employees, Contractors and Subcontractors: You are Covered by the Construction Industry Fair Play Act

The law says that you are an employee unless:

- You are free from direction and control in performing your job, **and**
- You perform work that is not part of the usual work done by the business that hired you, **and**
- You have an independently established business.

Your employer cannot consider you to be an independent contractor unless all three of these facts apply to your work.

It is against the law for an employer to misclassify employees as independent contractors or pay employees off the books.

Employee Rights: If you are an employee, you are entitled to state and federal worker protections. These include:

- Unemployment Insurance benefits, if you are unemployed through no fault of your own, able to work, and otherwise qualified,
- Workers' compensation benefits for on-the-job injuries,
- Payment for wages earned, minimum wage, and overtime (under certain conditions),
- Prevailing wages on public work projects,
- The provisions of the National Labor Relations Act, and
- A safe work environment.

It is a violation of this law for employers to retaliate against anyone who asserts their rights under the law. Retaliation subjects an employer to civil penalties, a private lawsuit or both.

Independent Contractors: If you are an independent contractor**, you must pay all taxes and Unemployment Insurance contributions required by New York State and Federal Law.**

Penalties for paying workers off the books or improperly treating employees as independent contractors:

- **Civil Penalty** — First offense: Up to $2,500 per employee

  Subsequent offense(s): Up to $5,000 per employee

- **Criminal Penalty** — First offense: Misdemeanor - up to 30 days in jail, up to a $25,000 fine and debarment from performing public work for up to one year.

  Subsequent offense(s): Misdemeanor - up to 60 days in jail or up to a $50,000 fine and debarment from performing public work for up to 5 years.

If you have questions about your employment status or believe that your employer may have violated your rights and you want to file a complaint, call the Department of Labor at (866) 435-1499 or send an email to dol.misclassified@labor.ny.gov. All complaints of fraud and violations are taken seriously. You can remain anonymous.

Employer Name:

IA 999 (09/16)

WE ARE YOUR DOL

NEW YORK STATE Department of Labor

New York State Department of Labor
Bureau of Public Work

Attention Employees

THIS IS A:

PUBLIC WORK PROJECT

If you are employed on this project as a **worker, laborer, or mechanic** you are entitled to receive the **prevailing wage and supplements rate** for the classification at which you are working.

Your pay stub and wage notice received upon hire must clearly state your wage rate and supplement rate.

Chapter 629 of the Labor Laws of 2007:

These wages are set by law and must be posted at the work site. They can also be found at: https://dol.ny.gov/bureau-public-work

If you feel that you have not received proper wages or benefits, please call our nearest office.*

Albany	(518) 457-2744	Patchogue	(631) 687-4882
Binghamton	(607) 721-8005	Rochester	(585) 258-4505
Buffalo	(716) 847-7159	Syracuse	(315) 428-4056
Garden City	(516) 228-3915	Utica	(315) 793-2314
New York City	(212) 932-2419	White Plains	(914) 997-9507
Newburgh	(845) 568-5287		

* For New York City government agency construction projects, please contact the Office of the NYC Comptroller at (212) 669-4443, or www.comptroller.nyc.gov – click on Bureau of Labor Law.

Contractor Name: _____

Project Location: _____

Requirements for OSHA 10 Compliance

Article 8 §220-h requires that when the advertised specifications, for every contract for public work, is $250,000.00 or more the contract must contain a provision requiring that every worker employed in the performance of a public work contract shall be certified as having completed an OSHA 10 safety training course. The clear intent of this provision is to require that all employees of public work contractors, required to be paid prevailing rates, receive such training “prior to the performing any work on the project.”

The Bureau will enforce the statute as follows:

All contractors and sub contractors must attach a copy of proof of completion of the OSHA 10 course to the first certified payroll submitted to the contracting agency and on each succeeding payroll where any new or additional employee is first listed.

Proof of completion may include but is not limited to:

- Copies of bona fide course completion card (*Note: Completion cards do not have an expiration date.)*
- Training roster, attendance record of other documentation from the certified trainer pending the issuance of the card.
- Other valid proof

**A certification by the employer attesting that all employees have completed such a course is not sufficient proof that the course has been completed.

Any questions regarding this statute may be directed to the New York State Department of Labor, Bureau of Public Work at 518-457-5589.

WICKS

Public work projects are subject to the Wicks Law requiring separate specifications and bidding for the plumbing, heating and electrical work, when the total project's threshold is $3 million in Bronx, Kings, New York, Queens and, Richmond counties; $1.5 million in Nassau, Suffolk and Westchester counties; and $500,000 in all other counties.

For projects below the monetary threshold, bidders must submit a sealed list naming each subcontractor for the plumbing, HVAC and electrical and the amount to be paid to each. The list may not be changed unless the public owner finds a legitimate construction need, including a change in specifications or costs or the use of a Project Labor Agreement (PLA), and must be open to public inspection.

Allows the state and local agencies and authorities to waive the Wicks Law and use a PLA if it will provide the best work at the lowest possible price. If a PLA is used, all contractors shall participate in apprentice training programs in the trades of work it employs that have been approved by the Department of Labor (DOL) for not less than three years. They shall also have at least one graduate in the last three years and use affirmative efforts to retain minority apprentices. PLA's would be exempt from Wicks, but deemed to be public work subject to prevailing wage enforcement.

The Commissioner of Labor shall have the power to enforce separate specification requirement s on projects, and may issue stop-bid orders against public owners for non-compliance.

Other new monetary thresholds, and similar sealed bidding for non-Wicks projects, would apply to certain public authorities including municipal housing authorities, NYC Construction Fund, Yonkers Educational Construction Fund, NYC Municipal Water Finance Authority, Buffalo Municipal Water Finance Authority, Westchester County Health Care Association, Nassau County Health Care Corp., Clifton-Fine Health Care Corp., Erie County Medical Center Corp., NYC Solid Waste Management Facilities, and the Dormitory Authority.

Contractors must pay subcontractors within a 7 days period.

(07.19)

Introduction to the Prevailing Rate Schedule

Information About Prevailing Rate Schedule

This information is provided to assist you in the interpretation of particular requirements for each classification of worker contained in the attached Schedule of Prevailing Rates.

Classification

It is the duty of the Commissioner of Labor to make the proper classification of workers taking into account whether the work is heavy and highway, building, sewer and water, tunnel work, or residential, and to make a determination of wages and supplements to be paid or provided. It is the responsibility of the public work contractor to use the proper rate. If there is a question on the proper classification to be used, please call the district office located nearest the project. District office locations and phone numbers are listed below.
Prevailing Wage Schedules are issued separately for "General Construction Projects" and "Residential Construction Projects" on a county-by-county basis.

General Construction Rates apply to projects such as: Buildings, Heavy & Highway, and Tunnel and Water & Sewer rates.
Residential Construction Rates generally apply to construction, reconstruction, repair, alteration, or demolition of one family, two family, row housing, or rental type units intended for residential use.
Some rates listed in the Residential Construction Rate Schedule have a very limited applicability listed along with the rate. Rates for occupations or locations not shown on the residential schedule must be obtained from the General Construction Rate Schedule. Please contact the local Bureau of Public Work office before using Residential Rate Schedules, to ensure that the project meets the required criteria.

*Contractor Registry (LL 220-I): Effective December 30th, 2024
Labor Law Section 220-i(6) prohibits contractors from bidding on public work and prohibits both contractors and subcontractors from commencing work on private and public projects subject to prevailing wage requirements. This section requires contractors to submit their Certificate of Registration with their bid materials. Each Certificate of Registration will have a unique registration number. Failure to provide proof of registration, as required by Labor Law Section 220-i, as a minimum qualification will result in the bidder being deemed non-responsive. There is a public database of registered contractors and subcontractors available online at data.ny.gov to confirm registration validity. For additional information on how to register and the requirements, visit https://dol.ny.gov/public-work-contractor-and-subcontractor-registry-landing

*Electronic Certified Payroll (LL 220-K): Effective December 31st, 2025
Effective December 31, 2025, all contractors and subcontractors who perform public work, or covered private work subject to the prevailing wage, will be required to submit certified payrolls electronically to the Bureau of Public Work and Prevailing Wage Enforcement. Additional information about the electronic certified payroll submission system will be made available on the Department's Website at https://dol.ny.gov/Electronic-Payroll

Payrolls and Payroll Records

Every contractor and subcontractor MUST keep original payrolls or transcripts subscribed and affirmed as true under penalty of perjury. Payrolls must be maintained for at least three (3) years from the projects date of completion. Additionally, as per Article 6 of the Labor Law, contractors and subcontractors are required to establish, maintain, and preserve for not less that six (6) years, contemporaneous, true, and accurate payroll records.

At a minimum, payrolls must show the following information for each person employed on a public work project: Name; Address, Last 4 Digits of Social Security number, Classification(s) in which the worker was employed, Hourly wage rate(s) paid, Supplements paid or provided, and Daily and weekly number of hours worked in each classification.

Payroll records and transcripts are required to be kept on site during all the time that work under that contract is being performed.

NOTE: *For more detailed information regarding Article 9 prevailing wage contracts, please refer to "General Provisions of Laws Covering Workers on Article 9 Public Work Building Service Contracts".*

If you have any questions concerning the attached schedule or would like additional information, please write to:

New York State Department of Labor
Bureau of Public Work
State Office Campus, Bldg. 12
Albany, NY 12240

OR

Contact the nearest BUREAU of PUBLIC WORK District Office

District Office Locations:	Telephone #	FAX #
Bureau of Public Work - Albany	518-457-2744	518-485-0240
Bureau of Public Work - Binghamton	607-721-8005	607-721-8004

Bureau of Public Work - Buffalo	716-847-7159	716-847-7650
Bureau of Public Work - Garden City	516-228-3915	516-794-3518
Bureau of Public Work - Newburgh	845-568-5287	845-568-5332
Bureau of Public Work - New York City	212-932-2419	212-775-3579
Bureau of Public Work - Patchogue	631-687-4882	631-687-4902
Bureau of Public Work - Rochester	585-258-4505	585-258-4708
Bureau of Public Work - Syracuse	315-428-4056	315-428-4671
Bureau of Public Work - Utica	315-793-2314	315-793-2514
Bureau of Public Work - White Plains	914-997-9507	914-997-9523
Bureau of Public Work - Central Office	518-457-5589	518-485-1870

Paid Holidays

Paid Holidays are days for which an eligible employee receives a regular day's pay, but is not required to perform work. If an employee works on a day listed as a paid holiday, this remuneration is in addition to payment of the required prevailing rate for the work actually performed.

Overtime

At a minimum, all work performed on a public work project in excess of eight hours in any one day or more than five days in any workweek is overtime. However, the specific overtime requirements for each trade or occupation on a public work project may differ. Specific overtime requirements for each trade or occupation are contained in the prevailing rate schedules.

Overtime holiday pay is the premium pay that is required for work performed on specified holidays. It is only required where the employee actually performs work on such holidays.

The applicable holidays are listed under HOLIDAYS: OVERTIME. The required rate of pay for these covered holidays can be found in the OVERTIME PAY section listings for each classification.

Supplemental Benefits

Particular attention should be given to the supplemental benefit requirements. Although in most cases the payment or provision of supplements is straight time for all hours worked, some classifications require the payment or provision of supplements, or a portion of the supplements, to be paid or provided at a premium rate for premium hours worked. Supplements may also be required to be paid or provided on paid holidays, regardless of whether the day is worked. The Overtime Codes and Notes listed on the particular wage classification will indicate these conditions as required.

Effective Dates

When you review the schedule for a particular occupation, your attention should be directed to the dates above the column of rates. These are the dates for which a given set of rates is effective. The rate listed is valid until the next effective rate change or until the new annual determination which takes effect on July 1 of each year.

All contractors and subcontractors are required to pay the current prevailing rates of wages and supplements. If you have any questions please contact the Bureau of Public Work or visit the New York State Department of Labor website (www.labor.ny.gov) for current wage rate information.

Shift Work

If the timeline of the contract requires shift work be performed to meet deadlines, the BPWE will enforce the shift work rate as the required rate on the project whether or not shift work is specifically addressed in the contract.

Paid Prenatal Leave

Every employer shall be required to provide to its employees twenty hours of paid prenatal personal leave during any fifty-two week calendar period. Paid prenatal personal leave shall mean leave taken for the health care services received by an employee during their pregnancy or related to such pregnancy, including physical examinations, medical procedures, monitoring and testing, and discussions with a healthcare provider related to the pregnancy. Paid prenatal personal leave may be taken in hourly increments. Benefits for paid prenatal personal leave shall be paid in hourly installments. Employees shall receive compensation at the employee's regular rate of pay, or the applicable minimum wage established by the labor law, whichever is greater, for the use of Paid Prenatal leave.

Apprentice Training Ratios

The following are the allowable ratios of registered Apprentices to Journey-workers.

For example, the ratio 1:1,1:3 indicates the allowable initial ratio is one Apprentice to one Journeyworker. The Journeyworker must be in place on the project before an Apprentice is allowed. Then three additional Journeyworkers are needed before a second Apprentice is allowed. The last ratio repeats indefinitely. Therefore, three more Journeyworkers must be present before a third Apprentice can be hired, and so on.

Please call Apprentice Training Central Office at (518) 457-6820 if you have any questions.

Title (Trade)	Ratio
Boilermaker (Construction)	1:1,1:4
Boilermaker (Shop)	1:1,1:3
Carpenter (Bldg.,H&H, Pile Driver/Dockbuilder)	1:1,1:4
Carpenter (Residential)	1:1,1:3
Electrical (Outside) Lineman	1:1,1:2
Electrician (Inside)	1:1,1:3
Elevator/Escalator Construction & Modernizer	1:1,1:2
Glazier	1:1,1:3
Insulation & Asbestos Worker	1:1,1:3
Iron Worker	1:1,1:4
Laborer	1:1,1:3
Mason	1:1,1:4
Millwright	1:1,1:4
Op Engineer	1:1,1:5
Painter	1:1,1:3
Plumber & Steamfitter	1:1,1:3
Roofer	1:1,1:2
Sheet Metal Worker	1:1,1:3
Sprinkler Fitter	1:1,1:2

If you have any questions concerning the attached schedule or would like additional information, please contact the nearest BUREAU of PUBLIC WORK District Office or write to:

New York State Department of Labor
Bureau of Public Work
State Office Campus, Bldg. 12
Albany, NY 12226

District Office Locations:	Telephone #	FAX #
Bureau of Public Work - Albany	518-457-2744	518-485-0240
Bureau of Public Work - Binghamton	607-721-8005	607-721-8004
Bureau of Public Work - Buffalo	716-847-7159	716-847-7650
Bureau of Public Work - Garden City	516-228-3915	516-794-3518
Bureau of Public Work - Newburgh	845-568-5287	845-568-5332
Bureau of Public Work - New York City	212-932-2419	212-775-3579
Bureau of Public Work - Patchogue	631-687-4882	631-687-4902
Bureau of Public Work - Rochester	585-258-4505	585-258-4708
Bureau of Public Work - Syracuse	315-428-4056	315-428-4671
Bureau of Public Work - Utica	315-793-2314	315-793-2514
Bureau of Public Work - White Plains	914-997-9507	914-997-9523
Bureau of Public Work - Central Office	518-457-5589	518-485-1870

Dutchess County General Construction

Boilermaker — 10/01/2025

JOB DESCRIPTION Boilermaker **DISTRICT** 4

ENTIRE COUNTIES
Bronx, Dutchess, Kings, Nassau, New York, Orange, Putnam, Queens, Richmond, Rockland, Suffolk, Sullivan, Ulster, Westchester

WAGES

Per Hour:	07/01/2025	01/01/2026
Boilermaker	$ 68.88	$ 70.38
Repairs & Renovations	68.88	70.38

Repairs & Renovation: Includes Repairing, Renovating and Replacement of parts to an existing unit(s).

SUPPLEMENTAL BENEFITS
Per Hour:

Boilermaker	33.5% of Hourly
Repair & Renovations	Wage Paid + $26.85

NOTE: "Hourly Wage Paid" shall include any and all premium(s) pay.

OVERTIME PAY
See (*B, O, **U) on OVERTIME PAGE
Note:* Includes 9th & 10th hours, double for 11th or more.
** Labor Day ONLY, if worked.

Repairs & Renovation see (B,E,Q) on OT Page

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 11, 12, 15, 25, 26, 29) on HOLIDAY PAGE

REGISTERED APPRENTICES
(1/2) Year Terms at the following percentage of Boilermaker's wage per hour:

1st	2nd	3rd	4th	5th	6th	7th
65%	70%	75%	80%	85%	90%	95%

SUPPLEMENTAL BENEFITS:

33.5% of Hourly Wage Paid Plus Amount Below:

1st	2nd	3rd	4th	5th	6th	7th
$20.36	21.28	22.22	23.12	24.07	25.00	25.93

NOTE: "Hourly Wage Paid" shall include any and all premium(s)

4-5

Broadband — 10/01/2025

JOB DESCRIPTION Broadband **DISTRICT** 4

ENTIRE COUNTIES
Albany, Allegany, Broome, Cattaraugus, Cayuga, Chautauqua, Chemung, Chenango, Clinton, Columbia, Cortland, Delaware, Dutchess, Erie, Essex, Franklin, Fulton, Genesee, Greene, Hamilton, Herkimer, Jefferson, Lewis, Livingston, Madison, Monroe, Montgomery, Niagara, Oneida, Onondaga, Ontario, Orleans, Oswego, Otsego, Rensselaer, Saratoga, Schenectady, Schoharie, Schuyler, Seneca, St. Lawrence, Steuben, Sullivan, Tioga, Tompkins, Ulster, Warren, Washington, Wayne, Wyoming, Yates

PARTIAL COUNTIES
Orange: Only in the Village of Greenwood Lake, Village of Highland Falls, Town of Tuxedo, and Town of Patterson

WAGES
NOTE: Applies to all public work and covered private projects, including those receiving ConnectAll funding subject to New York State Labor Law §224-E, solicited on or after July 1,2025. For all other projects solicited prior to July 1,2025 please see LINEMAN ELECTRICIAN-TELEDATA

Per Hour:	07/01/2025	08/04/2025
Field Tech	$ 51.31	$ 52.85

Install/Repair

For outside work (excluding installation on building construction/alteration/renovation projects), stopping at first point of attachment (demarcation), installing/maintaining/repairing broadband internet service.

"Broadband", "Broadband Service", or "Broadband Internet" means mass-market retail service by wire or radio that provides the capability to transmit data to and receive data from all or substantially all internet endpoints, including any capabilities that are incidental to and enable the operation of the communications service, but excluding dial-up internet access service.

Note: EXLCUDES work within ten (10) feet of High Voltage (600 Volts and over) transmission lines for this work, please see LINEMAN

SUPPLEMENTAL BENEFITS
Per Hour:

$ 23.24

OVERTIME PAY
See (B, K, *R) on OVERTIME PAGE
* Two and one half times the hourly rate after the 8th hour

HOLIDAY
Paid: See (5, 6, 7, 11, 12) on HOLIDAY PAGE
Overtime: See (5, 6, 7, 11, 12) on HOLIDAY PAGE

4-CWA-Dist2

Carpenter **10/01/2025**

JOB DESCRIPTION Carpenter **DISTRICT** 8

ENTIRE COUNTIES
Dutchess, Orange

WAGES
Per hour: 07/01/2025

Building:
Millwright $ 47.83
+ 8.44*

*This portion of the benefit is NOT subject to the SAME PREMIUM as shown for overtime.

SUPPLEMENTAL BENEFITS
Per hour:

Journeyman $ 35.39

OVERTIME PAY
See (B, E, E2, Q) on OVERTIME PAGE

HOLIDAY
Paid: See (18, 19) on HOLIDAY PAGE
Paid: See (5,6,11,13,16,18,19,25) for 1st & 2nd yr. Apprentices
Overtime: See (5,6,11,13,16,18,19,25) on HOLIDAY PAGE.

REGISTERED APPRENTICES
Wages per hour:
One (1) year terms:

1st	2nd	3rd	4th
$ 28.76 + 4.40*	$ 31.29 + 5.19*	$ 35.82 + 5.94*	$ 44.88 + 7.44*

*This portion of the benefit is NOT subject to the SAME PREMIUM as shown for overtime.

Supplemental benefits per hour:

1st	2nd	3rd	4th
$ 23.45	$ 25.24	$ 27.35	$ 30.08

8-740.2

Carpenter **10/01/2025**

JOB DESCRIPTION Carpenter **DISTRICT** 8

ENTIRE COUNTIES
Dutchess

PARTIAL COUNTIES
Orange: : The territory west demarcated by a line drawn from the Bear Mountain Bridge continuing east to the Bear Mountain Circle. The territory south demarcated by a line continuing north on 9W to the town of Cornwall where County Road 107 (also known as Quaker Rd) crosses under 9W to the centerline of Route 32, The territories south and east heading north on Route 32 to Orrs Mills Rd, then west on Orrs Mills Rd to Route 94, continue west and south on Route 94 to the Town of Chester, to the intersection of Kings Highway, continue south on Kings Highway to Bellvale Rd, west on Bellvale Rd to Bellvale Lakes Rd, then south on Bellvale Lakes Rd to Kain Rd, southeast on Kain Rd to Route 17A, then north and southeast along Route 17A to Route 210, then follow Route 210 to NJ Border.

WAGES
Per hour: 07/01/2025

Carpet/Resilient	
Floor Coverer	$ 36.78
	+ 3.48*

*This portion of the benefit is NOT subject to the SAME PREMIUM as shown for overtime.

INCLUDES HANDLING & INSTALLATION OF ARTIFICIAL TURF AND SIMILAR TURF INDOORS/OUTDOORS.

SUPPLEMENTAL BENEFITS
Per hour:
$ 29.09

OVERTIME PAY
See (B, E, Q) on OVERTIME PAGE

HOLIDAY
Paid: See (18, 19) on HOLIDAY PAGE
Paid for 1st & 2nd yr.
Apprentices: See (5, 6, 11, 13, 16, 18, 19, 25)
Overtime: See (5, 6, 11, 13, 16, 18, 19, 25) on HOLIDAY PAGE.

REGISTERED APPRENTICES
Wage per hour - (1) year terms:

1st	2nd	3rd	4th
$17.04	$20.32	$25.22	$30.14
+ 2.54*	+ 2.54*	+ 2.54*	+ 2.54*

*This portion of the benefit is NOT subject to the SAME PREMIUM as shown for overtime.

Supplemental Benefits per hour - All apprentice terms:

$ 21.47

8-2287D&O

Carpenter — 10/01/2025

JOB DESCRIPTION Carpenter **DISTRICT** 8

ENTIRE COUNTIES
Bronx, Dutchess, Kings, Nassau, New York, Orange, Putnam, Queens, Richmond, Rockland, Suffolk, Westchester

WAGES
Per Hour: 07/01/2025

Marine Construction:

Marine Diver	$ 76.46
	+ 10.16*
Marine Tender	$ 56.00
	+ 10.16*

*This portion of the benefit is NOT subject to the SAME PREMIUM as shown for overtime

SUPPLEMENTAL BENEFITS
Per Hour:

Journeyworker $ 46.48

OVERTIME PAY
See (B, E, E2, Q) on OVERTIME PAGE

HOLIDAY

Paid: See (18, 19) on HOLIDAY PAGE
Overtime: See (5, 6, 11, 13, 16, 18, 19, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES
Wages per hour:
One (1) year terms.

1st year	$ 27.98
	+ 5.66*
2nd year	33.58
	+ 5.66*
3rd year	41.96
	+ 5.66*
4th year	50.35
	+ 5.66*

*This portion of the benefit is NOT subject to the SAME PREMIUM as shown for overtime.

Supplemental Benefits
Per Hour:

All terms	$ 33.03

8-1456MC

Carpenter - Building / Heavy&Highway — 10/01/2025

JOB DESCRIPTION Carpenter - Building / Heavy&Highway **DISTRICT** 11

ENTIRE COUNTIES
Columbia, Dutchess, Orange, Sullivan, Ulster

WAGES
WAGES (per hour)

Applies to Carpenter (Building/Heavy & Highway/Tunnel), Dockbuilder, Piledriver, Dive Tender, and Diver (Dry):

	07/01/2025	07/01/2026 Additional
Base Wage	$ 38.34	$ 2.30**
	+ 6.38*	

Applies to Diver (Wet):

Base Wage	$ 50.00
	+ 6.38*

*For all hours paid straight or premium.
**To be allocated at a later date.

SHIFT WORK
SHIFT DIFFERENTIAL: When mandated by a Government Agency irregular or off shift can be worked. The Carpenter shall receive an additional fifteen percent (15%) of the base wage.

SUPPLEMENTAL BENEFITS
Per hour:

Journeyworker	$ 31.66

OVERTIME PAY
See (B, E, Q) on OVERTIME PAGE

HOLIDAY
BUILDING:
Paid: See (1) on HOLIDAY PAGE.
Overtime: See (5, 6, 16, 25) on HOLIDAY PAGE.
- Holidays that fall on Sunday will be observed Monday.

HEAVY&HIGHWAY/TUNNEL:
Paid: See (5, 6, 25) on HOLIDAY PAGE
Overtime: See (5, 6) on HOLIDAY PAGE
- Holidays that fall on Sunday will be observed Monday

- Must be employed during the five (5) work days immediately preceding a holiday or during the five (5) work days following the paid holiday to receive holiday pay
- If Employee is entitled to a paid holiday, the Employee is paid the Holiday wage and supplemental benefits whether they work or not. If Employee works the Holiday, the Employee will receive holiday pay (including supplemental benefits), plus the applicable premium wage for working the Holiday. If Employee works in excess of 8 hours on Holiday, then benefits will be paid for any hours in excess of 8 hours.

REGISTERED APPRENTICES
1 Year terms at the following wage rates.

1st	2nd	3rd	4th
$ 19.17	$ 23.00	$ 26.84	$ 30.67
+3.09*	+3.09*	+3.09*	+3.09*

*For all hours paid straight or premium

SUPPLEMENTAL BENEFITS per hour:

All Terms $ 16.81

11-279.2B/H&H

Electrician 10/01/2025

JOB DESCRIPTION Electrician **DISTRICT** 11

ENTIRE COUNTIES
Orange, Putnam, Rockland

PARTIAL COUNTIES
Dutchess: Towns of Fishkill, East Fishkill, and Beacon.

WAGES
Per hour:

	07/01/2025
Electrician Wireman/Technician	$ 51.50
	+ 10.00*

*For all hours paid straight or premium, not to be included in 3% calculation for supplemental benefits.
NOTE ADDITIONAL AMOUNTS PAID FOR THE FOLLOWING WORK LISTED BELOW (subject to overtime premiums):
- On jobs where employees are required to work from boatswain chairs, swinging scaffolds, etc., forty (40) feet or more above the ground, or under compressed air, using Scottair packs, or gas masks, they shall receive an additional $2.00 per hour above the regular straight time rate.
- Journeyman Wireman working in Shafts, Tunnels or on Barges: $5.00 above the Journeyman Wireman rate of pay
- Journeyman Wireman when performing welding or cable splicing: $3.00 above the Journeyman Wireman rate of pay
- Journeyman Wireman required to have a NYS Asbestos Certificate: $3.00 above the Journeyman Wireman rate of pay
- Journeyman Wireman required to have a CDL: $3.00 above the Journeyman Wireman rate of pay.

SHIFT WORK
SHIFT DIFFERENTIAL: On Public Work in New York State when shift work is mandated either in the job specifications or by the contracting agency, the following rates apply when shift is worked:

Between 4:30pm & 12:30am	$ 60.43
	+ 10.00*
Between 12:30am & 8:30am	$ 67.69
	+ 10.00*

SUPPLEMENTAL BENEFITS

Per hour:	07/01/2025
Journeyman	$ 30.69 plus 3% of straight or premium wage

OVERTIME PAY
See (B, E, Q) on OVERTIME PAGE

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 13, 15, 16, 25) on HOLIDAY PAGE
When the holiday falls on a Saturday it is observed the Friday before. When the holiday falls on a Sunday it is observed on the Monday after.

REGISTERED APPRENTICES
WAGES:
(1)year terms at the following rates

07/01/2025	1st	2nd	3rd	4th	5th	6th
1st Shift	$ 17.00	$ 20.60	$ 25.75	$ 30.90	$ 36.05	$ 38.63
	+1.00*	+1.00*	+1.00*	+2.00*	+2.50*	+2.50*

2nd Shift	19.94	24.17	30.22	36.26	42.30	45.32
	+1.00*	+1.00*	+1.00*	+2.00*	+2.50*	+2.50*
3rd Shift	22.34	27.08	33.85	40.01	47.38	50.77
	+1.00*	+1.00*	+1.00*	+2.00*	+2.50*	+2.50*

*For all hours paid straight or premium, not to be included in 3% calculation for supplemental benefits.

SUPPLEMENTAL BENEFITS per hour:
07/01/2025

1st term	$ 16.28 plus 3% of straight or premium wage
2nd term	$ 17.78 plus 3% of straight or premium wage
3rd term	$ 18.78 plus 3% of straight or premium wage
4th term	$ 19.78 plus 3% of straight or premium wage
5th term	$ 21.28 plus 3% of straight or premium wage
6th term	$ 21.28 plus 3% of straight or premium wage

11-363/1

Electrician — 10/01/2025

JOB DESCRIPTION Electrician **DISTRICT** 11

ENTIRE COUNTIES
Sullivan, Ulster

PARTIAL COUNTIES
Delaware: Only in the Townships of Andes, Harpersfield, Kortwright,Stamford, Bovina, Roxbury, Middletown and those portions of Colchester and Hancock south of the East Branch of the Delaware River.
Dutchess: All of the county except for the towns of Fishkill,East Fishkill, and Beacon.
Greene: That portion of the county south of a line following the south limits of the city of Catskill in a Westerly direction from the Hudson River to Highway 23A along 23A to the road following the Little Westkill and continuing along this road to Delaware County.

WAGES
Per hour:

	07/01/2025
Electrician Wireman/ Technician	
Electrical/Technician Projects	
under $ 250,000.00	$ 47.50
	+ 10.00*
over $ 250,000.00	$ 51.50
	+ 10.00*

*For all hours paid straight or premium, not to be included in 3% calculation for supplemental benefits.

NOTE ADDITIONAL AMOUNTS PAID FOR THE FOLLOWING WORK LISTED BELOW (subject to overtime premiums):
- On jobs where employees are required to work from boatswain chairs, swinging scaffolds, etc., forty (40) feet or more above the ground, or under compressed air, using Scottair packs, or gas masks, they shall receive an additional $2.00 per hour above the regular straight time rate.
- Journeyman Wireman working in Shafts, Tunnels or on Barges: $5.00 above the Journeyman Wireman rate of pay
- Journeyman Wireman when performing welding or cable splicing: $3.00 above the Journeyman Wireman rate of pay
- Journeyman Wireman required to have a NYS Asbestos Certificate: $3.00 above the Journeyman Wireman rate of pay
- Journeyman Wireman required to have a CDL: $3.00 above the Journeyman Wireman rate of pay.

SHIFT WORK
SHIFT DIFFERENTIAL: On Public Work in New York State when shift work is mandated either in the job specifications or by the contracting agency, the following rates apply:

Shift worked between 4:30pm & 12:30am	
Electrical/Technician Projects	
under $ 250,000.00	$ 55.73
	+ 10.00*
over $ 250,000.00	$ 60.43
	+ 10.00*
Shift worked between 12:30am & 8:30am	
Electrical/Technician Projects	
under $ 250,000.00	$ 62.43
	+ 10.00*
over $ 250,000.00	$ 67.69
	+ 10.00*

SUPPLEMENTAL BENEFITS

Per hour:	07/01/2025
Journeyman	$ 30.69 plus 3% of straight or premium wage

OVERTIME PAY
See (B, E, Q) on OVERTIME PAGE

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 13, 15, 16, 25) on HOLIDAY PAGE
When the holiday falls on a Saturday it is observed the Friday before. When the holiday falls on a Sunday it is observed on the Monday after.

REGISTERED APPRENTICES
WAGES:
(1)year terms at the following rates

07/01/2025	1st	2nd	3rd	4th	5th	6th
1st Shift	$ 17.00	$ 20.60	$ 25.75	$ 30.90	$ 36.05	$ 38.63
	+1.00*	+1.00*	+1.00*	+2.00*	+2.50*	+2.50*
2nd Shift	19.94	24.17	30.22	36.26	42.30	45.32
	+1.00*	+1.00*	+1.00*	+2.00*	+2.50*	+2.50*
3rd Shift	22.34	27.08	33.85	40.61	47.38	50.77
	+1.00*	+1.00*	+1.00*	+2.00*	+2.50*	+2.50*

*For all hours paid straight or premium, not to be included in 3% calculation for supplemental benefits.

SUPPLEMENTAL BENEFITS per hour:

07/01/2025	
1st term	$ 16.28 plus 3% of straight or premium wage
2nd term	$ 17.78 plus 3% of straight or premium wage
3rd term	$ 18.78 plus 3% of straight or premium wage
4th term	$ 19.78 plus 3% of straight or premium wage
5th term	$ 21.28 plus 3% of straight or premium wage
6th term	$ 21.28 plus 3% of straight or premium wage

11-363/2

Elevator Constructor — 10/01/2025

JOB DESCRIPTION Elevator Constructor **DISTRICT** 1

ENTIRE COUNTIES
Columbia, Dutchess, Greene, Orange, Putnam, Sullivan, Ulster

PARTIAL COUNTIES
Delaware: Towns of Andes, Bovina, Colchester, Davenport, Delhi, Harpersfield, Hemdon, Kortright, Meredith, Middletown, Roxbury, Hancock & Stamford
Rockland: Only the Township of Stony Point.
Westchester: Only the Townships of Bedford, Lewisboro, Cortland, Mt. Kisco, North Salem, Pound Ridge, Somers and Yorktown.

WAGES

Per Hour	07/01/2025	01/01/2026
Mechanic	$ 73.07	$ 76.12
Helper	70% of Mechanic Wage Rate	70% of Mechanic Wage Rate

SUPPLEMENTAL BENEFITS
Per hour

	07/01/2025	01/01/2026
Journeyworker/Helper	$ 38.435*	$ 38.985*

(*)Plus 6% of regular hourly if less than 5 years of service. Plus 8% of regular hourly rate if more than 5 years of service.

OVERTIME PAY
See (D, O) on OVERTIME PAGE

HOLIDAY
Paid: See (5, 6, 15, 16) on HOLIDAY PAGE
Overtime: See (5, 6, 15, 16) on HOLIDAY PAGE

Note: When a paid holiday falls on Saturday, it shall be observed on Friday. When a paid holiday falls on Sunday, it shall be observed on Monday.

REGISTERED APPRENTICES

Wages per hour:

0-6 mo*	6-12 mo	2nd yr	3rd yr	4th yr
50 %	55 %	65 %	70 %	80 %

(*)Plus 6% of the hourly rate, no additional supplemental benefits.

Supplemental Benefits per hour worked:

Same as Journeyperson/Helper

1-138

Glazier — 10/01/2025

JOB DESCRIPTION Glazier **DISTRICT** 8

ENTIRE COUNTIES

Bronx, Dutchess, Kings, Nassau, New York, Orange, Putnam, Queens, Richmond, Rockland, Suffolk, Sullivan, Ulster, Westchester

WAGES

Per hour:

	07/01/2025	11/01/2025
Glazier, Glass Tinting and Window Film	$ 64.23	$ 65.23
Scaffolding, including swing scaffold	69.23	70.23
*Mechanical Equipment	65.23	66.23
**Repair & Maintenance	31.71	32.44

*Mechanical equipment, scissor jacks, man lifts, booms & buckets 30' or more, but not pipe scaffolding.
**Repair & Maintenance- All repair & maintenance work on a particular building whenever performed, where the total cumulative Repair & Maintenance contract value is under $193,000.

SUPPLEMENTAL BENEFITS

Per hour:

Glazier, Glass Tinting Window Film, Scaffolding and Mechanical Equipment	$ 43.03	$ 43.88
Repair & Maintenance	25.12	25.37

OVERTIME PAY

See (B, E, Q, V) on OVERTIME PAGE
For 'Repair & Maintenance' see (B, B2, I, S) on overtime page.

HOLIDAY

Paid: See (5, 6, 16, 25) on HOLIDAY PAGE
Overtime: See (5, 6, 16, 25) on HOLIDAY PAGE
For 'Repair & Maintenance'
Paid: See(5, 6, 16, 25)
Overtime: See(5, 6, 16, 25)

REGISTERED APPRENTICES

Wage per hour:
(1) year terms at the following wage rates:

	07/01/2025	11/01/2025
1st term	$ 22.79	$ 23.29
2nd term	31.15	31.71
3rd term	41.53	42.23
4th term	50.90	51.70

Supplemental Benefits:
(Per hour)

1st term	$ 19.56	$ 19.80

2nd term	27.85	28.31
3rd term	33.49	34.09
4th term	36.73	37.41

8-1087 (DC9 NYC)

Insulator - Heat & Frost — 10/01/2025

JOB DESCRIPTION Insulator - Heat & Frost **DISTRICT** 8

ENTIRE COUNTIES
Dutchess, Orange, Putnam, Rockland, Westchester

WAGES

Per hour:	07/01/2025
Insulator/Fire Stop Work*	$ 62.42
Discomfort & Additional Training**	65.48

* Applies on all exclusive Fire Stop Work (When contract is for Fire Stop work only). No apprentices on these contracts only.

**Applies to work requiring; garb or equipment worn against the body not customarily worn by insulators; psychological evaluation ;special training, including but not limited to "Yellow Badge" radiation training

Note: Additional $10 a day for work 30 feet or more above floor or ground level.

SUPPLEMENTAL BENEFITS

Per hour:	
Insulator/Fire Stop Journeyworker:	$ 38.90
Discomfort & Additional Training:	$ 40.94

OVERTIME PAY
See (B, E, E2, Q) on OVERTIME PAGE

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Note: Last working day preceding Christmas and New Years day, workers shall work no later than 12:00 noon and shall receive 8 hrs pay.

Overtime: See (2*, 4, 6, 16, 25) on HOLIDAY PAGE.
*Note: Labor Day triple time if worked.

REGISTERED APPRENTICES
(1) year terms:

Insulator Apprentices:

1st	2nd	3rd	4th
$ 33.91	$ 39.61	$ 45.31	$ 51.02

Discomfort & Additional Training Apprentices:

1st	2nd	3rd	4th
$ 35.44	$ 41.44	$ 47.45	$ 53.47

Supplemental Benefits paid per hour:

Insulator Apprentices:

1st term	$ 19.81
2nd term	23.62
3rd term	27.44
4th term	31.26

Discomfort & Additional Training Apprentices:

1st term	$ 20.82
2nd term	24.85
3rd term	28.88
4th term	32.91

Ironworker — 10/01/2025

JOB DESCRIPTION Ironworker **DISTRICT** 11

ENTIRE COUNTIES
Dutchess, Orange, Putnam, Rockland, Sullivan, Ulster

WAGES
Per hour:

	07/01/2025	07/01/2026 Additional
Structural	$ 52.88	$ 2.00*
Reinforcing	52.88	2.00*
Ornamental	52.88	2.00*
Chain Link Fence	52.88	2.00*

(*) To be allocated at a later date.

NOTE: For Reinforcing classification ONLY, Ironworker 4-46Reinf rates apply in Rockland County's southern section (south of Convent Road and east of Blue Hills Road).

SHIFT WORK
On Government Mandated Irregular Workdays or Shift Work, the following wage will be paid:

1st Shift	$ 52.88
2nd Shift	57.94
3rd Shift	63.04

Note- Any shift that works past 12:00 midnight shall receive the 3rd shift differential.

SUPPLEMENTAL BENEFITS
Per hour:

Journeyman	$ 47.33

OVERTIME PAY
See (B1, Q, V) on OVERTIME PAGE

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 16) on HOLIDAY PAGE
If a holiday falls on Saturday, it will be observed Friday. If a holiday falls on Sunday, it will be observed Monday.

REGISTERED APPRENTICES
Wages:

(1) year terms at the following wage:

	1st yr	2nd yr	3rd yr	4th yr
1st Shift	$ 26.45	$ 31.73	$ 37.03	$ 42.31
2nd Shift	31.75	36.98	42.23	47.47
3rd Shift	35.22	40.78	46.36	51.92

Supplemental Benefits per hour:

	07/01/2025
1st year	$ 41.21
2nd year	42.43
3rd year	43.66
4th year	44.88

11-417

Laborer - Building — 10/01/2025

JOB DESCRIPTION Laborer - Building **DISTRICT** 11

ENTIRE COUNTIES
Dutchess

PARTIAL COUNTIES
Columbia: Only the Townships of Greenport, Claverack, Philmont,Clermont, Germantown, Livingston, Hillsdale, Gallatin, Copake, Ancram, Taghkanic and the City of Hudson.

WAGES
ALL WORK RELATED WITH TOXIC OR ANY ASBESTOS OR HAZARDOUS MATERIAL

WAGES: (per hour)

	07/01/2025	06/01/2026 Additional
Class 4	$ 51.45	$ 2.99*

*To be allocated at a later date.

These rates will cover all work within five feet of the building foundation line.

SHIFT WORK
Shift Differential: On all Governmental mandated irregular or off shift work, an additional 25% of wage is required. The 25% shift differential will be paid on public works contract for shifts or irregular workdays outside the normal working hours for 2nd and 3rd shifts or irregular workday or when mandated or required by state, federal, county, local or other governmental agency contracts.

SUPPLEMENTAL BENEFITS
Per hour:

Journeyman	$ 33.95
Shift	$ 41.29

OVERTIME PAY
See (B, *E, E5, **Q) on OVERTIME PAGE
*For first 8 hours on Saturday
**When an employee is required to work on a holiday which falls on a Sunday the employee shall be paid three (3) times the hourly rate and one (1) hour benefits for every hour worked. When an employee is required to work on a holiday which falls on a Saturday the employee shall be paid two and a half (2.5) times the hourly rate and one hour benefits for every hour worked.

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 16, 25) on HOLIDAY PAGE
Holidays that fall on Saturday shall be observed on Friday, when holidays fall on Sunday they shall be observed on Monday.

REGISTERED APPRENTICES
(1000) hour terms at the following wages.

	07/01/2025
1st term	$ 29.50
2nd term	34.05
3rd term	38.60
4th term	43.15

Supplemental Benefits per hour:

All Terms Regular	$ 30.35
All Terms Shift Rate	36.75

11-17tox B

Laborer - Building — 10/01/2025

JOB DESCRIPTION Laborer - Building **DISTRICT** 8

ENTIRE COUNTIES
Dutchess

PARTIAL COUNTIES
Columbia: Only the Townships of Ancram, Claverack, Clermont, Copake, Gallatin, Germantown, Greenport, Hillsdale, Hudson, Livingston, Philmont and Taconic.

WAGES
GROUP # 1:
All Laborers except those listed in Group 2

GROUP # 2:
Blaster, Laser Beam Oper., Asphalt Rakers, & Drilling Equipment Only Where a Separate Air Compressor Unit Supplies Power

WAGES per hour:	07/01/2025
GROUP # 1	$ 41.10*
GROUP # 2	43.45*

*Subtract $ 4.50 to calculate overtime premium

Note: Any job requiring Hazwopper Certification will pay $1.00 above job classification wage rate.

SUPPLEMENTAL BENEFITS
Per hour:

Journeyman	$ 31.50

OVERTIME PAY
See (B, F, R) on OVERTIME PAGE

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6) on HOLIDAY PAGE
Note: Whenever a holidays falls on Sunday, it will be observed on the following Monday.

REGISTERED APPRENTICES
Wages per hour: 07/01/2025

1000 Hour terms

1st term	$ 29.50
2nd term	34.05
3rd term	38.60
4th term	40.00

Note: Any job requiring Hazwopper Certification will pay $1.00 above job classification wage rate.

Supplemental Benefits per hour:

All terms	$ 24.60

8-235

Laborer - Heavy&Highway 10/01/2025

JOB DESCRIPTION Laborer - Heavy&Highway **DISTRICT** 8

ENTIRE COUNTIES
Dutchess

PARTIAL COUNTIES
Columbia: Only the Townships of Ancram, Claverack, Clermont, Copake,Gallatin, Germantown, Greenport, Hillsdale, Hudson, Livingston, Philmont and Taconic.

WAGES
GROUP I: Blaster, Asphalt Screedman, ACI Certified Flatwork Finisher, Pipe Jacking and Boring Operations, Operator Qualified Dead Condition Pipe Fuser (B Mechanic)

GROUP II: Burner, Drill Operator, Jumbo Driller, Wagon Driller, Air Track Driller, Hydraulic Driller, Self Contained Rotary Drill Operator, Pneumatic Dowel Driller, Concrete Form Aligner, Concrete Form and Curb Form Highway, Concrete Finisher, Asphalt Raker, Pipe Fusion, Wrecking "Bar Person", Operator Qualified Peer Checker.

GROUP III: Asphalt Curb Machine Operator, Jeepers Operator, Pavement Breaker Operator , Power Saw Operator, Jack Hammer Drill, all types Pneumatic Tool and Gasoline Drill, Concrete Saw, Gunning, Railroad, Spike Puller, Sandblasting, Shoring, Pipe Layer, Deck Winches on Scows, Power Buggy and Operator, Power Wheelbarrow Operator, Laser Bean and X-Ray Operator, Pipe Religner, Underpinning, Chain Saw, Tree Cutter, Jack Leg Driller, Hydraulic Rock Splitter, certified, Certified Scaffold Erector, Remote Controlled Demolition Robot, Wrecking "Bar Person" Helper, Utility Per Diem Laborer, Compressed air-lance, Water jet lance

Group IV: General Concrete Laborers - anything pertaining to concrete, aggregate or concrete material handling, Puddlers, Asphalt Worker, Crack Router Operator, Rock Scalers, Vibrator Operator, Bit Grinder, Concrete Grinder, Remote Walk Behind Roller (Wacker, Rammax, etc), Air Tampers and All Tampers not covered by any other classification, Form Pin Pullers, Pumps and their operation, Service of Air Power, Epoxy and Waterproofing Worker, Fine Grade person between forms, Barco Rammer, Guard Rail Installation and Demolition Link Fence, Steel Kings, Wire Mesh, Setting of all Paving Blocks, Brick Paver and Rubber Pavers, Rip Rap and Dry Stone Layer Wall, Stone Work and Pointing, Cement Spray Men, Gabion Basket Assembler, Installation of Noise Barrier, Jersey Barrier and Joints, Pre-Cast Manholes, and Pre -cast and Pre-cast Catch Basins, Crib Retaining Walls

Group V: All Driller Helpers(including Hydraulic Wagon Air Track). Common Laborers, Certified Fire Watch Laborers, All AFL/CIO Trades, Signal Person Truck Spotters, Power Person , Landscaping and Nursery Person, Artificial Turf, Placing Fabric on Landfill, Sign Installer, Temporary and Interim Pavement Line Striping, String Line Automation Grades, Lock Level, Certified Traffic Safety and Control (Pattern)

Group V (A): Flagperson

Group VI: Confined Space Laborer

Group VII: Operator Qualified Gas Mechanic

WAGES per hour	07/01/2025
Group I:	$ 51.40

Group II:	49.99
Group III:	49.58
Group IV:	49.21
Group V:	48.85
Group V(A):	42.25
Group VI:	50.93
Group VII:	61.80

Note: All employees working on a project that requires Hazwopper Certification will receive $1.00 per hour over job classification rate of pay.

SHIFT WORK
Supplemental Benefits: $ 41.60*

*Applies for contracting agency mandated irregular shift work

All employees who work an irregular work day that starts after 9:00 AM on a governmental mandated schedule shall be paid an additional 15% per hour.

SUPPLEMENTAL BENEFITS

Per hour:	07/01/2025
Journeyman	$ 30.60

OVERTIME PAY
See (B, E, E2, Q) on OVERTIME PAGE

HOLIDAY
Paid: See (5, 6) on HOLIDAY PAGE
Overtime: See (5, 6) on HOLIDAY PAGE
Note: Whenever a holidays falls on Sunday, it will be observed on the following Monday.

REGISTERED APPRENTICES
Wages per hour
1000 hour year terms

1st Term	$ 29.50
2nd Term	34.05
3rd Term	38.60
4th Term	40.00

Note: All employees working on a project that requires Hazwopper Certification will receive $1.00 per hour over job classification rate of pay.

Supplemental Benefits per hour:

All Terms	$ 24.60

8-235h

Laborer - Heavy&Highway 10/01/2025

JOB DESCRIPTION Laborer - Heavy&Highway **DISTRICT** 11

ENTIRE COUNTIES
Dutchess

PARTIAL COUNTIES
Columbia: Only the Townships of Claverack, Clermont, Greenport, Philmont, Germantown,Livingston, Hillsdale, Taghkanic, Gallatin, Copake, Ancram, City of Hudson.

WAGES
ALL WORK RELATED WITH TOXIC OR ANY ASBESTOS OR HAZARDOUS MATERIAL, BIOREMEDIATION AND PHYTO REMEDIATION(Five feet or more outside of building foundation line)

WAGES:(per hour)	07/01/2025	06/01/2026
Class 3	$ 54.00	$ 56.05

SHIFT WORK
SHIFT DIFFERENTIAL: Night work and irregular shift require 20% increase on wages for all Government mandated night and irregular shift work.

SUPPLEMENTAL BENEFITS

Per hour:		
Journeyman	$ 34.03	$ 35.28
Shift	39.60	41.37

OVERTIME PAY

See (B, E, P, *R, **S, ***T, X) on OVERTIME PAGE
*For Mon-Fri Holidays, Double Benefits to be paid for all hours worked.
**For Saturday Holidays or Friday recognized, Double Benefits for all hours worked.
***For Sunday Holidays or Monday recognized, Double Benefits for all hours worked.

HOLIDAY
Paid: See (5, 6, 15, 25) on HOLIDAY PAGE
Overtime: See (5, 6, 15, 25) on HOLIDAY PAGE
To be eligible for a paid holiday, an employee must work at least two (2) days in the calendar week or payroll week in which the holiday falls.

REGISTERED APPRENTICES
(1000) hour terms at the following wages.

	07/01/2025
1st term	$ 29.50
2nd term	34.05
3rd term	38.60
4th term	43.15

Supplemental Benefits per hour:

All Terms Regular	$ 30.35
All Terms Shift Rate	35.27

11-17tox HH

Laborer - Tunnel — 10/01/2025

JOB DESCRIPTION Laborer - Tunnel **DISTRICT** 11

ENTIRE COUNTIES
Columbia, Dutchess, Greene, Orange, Otsego, Putnam, Rockland, Sullivan, Ulster, Westchester

PARTIAL COUNTIES
Chenango: Townships of Columbus, Sherburne and New Berlin.
Delaware: Townships of Andes, Bovina, Middletown, Roxbury, Franklin, Hamden, Stamford, Delhi, Kortright, Harpersfield, Merideth and Davenport.

WAGES
Class 1: All support laborers/sandhogs working above the shaft or tunnel.

Class 2: All laborers/sandhogs working in the shaft or tunnel.

Class 4: Safety Miners

Class 5: Site work related to Shaft/Tunnel

WAGES: (per hour)

	07/01/2025	06/01/2026 Additional
Class 1	$ 58.55	$ 2.75*
Class 2	60.70	2.75*
Class 4	67.10	2.75*
Class 5	51.40	2.75*

*To be allocated at a later date

Toxic and hazardous waste, lead abatement and asbestos abatement work will be paid an additional $ 3.00 an hour.

SUPPLEMENTAL BENEFITS
Per hour:

Benefit 1	$ 37.88
Benefit 2	54.01
Benefit 3	70.12

Benefit 1 applies to straight time hours, paid holidays not worked.
Benefit 2 applies to over 8 hours in a day (M-F) and Saturday hours worked.
Benefit 3 applies to Sunday and Holiday hours worked.

OVERTIME PAY
See (B, E, Q, X) on OVERTIME PAGE

HOLIDAY
Paid: See (5, 6, 15, 25) on HOLIDAY PAGE
Overtime: See (5, 6, 15, 16, 25) on HOLIDAY PAGE

When a recognized Holidays falls on Saturday or Sunday, holidays falling on Saturday shall be recognized or observed on Friday and holidays falling on Sunday shall be recognized or observed on Monday. Employees ordered to work on the Saturday or Sunday of the holiday or on the recognized or the observed Friday or Monday for those holidays falling on Saturday or Sunday shall receive double time the established rate and benefits for the holiday.

REGISTERED APPRENTICES
FOR APPRENTICE RATES, refer to the appropriate Laborer Heavy & Highway wage rate contained in the wage schedule for the County and location where the work is to be performed.

11-17/60/235/754Tun

Lineman Electrician — 10/01/2025

JOB DESCRIPTION Lineman Electrician **DISTRICT** 6

ENTIRE COUNTIES
Albany, Allegany, Broome, Cattaraugus, Cayuga, Chautauqua, Chemung, Chenango, Clinton, Columbia, Cortland, Delaware, Dutchess, Erie, Essex, Franklin, Fulton, Genesee, Greene, Hamilton, Herkimer, Jefferson, Lewis, Livingston, Madison, Monroe, Montgomery, Niagara, Oneida, Onondaga, Ontario, Orange, Orleans, Oswego, Otsego, Putnam, Rensselaer, Rockland, Saratoga, Schenectady, Schoharie, Schuyler, Seneca, St. Lawrence, Steuben, Sullivan, Tioga, Tompkins, Ulster, Warren, Washington, Wayne, Wyoming, Yates

WAGES
A Lineman/Technician shall perform all overhead aerial work. A Lineman/Technician on the ground will install all electrical panels, connect all grounds, install and connect all electrical conductors, assembly of all electrical materials, conduit, pipe, or raceway; placing of fish wire; pulling of cables, wires or fiber optic cable through such raceways; splicing of conductors; dismantling of such structures, lines or equipment.

Crane Operators: Operation of any type of crane on line projects.
Crawler Backhoe: Operation of tracked excavator/crawler backhoe with 1/2 yard bucket or larger on line projects.
Digging Machine Operator: All other digging equipment and augering on line projects.

A Groundman/Truck Driver shall: Build and set concrete forms, handle steel mesh, set footer cages, transport concrete in a wheelbarrow, hand or machine concrete vibrator, finish concrete footers, mix mortar, grout pole bases, cover and maintain footers while curing in cold weather, operate jack hammer, operate hand pavement breaker, tamper, concrete and other motorized saws, as a drill helper, operate and maintain generators, water pumps, chainsaws, sand blasting, operate mulching and seeding machine, air tools, electric tools, gas tools, load and unload materials, hand shovel and/or broom, prepare and pour mastic and other fillers, assist digger operator/equipment operator in ground excavation and restoration, landscape work and painting. Only when assisting a lineman technician, a groundman/truck driver may assist in installing conduit, pipe, cables and equipment.

NOTE: Includes Teledata Work within ten (10) feet of High Voltage Transmission Lines. Also includes digging of holes for poles, anchors, footer, and foundations for electrical equipment.

-----Below rates applicable on all overhead and underground distribution and maintenance work, and all overhead and underground transmission line work and the installation of fiber optic cable where no other construction trades are or have been involved. Includes access matting for line work.

Per hour:	07/01/2025	05/04/2026	05/03/2027	05/01/2028
Group A:				
Lineman, Technician	$ 61.56	$ 64.37	$ 66.84	$ 69.47
Crane, Crawler Backhoe	61.56	64.37	66.84	69.47
Welder, Cable Splicer	61.56	64.37	66.84	69.47
Group B:				
Digging Mach. Operator	$ 55.40	$ 57.93	$ 60.16	$ 62.52
Group C:				
Tractor Trailer Driver	$ 52.33	$ 54.71	$ 56.81	$ 59.05
Groundman, Truck Driver	49.25	51.50	53.47	55.58
Equipment Mechanic	49.25	51.50	53.47	55.58
Group D:				
Flagger	$ 33.86	$ 35.40	$ 36.76	$ 38.21

Additional 3% per hour above regular rate for entire crew when a helicopter is used. This will increase to 5% on May 03, 2027.

-----Below rates applicable on all electrical sub-stations, switching structures, fiber optic cable and all other work not defined as "Utility outside electrical work." Includes access matting for line work.

Group A:				
Lineman, Technician	$ 61.56	$ 64.37	$ 66.84	$ 69.47
Crane, Crawler Backhoe	61.56	64.37	66.84	69.47

Cable Splicer	67.72	70.81	73.52	76.42
Certified Welder, Pipe Type Cable	$ 64.64	$ 67.59	$ 70.18	$ 72.94
Group B:				
Digging Mach. Operator	$ 55.40	$ 57.93	$ 60.16	$ 62.52
Group C:				
Tractor Trailer Driver	$ 52.33	$ 54.71	$ 56.81	$ 59.05
Groundman, Truck Driver	49.25	51.50	53.47	55.58
Equipment Mechanic	49.25	51.50	53.47	55.58
Group D:				
Flagger	$ 33.86	$ 35.40	$ 36.76	$ 38.12

Additional 3% per hour above regular rate for entire crew when a helicopter is used. This will increase to 5% on May 03, 2027.

-----Below rates applicable on all switching structures, maintenance projects, railroad catenary install/maintenance third rail installation, bonding of rails and pipe type cable and installation of fiber optic cable. Includes access matting for line work.

Group A:				
Lineman, Tech, Welder	$ 62.94	$ 65.81	$ 68.34	$ 71.03
Crane, Crawler Backhoe	62.94	65.81	68.34	71.03
Cable Splicer	69.23	72.39	75.17	78.13
Certified Welder, Pipe Type Cable	66.09	69.10	71.76	74.58
Group B:				
Digging Mach. Operator	$ 56.65	$ 59.23	$ 61.51	$ 63.93
Group C:				
Tractor Trailer Driver	$ 53.50	$ 55.94	$ 58.09	$ 60.38
Groundman, Truck Driver	50.35	52.65	54.67	56.82
Equipment Mechanic	50.35	52.65	54.67	56.82
Group D:				
Flagger	$ 34.62	$ 36.20	$ 37.59	$ 39.07

Additional 3% per hour above regular rate for entire crew when a helicopter is used. This will increase to 5% on May 03, 2027.

-----Below rates applicable on all overhead and underground transmission line work & fiber optic cable where other construction trades are or have been involved. This applies to transmission line work only, not other construction. Includes access matting for line work.

Group A:				
Lineman, Tech, Welder	$ 64.18	$ 67.10	$ 69.68	$ 72.43
Crane, Crawler Backhoe	64.18	67.10	69.68	72.43
Group B:				
Digging Mach. Operator	$ 57.76	$ 60.39	$ 62.71	$ 65.19
Group C:				
Tractor Trailer Driver	$ 54.55	$ 57.04	$ 59.23	$ 61.57
Groundman, Truck Driver	51.34	53.68	55.74	57.94
Equipment Mechanic	51.34	53.68	55.74	57.94
Group D:				
Flagger	$ 35.30	$ 36.91	$ 38.32	$ 39.84

Additional 3% per hour above regular rate for entire crew when a helicopter is used. This will increase to 5% on May 03, 2027.

SHIFT WORK

THE FOLLOWING RATES WILL APPLY ON ALL CONTRACTING AGENCY MANDATED MULTIPLE SHIFTS OF AT LEAST FIVE (5) DAYS DURATION WORKED BETWEEN THE HOURS LISTED BELOW:

1ST SHIFT	8:00 AM to 4:30 PM REGULAR RATE
2ND SHIFT	4:30 PM to 1:00 AM REGULAR RATE PLUS 17.3 %
3RD SHIFT	12:30 AM to 9:00 AM REGULAR RATE PLUS 31.4 %

SUPPLEMENTAL BENEFITS

Per hour:

	07/01/2025	05/04/2026	05/03/2027	05/01/2028
Group A	$ 31.90*	$ 32.90*	$ 34.40*	$ 35.90*
Group B	$ 27.90*	$ 28.90*	$ 30.40*	$ 31.90*
Group C	$ 27.70*	$ 28.50*	$ 29.70*	$ 30.90*
Group D	$ 27.65*	$ 28.40*	$ 29.53*	$ 30.66*

*Plus 7 % of the hourly wage paid. The 7% is based on straight time or premium time.

OVERTIME PAY

See (B, E, Q, X) on OVERTIME PAGE. NOTE: Double time for all emergency work designated by the Dept. of Jurisdiction.
WAGE CAP - Double the straight time hourly base wage shall be the maximum hourly wage compensation for any hour worked. Contractor is still responsible to pay the hourly benefit amount for each hour worked.

HOLIDAY

Paid See (5, 6, 8, 15, 25) on HOLIDAY PAGE
Overtime See (5, 6, 8, 15, 25) on HOLIDAY PAGE
NOTE: All paid holidays falling on Saturday shall be observed on the preceding Friday. All paid holidays falling on Sunday shall be observed on the following Monday. Supplements for holidays paid at straight time.

REGISTERED APPRENTICES

WAGES per hour: 1000 hour terms at the following percentage of the applicable Journeyworker's Lineman wage.

1st	2nd	3rd	4th	5th	6th	7th
60%	65%	70%	75%	80%	85%	90%

SUPPLEMENTAL BENEFITS per hour:

	07/01/2025	05/04/2026	05/03/2027	05/01/2028
All terms:	$ 27.65*	$ 28.40*	$ 29.53*	$ 30.66*

*Plus 7% of the hourly wage paid. The 7% is based on straight time or premium time.

6-1249a

Lineman Electrician - Teledata — 10/01/2025

JOB DESCRIPTION Lineman Electrician - Teledata **DISTRICT** 6

ENTIRE COUNTIES

Albany, Allegany, Broome, Cattaraugus, Cayuga, Chautauqua, Chemung, Chenango, Clinton, Columbia, Cortland, Delaware, Dutchess, Erie, Essex, Franklin, Fulton, Genesee, Greene, Hamilton, Herkimer, Jefferson, Lewis, Livingston, Madison, Monroe, Montgomery, Niagara, Oneida, Onondaga, Ontario, Orange, Orleans, Oswego, Otsego, Putnam, Rensselaer, Rockland, Saratoga, Schenectady, Schoharie, Schuyler, Seneca, St. Lawrence, Steuben, Sullivan, Tioga, Tompkins, Ulster, Warren, Washington, Wayne, Westchester, Wyoming, Yates

WAGES

NOTE: Applies to all public work and covered private projects, including those receiving ConnectAll funding subject to LL 224-E,solicited prior to July 1, 2025. For all projects, excluding dial-up internet access service, solicited on or after July 1, 2025, please see BROADBAND

Per hour:	07/01/2025
Cable Splicer	$ 40.81
Installer, Repairman	$ 38.73
Teledata Lineman	$ 38.73
Tech., Equip. Operator	$ 38.73
Groundman/Flagger	$ 20.53

For outside work, stopping at first point of attachment (demarcation).

NOTE: EXCLUDES Teledata work within ten (10) feet of High Voltage (600 volts and over) transmission lines. For this work, please see LINEMAN.

SHIFT WORK

THE FOLLOWING RATES APPLY WHEN THE CONTRACTING AGENCY MANDATES MULTIPLE SHIFTS OF AT LEAST FIVE (5) DAYS DURATION ARE WORKED. WHEN TWO (2) OR THREE (3) SHIFTS ARE WORKED THE FOLLOWING RATES APPLY:

1ST SHIFT	REGULAR RATE
2ND SHIFT	REGULAR RATE PLUS 10%
3RD SHIFT	REGULAR RATE PLUS 15%

SUPPLEMENTAL BENEFITS

Per hour:

Journeyworker	$ 5.77 *plus 3% of the hour wage paid

*The 3% is based on the hourly wage paid, straight time rate or premium rate.

OVERTIME PAY
See (B, E, Q) on OVERTIME PAGE
WAGE CAP - Double the straight time hourly base wage shall be the maximum hourly wage compensation for any hour worked. Contractor is still responsible to pay the hourly benefit amount for each hour worked.

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 16) on HOLIDAY PAGE

6-1249LT - Teledata

Lineman Electrician - Traffic Signal, Lighting — 10/01/2025

JOB DESCRIPTION Lineman Electrician - Traffic Signal, Lighting **DISTRICT** 6

ENTIRE COUNTIES
Columbia, Dutchess, Orange, Putnam, Rockland, Ulster

WAGES
Lineman/Technician shall perform all overhead aerial work. A Lineman/Technician on the ground will install all electrical panels, connect all grounds, install and connect all electrical conductors which includes, but is not limited to road loop wires; conduit and plastic or other type pipes that carry conductors, flex cables and connectors, and to oversee the encasement or burial of such conduits or pipes.

Crane Operators: Operation of any type of crane on Traffic Signal/Lighting projects.
Crawler Backhoe: Operation of tracked excavator/crawler backhoe with 1/2 yard bucket or larger on Traffic Signal/Lighting projects.
Digging Machine Operator: All other digging equipment and augering on Traffic Signal/Lighting projects.

A Groundman/Truck Driver shall: Build and set concrete forms, handle steel mesh, set footer cages, transport concrete in a wheelbarrow, hand or machine concrete vibrator, finish concrete footers, mix mortar, grout pole bases, cover and maintain footers while curing in cold weather, operate jack hammer, operate hand pavement breaker, tamper, concrete and other motorized saws, as a drill helper, operate and maintain generators, water pumps, chainsaws, sand blasting, operate mulching and seeding machine, air tools, electric tools, gas tools, load and unload materials, hand shovel and/or broom, prepare and pour mastic and other fillers, assist digger operator/equipment operator in ground excavation and restoration, landscape work and painting. Only when assisting a lineman technician, a groundman/truck driver may assist in installing conduit, pipe, cables and equipment.

A flagger's duties shall consist of traffic control only.

Per hour:	07/01/2025	05/04/2026	05/03/2027	05/01/2028
Group A:				
Lineman, Technician	$ 54.19	$ 56.70	$ 58.85	$ 61.15
Crane, Crawler Backhoe	54.19	56.70	58.85	61.15
Certified Welder	56.90	59.54	61.79	64.21
Group B:				
Digging Machine	$ 48.77	$ 51.03	$ 52.97	$ 55.04
Group C:				
Tractor Trailer Driver	$ 46.06	$ 48.20	$ 50.02	$ 51.98
Groundman, Truck Driver	43.35	45.36	47.08	48.92
Equipment Mechanic	43.35	45.36	47.08	48.92
Group D:				
Flagger	$ 32.51	$ 34.02	$ 35.31	$ 36.69

Above rates are applicable for installation, testing, operation, maintenance and repair on all Traffic Control (Signal) and Illumination (Lighting) projects, Traffic Monitoring Systems, and Road Weather Information Systems. Includes digging of holes for poles, anchors, footer foundations for electrical equipment; assembly of all electrical materials or raceway; placing of fish wire; pulling of cables, wires or fiber optic cable through such raceways; splicing of conductors; dismantling of such structures, lines or equipment.

SHIFT WORK
THE FOLLOWING RATES WILL APPLY ON ALL CONTRACTING AGENCY MANDATED MULTIPLE SHIFTS OF AT LEAST FIVE (5) DAYS DURATION WORKED BETWEEN THE HOURS LISTED BELOW:

1ST SHIFT	8:00 AM TO 4:30 PM REGULAR RATE
2ND SHIFT	4:30 PM TO 1:00 AM REGULAR RATE PLUS 17.3%
3RD SHIFT	12:30 AM TO 9:00 AM REGULAR RATE PLUS 31.4%

SUPPLEMENTAL BENEFITS
Per hour worked:

	07/01/2025	05/04/2026	05/03/2027	05/01/2028
Group A	$ 31.90*	$ 32.90*	$ 34.40*	$ 35.90*
Group B	$ 27.90*	$ 28.90*	$ 30.40*	$ 31.90*
Group C	$ 27.70*	$ 28.50*	$ 29.70*	$ 30.90*
Group D	$ 27.65*	$ 28.40*	$ 29.53*	$ 30.66*

* Plus 7% of the hourly wage paid. The 7% is based on straight time or premium time.

OVERTIME PAY
See (B, E, Q, X) on OVERTIME PAGE. NOTE: Double time for all emergency work designated by the Dept. of Jurisdiction.
WAGE CAP - Double the straight time hourly base wage shall be the maximum hourly wage compensation for any hour worked. Contractor is still responsible to pay the hourly benefit amount for each hour worked.

HOLIDAY
Paid: See (5, 6, 8, 15, 25) on HOLIDAY PAGE
Overtime: See (5, 6, 8, 15, 25) on HOLIDAY PAGE
NOTE: All paid holidays falling on Saturday shall be observed on the preceding Friday. All paid holidays falling on Sunday shall be observed on the following Monday. Supplements for holidays paid at straight time.

REGISTERED APPRENTICES
WAGES per hour: 1000 hour terms at the following percentage of the applicable Journeyworker's Lineman wage.

1st	2nd	3rd	4th	5th	6th	7th
60%	65%	70%	75%	80%	85%	90%

SUPPLEMENTAL BENEFITS per hour:

	07/01/2025	05/04/2026	05/03/2027	05/01/2028
All terms:	$ 27.65*	$ 28.40*	$ 29.53*	$ 30.66*

* Plus 7% of the hourly wage paid. The 7% is based on straight time or premium time.

6-1249aReg8LT

Lineman Electrician - Tree Trimmer — 10/01/2025

JOB DESCRIPTION Lineman Electrician - Tree Trimmer **DISTRICT** 6

ENTIRE COUNTIES
Albany, Allegany, Broome, Cattaraugus, Cayuga, Chautauqua, Chemung, Chenango, Clinton, Columbia, Cortland, Delaware, Dutchess, Erie, Essex, Franklin, Fulton, Genesee, Greene, Hamilton, Herkimer, Jefferson, Lewis, Livingston, Madison, Monroe, Montgomery, Niagara, Oneida, Onondaga, Ontario, Orange, Orleans, Oswego, Otsego, Putnam, Rensselaer, Rockland, Saratoga, Schenectady, Schoharie, Schuyler, Seneca, St. Lawrence, Steuben, Sullivan, Tioga, Tompkins, Ulster, Warren, Washington, Wayne, Wyoming, Yates

WAGES
Applies to line clearance, tree work and right-of-way preparation on all new or existing energized overhead or underground electrical, telephone and CATV lines. This also includes stump removal near underground energized electrical lines including telephone and CATV lines.

Per hour:	07/01/2025	01/04/2026	01/03/2027
Tree Trimmer	$ 33.18	$ 34.67	$ 36.23
Equipment Operator	29.35	30.67	32.05
Equipment Mechanic	29.35	30.67	32.05
Truck Driver	23.85	24.93	26.05
Groundman	19.64	20.53	21.45
Flagger	15.50	16.20	16.93

SUPPLEMENTAL BENEFITS
Per hour:

	07/01/2025	01/04/2026	01/03/2027
Journeyworker	$ 10.98*	$ 11.23*	$ 11.48*

* Plus 4.5% of the hourly wage paid. The 4.5% is based on straight time rate or premium rate.

OVERTIME PAY
See (B, E, Q, X) on OVERTIME PAGE
WAGE CAP - Double the straight time hourly base wage shall be the maximum hourly wage compensation for any hour worked. Contractor is still responsible to pay the hourly benefit amount for each hour worked.

HOLIDAY
Paid: See (5, 6, 8, 15, 16, 25) on HOLIDAY PAGE
Overtime: See (5, 6, 8, 15, 16, 25) on HOLIDAY PAGE
NOTE: All paid holidays falling on a Saturday shall be observed on the preceding Friday. All paid holidays falling on a Sunday shall be observed on the following Monday.

6-1249TT

Mason - Building — 10/01/2025

JOB DESCRIPTION Mason - Building **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Dutchess, Kings, Nassau, New York, Orange, Putnam, Queens, Richmond, Rockland, Suffolk, Sullivan, Ulster, Westchester

WAGES
Per Hour:

	07/01/2025	07/07/2025	01/05/2026 Additional
Marble Cutters & Setters	$ 64.21	$ 64.66	$ 0.75

SUPPLEMENTAL BENEFITS
Per Hour:

Journeyworker	$ 40.51	$ 40.82

OVERTIME PAY
See (B, E, Q, V) on OVERTIME PAGE

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 8, 11, 15, 16, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES
Wage Per Hour:

750 hour terms at the following wage

	1st	2nd	3rd	4th	5th	6th	7th	8th
	0-3000	3001-3750	3751-4500	4501-5250	5251-6000	6001-6750	6751-7500	7500+
07/01/2025	$27.24	$40.84	$44.25	$47.63	$51.05	$54.58	$60.99	$64.21
07/07/2025	$27.60	$41.50	$44.98	$48.45	$51.94	$54.81	$64.66	$64.66

Supplemental Benefits per hour:

	1st	2nd	3rd	4th	5th	6th	7th	8th
07/01/2025	$26.88	$30.14	$30.95	$31.78	$32.59	$38.07	$39.71	$40.51
07/07/2025	$26.95	$30.02	$30.78	$31.55	$32.32	$38.53	$40.82	$40.82

9-7/4

Mason - Building — 10/01/2025

JOB DESCRIPTION Mason - Building **DISTRICT** 11

ENTIRE COUNTIES
Dutchess, Sullivan, Ulster

PARTIAL COUNTIES
Orange: Entire county except the Township of Tuxedo.

WAGES
Per hour:

	07/01/2025
Bricklayer	$ 47.96
Cement Mason	47.96
Plasterer/Stone Mason	47.96
Pointer/Caulker	47.96

Additional $1.00 per hour for power saw work
Additional $0.50 per hour for swing scaffold or staging work

SHIFT WORK
SHIFT WORK: When shift work or an irregular workday is mandated or required by state, federal, county, local or other governmental agency contracts, the following premiums apply:
Irregular workday requires 15% premium
Second shift an additional 15% of wage plus benefits to be paid
Third shift an additional 25% of wage plus benefits to be paid

SUPPLEMENTAL BENEFITS
Per hour:

Journeyman	$ 38.61

OVERTIME PAY

Cement Mason	See (B, E, Q, W) on OVERTIME PAGE.
All Others	See (B, E, Q) on OVERTIME PAGE.

HOLIDAY

Paid:	See (1) on HOLIDAY PAGE
Overtime:	See (5, 6, 16, 25) on HOLIDAY PAGE

Whenever any of the above holidays fall on Sunday, they will be observed on Monday. Whenever any of the above holidays fall on Saturday, they will be observed on Friday.

REGISTERED APPRENTICES
Wages per hour:

750 hour terms at the following percentage of Journeyman's wage

1st	2nd	3rd	4th	5th	6th	7th	8th
50%	55%	60%	65%	70%	75%	80%	85%

Supplemental Benefits per hour

750 hour terms at the following percentage of journeyman supplements

1st	2nd	3rd	4th	5th	6th	7th	8th
50%	55%	60%	65%	70%	75%	80%	85%

11-5du-b

Mason - Building — 10/01/2025

JOB DESCRIPTION Mason - Building **DISTRICT** 9

ENTIRE COUNTIES
Dutchess, Orange, Putnam, Sullivan, Ulster

WAGES

Per hour:	07/01/2025	12/01/2025 Additional	06/01/2026 Additional
Tile, Marble,& Terrazzo Mechanic/Setter	$ 58.52	$ 0.90	$ 1.12

SUPPLEMENTAL BENEFITS
Per Hour:
Journeyworker: $ 26.16*
+6.16

* This portion of benefits subject to same premium rate as shown for overtime wages.

OVERTIME PAY
See (B, E, Q) on OVERTIME PAGE
Double time rate applies after 10 hours

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 11, 15, 16, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES
Wage per hour:
(Counties of Orange & Putnam)
750 hour terms at the following wage rate:

1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
1-750	751-1500	1501-2250	2251-3000	3001-3750	3751-4500	4501-5250	5251-6000	6001-6750	6751-7500
07/01/2025									
$22.32	$27.46	$34.56	$39.66	$43.35	$46.96	50.69	$55.79	$58.36	$65.03

Supplemental Benefits per hour:
(Counties of Orange & Putnam)

1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
07/01/2025									
$13.00* + 0.76	$13.00* + 0.81	$16.11* + 0.92	$16.11* + 0.97	$17.11* + 1.44	$18.61* + 1.49	$19.61* + 1.92	$19.61* + 1.97	$19.61* + 4.57	$29.61* + 8.53

Wages per hour:
(Counties of Dutchess, Sullivan, Ulster)

750 hour terms at the following wage rate:

1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
1-750	751-1500	1501-2250	2251-3000	3001-3750	3751-4500	4501-5250	5251-6000	6001-6750	6751-7500
07/01/2025									
$21.31	$25.76	$27.62	$32.09	$35.13	$39.09	$42.67	$46.14	$47.59	$51.76

Supplemental Benefits per hour:
(Counties of Dutchess, Sullivan, Ulster)

1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
07/01/2025									
$14.00* + 0.76	$14.00* + 0.81	$16.61* + 0.85	$16.61* + 0.90	$17.61* + 1.36	$18.11* + 1.41	$18.61* + 1.83	$19.61* + 1.88	$19.61* + 4.94	$24.36* + 5.03

* This portion of benefits subject to same premium rate as shown for overtime wages.

9-7/52B

Mason - Building — 10/01/2025

JOB DESCRIPTION Mason - Building **DISTRICT** 9

ENTIRE COUNTIES
Dutchess, Orange, Putnam, Sullivan, Ulster

WAGES

Per hour:	07/01/2025	12/01/2025	06/01/2026
Building		Additional	Additional
Tile, Marble, & Terrazzo Finisher	$ 48.18	$ 0.77*	$ 0.95*

*To be allocated at a later date.

SUPPLEMENTAL BENEFITS
Journeyworker:

Per Hour	$ 22.96*

+ 6.02

*This portion of benefits subject to same premium rate as shown for overtime wages

OVERTIME PAY
See (A, *E, Q) on OVERTIME PAGE
Double time rate applies after 10 hours on Saturdays.

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 11, 15, 16, 25) on HOLIDAY PAGE

9-7/88B-tf

Mason - Heavy&Highway 10/01/2025

JOB DESCRIPTION Mason - Heavy&Highway **DISTRICT** 11

ENTIRE COUNTIES
Dutchess, Sullivan, Ulster

PARTIAL COUNTIES
Orange: Entire county except the Township of Tuxedo.

WAGES
Per hour:

	07/01/2025
Bricklayer	$ 48.46
Cement Mason	48.46
Marble/Stone Mason	48.46
Plasterer	48.46
Pointer/Caulker	48.46

Additional $1.00 per hour for power saw work
Additional $0.50 per hour for swing scaffold or staging work

SHIFT WORK
When shift work or an irregular workday is mandated or required by state, federal, county, local or other governmental contracts, the following rates apply:

Irregular workday requires 15% premium
Second shift an additional 15% of wage plus benefits to be paid
Third shift an additional 25% of wage plus benefits to be paid

SUPPLEMENTAL BENEFITS
Per hour:
Journeyman $ 38.61

OVERTIME PAY
Cement Mason See (B, E, Q, W)
All Others See (B, E, Q)

HOLIDAY
Paid: See (5, 6, 16, 25) on HOLIDAY PAGE
Overtime: See (5, 6, 16, 25) on HOLIDAY PAGE
- Whenever any of the above holidays fall on Sunday, they will be observed on Monday. Whenever any of the above holidays fall on Saturday, they will be observed on Friday.
- Supplemental Benefits are not paid for paid Holiday
- If Holiday is worked, Supplemental Benefits are paid for hours worked.
- Whenever an Employee works within three (3) calendar days before a holiday, the Employee shall be paid for the Holiday.

REGISTERED APPRENTICES
Wages per hour:

750 hour terms at the following percentage of Journeyman's wage

1st	2nd	3rd	4th	5th	6th	7th	8th
50%	55%	60%	65%	70%	75%	80%	85%

Supplemental Benefits per hour

750 hour terms at the following percentage of journeyman supplements

1st	2nd	3rd	4th	5th	6th	7th	8th
50%	55%	60%	65%	70%	75%	80%	85%

11-5du-H/H

Operating Engineer - Building **10/01/2025**

JOB DESCRIPTION Operating Engineer - Building **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, New York, Putnam, Queens, Richmond, Westchester

PARTIAL COUNTIES
Dutchess: that part of Dutchess County lying south of the North City Line of the City of Poughkeepsie.

WAGES
NOTE: Construction surveying
Party Chief--One who directs a survey party
Instrument Man--One who runs the instrument and assists Party Chief.
Rodman--One who holds the rod and assists the Survey Crew

Wages:(Per Hour)	07/01/2025
Building Construction:	
Party Chief	$ 81.94
Instrument Man	60.49
Rodman	40.63
Steel Erection:	
Party Chief	$ 84.04
Instrument Man	63.19
Rodman	43.31
Heavy Construction-NYC counties only: (Foundation, Excavation.)	
Party Chief	$ 88.97
Instrument man	66.04
Rodman	55.85

SUPPLEMENTAL BENEFITS

Per Hour:	07/01/2025
Building Construction	$ 29.45* + 7.65
Steel Erection	31.25* + 7.65
Heavy Construction	32.06* + 7.64

* This portion subject to SAME premium as wages

Non-Worked Holiday Supplemental Benefit:
$ 22.48

OVERTIME PAY
See (A, B, E, Q) on OVERTIME PAGE
Code "A" applies to Building Construction and has double the rate after 7 hours on Saturdays.
Code "B" applies to Heavy Construction and Steel Erection and has double the rate after 8 hours on Saturdays.

HOLIDAY
Paid: See (5, 6, 9, 11, 15, 16, 25) on HOLIDAY PAGE
Overtime: See (5, 6, 9, 11, 15, 16, 25) on HOLIDAY PAGE

9-15Db

Operating Engineer - Building **10/01/2025**

JOB DESCRIPTION Operating Engineer - Building **DISTRICT** 8

ENTIRE COUNTIES
Putnam, Westchester

PARTIAL COUNTIES

Dutchess: All the counties of Westchester and Putnam and the southern part of Dutchess County defined by the northern boundary line of the City of Poughkeepsie, then due east to Route 115, then north along Route 115 to Bedell Road, then east along Bedell Road to Van Wagner Road, then north along Van Wagner Road to Bower Road, then east along Bower Road to Route 44 and along Route 44 east to Route 343, then along Route 343 east to the northern boundary of Town of Dover Plains and east along the northern boundary of Town of Dover Plains to the border line of the State of Connecticut and bordered on the west by the middle of the Hudson River.

WAGES

GROUP I:
Cranes (All Types up to 49 tons), Boom Trucks, Cherry Pickers (All Types), Clamshell Crane, Derrick (Stone and Steel), Dragline, Franki Pile Rig or similar, High Lift (Lull or similar) with crane attachment and winch used for hoisting or lifting, Hydraulic Cranes, Pile Drivers, Potain and similar.

Cranes (All types 50-99 tons), Drill Rig Casa Grande (CAT or similar), Franki Pile Rig or similar, Hydraulic Cranes (All types including Crawler Cranes- No specific boom length).

Cranes (All types 100 tons and over), All Tower Cranes, All Climbing Cranes irrespective of manufacturer and regardless of how the same is rigged, Franki Pile Rig or similar, Conventional Cranes (All types including Crawler Cranes-No specific boom length), Hydraulic Cranes.

GROUP I-A: Barber Green Loader-Euclid Loader, Bulldozer, Carrier-Trailer Horse, Concrete Cleaning Decontamination Machine Operator, Concrete-Portable Hoist, Conway or Similar Mucking Machines, Elevator & Cage, Excavators all types, Front End Loaders, Gradall, Shovel, Backhoe, etc.(Crawler or Truck), Heavy Equipment Robotics Operator/Mechanic, Hoist Engineer-Material, Hoist Portable Mobile Unit, Hoist(Single, Double or Triple Drum), Horizontal Directional Drill Locator, Horizontal Directional Drill Operator and Jersey Spreader, Letourneau or Tournapull(Scrapers over 20 yards Struck), Lift Slab Console, etc., Lull HiLift or Similar, Master Environmental Maintenance Mechanics, Mucking Machines Operator/Mechanic or Similar Type, Overhead Crane, Pavement Breaker(Air Ram), Paver(Concrete), Post Hole Digger, Power House Plant, Road Boring Machine, Road Mix Machine, Ross Carrier and Similar Machines, Rubber tire double end backhoes and similar machines, Scoopmobile Tractor-Shovel Over 1.5 yards, Shovel (Tunnels), Spreader (Asphalt) Telephie(Cableway), Tractor Type Demolition Equipment, Trenching Machines-Vermeer Concrete Saw Trencher and Similar, Ultra High Pressure Waterjet Cutting Tool System, Vacuum Blasting Machine operator/mechanic, Winch Truck A Frame.

GROUP I-B: Compressor (Steel Erection), Mechanic (Outside All Types), Negative Air Machine (Asbestos Removal), Push Button (Buzz Box) Elevator.

GROUP II: Compactor Self-Propelled, Concrete Pump, Crane Operator in Training (Over 100 Tons), Grader, Machines Pulling Sheep's Foot Roller, Roller (4 ton and over), Scrapers (20 yards Struck and Under), Vibratory Rollers, Welder.

GROUP III-A: Asphalt Plant, Concrete Mixing Plants, Forklift (All power sources), Joy Drill or similar, Tractor Drilling Machine, Loader (1 1/2 yards and under), Portable Asphalt Plant, Portable Batch Plant, Portable Crusher, Skid Steer (Bobcat or similar), Stone Crusher, Well Drilling Machine, Well Point System.

GROUP III-B: Compressor Over 125 cu. Feet, Conveyor Belt Machine regardless of size, Compressor Plant, Ladder Hoist, Stud Machine.

GROUP IV-A: Batch Plant, Concrete Breaker, Concrete Spreader, Curb Cutter Machine, Finishing Machine-Concrete, Fine Grading Machine, Hepa Vac Clean Air Machine, Material Hopper(sand, stone, cement), Mulching Grass Spreader, Pump Gypsum etc, Pump-Plaster-Grout-Fireproofing. Roller(Under 4 Ton),Spreading and Fine Grading Machine, Steel Cutting Machine, Siphon Pump, Tar Joint Machine, Television Cameras for Water, Sewer, Gas etc. Turbo Jet Burner or Similar Equipment, Vibrator (1 to 5).

GROUP IV-B: Compressor (all types), Heater (All Types), Fire Watchman, Lighting Unit (Portable & Generator) Pump, Pump Station(Water, Sewer, Portable, Temporary), Welding Machine (Steel Erection & Excavation).

GROUP V: Mechanics Helper, Motorized Roller (walk behind), Stock Attendant, Welder's Helper, Maintenance Engineer Crane(75 ton and over).

Group VI-A: Welder Certified
GROUP VI-B: Utility Man, Warehouse Man.

WAGES: (per hour)

	07/01/2025	03/02/2026
GROUP I		
Cranes- up to 49 tons	$ 69.25	$ 71.19
Cranes- 50 tons to 99 tons	71.67	73.69
Cranes- 100 tons and over	81.89	84.27
GROUP I-A	60.56	62.20
GROUP I-B	55.77	57.24
GROUP II	58.42	59.98
GROUP III-A	56.26	57.75
GROUP III-B	53.54	54.93
GROUP IV-A	55.69	57.16
GROUP IV-B	47.01	48.17

GROUP V	50.72	52.01
Group VI-A	59.54	61.05
GROUP VI-B		
Utility Man	48.10	49.30
Warehouse Man	50.44	51.72

An additional 20% to wage when required to wear protective equipment on hazardous/toxic waste projects.
Engineers operating cranes with booms 100 feet but less than 149 feet in length will be paid an additional $2.00 per hour.
Engineers operating cranes with booms 149 feet or over in length will be paid an additional $3.00 per hour.
Loader operators over 5 cubic yard capacity additional .50 per hour.
Shovel operators over 4 cubic yard capacity additional $1.00 per hour.

SUPPLEMENTAL BENEFITS
Per hour:

Journeyworker	$ 32.92	34.52

OVERTIME PAY
See (B, E, Q, V) on OVERTIME PAGE

HOLIDAY
Paid: See (5, 6, 8, 15, 25, 26) on HOLIDAY PAGE
Overtime: See (5, 6, 8, 15, 25, 26, 28) on HOLIDAY PAGE

8-137B

Operating Engineer - Building — 10/01/2025

JOB DESCRIPTION Operating Engineer - Building **DISTRICT** 1

ENTIRE COUNTIES
Albany, Clinton, Columbia, Essex, Franklin, Fulton, Greene, Hamilton, Herkimer, Montgomery, Otsego, Rensselaer, Saratoga, Schenectady, Schoharie, Warren, Washington

PARTIAL COUNTIES
Dutchess: Defined as north of the northern boundary line of City of Poughkeepsie then due east to Route 115 to Bedell Road then east along Bedell Road to VanWagner Road then north along VanWagner Road to Bower Road then east along Bower Road to Rte. 44 east to Route 343 then along Route 343 east to the northern boundary of Town of Dover Plains and east along the northern boundary of Town of Dover Plains to Connecticut.

WAGES
NOTE:
-- In the event that equipment listed below is operated by robotic control, the classification covering the operation will be the same as if manually operated.
-- If a second employee is required by the employer for operation of any covered machine, they shall be an Engineer Class C

CLASS A1*: All cranes that require A NYS crane license, tower cranes**(including self erecting), hydraulic cranes, locomotive crane, piledriver, cableway, derricks, whirlies, dragline, boom trucks, cherry pickers, overhead cranes (gantry or saddle type), truck cranes

CLASS A:
Shovel, Excavators 18,001 lbs. and above(including rubber tire full swing), Gradalls, power road grader, all CMI equipment, front-end rubber tire loader, tractor-mounted drill (quarry master), mucking machine, concrete central mix plant, concrete pump, belcrete system, automated asphalt concrete plant, and tractor road paver, boom trucks 5 tons and under, maintenance engineer, self-contained crawler drill-hydraulic rock drill, Profiler/Milling machine.

CLASS B:
Excavators 18,000 lbs. and under, Backhoes (rubber tired backhoe/loader combination), bulldozer, pushcat, tractor, traxcavator, scraper, LeTourneau grader, form fine grader, self-propelled soil compactor (fill roller), asphalt roller, blacktop spreader, power brooms, sweepers, trenching machine, Barber Green loader, side booms, hydro hammer, concrete spreader, concrete finishing machine, one drum hoist, power hoisting (single drum), hoist two drum or more, three drum engine, power hoisting (two drum and over), two drum and swinging engine, three drum swinging engine, hod hoist, A-L frame winches, core and well drillers (one drum), post hole digger, model CHB Vibro-Tamp or similar machine, batch bin and plant operator, dinky locomotive, skid steer loader, track excavator 5/8 cubic yard or smaller, front end rubber tired loader under four cubic yards, vacum machine (mounted or towed).

CLASS C:
Fork lift, high lift, all terrain fork lift: or similar, oiler, fireman and heavy-duty greaser, boilers and steam generators, pump, vibrator, motor mixer, air compressor, dust collector, welding machine, well point, mechanical heater, generators, temporary light plants, electric submersible pumps 4" and over, murphy type diesel generator, conveyor, elevators, concrete mixer, beltcrete power pack (belcrete system), seeding, and mulching machines, pumps, rotating telehandler (that does not require NYS crane license).

WAGES per hour

	07/01/2025
Class A1*	$ 55.42

Class A	$ 54.93
Class B	$ 53.91
Class C	$ 51.01

(*) TONNAGE RATING PREMIUMS:
Note: Additional value subject to same premiums as shown for OT
All cranes 1000 tons and over, A1 rate plus $7.00
All cranes 800-999 tons, A1 rate plus $6.00
All cranes 600-799 tons, A1 rate plus $5.00
All cranes 400-599 tons, A1 rate plus $4.00
All cranes 200-399 tons, A1 rate plus $3.00
All cranes 111-199 tons, A1 rate plus $2.25
All cranes 110 tons and under, A1 rate only

(**)Additional $0.50 per hr on A1 rate for Tower Cranes (no tonnage premiums apply)
Additional $2.50 per hr over B rate for Nuclear Leader work.
Additional $2.50 per hour if work requires Personal Protective Equipment for hazardous waste site activities with a level C or over rating.

SUPPLEMENTAL BENEFITS
Per hour

	07/01/2025
Journeyworker	$ 33.50

OVERTIME PAY
See (B, E, Q) on OVERTIME PAGE

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6) on HOLIDAY PAGE
NOTE: All hours worked on designated holidays shall be paid a double the hourly rate of pay plus 8 hours of straight time.
NOTE: If a holiday falls on Sunday, it will be celebrated on Monday. If the holiday falls on Saturday, it will be celebrated on Friday.

REGISTERED APPRENTICES
Wages per hour

1000 hours terms at the following percentage of Journeyworker's wage Class B

1st	2nd	3rd	4th
60%	70%	80%	90%

Supplemental Benefits per hour worked

	07/01/2025
All terms	$ 28.80

1-158 Alb

Operating Engineer - Building — 10/01/2025

JOB DESCRIPTION Operating Engineer - Building **DISTRICT** 1

ENTIRE COUNTIES
Broome, Chenango, Tioga

PARTIAL COUNTIES
Dutchess: Defined as north of the northern boundary line of City of Poughkeepsie then due east to Route 115 to Bedell Road then east along Bedell Road to VanWagner Road then north along VanWagner Road to Bower Road then east along Bower Road to Rte. 44 east to Route 343 then along Route 343 east to the northern boundary of Town of Dover Plains and east along the northern boundary of Town of Dover Plains to Connecticut.

WAGES
NOTE:
--In the event that equipment listed below is operated by robotic control, the classification covering the operation will be the same as if manually operated.
--If a second employee is required by the employer for operation of any covered machine, they shall be an Engineer Class C

CLASS A1*: All cranes that require NYS crane license, tower cranes**(including self erecting), hydraulic cranes, locomotive crane, piledriver, cableway, derricks, whirlies, dragline, boom trucks, cherry pickers, overhead cranes (gantry or saddle type), truck cranes

CLASS A:

Shovel, Excavators 18,001 lbs. and above(including rubber tire full swing), Gradalls, power road grader, all CMI equipment, front-end rubber tire loader, tractor-mounted drill (quarry master), mucking machine, concrete central mix plant, concrete pump, belcrete system, automated asphalt concrete plant, and tractor road paver, boom trucks 5 tons and under, maintenance engineer, self-contained crawler drill-hydraulic rock drill, Profiler/Milling machine.

CLASS B:
Excavators 18,000 lbs. and under, Backhoes (rubber tired backhoe/loader combination), bulldozer, pushcat, tractor, traxcavator, scraper, LeTourneau grader, form fine grader, self-propelled soil compactor (fill roller), asphalt roller, blacktop spreader, power brooms, sweepers, trenching machine, Barber Green loader, side booms, hydro hammer, concrete spreader, concrete finishing machine, one drum hoist, power hoisting (single drum), hoist two drum or more, three drum engine, power hoisting (two drum and over), two drum and swinging engine, three drum swinging engine, hod hoist, A-L frame winches, core and well drillers (one drum), post hole digger, model CHB Vibro-Tamp or similar machine, batch bin and plant operator, dinky locomotive, skid steer loader, track excavator 5/8 cubic yard or smaller, front end rubber tired loader under four cubic yards, vacum machine (mounted or towed).

CLASS C:
Fork lift, high lift, all terrain fork lift: or similar, oiler, fireman and heavy-duty greaser, boilers and steam generators, pump, vibrator, motor mixer, air compressor, dust collector, welding machine, well point, mechanical heater, generators, temporary light plants, electric submersible pumps 4" and over, murphy type diesel generator, conveyor, elevators, concrete mixer, beltcrete power pack (belcrete system), seeding, and mulching machines, pumps, rotating telehandler (that does not require NYS crane license).

WAGES per hour

	07/01/2025
Class A1*	$ 51.71
Class A	$ 49.31
Class B	$ 48.85
Class C	$ 46.54

(*) TONNAGE RATING PREMIUMS:
Note: Additional value subject to same premiums as shown for OT
All cranes 1000 tons and over, A1 rate plus $7.00
All cranes 800-999 tons, A1 rate plus $6.00
All cranes 600-799 tons, A1 rate plus $5.00
All cranes 400-599 tons, A1 rate plus $4.00
All cranes 200-399 tons, A1 rate plus $3.00
All cranes 111-199 tons, A1 rate plus $2.25
All cranes 110 tons and under, A1 rate only

(**)Additional $0.50 per hr over A1 rate for Tower Cranes (no tonnage premium applies)
Additional $2.50 per hr over B rate for Nuclear Leader work.
Additional $2.50 per hour if work requires Personal Protective Equipment for hazardous waste site activities with a level C or over rating.

SUPPLEMENTAL BENEFITS
Per hour

	07/01/2025
Journeyworker	$ 32.95

OVERTIME PAY
See (B, E, Q) on OVERTIME PAGE

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6) on HOLIDAY PAGE
NOTE: All hours worked on designated holidays shall be paid a double the hourly rate of pay plus 8 hours of straight time.
NOTE: If a holiday falls on Sunday, it will be celebrated on Monday. If the holiday falls on Saturday, it will be celebrated on Friday.

REGISTERED APPRENTICES
Wages per hour

1000 hours terms at the following percentage of Journeyworker's wage Class B:

1st	2nd	3rd	4th
60%	70%	80%	90%

Supplemental Benefits per hour worked

	07/01/2025
All terms	$ 28.35

1-158 BCT

Operating Engineer - Heavy&Highway 10/01/2025

JOB DESCRIPTION Operating Engineer - Heavy&Highway **DISTRICT** 8

ENTIRE COUNTIES
Putnam, Westchester

PARTIAL COUNTIES
Dutchess: All the counties of Westchester and Putnam and the southern part of Dutchess County defined by the northern boundary line of the City of Poughkeepsie, then due east to Route 115, then north along Route 115 to Bedell Road, then east along Bedell Road to Van Wagner Road, then north along Van Wagner Road to Bower Road, then east along Bower Road to Route 44 and along Route 44 east to Route 343, then along Route 343 east to the northern boundary of Town of Dover Plains and east along the northern boundary of Town of Dover Plains to the border line of the State of Connecticut and bordered on the west by the middle of the Hudson River.

WAGES
GROUP I: Boom Truck, Cherry Picker, Clamshell, Crane, (Crawler, Truck),
Dragline, Drill Rig (Casa Grande, Cat, or Similar), Floating Crane (Crane on Barges) under 100 tons, Gin Pole, Hoist Engineer-Concrete (Crane-Derrick-Mine Hoist), Knuckle Boom Crane, Rough Terrain Crane.

GROUP I-A: Auger (Truck or Truck Mounted), Boat Captain, Bulldozer-All Sizes, Central Mix Plant Operator, Chipper (all types), Close Circuit T.V., Combination Loader/Backhoe, Compactor with Blade, Concrete Finishing Machine, Gradall, Grader (Motor Grader), Elevator & Cage (Materials or Passenger), Excavator (and all attachments), Front End Loaders (1 1/2 yards and over), High Lift Lull and similar, Hoist (Single, Double, Triple Drum), Hoist Portable Mobile Unit, Hoist Engineer (Material), Jack and Bore Machine, Log Skidders, Mill Machines, Mucking Machines, Overhead Crane, Paver (concrete), Post Pounder (of any type), Push Cats, Road Reclaimer, Robot Hammer (Brokk or similar), Robotic Equipment (Scope of Engineer Schedule), Ross Carrier and similar, Scrapers (20 yard struck and over), Side Boom, Slip Form Machine, Spreader (Asphalt), Trenching Machines (Telephies-Vermeer Concrete Saw), Tractor Type Demolition Equipment, Vacuum Truck. Vibratory Roller(Riding) or Roller used in mainline paving operations.

GROUP I-B: Asphalt Mobile Conveyor/Transfer Machine, Road Paver (Asphalt).

GROUP II-A: Ballast Regulators, Compactor Self Propelled, Fusion Machine, Rail Anchor Machines, Roller (4 ton and over), Scrapers (20 yard struck and under).

GROUP II-B: Mechanic (Outside) All Types, Shop Mechanic.

GROUP III: Air Tractor Drill, Asphalt Plant, Batch Plant, Boiler (High Pressure), Concrete Breaker (Track or Rubber Tire), Concrete Pump, Concrete Spreader, Excavator Drill, Farm Tractor, Forklift (all types), Gas Tapping (Live), Hydroseeder, Loader (1 1/2 yards and under), Locomotive (all sizes), Machine Pulling Sheeps Foot Roller, Portable Asphalt Plant, Portable Batch Plant, Portable Crusher (Apprentice), Powerhouse Plant, Roller (under 4 ton), Sheer Excavator, Skid Steer/Bobcat, Stone Crusher, Sweeper (with seat), Well Drilling Machine.

GROUP IV: Service Person (Grease Truck), Deckhand.

GROUP IV-B: Conveyor Belt Machine (Truck Mounted), Heater (all types), Lighting Unit (Portable), Maintenance Engineer (For Crane Only), Mechanics Helper, Pump (Fireproofing), Pumps-Pump Station/Water/Sewer/Gypsum/Plaster, etc., Pump Truck (Sewer Jet or Similar), Welders Helper, Welding Machine (Steel Erection), Well Point System.

GROUP V: All Tower Cranes-All Climbing Cranes and all cranes of 100-ton capacity or greater (3900 Manitowac or similar) irrespective of manufacturer and regardless of how the same is rigged, Hoist Engineer (Steel), Engineer-Pile Driver, Jersey Spreader, Pavement Breaker/Post Hole Digger.

WAGES: Per hour:	07/01/2025	03/02/2026
Group I	$ 70.57	$ 72.77
Group I-A	62.07	63.97
Group I-B	65.47	67.49
Group II-A	59.40	61.21
Group II-B	61.30	63.17
Group III	58.34	60.12
Group IV	52.91	54.49
Group IV-B	45.28	46.59
Group V		
Engineer All Tower, Climbing and Cranes of 100 Tons	80.08	82.61
Hoist Engineer(Steel)	72.41	74.67
Engineer(Pile Driver)	77.30	79.73
Jersey Spreader, Pavement Breaker (Air Ram)Post Hole Digger	60.80	62.66

Engineers operating cranes with booms 100 feet but less than 149 feet in length will be paid an additional $2.00 per hour over the rate listed in the Wage Schedule. Engineers operating cranes with booms 149 feet or over in length will be paid an additional $3.00 per hour over the rate listed in the Wage Schedule. Loader and Excavator Operators: over 5 cubic yards capacity $0.50 per hour over the rate listed in the Wage Schedule. Shovel Operators: over 4 cubic yards capacity $1.00 per hour over the rate listed in the Wage Schedule.

SHIFT WORK
A 15% premium on all hours paid, including overtime hours for 2nd, 3rd shifts
on all government mandated off-shift work

SUPPLEMENTAL BENEFITS
Per hour:

Journeyworker:	$ 36.48 up to 40 Hours	$ 38.08 up to 40 hours
	After 40 hours $ 26.58* PLUS $ 1.40 on all hours worked	After 40 hours $ 27.63* PLUS $ 1.45 on all hours worked

*This amount is subject to premium

OVERTIME PAY
See (B, E, P, *R, **U) on OVERTIME PAGE

HOLIDAY
Paid: See (5, 6, 8, 15, 25, 26, 28) on HOLIDAY PAGE
Overtime..... See (5, 6, 8, 15, 25, 26) on OVERTIME PAGE

* For Holiday codes 8,15,25,26 code R applies
** For Holiday codes 5 & 6 code U applies

Note: If employees are required to work on Easter Sunday they shall be paid at the rate of triple time.

REGISTERED APPRENTICES
(1)year terms at the following rate.

1st term	$ 37.24	$ 38.38
2nd term	43.45	44.78
3rd term	49.66	51.18
4th term	55.86	57.57

Supplemental Benefits per hour:

	$ 27.98	$ 29.08

8-137HH

Operating Engineer - Heavy&Highway — 10/01/2025

JOB DESCRIPTION Operating Engineer - Heavy&Highway **DISTRICT** 1

ENTIRE COUNTIES
Albany, Broome, Chenango, Clinton, Columbia, Essex, Franklin, Fulton, Greene, Hamilton, Herkimer, Montgomery, Otsego, Rensselaer, Saratoga, Schenectady, Schoharie, Tioga, Warren, Washington

PARTIAL COUNTIES
Dutchess: Defined as north of the northern boundary line of City of Poughkeepsie then due east to Route 115 to Bedell Road then east along Bedell Road to VanWagner Road then north along VanWagner Road to Bower Road then east along Bower Road to Rte. 44 east to Route 343 then along Route 343 east to the northern boundary of Town of Dover Plains and east along the northern boundary of Town of Dover Plains to Connecticut.

WAGES
NOTE:
--- In the event that equipment listed below is operated by robotic control, the classification covering the operation will be the same as if manually operated.
--- If a second employee is required by the employer for operation of any covered machine, they shall be an Engineer Class C

CLASSIFICATION A1*: All Cranes that require a NYS Crane License; tower cranes(including self erecting)**, hydraulic cranes, locomotive crane, piledriver, cableway, derricks, whirlies, dragline, boom trucks, cherry pickers, overhead cranes (gantry or saddle type), truck cranes

CLASSIFICATION A:

Asphalt Curb Machine (Self Propelled, Slipform), Asphalt Paver, Automated Concrete Spreader (CMI Type), Automatic Fine Grader, Backhoe (Except Tractor Mounted, Rubber Tired), Backhoe Excavator Full Swing (CAT 212 or similar type), Back Filling Machine, Belt Placer (CMI Type), Blacktop Plant (Automated), Blacktop Roller, Boom truck, GPS operated Bull Dozer, Cableway, Caisson Auger, Central Mix Concrete Plant (Automated), Concrete Curb Machine (Self Propelled, Slipform), Concrete Pump, Crane, Cherry Picker, Derricks (steel erection), Dragline, Overhead Crane (Gantry or Straddle type), Pile Driver, Truck Crane, Directional Drilling Machine, Dredge, Dual Drum Paver, Excavator (All Purpose Hydraulically Operated) (Gradall or Similar), Front End Loader (4 cu. yd. and Over), Head Tower (Sauerman or Equal), Hoist (Two or Three Drum), Holland Loader, Maintenance Engineer, Mine Hoist, Mucking Machine or Mole, PB-4 and similar type, Power Grader, Profiler/Milling Machine (over 105 H.P.), Quad 9, Quarry Master (or equivalent), Rotating Telehandler, Scraper (Including Challenger Type), Shovel, Side Boom, Slip Form Paver (If a second man is needed, he shall be an Oiler), Tractor Drawn BeltType Loader, Truck or Trailer Mounted Log Chipper (Self Feeder), Tug Operator (Manned Rented Equipment Excluded), Tunnel Shovel

CLASSIFICATION B:
Backhoe (Tractor Mounted, Rubber Tired), Bituminous Recycler Machine, Bituminous Spreader and Mixer, Blacktop Plant (Non-Automated), Blast or Rotary Drill (Truck or Tractor Mounted), Brokk, Boring Machine, Cage Hoist, Central Mix Plant [(Non-Automated) and All Concrete Batching Plants], Concrete Paver (Over 16S), Crawler Drill (Self-contained), Crusher, Diesel Power Unit, Drill Rigs, Tractor Mounted, Front End Loader (Under 4 cu. yd.), Greaseman/Lubrication Engineer, Hi Pressure Boiler (15 lbs. and over), Hoist (One Drum), Hydro-Axe, Kolman Plant Loader and Similar Type Loaders (If Employer requires another man to clean the screen or to maintain the equipment, he shall be an Oiler), L.C.M. Work Boat Operator, Locomotive, Material handling knuckle boom, Mini Excavator (under 18,000 lbs.), Mixer (for stabilized base self-propelled), Monorail Machine, Plant Engineer, Prentice Loader, Profiler/Milling Machine (105 H.P. and under), Pug Mill, Pump Crete, Ready Mix Concrete Plant, Refrigeration Equipment (for soil stabilization), Road Widener, Roller (all above subgrade), Sea Mule, Self-contained Ride-on Rock Drill(Excluding Air-Track Type Drill), Skidder, Tractor with Dozer and/or Pusher, Trencher, Tugger Hoist, Vacum machine (mounted or towed), Vermeer saw (ride on, any size or type), Welder, Winch, Winch Cat

CLASSIFICATION C:
A Frame Winch Hoist on Truck, Articulated Heavy Hauler, Aggregate Plant, Asphalt or Concrete Grooving Machine (ride on), Ballast Regulator(Ride-on), Boiler (used in conjunction with production), Bituminous Heater (self-propelled), Boat (powered), Cement and Bin Operator, Concrete Pavement Spreader and Finisher Concrete Paver or Mixer (16' and under), Concrete Saw (self-propelled), Conveyor, Deck Hand, Directional Drill Machine Locator, Drill (Core and Well), Farm Tractor with accessories, Fine Grade Machine, Fireman, Fork Lift, Form Tamper, Grout Pump, Gunite Machine, Hammers (Hydraulic self-propelled), Hydra-Spiker (ride-on), Hydraulic Pump (jacking system), Hydro-Blaster (Water), Mulching Machine, Oiler, Parapet Concrete or Pavement Grinder, Post Hole Digger and Post Driver, Power Broom (towed), Power Heaterman, Power Sweeper, Revinius Widener, Roller (Grade and Fill), Scarifier (ride-on), Shell Winder, Skid steer loader (Bobcat or similar; including all attachments), Span-Saw (ride-on), Steam Cleaner, Tamper (ride-on), Tie Extractor (ride-on), Tie Handler (ride-on), Tie Inserter (ride-on), Tie Spacer (ride-on), Tire Repair, Track Liner (ride-on), Tractor, Tractor (with towed accessories), Vibratory Compactor, Vibro Tamp, Well Point, and the following hands-off equipment: Compressors, Dust Collectors, Generators, Pumps, Welding Machines, Light Plants and Heaters

WAGES per hour

	07/01/2025
Class A1*	$ 60.30
Class A	57.30
Class B	56.39
Class C	53.82

(*) TONNAGE RATING PREMIUMS:
Cranes over 1000 tons, A1 rate plus $7.00
Cranes from 800-999 tons, A1 rate plus $6.00
Cranes from 600-799 tons, A1 rate plus $5.00
Cranes from 400-599 tons, A1 rate plus $4.00
Cranes from 200-399 tons, A1 rate plus $3.00
Cranes from 111-199 tons, A1 rate plus $2.00
Cranes from 65-110 tons, A1 rate plus $1.50
Cranes from 0-64 Tons, A1 rate only
NOTE: Additional value subject to same premiums as shown for OT

(**) Tower Cranes, A1 rate plus $3.00 (no tonnage premiums apply)
-- Cranes in Luffer Configuration, A1 rate plus $5.00
-- Cranes with external ballast (tray or wagon), A1 rate plus $5.00
NOTE: Additional value subject to same premiums as shown for OT

Additional $2.50 per hr. for hazardous waste removal work on State and/or Federally designated waste site which require employees to wear Level C or above forms of personal protection.

SHIFT WORK
Additional $2.50 per hour for All Employees who work a single irregular work shift, of at least 5 consecutive days, starting from 5:00 PM to 1:00 AM that is mandated by the Contracting Agency.

SUPPLEMENTAL BENEFITS
Per hour

	07/01/2025
Journeyworker	$ 33.70

OVERTIME PAY
See (B, E, Q) on OVERTIME PAGE

HOLIDAY
Paid: See (5, 6) on HOLIDAY PAGE
Overtime: See (5, 6) on HOLIDAY PAGE
Note: If the holiday falls on Sunday, it will be observed on Monday. If the observed Monday Holiday is worked, pay shall be double time plus Holiday pay for time worked. If the Holiday falls on a Saturday and is worked pay shall be double time plus Holiday pay for time worked. If the Holiday falls on a Saturday employer can choose to observe the paid holiday Saturday or give Friday off with holiday pay.

REGISTERED APPRENTICES
Wages per hour

1000 hours terms at the following percentage of Journeyworker's wage Class B

1st	2nd	3rd	4th
60%	70%	80%	90%

Supplemental Benefits per hour worked

	07/01/2025
All Terms	$ 28.30

1-158H/H Alb

Operating Engineer - Heavy&Highway — 10/01/2025

JOB DESCRIPTION Operating Engineer - Heavy&Highway **DISTRICT** 9

ENTIRE COUNTIES
Putnam, Westchester

PARTIAL COUNTIES
Dutchess: South of the North city line of Poughkeepsie

WAGES
Party Chief - One who directs a survey party
Instrument Man - One who runs the instrument and assists Party Chief
Rodman - One who holds the rod and in general, assists the Survey Crew
Categories cover GPS & Underground Surveying

Per Hour:	07/01/2025
Party Chief	$ 85.77
Instrument Man	63.48
Rodman	53.53

SUPPLEMENTAL BENEFITS

Per Hour:	07/01/2025
All Categories	
Straight Time:	$ 32.06* + $7.64
Premium:	
Time & 1/2	$ 48.09* + $7.64
Double Time	$ 64.12* + $7.64

*This portion is subject to the SAME premium as wages.

Non-Worked Holiday Supplemental Benefits:
$ 22.47

OVERTIME PAY
See (B, *E, Q) on OVERTIME PAGE
* Doubletime paid on all hours in excess of 8 hours on Saturday

HOLIDAY
Paid: See (5, 6, 7, 11, 12) on HOLIDAY PAGE
Overtime: See (5, 6, 7, 11, 12) on HOLIDAY PAGE

9-15Dh

Operating Engineer - Heavy&Highway - Tunnel 10/01/2025

JOB DESCRIPTION Operating Engineer - Heavy&Highway - Tunnel **DISTRICT** 8

ENTIRE COUNTIES
Putnam, Westchester

PARTIAL COUNTIES
Dutchess: All the counties of Westchester and Putnam and the southern part of Dutchess County defined by the northern boundary line of the City of Poughkeepsie, then due east to Route 115, then north along Route 115 to Bedell Road, then east along Bedell Road to Van Wagner Road, then north along Van Wagner Road to Bower Road, then east along Bower Road to Route 44 and along Route 44 east to Route 343, then along Route 343 east to the northern boundary of Town of Dover Plains and east along the northern boundary of Town of Dover Plains to the border line of the State of Connecticut and bordered on the west by the middle of the Hudson River.

WAGES
GROUP I: Boom Truck, Cherry Picker, Clamshell, Crane(Crawler, Truck), Dragline, Drill Rig Casa Grande(Cat or Similar), Floating Crane(Crane on Barge-Under 100 Tons), Hoist Engineer(Concrete/Crane-Derrick-Mine Hoist), Knuckle Boom Crane, Rough Terrain Crane.

GROUP I-A: Auger(Truck or Truck Mounted), Boat Captain, Bull Dozer-all sizes, Central Mix Plant Operator, Chipper-all types, Close Circuit T.V., Combination Loader/Backhoe, Compactor with Blade, Concrete Finishing Machine, Gradall, Grader(Motor Grader), Elevator & Cage(Materials or Passengers), Excavator(and all attachments), Front End Loaders(1 1/2 yards and over), High Lift Lull, Hoist(Single, Double, Triple Drum), Hoist Portable Mobile Unit, Hoist Engineer(Material), Jack and Bore Machine, Log Skidder, Milling Machine, Moveable Concrete Barrier Transfer & Transport Vehicle, Mucking Machines. Overhead Crane, Paver(Concrete), Post Pounder of any type, Push Cats, Road Reclaimer, Robot Hammer(Brokk or similar), Robotic Equipment(Scope of Engineer Schedule), Ross Carrier and similar machines, Scrapers(20 yards struck and over), Side Boom, Slip Form Machine, Spreader(Asphalt), Trenching Machines, Telephies-Vermeer Concrete Saw, Tractor type demolition equipment, Vacuum Truck, Vibratory Roller (Riding) used in mainline paving operations.

GROUP I-B: Asphalt Mobile Conveyor/Transfer Machine, Road Paver(Asphalt).

GROUP II-A: Ballast Regulators, Compactor(Self-propelled), Fusion Machine, Rail Anchor Machines, Roller(4 ton and over), Scrapers(20 yard struck and under).

GROUP II-B: Mechanic(outside)all types, Shop Mechanic.

GROUP III: Air Tractor Drill, Asphalt Plant, Batch Plant, Boiler(High Pressure), Concrete Breaker(Track or Rubber Tire), Concrete Pump, Concrete Spreader, Excavator Drill, Farm Tractor, Forklift(all types of power), Gas Tapping(Live), Hydroseeder, Loader(1 1/2 yards and under), Locomotive(all sizes), Machine Pulling Sheeps Foot Roller, Portable Asphalt Plant, Portable Batch Plant, Portable Crusher(Apprentice), Powerhouse Plant, Roller(under 4 ton), Sheer Excavator, Skidsteer/Bobcat, Stone Crusher, Sweeper(with seat), Well Drilling Machine.

GROUP IV-A: Service Person(Grease Truck), Deckhand.

GROUP IV-B: Conveyor Belt Machine(Truck Mounted), Heater(all types), Lighting Unit(Portable), Maintenance Engineer(for Crane only), Mechanics Helper, Pump(Fireproofing), Pumps-Pump Station/Water/Sewer/Gypsum/Plaster, etc., Pump Truck(Sewer Jet or similar), Welding Machine(Steel Erection), Welders Helper.

GROUP V-A: Engineer(all Tower Cranes, all Climbing Cranes & all Cranes of 100 ton capacity or greater),Hoist Engineer(Steel-Sub Structure), Engineer-Pile Driver, Jersey-Spreader, Pavement breaker, Post Hole Digger

WAGES: (per hour)

	07/01/2025	03/02/2026
GROUP I	$ 70.57	$ 72.77
GROUP I-A	62.07	63.97
GROUP I-B	65.47	67.49
GROUP II-A	59.40	61.21
GROUP II-B	61.30	63.17
GROUP III	58.34	60.12
GROUP IV-A	52.91	54.49
GROUP IV-B	45.28	46.59
GROUP V-A Engineer-Cranes	80.08	82.61

Engineer-Pile Driver	77.30	79.73
Hoist Engineer	72.41	74.67
Jersey Spreader/Post Hole Digger	60.80	62.66

An additional 20% to wage when required to wear protective equipment on hazardous/toxic waste projects. Operators required to use two buckets pouring concrete on other than road pavement shall receive $0.50 per hour over scale. Engineers operating cranes with booms 100 feet but less than 149 feet in length will be paid an additional $2.00 per hour. Engineers operating cranes with booms 149 feet or over in length will be paid an additional $3.00 per hour. Operators of shovels with a capacity over (4) cubic yards shall be paid an additional $1.00 per hour. Operators of loaders with a capacity over (5) cubic yards shall be paid an additional $0.50 per hour.

SHIFT WORK
A 15% premium on all hours paid, including overtime hours for 2nd, 3rd shifts
on all government mandated off-shift work

SUPPLEMENTAL BENEFITS
Per hour:
Journeyworker:

	$ 36.48 up to 40 hours After 40 hours $26.58 plus $1.40 on all hours worked	$ 38.08 up to 40 hours After 40 hours $27.63 plus $1.45 on all hours worked

OVERTIME PAY
See (D, O, *U, V) on OVERTIME PAGE

HOLIDAY
Paid: See (5, 6, 8, 15, 25, 26) on HOLIDAY PAGE
Overtime: See (5, 6, 8, 15, 25, 26) on HOLIDAY PAGE
* Note: For Holiday codes 5 & 6, code U applies.
For Holiday codes 8, 15, 25, 26, code R applies.
Note: If employees are required to work on Easter Sunday, they shall be paid at the rate of triple time.

REGISTERED APPRENTICES
(1)year terms at the following rates:

1st term	$ 37.24	$ 38.38
2nd term	43.45	44.78
3rd term	49.66	51.18
4th term	55.86	57.57
Supplemental Benefits per hour:		
All terms	$ 27.98	$ 29.08

8-137Tun

Operating Engineer - Marine Dredging — 10/01/2025

JOB DESCRIPTION Operating Engineer - Marine Dredging **DISTRICT** 4

ENTIRE COUNTIES
Albany, Bronx, Cayuga, Clinton, Columbia, Dutchess, Essex, Franklin, Greene, Jefferson, Kings, Monroe, Nassau, New York, Orange, Oswego, Putnam, Queens, Rensselaer, Richmond, Rockland, St. Lawrence, Suffolk, Ulster, Washington, Wayne, Westchester

WAGES
These wage rates do not apply to Operating Engineers on land-based construction projects. For those projects, refer to the Operating Engineers Heavy/Highway rates. The wage rates listed below apply specifically to all equipment and operators involved in marine dredging work within navigable waters located in the counties listed above.

Per Hour:	07/01/2025	10/01/2025
CLASS A1 Deck Captain, Leverman, Mechanical Dredge Operator, Licensed Tug Operator with MOTV	$ 47.07	$ 48.48

CLASS A2 Crane Operator (360 swing)	41.94	43.20
CLASS B Dozer, Front Loader Operator (On Land)	To conform to Operating Engineer Prevailing Wage in locality where work is being performed including benefits.	
CLASS B1 Derrick Operator (180 swing), Spider/Spill Barge Operator I/II, Fill Placer, Engineer, Chief Mate, Electrician,Chief Welder,Maintenance Engineer, Licensed Boat, Crew Boat Operator	40.71	41.93
CLASS B2 Certified Welder	38.31	39.46
CLASS C1 Drag Barge Operator, Steward, Mate, Assistant Fill Placer	37.26	38.38
CLASS C2 Boat Operator	36.07	37.15
CLASS D Shoreman, Deckhand, Oiler, Rodman, Scowman, Cook, Messman, Porter/Janitor	29.96	30.86

SUPPLEMENTAL BENEFITS
Per Hour:
THE FOLLOWING SUPPLEMENTAL BENEFITS APPLY TO ALL CATEGORIES

All Classes: 7% of Hourly Straight time wage + $12.00.

Additional $0.63 per hour for Overtime hours

OVERTIME PAY
See (B2, F, R) on OVERTIME PAGE

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 8, 15, 26) on HOLIDAY PAGE

4-25a-MarDredge

Operating Engineer - Survey Crew — 10/01/2025

JOB DESCRIPTION Operating Engineer - Survey Crew **DISTRICT** 12

ENTIRE COUNTIES
Albany, Allegany, Broome, Cayuga, Chemung, Chenango, Clinton, Columbia, Cortland, Essex, Franklin, Fulton, Greene, Hamilton, Herkimer, Jefferson, Lewis, Livingston, Madison, Monroe, Montgomery, Oneida, Onondaga, Ontario, Oswego, Otsego, Rensselaer, Saratoga, Schenectady, Schoharie, Schuyler, Seneca, St. Lawrence, Steuben, Tioga, Tompkins, Warren, Washington, Wayne, Yates

PARTIAL COUNTIES
Dutchess: The northern portion of the county from the northern boundary line of the City of Poughkeepsie, north.
Genesee: Only the portion of the county that lies east of a line down the center of Route 98 to include all area that lies within the City of Batavia.

WAGES
These rates apply to Building, Tunnel and Heavy Highway.

Per hour:
SURVEY CLASSIFICATIONS:

Party Chief - One who directs a survey party.
Instrument Person - One who operates the surveying instruments.
Rod Person - One who holds the rods and assists the Instrument Person.

	07/01/2025
Party Chief	$ 52.91

Instrument Person	48.67
Rod Person	36.29

Additional $3.00/hr. for Tunnel Work
Additional $2.50/hr. for Hazardous Work Site

SUPPLEMENTAL BENEFITS
Per hour worked:

Journeyman	$ 30.10

OVERTIME PAY
See (B, E, P, *X) on OVERTIME PAGE
*Note: $25.10/Hr. Only for "ALL" premium hours paid when worked.

HOLIDAY
Paid: See (5, 6) on HOLIDAY PAGE
Overtime: See (5, 6) on HOLIDAY PAGE

REGISTERED APPRENTICES
WAGES: 1000 hour terms based on the Percentage of Rod Persons Wage:

	07/01/2025
0-1000	60%
1001-2000	70%
2001-3000	80%

SUPPLEMENTAL BENEFIT per hour worked:

0-1000	$ 21.88 / PHP $18.03
1001-2000	24.90 / " 20.45
2001-3000	27.93/ " 22.93

NOTE: PHP is premium hours paid when worked.

12-158-545 D.H.H.

Operating Engineer - Survey Crew - Consulting Engineer — 10/01/2025

JOB DESCRIPTION Operating Engineer - Survey Crew - Consulting Engineer **DISTRICT** 12

ENTIRE COUNTIES
Albany, Allegany, Broome, Cayuga, Chemung, Chenango, Clinton, Columbia, Cortland, Essex, Franklin, Fulton, Greene, Hamilton, Herkimer, Jefferson, Lewis, Livingston, Madison, Monroe, Montgomery, Oneida, Onondaga, Ontario, Oswego, Otsego, Rensselaer, Saratoga, Schenectady, Schoharie, Schuyler, Seneca, St. Lawrence, Steuben, Tioga, Tompkins, Warren, Washington, Wayne, Yates

PARTIAL COUNTIES
Dutchess: The northern portion of the county from the northern boundary line of the City of Poughkeepsie, north.
Genesee: Only the portion of the county that lies east of a line down the center of Route 98 to include all area that lies within the City of Batavia.

WAGES
These rates apply to feasibility and preliminary design surveying, line and grade surveying for inspection or supervision of construction when performed under a Consulting Engineer Agreement.

Per hour:
SURVEY CLASSIFICATIONS:

Party Chief - One who directs a survey party.
Instrument Person - One who operates the surveying instruments.
Rod Person - One who holds the rods and assists the Instrument Person.

	07/01/2025
Party Chief	$ 52.91
Instrument Person	48.67
Rod Person	36.29

Additional $3.00/hr. for Tunnel Work.
Additional $2.50/hr. for EPA or DEC certified toxic or hazardous waste work.

SUPPLEMENTAL BENEFITS
Per hour worked:

Journeyman	$ 30.10

OVERTIME PAY
See (B, E, Q, *X) on OVERTIME PAGE
*Note: $25.10/Hr. Only for "ALL" premium hours paid when worked.

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6) on HOLIDAY PAGE

REGISTERED APPRENTICES
WAGES: 1000 hour terms based on percentage of Rod Persons Wage:

	07/01/2025
0-1000	60%
1001-2000	70%
2001-3000	80%

SUPPLEMENTAL BENEFIT per hour worked:

0-1000	$ 21.88 / PHP $18.03
1001-2000	$ 24.90 / " 20.45
2001-3000	$ 27.93 / " 22.93

NOTE: PHP is premium hours paid when worked.

12-158-545 DCE

Operating Engineer - Survey Crew - Consulting Engineer — 10/01/2025

JOB DESCRIPTION Operating Engineer - Survey Crew - Consulting Engineer **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Putnam, Queens, Richmond, Suffolk, Westchester

PARTIAL COUNTIES
Dutchess: That part in Duchess County lying South of the North City line of Poughkeepsie.

WAGES
Feasibility and preliminary design surveying, any line and grade surveying for inspection or supervision of construction.

Per hour:	07/01/2025
Survey Classifications	
Party Chief	$ 51.16
Instrument Man	42.44
Rodman	36.92

SUPPLEMENTAL BENEFITS
Per Hour:

All Crew Members:	$ 24.53

OVERTIME PAY
OVERTIME:.... See (B, E*, Q, V) ON OVERTIME PAGE.
*Double-time paid on the 9th hour on Saturday.

HOLIDAY
Paid: See (5, 6, 7, 11, 16) on HOLIDAY PAGE
Overtime: See (5, 6, 7, 11, 16) on HOLIDAY PAGE

9-15dconsult

Operating Engineer - Tunnel — 10/01/2025

JOB DESCRIPTION Operating Engineer - Tunnel **DISTRICT** 7

ENTIRE COUNTIES
Albany, Allegany, Broome, Cayuga, Chemung, Chenango, Clinton, Columbia, Cortland, Essex, Franklin, Fulton, Greene, Hamilton, Herkimer, Jefferson, Lewis, Livingston, Madison, Monroe, Montgomery, Oneida, Onondaga, Ontario, Oswego, Otsego, Rensselaer, Saratoga, Schenectady, Schoharie, Schuyler, Seneca, St. Lawrence, Steuben, Tioga, Tompkins, Warren, Washington, Wayne, Yates

PARTIAL COUNTIES
Dutchess: Northern part of Dutchess, to the northern boundary line of the City of Poughkeepie, then due east to Route 115 to Bedell Road, then east along Bedell Road to VanWagner Road, then north along VanWagner Road to Bower Road, then east along Bower Road to Rte. 44 east to Rte. 343, then along Rte. 343 east to the northern boundary of the Town of Dover Plains and east along the northern boundary of the Town of Dover Plains, to the borderline of the State of Connecticut.
Genesee: Only that portion of the county that lies east of a line drawn down the center of Route 98 and the entirety of the City of Batavia.

WAGES

CLASS A: Automatic Concrete Spreader (CMI Type); Automatic Fine Grader; Backhoe (except tractor mounted, rubber tired); Belt Placer (CMI Type); Blacktop Plant (automated); Cableway; Caisson Auger; Central Mix Concrete Plant (automated); Concrete Curb Machine (self-propelled slipform); Concrete Pump (8" or over); Dredge; Dual Drum Paver; Excavator; Front End Loader (4 cu. yd & over); Gradall; Head Tower (Sauerman or Equal); Hoist (shaft); Hoist (two or three Drum); Log Chipper/Loader (self-feeder); Maintenance Engineer (shaft and tunnel); any Mechanical Shaft Drill; Mine Hoist; Mining Machine(Mole and similar types); Mucking Machine or Mole; Overhead Crane (Gantry or Straddle Type); Pile Driver; Power Grader; Remote Controlled Mole or Tunnel Machine; Scraper; Shovel; Side Boom; Slip Form Paver (If a second man is needed, they shall be an Oiler); Tripper/Maintenance Engineer (shaft & tunnel); Tractor Drawn Belt-Type Loader; Tug Operator (manned rented equipment excluded); Tunnel Shovel.

CLASS B: Automated Central Mix Concrete Plant; Backhoe (topside); Backhoe (track mounted, rubber tired); Backhoe (topside); Bituminous Spreader and Mixer, Blacktop Plant (non-automated); Blast or Rotary Drill (truck or tractor mounted); Boring Machine; Cage Hoist; Central Mix Plant(non-automated); all Concrete Batching Plants; Compressors (4 or less exceeding 2,000 c.f.m. combined capacity); Concrete Pump; Crusher; Diesel Power Unit; Drill Rigs (tractor mounted); Front End Loader (under 4 cu. yd.); Grayco Epoxy Machine; Hoist (One Drum); Hoist (2 or 3 drum topside); Knuckle Boom material handler; Kolman Plant Loader & similar type Loaders (if employer requires another person to clean the screen or to maintain the equipment, they shall be an Oiler); L.C.M. Work Boat Operator; Locomotive; Maintenance Engineer (topside); Maintenance Grease Man; Mixer (for stabilized base-self-propelled); Monorail Machine; Plant Engineer; Personnel Hoist; Pump Crete; Ready Mix Concrete Plant; Refrigeration Equipment (for soil stabilization); Road Widener; Roller (all above sub-grade); Sea Mule; Shotcrete Machine; Shovel (topside); Tractor with Dozer and/or Pusher; Trencher; Tugger Hoist; Tunnel Locomotive; Vacuum Machine (mounted or towed); Welder; Winch; Winch Cat.

CLASS C: A Frame Truck; All Terrain Telescoping Material Handler; Ballast Regulator (ride-on); Compressors (4 not to exceed 2,000 c.f.m. combined capacity; or 3 or less with more than 1200 c.f.m. but not to exceed 2,000 c.f.m.); Compressors ((any size, but subject to other provisions for compressors), Dust Collectors, Generators, Pumps, Welding Machines, Light Plants (4 or any type combination)); Concrete Pavement Spreaders and Finishers; Conveyor; Drill (core); Drill (well); Electric Pump used in conjunction with Well Point System; Farm Tractor with Accessories; Fine Grade Machine; Fork Lift; Grout Pump (over 5 cu. ft.); Gunite Machine; Hammers (hydraulic-self-propelled); Hydra-Spiker (ride-on); Hydra-Blaster (water); Hydro-Blaster; Motorized Form Carrier; Post Hole Digger and Post Driver; Power Sweeper; Roller grade & fill); Scarifer (ride-on); Span-Saw (ride-on); Submersible Electric Pump (when used in lieu of well points); Tamper (ride-on); Tie-Extractor (ride-on), Tie Handler (ride-on), Tie Inserter (ride-on), Tie Spacer (ride-on); Track Liner (ride-on); Tractor with towed accessories; Vibratory Compactor; Vibro Tamp, Well Point.

CLASS D: Aggregate Plant; Cement & Bin Operator; Compressors (3 or less not to exceed 1,200 c.f.m. combined capacity); Compressors ((any size, but subject to other provisions for compressors), Dust Collectors, Generators, Pumps, Welding Machines, Light Plants (3 or less or any type or combination)); Concrete Saw (self-propelled); Form Tamper; Greaseman; Hydraulic Pump (jacking system); Junior Engineer; Light Plants; Mulching Machine; Oiler; Parapet Concrete or Pavement Grinder; Power Broom (towed); Power Heaterman (when used for production); Revinius Widener; Shell Winder; Steam Cleaner; Tractor.

Per hour:	07/01/2025
CLASS A	$ 58.44
CLASS B	57.22
CLASS C	54.43
CLASS D	51.42

Additional $5.00 per hour for Hazardous Waste Work on a state or federally designated hazardous waste site where the Operating Engineer is in direct contact with hazardous material and when personal protective equipment is required for respiratory, skin and eye protection.

CRANES:
Crane 1: All cranes, including self-erecting.
Crane 2: All Lattice Boom Cranes and all cranes with a manufacturer's rating of fifty (50) ton and over.
Crane 3: All hydraulic cranes and derricks with a manufacturer's rating of forty nine (49) ton and below, including boom trucks.

Crane 1	$ 62.44
Crane 2	61.44
Crane 3	60.44

SUPPLEMENTAL BENEFITS

Per hour:

$ 25.90
+ 10.10*

* This portion of the benefits subject to SAME PREMIUM as shown for overtime wages.

OVERTIME PAY

See (B, B2, E, Q, X) on OVERTIME PAGE

HOLIDAY

Paid: See (5, 6) on HOLIDAY PAGE
Overtime: See (5, 6) on HOLIDAY PAGE
NOTE: If a holiday falls on Sunday, it shall be observed on Monday.

REGISTERED APPRENTICES
WAGES:(1000) hours terms at the following percentage of Journeyworker's Class B wage.

1st term	60%
2nd term	65%
3rd term	70%
4th term	75%

SUPPLEMENTAL BENEFITS per hour: Same as Journeyworker

7-158-832TL.

Painter — 10/01/2025

JOB DESCRIPTION Painter **DISTRICT** 1

ENTIRE COUNTIES
Columbia, Dutchess, Greene, Orange, Sullivan, Ulster

WAGES
Per hour

	07/01/2025
Brush/Paper Hanger	$ 40.45
Dry Wall Finisher	40.45
Lead Abatement	40.45
Sandblaster-Painter	40.45
Spray Rate	41.45

See Bridge Painting rates for the following work:
Structural Steel, all work performed on tanks, ALL BRIDGES, towers, smoke stacks, flag poles. Rate shall apply to all of said areas from the ground up.

SUPPLEMENTAL BENEFITS
Per hour

Journeyworker	$ 27.72

OVERTIME PAY
See (B, E, E2, Q) on OVERTIME PAGE

HOLIDAY

Paid:	See (1) on HOLIDAY PAGE
Overtime:	See (5, 6) on HOLIDAY PAGE

REGISTERED APPRENTICES
Wages per hour

Six (6) month terms at the following percentage of Journeyperson's wage

1st	2nd	3rd	4th	5th	6th
50%	55%	65%	75%	85%	95%

Supplemental Benefits per hour worked

1st term	$ 11.64
All others	27.72

1-155

Painter - Bridge & Structural Steel — 10/01/2025

JOB DESCRIPTION Painter - Bridge & Structural Steel **DISTRICT** 8

ENTIRE COUNTIES
Albany, Bronx, Clinton, Columbia, Dutchess, Essex, Franklin, Fulton, Greene, Hamilton, Kings, Montgomery, Nassau, New York, Orange, Putnam, Queens, Rensselaer, Richmond, Rockland, Saratoga, Schenectady, Schoharie, Suffolk, Sullivan, Ulster, Warren, Washington, Westchester

WAGES
Per Hour:
STEEL:

Bridge Painting:	07/01/2025	10/01/2025
	$ 56.25	$ 57.00
	+ 11.10*	+ 12.10*

ADDITIONAL $7.00 per hour for POWER TOOL/SPRAY, whether straight time or overtime.

NOTE: All premium wages are to be calculated on base rate per hour only.

* For the period of May 1st to November 15th, this amount is payable up to 40 hours. For the period of Nov 16th to April 30th, this amount is payable up to 50 hours. EXCEPTION: First and last week of employment, and for the weeks of Memorial Day, Independence Day and Labor Day, where the amount is paid for the actual number of hours worked (50 hour cap).

** To be allocated a later date

NOTE: Generally, for Bridge Painting Contracts, ALL WORKERS on and off the bridge (including Flagmen) are to be paid Painter's Rate; the contract must be ONLY for Bridge Painting.

SHIFT WORK

When directly specified in public agency or authority contract documents for an employer to work a second shift and works the second shift with employees other than from the first shift, all employees who work the second shift will be paid 10% of the base wage shift differential in lieu of overtime for the first eight (8) hours worked after which the employees shall be paid at time and one half of the regular wage rate. When a single irregular work shift is mandated in the job specifications or by the contracting agency, wages shall be paid at time and one half for single shifts between the hours of 3pm-11pm or 11pm-7am.

SUPPLEMENTAL BENEFITS

Per Hour:
Journeyworker:

	$ 13.33	$ 13.49
	+ 30.76*	+ 31.27*

* For the period of May 1st to November 15th, this amount is payable up to 40 hours. For the period of Nov 16th to April 30th, this amount is payable up to 50 hours. EXCEPTION: First and last week of employment, and for the weeks of Memorial Day, Independence Day and Labor Day, where the amount is paid for the actual number of hours worked (50 hour cap).

OVERTIME PAY

See (B, F, R) on OVERTIME PAGE

HOLIDAY

Paid: See (1) on HOLIDAY PAGE
Overtime: See (4, 6) on HOLIDAY PAGE

REGISTERED APPRENTICES

Wage - Per hour:
Apprentices: (1) year terms.

	07/01/2025	10/01/2025
1st year	$ 22.50	$ 22.80
	+ 4.44	+ 4.54*
2nd year	$ 33.75	$ 34.20
	+ 6.63	+ 7.26*
3rd year	$ 45.00	$ 45.60
	+ 8.88	+ 10.60*
Supplemental Benefits - Per hour:		
1st year	$ 1.52	$ 18.63*
	+ 12.51	
2nd year	$ 8.00	$ 8.09
	+ 18.47	+ 19.04*
3rd year	$ 10.66	$ 10.79
	+ 24.62	+ 25.39*

NOTE: All premium wages are to be calculated on base rate per hour only.

8-DC-9/806/155-BrSS

Painter - Line Striping **10/01/2025**

JOB DESCRIPTION Painter - Line Striping **DISTRICT** 8

ENTIRE COUNTIES
Albany, Clinton, Columbia, Dutchess, Essex, Franklin, Fulton, Greene, Hamilton, Montgomery, Nassau, Orange, Putnam, Rensselaer, Rockland, Saratoga, Schenectady, Schoharie, Suffolk, Sullivan, Ulster, Warren, Washington, Westchester

WAGES
Per hour:

Painter (Striping-Highway):	07/01/2025	04/01/2026
Striping-Machine Operator*	$ 35.49	$ 36.93
Linerman Thermoplastic	42.74	44.44

Note: * Includes but is not limited to: Positioning of cones and directing of traffic using hand held devices. Excludes the Driver/Operator of equipment used in the maintenance and protection of traffic safety.

SHIFT WORK
When directly specified in public agency or authority contract documents there shall be a 30% night shift premium pay differential for all work performed after 9:00pm and before 5:00am.

SUPPLEMENTAL BENEFITS
Per hour paid:
Journeyworker:

Striping Machine Operator:	$24.30	$ 24.95
Linerman Thermoplastic:	24.30	24.95

OVERTIME PAY
See (B, B2, E2, F, S) on OVERTIME PAGE

HOLIDAY
Paid: See (5, 20) on HOLIDAY PAGE
Overtime: See (5, 20) on HOLIDAY PAGE

REGISTERED APPRENTICES
One (1) year terms at the following wage rates:

	07/01/2025	01/01/2026	04/01/2026
1st Term:	$ 16.50	$ 17.00	$ 17.00
2nd Term:	21.29	20.47	22.16
3rd Term:	28.39	27.30	29.54

Supplemental Benefits per hour:

All terms:	$ 24.30	$ 24.30	$ 24.95

8-1456-LS

Painter - Metal Polisher — 10/01/2025

JOB DESCRIPTION Painter - Metal Polisher **DISTRICT** 8

ENTIRE COUNTIES
Albany, Allegany, Bronx, Broome, Cattaraugus, Cayuga, Chautauqua, Chemung, Chenango, Clinton, Columbia, Cortland, Delaware, Dutchess, Erie, Essex, Franklin, Fulton, Genesee, Greene, Hamilton, Herkimer, Jefferson, Kings, Lewis, Livingston, Madison, Monroe, Montgomery, Nassau, New York, Niagara, Oneida, Onondaga, Ontario, Orange, Orleans, Oswego, Otsego, Putnam, Queens, Rensselaer, Richmond, Rockland, Saratoga, Schenectady, Schoharie, Schuyler, Seneca, St. Lawrence, Steuben, Suffolk, Sullivan, Tioga, Tompkins, Ulster, Warren, Washington, Wayne, Westchester, Wyoming, Yates

WAGES

	07/01/2025
Metal Polisher	$ 40.33
Metal Polisher*	41.43
Metal Polisher**	44.33

*Note: Applies on New Construction & complete renovation
** Note: Applies when working on scaffolds over 34 feet.

SUPPLEMENTAL BENEFITS

Per Hour:	07/01/2025
Journeyworker:	
All classification	$ 13.44

OVERTIME PAY
See (B, E, P, T) on OVERTIME PAGE

HOLIDAY
Paid: See (5, 6, 11, 15, 16, 25, 26) on HOLIDAY PAGE
Overtime: See (5, 6, 11, 15, 16, 25, 26) on HOLIDAY PAGE

REGISTERED APPRENTICES
Wages per hour:
One (1) year term at the following wage rates:

	07/01/2025
1st year	$ 20.17
2nd year	22.18
3rd year	24.20
1st year*	$ 20.56
2nd year*	22.62
3rd year*	24.74
1st year**	$ 22.67
2nd year**	24.68
3rd year**	26.70

*Note: Applies on New Construction & complete renovation
** Note: Applies when working on scaffolds over 34 feet.

Supplemental benefits:
Per hour:

1st year	$ 8.94
2nd year	8.94
3rd year	8.94

8-8A/28A-MP

Plumber — 10/01/2025

JOB DESCRIPTION Plumber **DISTRICT** 8

ENTIRE COUNTIES
Dutchess

PARTIAL COUNTIES
Delaware: Only the Townships of Middletown and Roxbury.
Ulster: Entire county (including Wallkill and Shawangunk Prisons in Town of Shawangunk) EXCEPT for remainder of Town of Shawangunk, and Towns of Plattekill, Marlboro, and Wawarsing.

WAGES
Per hour:

	07/01/2025
Plumber & Steamfitter	$ 60.66

SHIFT WORK
SHIFT WORK:
When directly specified in public agency or authority contract documents, shift work outside the regular hours of work shall be comprised of eight (8) hours per shift not including Saturday, Sundays and holidays. One half (1/2) hour shall be allowed for lunch after the first four (4) hours of each shift. Wage and Fringes for shift work shall be straight time plus a shift premium of twenty-five (25%) percent. A minimum of five days Monday through Friday must be worked to establish shift work.

SUPPLEMENTAL BENEFITS
Per hour:

Journeyworker:	$ 45.35

OVERTIME PAY
See (B, E, E2, Q, V) on OVERTIME PAGE

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 8, 16, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES
(1)year terms at the following rates:

	07/01/2025
1st year	$ 23.24

2nd year	32.02
3rd year	37.15
4th year	44.51
5th year	51.20

Supplemental Benefits per hour:

1st year	$ 19.15
2nd year	24.55
3rd year	28.50
4th year	32.99
5th year	36.44

8-21.2-SF

Plumber - HVAC / Service — 10/01/2025

JOB DESCRIPTION Plumber - HVAC / Service **DISTRICT** 8

ENTIRE COUNTIES
Dutchess, Putnam, Westchester

PARTIAL COUNTIES
Delaware: Only the townships of Middletown and Roxbury
Ulster: Entire County(including Wallkill and Shawangunk Prisons) except for remainder of Town of Shawangunk and Towns of Plattekill, Marlboro, and Wawarsing.

WAGES
Per hour: 07/01/2025

HVAC Service	$ 44.43
	+ $ 4.52*

*This portion of the benefit is NOT subject to the SAME PREMIUM as shown for overtime.

SUPPLEMENTAL BENEFITS
Per hour:

Journeyworker HVAC Service
$ 31.84

OVERTIME PAY
See (B, F, R) on OVERTIME PAGE

HOLIDAY
Paid: See (5, 6, 16, 25) on HOLIDAY PAGE
Overtime: See (5, 6, 16, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES
HVAC SERVICE
(1)year terms at the following wages:

1st yr.	2nd yr.	3rd yr.	4th yr.	5th yr.
$ 20.11	$ 23.87	$ 29.70	$ 36.53	$ 39.73
+$2.45*	+$2.79*	+$3.34*	+$4.00*	+$4.26*

*This portion of the benefit is NOT subject to the SAME PREMIUM as shown for overtime.

Supplemental Benefits per hour:

Apprentices 07/01/2025

1st term	$ 22.13
2nd term	23.85
3rd term	25.71
4th term	28.29
5th term	30.11

8-21.1&2-SF/Re/AC

Plumber - Jobbing & Alterations — 10/01/2025

JOB DESCRIPTION Plumber - Jobbing & Alterations **DISTRICT** 8

ENTIRE COUNTIES

Dutchess, Putnam, Westchester

PARTIAL COUNTIES
Ulster: Entire county (including Wallkill and Shawangunk Prisons in Town of Shawangunk) EXCEPT for remainder of Town of Shawangunk, and Towns of Plattekill, Marlboro, and Wawarsing.

WAGES

Per hour:	07/01/2025
Journeyworker:	$ 50.68

Repairs, replacements and alteration work is any repair or replacement of a present plumbing system that does not change existing roughing or water supply lines.

SHIFT WORK
When directly specified in public agency or authority contract documents, shift work outside the regular hours of work shall be comprised of eight (8) hours per shift not including Saturday, Sundays and holidays. One half (1/2) hour shall be allowed for lunch after the first four (4) hours of each shift. Wage and Fringes for shift work shall be straight time plus a shift premium of twenty-five (25%) percent. A minimum of five days Monday through Friday must be worked to establish shift work.

SUPPLEMENTAL BENEFITS

Per hour:	
Journeyworker	$ 37.83

OVERTIME PAY
See (B, *E, E2, Q, V) on OVERTIME PAGE
*When used as a make-up day, hours after 8 on Saturday shall be paid at time and one half.

HOLIDAY

Paid:	See (1) on HOLIDAY PAGE
Overtime:	See (5, 6, 8, 16, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES
(1) year terms at the following wages:

1st year	$ 21.76
2nd year	24.20
3rd year	26.41
4th year	37.03
5th year	39.14

Supplemental Benefits per hour:

1st year	$ 12.65
2nd year	14.82
3rd year	19.10
4th year	25.85
5th year	28.01

8-21.3-J&A

Roofer — 10/01/2025

JOB DESCRIPTION Roofer **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Dutchess, Kings, New York, Orange, Putnam, Queens, Richmond, Rockland, Sullivan, Ulster, Westchester

WAGES

Per Hour:	07/01/2025	05/01/2026 Additional
Roofer/Waterproofer	$ 50.25 + $7.00*	+ $ 2.75

* This portion is not subjected to overtime premiums.

Note: Abatement/Removal of Asbestos containing roofs and roofing material is classified as Roofer.

SUPPLEMENTAL BENEFITS
Per Hour: $ 32.62

OVERTIME PAY
See (B, H) on OVERTIME PAGE
Note: An observed holiday that falls on a Sunday will be observed the following Monday.

HOLIDAY
Overtime: See (5, 6) on HOLIDAY PAGE

REGISTERED APPRENTICES

(1) year term apprentices indentured prior to 01/01/2023

1st	2nd	3rd	4th
$ 17.59	$ 25.13	$ 30.15	$ 37.69
	+ 3.50*	+ 4.20*	+ 5.26*

Supplements:

1st	2nd	3rd	4th
$ 4.22	$ 16.69	$ 19.87	$ 24.65

* This portion is not subjected to overtime premiums.

(1) year term apprentices indentured after 01/01/2023

1st	2nd	3rd	4th	5th
$ 19.10	$ 22.61	$ 25.13	$ 30.15	$ 37.69
	+ 3.16*	+ 3.50*	+ 4.20*	+ 5.26*

Supplements:

1st	2nd	3rd	4th	5th
$ 7.95	$ 15.09	$ 16.69	$ 19.87	$ 24.65

* This portion is not subjected to overtime premiums.

9-8R

Sheetmetal Worker — 10/01/2025

JOB DESCRIPTION Sheetmetal Worker **DISTRICT** 8

ENTIRE COUNTIES

Dutchess, Orange, Putnam, Rockland, Sullivan, Ulster, Westchester

WAGES

	07/01/2025
SheetMetal Worker	$ 51.48
	+ 3.81*

*This portion of the benefit is NOT subject to the SAME PREMIUM as shown for overtime.

SHIFT WORK

For all NYS D.O.T. and other Governmental mandated off-shift work:
10% increase for additional shifts for a minimum of five (5) days

SUPPLEMENTAL BENEFITS

Journeyworker $ 47.43

OVERTIME PAY

OVERTIME:.. See (B, E, Q,) on OVERTIME PAGE.

HOLIDAY

Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 8, 15, 16, 23) on HOLIDAY PAGE

REGISTERED APPRENTICES

1st	2nd	3rd	4th	5th	6th	7th	8th
$ 21.00	$ 21.71	$ 24.12	$ 26.51	$ 28.93	$ 31.37	$ 34.25	$ 37.11
+ 1.52*	+ 1.71*	+ 1.91*	+ 2.10*	+ 2.29*	+ 2.48*	+ 2.67*	+ 2.86*

*This portion of the benefit is NOT subject to the SAME PREMIUM as shown for overtime.

Supplemental Benefits per hour:

Apprentices	
1st term	$ 18.57
2nd term	22.80
3rd term	25.34
4th term	27.88
5th term	30.40
6th term	32.92
7th term	34.99
8th term	37.08

8-38

Sprinkler Fitter — 10/01/2025

JOB DESCRIPTION Sprinkler Fitter **DISTRICT** 1

ENTIRE COUNTIES
Dutchess, Orange, Putnam, Rockland, Sullivan, Ulster, Westchester

WAGES

Per hour	07/01/2025
Sprinkler Fitter	$ 57.20

SUPPLEMENTAL BENEFITS

Per hour	
Journeyworker	$ 31.36

OVERTIME PAY
See (B, E, Q) on OVERTIME PAGE

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6) on HOLIDAY PAGE
Note: When a holiday falls on Sunday, the following Monday shall be considered a holiday and all work performed on either day shall be at the double time rate. When a holiday falls on Saturday, the preceding Friday shall be considered a holiday and all work performed on either day shall be at the double time rate.

REGISTERED APPRENTICES
Wages per hour

One Half Year terms at the following wage.

1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
$ 29.33	$ 32.75	$ 35.47	$ 38.20	$ 40.25	$ 43.66	$ 46.39	$ 49.12	$ 51.85	$ 54.58

Supplemental Benefits per hour

1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
$ 9.57	$ 9.57	$ 21.49	$ 21.49	$ 21.74	$ 21.74	$ 21.74	$ 21.74	$ 21.74	$ 21.74

1-669.2

Teamster - Building / Heavy&Highway 10/01/2025

JOB DESCRIPTION Teamster - Building / Heavy&Highway **DISTRICT** 11

ENTIRE COUNTIES
Dutchess, Orange, Rockland, Sullivan, Ulster

WAGES
GROUP I: LeTourneau Tractors, Double Barrel Euclids, Athney Wagons and similar equipment (except when hooked to scrapers), I-Beam and Pole Trailers, Tire Trucks, Tractor and Trailers with 5 axles and over, Articulated Back Dumps and Road Oil Distributors, Articulated Water Trucks and Fuel Trucks/Trailers, positions requiring a HAZMAT CDL endorsement.

GROUP II: Drivers on detachable Gooseneck Low Bed Trailers rated over 35 tons.

GROUP III: All equipment 25 yards and up to and including 30-yard bodies and cable Dump Trailers and Powder and Dynamite Trucks.

GROUP IV: All Equipment up to and including 24-yard bodies, Mixer Trucks, Dump Crete Trucks and similar types of equipment, Fuel Trucks, Batch Trucks and all other Tractor Trailers, Hi-Rail Truck.

GROUP V: Tri-Axles, Ten Wheelers, Grease Trucks, Tillerman, Pattern Trucks, Attenuator Trucks, Water Trucks, Bus.

GROUP VI: Straight Trucks.

GROUP VII: Pick-up Trucks for hauling materials and parts, and Escort Man over-the-road.

WAGES: (per hour)	07/01/2025	05/01/2026
GROUP I	$ 37.91	$ 39.51
GROUP II	39.03	40.63
GROUP III	37.35	38.95
GROUP IV	37.13	38.73
GROUP V	37.02	38.62
GROUP VI	36.90	38.50

GROUP VII	36.90	38.50

NOTE ADDITIONAL PREMIUMS:

- Employees engaged in hazardous/toxic waste removal, on a State or Federally designated hazardous/toxic waste site, where the employee comes in contact with hazardous/toxic waste material and when personal protective equipment is required for respiratory, skin, or eye protection, the employee shall receive an additional 20% premium above the hourly wage.

SHIFT WORK
- On projects requiring an irregular shift a premium of 10% will be paid on wages. The premium will be paid for off-shift or irregular shift work when mandated by Governmental Agency.

SUPPLEMENTAL BENEFITS
Per hour:

First 40 hours	$ 46.37	$ 47.68
Over 40 hours	38.37	39.68

OVERTIME PAY
See (*B, E, **E2, ***P, X) on OVERTIME PAGE
*Holidays worked Monday through Friday receive Double Time (2x) after 8 hours.
**Makeup day limited to the employees who were working on the site that week.
***Sunday Holidays are paid at a rate of double time and one half (2.5x) for all hours worked.

HOLIDAY
Paid: See (5, 6, 15, 25) on HOLIDAY PAGE
Overtime: See (*1) on HOLIDAY PAGE
- Any employee working two (2) days in any calendar week during which a holiday occurs shall receive a days pay for each holiday occurring during said week. This provision shall also apply if a holiday falls on a Saturday or Sunday.
*See OVERTIME PAY section for when additional premium is applicable on Holiday hours worked.

11-445B/HH

Teamster - Delivery - Building / Heavy&Highway — 10/01/2025

JOB DESCRIPTION Teamster - Delivery - Building / Heavy&Highway **DISTRICT** 11

ENTIRE COUNTIES
Dutchess, Orange, Rockland, Sullivan, Ulster

WAGES
THESE RATES ARE ONLY TO BE USED FOR DELIVERY OF AGGREGATE MATERIALS TO THE JOB SITE. FOR ALL ONSITE WORK AND HAULING OF SPOILS SEE THE TEAMSTER BUILDING/HEAVY & HIGHWAY RATES.

Group 1 Tractor Trailer Drivers
Group 2 Tri- Axle

Wages:	07/01/2025	05/01/2026
Group 1	$ 37.35	$ 38.95
Group 2	37.02	38.62

Hazardous/Toxic Waste Removal additional 20% when personal protective equipment is required.

SUPPLEMENTAL BENEFITS
Per hour paid:

First 40 hours	$ 46.37	$ 47.68
Over 40 hours	0.00	0.00

OVERTIME PAY
See (B, E, Q, X) on OVERTIME PAGE

HOLIDAY
Paid: See (5, 13, 15, 16, 20, 22, 25, 26) on HOLIDAY PAGE
Overtime: See (5, 13, 15, 16, 20, 22, 25, 26) on HOLIDAY PAGE
- Employee must work either the scheduled day of work before or the scheduled day of work after the holiday in the workweek.
- Any employee working one (1) day in the calendar week during which a holiday occurs shall receive a day's pay for each holiday occurring during said week. This provision shall also apply if a holiday falls on a Saturday.
- When any of the recognized holidays occur on Sunday and are celebrated any day before or after the holiday Sunday, such days shall be considered as the holiday and paid for as such.

11-445 B/HH Delivery

Welder — 10/01/2025

JOB DESCRIPTION Welder **DISTRICT** 1

ENTIRE COUNTIES

Albany, Allegany, Bronx, Broome, Cattaraugus, Cayuga, Chautauqua, Chemung, Chenango, Clinton, Columbia, Cortland, Delaware, Dutchess, Erie, Essex, Franklin, Fulton, Genesee, Greene, Hamilton, Herkimer, Jefferson, Kings, Lewis, Livingston, Madison, Monroe, Montgomery, Nassau, New York, Niagara, Oneida, Onondaga, Ontario, Orange, Orleans, Oswego, Otsego, Putnam, Queens, Rensselaer, Richmond, Rockland, Saratoga, Schenectady, Schoharie, Schuyler, Seneca, St. Lawrence, Steuben, Suffolk, Sullivan, Tioga, Tompkins, Ulster, Warren, Washington, Wayne, Westchester, Wyoming, Yates

WAGES

Per hour 07/01/2025

Welder: To be paid the same rate of the mechanic performing the work.*

*EXCEPTION: If a specific welder certification is required, then the 'Certified Welder' rate in that trade tag will be paid.

OVERTIME PAY

HOLIDAY

1-As Per Trade

Overtime Codes

Following is an explanation of the code(s) listed in the OVERTIME section of each classification contained in the attached schedule. Additional requirements may also be listed in the HOLIDAY section.

NOTE: Supplemental Benefits are 'Per hour worked' (for each hour worked) unless otherwise noted

(AA)	Time and one half of the hourly rate after 7 and one half hours per day
(A)	Time and one half of the hourly rate after 7 hours per day
(B)	Time and one half of the hourly rate after 8 hours per day
(B1)	Time and one half of the hourly rate for the 9th & 10th hours week days and the 1st 8 hours on Saturday. Double the hourly rate for all additional hours
(B2)	Time and one half of the hourly rate after 40 hours per week
(B3)	Time and one half of the hourly rate after 40 straight hours per week
(C)	Double the hourly rate after 7 hours per day
(C1)	Double the hourly rate after 7 and one half hours per day
(D)	Double the hourly rate after 8 hours per day
(D1)	Double the hourly rate after 9 hours per day
(E)	Time and one half of the hourly rate on Saturday
(E1)	Time and one half 1st 4 hours on Saturday; Double the hourly rate all additional Saturday hours
(E2)	Saturday may be used as a make-up day at straight time when a day is lost during that week due to inclement weather
(E3)	Between November 1st and March 3rd Saturday may be used as a make-up day at straight time when a day is lost during that week due to inclement weather, provided a given employee has worked between 16 and 32 hours that week
(E4)	Sunday may be used as a make-up day at straight time when a day is lost during that week due to inclement weather
(E5)	Double time after 8 hours on Saturdays
(F)	Time and one half of the hourly rate on Saturday and Sunday
(G)	Time and one half of the hourly rate on Saturday and Holidays
(H)	Time and one half of the hourly rate on Saturday, Sunday, and Holidays
(I)	Time and one half of the hourly rate on Sunday
(J)	Time and one half of the hourly rate on Sunday and Holidays
(K)	Time and one half of the hourly rate on Holidays
(L)	Double the hourly rate on Saturday
(M)	Double the hourly rate on Saturday and Sunday
(N)	Double the hourly rate on Saturday and Holidays
(O)	Double the hourly rate on Saturday, Sunday, and Holidays
(P)	Double the hourly rate on Sunday
(Q)	Double the hourly rate on Sunday and Holidays
(R)	Double the hourly rate on Holidays

(S)	Two and one half times the hourly rate for Holidays
(S1)	Two and one half times the hourly rate the first 8 hours on Sunday or Holidays One and one half times the hourly rate all additional hours.
(T)	Triple the hourly rate for Holidays
(U)	Four times the hourly rate for Holidays
(V)	Including benefits at SAME PREMIUM as shown for overtime
(W)	Time and one half for benefits on all overtime hours.
(X)	Benefits payable on Paid Holiday at straight time. If worked, additional benefit amount will be required for worked hours. (Refer to other codes listed.)

Holiday Codes

PAID Holidays:

Paid Holidays are days for which an eligible employee receives a regular day's pay, but is not required to perform work. If an employee works on a day listed as a paid holiday, this remuneration is in addition to payment of the required prevailing rate for the work actually performed.

OVERTIME Holiday Pay:

Overtime holiday pay is the premium pay that is required for work performed on specified holidays. It is only required where the employee actually performs work on such holidays. The applicable holidays are listed under HOLIDAYS: OVERTIME. The required rate of pay for these covered holidays can be found in the OVERTIME PAY section listings for each classification.

Following is an explanation of the code(s) listed in the HOLIDAY section of each classification contained in the attached schedule. The Holidays as listed below are to be paid at the wage rates at which the employee is normally classified.

(1)	None
(2)	Labor Day
(3)	Memorial Day and Labor Day
(4)	Memorial Day and July 4th
(5)	Memorial Day, July 4th, and Labor Day
(6)	New Year's, Thanksgiving, and Christmas
(7)	Lincoln's Birthday, Washington's Birthday, and Veterans Day
(8)	Good Friday
(9)	Lincoln's Birthday
(10)	Washington's Birthday
(11)	Columbus Day
(12)	Election Day
(13)	Presidential Election Day
(14)	1/2 Day on Presidential Election Day
(15)	Veterans Day
(16)	Day after Thanksgiving
(17)	July 4th
(18)	1/2 Day before Christmas
(19)	1/2 Day before New Years
(20)	Thanksgiving
(21)	New Year's Day
(22)	Christmas
(23)	Day before Christmas
(24)	Day before New Year's
(25)	Presidents' Day
(26)	Martin Luther King, Jr. Day
(27)	Memorial Day
(28)	Easter Sunday

(29) Juneteenth

New York State Department of Labor - Bureau of Public Work
State Office Building Campus
Building 12 - Room 130
Albany, New York 12226

REQUEST FOR WAGE AND SUPPLEMENT INFORMATION

As Required by Articles 8 and 9 of the NYS Labor Law

Fax (518) 485-1870 or mail this form for new schedules or for determination for additional occupations.

This Form Must Be Typed

Submitted By: (Check Only One) ☐ Contracting Agency ☐ Architect or Engineering Firm ☐ Public Work District Office Date:

A. Public Work Contract to be let by: (Enter Data Pertaining to Contracting/Public Agency)

1. Name and complete address ☐ (Check if new or change)

Telephone Fax

E-Mail:

2. NY State Units (see Item 5).

- ☐ 01 DOT
- ☐ 02 OGS
- ☐ 03 Dormitory Authority
- ☐ 04 State University Construction Fund
- ☐ 05 Mental Hygiene Facilities Corp.
- ☐ 06 OTHER N.Y. STATE UNIT
- ☐ 07 City
- ☐ 08 Local School District
- ☐ 09 Special Local District, i.e., Fire, Sewer, Water District
- ☐ 1O Village
- ☐ 11 Town
- ☐ 12 County
- ☐ 13 Other Non-N.Y. State (Describe)

3. SEND REPLY TO ☐ (check if new or change)
Name and complete address:

Telephone Fax

E-Mail:

4. SERVICE REQUIRED. Check appropriate box and provide project information.

☐ New Schedule of Wages and Supplements.

APPROXIMATE BID DATE :

☐ Additional Occupation and/or Redetermination

PRC NUMBER ISSUED PREVIOUSLY FOR THIS PROJECT :

OFFICE USE ONLY

B. PROJECT PARTICULARS

5. Project Title _____

Description of Work _____

_____

Contract Identification Number _____

Note: For NYS units, the OSC Contract No. _____

6. Location of Project:
Location on Site _____

Route No/Street Address _____

Village or City _____

Town _____

County _____

7. Nature of Project - Check One:

- ☐ 1. New Building
- ☐ 2. Addition to Existing Structure
- ☐ 3. Heavy and Highway Construction (New and Repair)
- ☐ 4. New Sewer or Waterline
- ☐ 5. Other New Construction (Explain)
- ☐ 6. Other Reconstruction, Maintenance, Repair or Alteration
- ☐ 7. Demolition
- ☐ 8. Building Service Contract

8. OCCUPATION FOR PROJECT :

- ☐ Construction (Building, Heavy Highway/Sewer/Water)
- ☐ Tunnel
- ☐ Residential
- ☐ Landscape Maintenance
- ☐ Elevator maintenance
- ☐ Exterminators, Fumigators
- ☐ Fire Safety Director, NYC Only
- ☐ Fuel Delivery
- ☐ Guards, Watchmen
- ☐ Janitors, Porters, Cleaners, Elevator Operators
- ☐ Moving furniture and equipment
- ☐ Trash and refuse removal
- ☐ Window cleaners
- ☐ Other (Describe)

9. Does this project comply with the Wicks Law involving separate bidding? YES ☐ NO ☐

10. Name and Title of Requester

Signature

SEE PAGE TWO FOR LAWS RELATING TO PUBLIC WORK CONTRACTS

NEW YORK STATE DEPARTMENT OF LABOR
Bureau of Public Work - Debarment List

LIST OF EMPLOYERS INELIGIBLE TO BID ON OR BE AWARDED ANY PUBLIC WORK CONTRACT

Under Article 8 and Article 9 of the NYS Labor Law, a contractor, sub-contractor and/or its successor shall be debarred and ineligible to submit a bid on or be awarded any public work or public building service contract/sub-contract with the state, any municipal corporation or public body for a period of five (5) years from the date of debarment when:

- Two (2) final determinations have been rendered within any consecutive six-year (6) period determining that such contractor, sub-contractor and/or its successor has WILLFULLY failed to pay the prevailing wage and/or supplements;
- One (1) final determination involves falsification of payroll records or the kickback of wages and/or supplements.

The agency issuing the determination and providing the information, is denoted under the heading 'Fiscal Officer'. DOL = New York State Department of Labor; NYC = New York City Comptroller's Office; AG = New York State Attorney General's Office; DA = County District Attorney's Office.

Debarment Database: To search for contractors, sub-contractors and/or their successors debarred from bidding or being awarded any public work contract or subcontract under NYS Labor Law Articles 8 and 9, or under NYS Workers' Compensation Law Section 141-b, access the database at this link: https://apps.labor.ny.gov/EDList/searchPage.do

For inquiries please call 518-457-5589.

NYSDOL Bureau of Public Work Debarment List 09/26/2025

Article 8

AGENCY	Fiscal Officer	FEIN	EMPLOYER NAME	EMPLOYER DBA NAME	ADDRESS	DEBARMENT START DATE	DEBARMENT END DATE
DOL	DOL	*****5754	0369 CONTRACTORS, LLC		515 WEST AVE UNIT PH 13NORWALK CT 06850	05/12/2021	05/12/2026
DOL	DOL	*****5784	A.J.M. TRUCKING, INC.		PO BOX 2064 MONROE NY 10950	02/12/2024	02/12/2029
DOL	DOL		AKHLAQ OULAKH		4307 28TH AVE ASTORIA NY 11103	10/11/2024	10/11/2029
DOL	NYC		ALL COUNTY SEWER & DRAIN, INC.		7 GREENFIELD DR WARWICK NY 10990	03/25/2022	03/25/2027
DOL	DOL	*****8387	AMERICAN PAVING & MASONRY, CORP.		8 FOREST AVE GLEN COVE NY 11542	05/24/2024	05/24/2029
DOL	DOL	*****8654	AMERICAN PAVING, INC.		8 FORREST AVE. GLEN COVE NY 11542	05/24/2024	05/24/2029
DOL	NYC		AMJED PARVEZ		401 HANOVER AVENUE STATEN ISLAND NY 10304	01/11/2021	01/11/2026
DOL	DOL		ANGELO GARCIA		515 WEST AVE UNIT PH 13NORWALK CT 06850	05/12/2021	05/12/2026
DOL	DOL		ANGELO STANCO		8 FOREST AVE. GLEN COVE NY 11542	05/24/2024	05/24/2029
DOL	DOL		ANGELO TONDO		449 WEST MOMBSHA ROAD MONROE NY 10950	06/06/2022	06/06/2027
DOL	DOL	*****4231	ANKER'S ELECTRIC SERVICE, INC.		10 SOUTH 5TH ST LOCUST VALLEY NY 11560	09/26/2022	09/26/2027
DOL	DOL		ANTHONY MONGELLI		PO BOX 2064 MONROE NY 10950	02/12/2024	02/12/2029
DOL	DOL	*****8421	B & B DRYWALL, INC		206 WARREN AVE APT 1WHITE PLAINS NY 10603	12/14/2021	12/14/2026
DOL	NYC	*****2113	BHW CONTRACTING, INC.		401 HANOVER AVENUE STATEN ISLAND NY 10304	01/11/2021	01/11/2026
DOL	DA	*****2404	BJA RENOVATION, CORP		33 DOLLARD DR NORTH BABYLON NY 11703	03/19/2025	03/19/2030
DOL	DOL	*****5078	BLACK RIVER TREE REMOVAL, LLC		29807 ANDREWS ROAD BLACK RIVER NY 13032	10/17/2023	10/17/2028
DOL	DOL		BRADLEY J SCHUKA		4 BROTHERS ROAD WAPPINGERS FALLS NY 12590	10/20/2020	10/20/2025
DOL	DOL	*****5161	CALADRI DEVELOPMENT CORP.		1223 PARK ST. PEEKSKILL NY 10566	05/17/2021	05/17/2026
DOL	DOL	*****3391	CALI ENTERPRISES, INC.		1223 PARK STREET PEEKSKILL NY 10566	05/17/2021	05/17/2026
DOL	DOL	*****4155	CASA BUILDERS, INC.	FRIEDLANDER CONSTRUCTION	64 N PUTT CONNERS ROAD NEW PALTZ NY 12561	05/10/2023	05/10/2028
DOL	AG	*****7247	CENTURY CONCRETE CORP		2375 RAYNOR ST RONKONKOMA NY 11779	08/04/2021	08/04/2026
DOL	DOL	*****0026	CHANTICLEER CONSTRUCTION LLC		4 BROTHERS ROAD WAPPINGERS FALLS NY 12590	10/20/2020	10/20/2025
DOL	NYC	*****2117	CHARAN ELECTRICAL ENTERPRISES		9-11 40TH AVENUE LONG ISLAND CITY NY 11101	09/26/2023	09/26/2028
DOL	DOL		CHRISTOPHER GRECO		26 NORTH MYRTLE AVENUE SPRING VALLEY NY 10956	02/18/2021	02/18/2026
DOL	DOL		CHRISTOPHER PEROSI		5507 NESCONSET HIGHWAY MT. SINAI NY 11766	07/17/2025	07/17/2030
DOL	DOL	*****2281	CORRAO TRUCKING, INC.		PO BOX 393 NANUET NY 10954	09/17/2024	09/17/2029
DOL	DOL		CRAIG JOHANSEN		10 SOUTH 5TH ST LOCUST VALLEY NY 11560	09/26/2022	09/26/2027
DOL	DOL	*****3228	CROSS-COUNTY LANDSCAPING AND TREE SERVICE, INC.	ROCKLAND TREE SERVICE	26 NORTH MYRTLE AVENUE SPRING VALLEY NY 10956	02/18/2021	02/18/2026
DOL	DOL	*****7619	DANCO CONSTRUCTION UNLIMITED INC.		485 RAFT AVENUE HOLBROOK NY 11741	10/19/2021	10/19/2026
DOL	DOL		DANIEL ROBERT MCNALLY		7 GREENFIELD DRIVE WARWICK NY 10990	03/25/2022	03/25/2027
DOL	DOL		DARWIN PEGUESE		6400 BALTIMORE NATIONAL SUITE 602CANTONSVILLE NY 21228	10/24/2024	10/24/2029
DOL	DOL		DAVID FRIEDLANDER		64 NORTH PUTT CORNERS RD NEW PALTZ NY 12561	05/10/2023	05/10/2028
DOL	DOL		DINA TAYLOR		64 N PUTT CONNERS RD NEW PALTZ NY 12561	05/10/2023	05/10/2028
DOL	AG		EDWIN HUTZLER		23 NORTH HOWELLS RD BELLPORT NY 11713	08/04/2021	08/04/2026

DOL	DA		EDWIN HUTZLER		2375 RAYNOR STREET RONKONKOMA NY 11779	08/04/2021	08/04/2026
DOL	DOL	*****2337	EGL DRAINAGE SOLUTION & REPAIRS LLC		5507 NESCONSET HIGHWAY MT. SINAI NY 11766	07/17/2025	07/17/2030
DOL	DOL	*****0780	EMES HEATING & PLUMBING CONTR		5 EMES LANE MONSEY NY 10952	01/20/2002	01/20/3002
DOL	DOL		EMIL KISZKO		84 DIAMOND ST BROOKLYN NY 11222	07/18/2024	07/18/2029
DOL	DOL	*****3298	EMJACK CONSTRUCTION CORP.		84 DIAMOND ST BROOKLYN NY 11222	07/18/2024	07/18/2029
DOL	DOL	*****3298	EMJACK CONSTRUCTION LLC		4192 SIR ANDREW CIRCLE DOYLESTOWN PA 18902	07/18/2024	07/18/2029
DOL	DOL		EUGENIUSZ "GINO" KUCHAR		195 KINGSLAND AVE BROOKLYN NY 11222	12/22/2023	12/22/2028
DOL	DA		FREDERICK HUTZLER		2375 RAYNOR STREET RONKONKOMA NY 11779	08/04/2021	08/04/2026
DOL	DOL	*****2998	G.E.M. AMERICAN CONSTRUCTION CORP.		195 KINGSLAND AVE BROOKLYN NY 11222	12/22/2023	12/22/2028
DOL	DA		GEORGE LUCEY		150 KINGS STREET BROOKLYN NY 11231	01/19/1998	01/19/2998
DOL	DA		GIOVANNA TRAVALJA		3735 9TH ST LONG ISLAND CITY NY 11101	01/05/2023	01/05/2028
DOL	DA		GIOVANNI NAPOLITANO		2501 BAYVIEW AVENUE WANTAGH NY 11793	02/21/2024	02/21/2029
DOL	DA	*****0213	GORILLA CONTRACTING GROUP, LLC		505 MANHATTAN AVE WEST BABYLON NY 11704	10/05/2023	10/05/2028
DOL	DA	*****4760	GTX CONSTRUCTION ASSOCIATES, CORP		2501 BAYVIEW AVE WANTAGH NY 11793	02/21/2024	02/21/2029
DOL	DOL		HERBERT CLEMEN		42 FOWLER AVENUE CORTLAND MANOR NY 10567	01/24/2023	01/24/2028
DOL	DOL		HERBERT CLEMEN		42 FOWLER AVENUE CORTLAND MANOR NY 10567	10/25/2022	10/25/2027
DOL	DOL	*****2397	ISLAND BREEZE MARINE, INC.		6400 BALTIMORE NATIONAL CANTONSVILLE MD 21228	10/24/2024	10/24/2029
DOL	DOL	*****5010	J. LINDSLEY ENTERPRISE, LLC		1002 STATE ROUTE 176 FULTON NY 13069	07/30/2025	07/30/2030
DOL	DOL	*****0241	J. LINDSLEY ROOFING, LLC		211 NORTH 2ND STREET FULTON NY 13069	07/30/2025	07/30/2030
DOL	DOL	*****9211	J. WASE CONSTRUCTION CORP.		8545 RT 9W ATHENS NY 12015	03/09/2021	03/09/2026
DOL	DOL		J.M.J CONSTRUCTION		151 OSTRANDER AVENUE SYRACUSE NY 13205	11/21/2022	11/21/2027
DOL	DOL		J.R. NELSON CONSTRUCTION		531 THIRD STREET ALBANY NY 12206	11/07/2023	11/07/2028
DOL	DOL		J.R. NELSON CONSTRUCTION		531 THIRD STREET ALBANY NY 12206	12/22/2022	12/22/2027
DOL	DOL		J.R. NELSON CONSTRUCTION		531 THIRD STREET ALBANY NY 12206	10/25/2022	10/25/2027
DOL	DOL		J.R. NELSON, LLC		531 THIRD STREET ALBANY NY 12206	12/22/2022	12/22/2027
DOL	DOL		J.R. NELSON, LLC		531 THIRD STREET ALBANY NY 12206	11/07/2023	11/07/2028
DOL	DOL		J.R. NELSON, LLC		531 THIRD STREET ALBANY NY 12206	10/25/2022	10/25/2027
DOL	DOL		J.R.N COMPANIES, LLC		531 THIRD STREET ALBANY NY 12206	12/12/2022	12/12/2027
DOL	DOL		J.R.N COMPANIES, LLC		531 THIRD STREET ALBANY NY 12206	11/07/2023	11/07/2028
DOL	DOL		J.R.N COMPANIES, LLC		531 THIRD STREET ALBANY NY 12206	10/25/2022	10/25/2027
DOL	DOL	*****1147	J.R.N. CONSTRUCTION, LLC		531 THIRD ST ALBANY NY 12206	11/07/2023	11/07/2028
DOL	DOL	*****1147	J.R.N. CONSTRUCTION, LLC		531 THIRD ST ALBANY NY 12206	12/22/2022	12/22/2027
DOL	DOL	*****1147	J.R.N. CONSTRUCTION, LLC		531 THIRD ST ALBANY NY 12206	10/25/2022	10/25/2027
DOL	DOL		JAMES J. BAKER		7901 GEE ROAD CANASTOTA NY 13032	08/17/2021	08/17/2026
DOL	DOL		JAMES LINDSLEY		211 NORTH 2ND STREET FULTON NY 13069	07/30/2025	07/30/2030
DOL	DOL		JASON P. RACE		3469 STATE RT. 69 PERISH NY 13131	09/29/2021	09/29/2026
DOL	DOL		JASON P. RACE		3469 STATE RT. 69 PERISH NY 13131	02/09/2022	02/09/2027

DOL	DOL		JASON P. RACE		3469 STATE RT. 69 PERISH NY 13131	11/15/2022	11/15/2027
DOL	DOL		JASON P. RACE		3469 STATE RT. 69 PERISH NY 13131	03/01/2022	03/01/2027
DOL	DOL	*****7993	JBS DIRT, INC.		7901 GEE ROAD CANASTOTA NY 13032	08/17/2021	08/17/2026
DOL	DOL	*****2435	JEFFEL D. JOHNSON	JMJ7 AND SON	5553 CAIRNSTRAIL CLAY NY 13041	11/21/2022	11/21/2027
DOL	DOL		JEFFEL JOHNSON ELITE CARPENTER REMODEL AND CONSTRUCTION		C2 EVERGREEN CIRCLE LIVERPOOL NY 13090	11/21/2022	11/21/2027
DOL	DOL	*****2435	JEFFREY M. JOHNSON	JMJ7 AND SON	5553 CAIRNS TRAIL CLAY NY 13041	11/21/2022	11/21/2027
DOL	DOL		JENNIFER LINDSLEY		211 NORTH 2ND STREET FULTON NY 13069	07/30/2025	07/30/2030
DOL	DOL		JIM PLAUGHER		17613 SANTE FE LINE ROAD WAYNEFIELD OH 45896	07/16/2021	07/16/2026
DOL	DOL		JMJ7 & SON CONSTRUCTION, LLC		5553 CAIRNS TRAIL LIVERPOOL NY 13041	11/21/2022	11/21/2027
DOL	DOL		JMJ7 AND SONS CONTRACTORS		5553 CAIRNS TRAIL CLAY NY 13041	11/21/2022	11/21/2027
DOL	DOL		JMJ7 CONTRACTORS		7014 13TH AVENUE BROOKLYN NY 11228	11/21/2022	11/21/2027
DOL	DOL		JMJ7 CONTRACTORS AND SONS		5553 CAIRNS TRAIL CLAY NY 13041	11/21/2022	11/21/2027
DOL	DOL		JMJ7 CONTRACTORS, LLC		5553 CAIRNS TRAIL CLAY NY 13041	11/21/2022	11/21/2027
DOL	DOL		JOHN MARKOVIC		47 MANDON TERRACE HAWTHORN NJ 07506	03/29/2021	03/29/2026
DOL	DOL		JOHN WASE		8545 RT 9W ATHENS NY 12015	03/09/2021	03/09/2026
DOL	DOL		JORGE RAMOS		8970 MIKE GARCIA DR MANASSAS VA 20109	07/16/2021	07/16/2026
DOL	DA		JOSEPH DEMASCO		33 DOLLARD DRIVE NORTH BABYLON NY 11703	03/19/2025	03/19/2030
DOL	DOL		JOSEPH HALL		937 US ROUTE 11 CENTRAL SQUARE NY 13036	10/21/2024	10/21/2029
DOL	DOL	*****2271	JOSEPH HALL COMPANIES LLC		937 US ROUTE 11 CENTRAL SQUARE NY 13036	10/21/2024	10/21/2029
DOL	DOL		JOSEPH K. SALERNO		1010 TILDEN AVE UTICA NY 13501	07/24/2023	07/24/2028
DOL	DOL		JOSEPH K. SALERNO II		1010 TILDEN AVE UTICA NY 13501	07/24/2023	07/24/2028
DOL	DOL	*****5116	JP RACE PAINTING, INC. T/A RACE PAINTING		3469 STATE RT. 69 PERISH NY 13131	02/09/2022	02/09/2027
DOL	DOL	*****5116	JP RACE PAINTING, INC. T/A RACE PAINTING		3469 STATE RT. 69 PERISH NY 13131	11/15/2022	11/15/2027
DOL	DOL	*****5116	JP RACE PAINTING, INC. T/A RACE PAINTING		3469 STATE RT. 69 PERISH NY 13131	09/29/2021	09/29/2026
DOL	DOL	*****5116	JP RACE PAINTING, INC. T/A RACE PAINTING		3469 STATE RT. 69 PERISH NY 13131	03/01/2022	03/01/2027
DOL	DOL	*****5116	JP RACE PAINTING, INC. T/A RACE PAINTING		3469 STATE RT. 69 PERISH NY 13131	03/01/2022	03/01/2027
DOL	DOL		JRN CONSTRUCTION CO, LLC		1024 BROADWAY ALBANY NY 12204	11/07/2023	11/07/2028
DOL	DOL	*****1147	JRN CONSTRUCTION, LLC		531 THIRD STREET ALBANY NY 12206	10/25/2022	10/25/2027
DOL	DOL	*****1147	JRN CONSTRUCTION, LLC		531 THIRD STREET ALBANY NY 12206	12/22/2022	12/22/2027
DOL	DOL	*****1147	JRN CONSTRUCTION, LLC		531 THIRD STREET ALBANY NY 12206	11/07/2023	11/07/2028
DOL	DOL		JRN PAVING, LLC		531 THIRD STREET ALBANY NY 12206	10/25/2022	10/25/2027
DOL	DOL		JRN PAVING, LLC		531 THIRD STREET ALBANY NY 12206	12/22/2022	12/22/2027
DOL	DOL		JRN PAVING, LLC		531 THIRD STREET ALBANY NY 12206	11/07/2023	11/07/2028
DOL	DOL		JULIUS AND GITA BEHREND		5 EMES LANE MONSEY NY 10952	11/20/2002	11/20/3002
DOL	DOL		KARIN MANGIN		796 PHELPS ROAD FRANKLIN LAKES NJ 07417	12/01/2020	12/01/2025
DOL	DOL		KATE E. CONNOR		7088 INTERSTATE ISLAND RD SYRACUSE NY 13209	03/31/2021	03/31/2026

DOL	DOL		KEAN INDUSTRIES, LLC		2345 RT. 52 SUITE 2NHOPEWELL JUNCTION NY 12533	12/18/2023	12/18/2028
DOL	DOL	*****2959	KELC DEVELOPMENT, INC		7088 INTERSTATE ISLAND RD SYRACUSE NY 13209	03/31/2021	03/31/2026
DOL	DOL		KEVIN FUNEZ URBINA A/K/A KEVIN FUNEZ		1009 LYNDALE AVE TRENTON NJ 08629	12/16/2024	12/16/2029
DOL	DOL		KIMBERLY F. BAKER		7901 GEE ROAD CANASTOTA NY 13032	08/17/2021	08/17/2026
DOL	DOL	*****8760	KJ&J CONSTRUCTION, LLC		1009 LYNDALE AVE TRENTON NJ 08629	12/16/2024	12/16/2029
DOL	DOL		KMA GROUP II, INC.		29-10 38TH AVENUE LONG ISLAND CITY NY 11101	10/11/2023	10/11/2028
DOL	DOL	*****1833	KMA GROUP INC.		29-10 38TH AVENUE LONG ISLAND CITY NY 11101	10/11/2023	10/11/2028
DOL	DOL		KMA INSULATION, INC.		29-10 38TH AVENUE LONG ISLAND CITY NY 11101	10/11/2023	10/11/2028
DOL	DOL		KRIN HEINEMANN		2345 ROUTE 52, SUITE 2N HOPEWELL JUNCTION NY 12533	12/18/2023	12/18/2028
DOL	NYC		KULWANT S. DEOL		9-11 40TH AVENUE LONG ISLAND CITY NY 11101	09/26/2023	09/26/2028
DOL	DA	*****8816	LAKE CONSTRUCTION AND DEVELOPMENT CORPORATION		150 KINGS STREET BROOKLYN NY 11231	08/19/1998	08/19/2998
DOL	DOL		LEROY E. NELSON JR		531 THIRD ST ALBANY NY 12206	10/25/2022	10/25/2027
DOL	DOL		LEROY E. NELSON JR		531 THIRD ST ALBANY NY 12206	12/22/2022	12/22/2027
DOL	DOL		LEROY E. NELSON JR		531 THIRD ST ALBANY NY 12206	11/07/2023	11/07/2028
DOL	DOL	*****3716	LIGHTNIN ELECTRIC INC.		3418 NORTHERN BLVD SUITE 5-27LONG ISLAND CITY NY 11101	12/13/2024	12/13/2029
DOL	AG	*****3291	LINTECH ELECTRIC, INC.		3006 TILDEN AVE BROOKLYN NY 11226	02/16/2022	02/16/2027
DOL	DOL		LOUIS A. CALICCHIA		1223 PARK ST. PEEKSKILL NY 10566	05/17/2021	05/17/2026
DOL	DOL	*****2196	MAINSTREAM SPECIALTIES, INC.		11 OLD TOWN RD SELKIRK NY 12158	02/02/2021	02/02/2026
DOL	DA		MANUEL P TOBIO		150 KINGS STREET BROOKLYN NY 14444	08/19/1998	08/19/2998
DOL	DA		MANUEL TOBIO		150 KINGS STREET BROOKLYN NY 11231	08/19/1998	08/19/2998
DOL	DOL	*****1320	MJC MASON CONTRACTING, INC.		42 FOWLER AVENUE CORTLAND MANOR NY 10567	10/25/2022	10/25/2027
DOL	DOL	*****1320	MJC MASON CONTRACTING, INC.		42 FOWLER AVENUE CORTLAND MANOR NY 10567	01/24/2023	01/24/2028
DOL	DOL		MOHAMMAD MIAN		8269 21ST ST BELLEROSE NY 11426	12/22/2022	12/22/2027
DOL	NYC		NASEER CHAUDHRY		2349 BRAGG STREET BROOKLYN NY 11229	04/22/2025	04/22/2030
DOL	DOL	*****7790	NATIONAL BUILDING & RESTORATION CORP		1010 TILDEN AVE UTICA NY 13501	07/24/2023	07/24/2028
DOL	DOL	*****1797	NATIONAL CONSTRUCTION SERVICES, INC		1010 TILDEN AVE UTICA NY 13501	07/24/2023	07/24/2028
DOL	NYC		NAVIT SINGH		402 JERICHO TURNPIKE NEW HYDE PARK NY 11040	08/10/2022	08/10/2027
DOL	DOL		NELCO CONTRACTING, LLC		1024 BROADWAY ALBANY NY 12204	11/07/2023	11/07/2028
DOL	DA		NICHOLAS BARNETT		33 DOLLARD DR BABYLON NY 11703	03/04/2025	03/04/2030
DOL	DA		NICHOLAS T. ANALITIS		505 MANHATTAN AVE WEST BABYLON NY 11704	10/05/2023	10/05/2028
DOL	DOL		NICHOLE E. FRASER A/K/A NICHOLE RACE		3469 STATE RT. 69 PERISH NY 13131	03/01/2022	03/01/2027
DOL	DOL		NICHOLE E. FRASER A/K/A NICHOLE RACE		3469 STATE RT. 69 PERISH NY 13131	11/15/2022	11/15/2027
DOL	DOL		NICHOLE E. FRASER A/K/A NICHOLE RACE		3469 STATE RT. 69 PERISH NY 13131	09/29/2021	09/29/2026
DOL	DOL		NICHOLE E. FRASER A/K/A NICHOLE RACE		3469 STATE RT. 69 PERISH NY 13131	02/09/2022	02/09/2027
DOL	DOL		NIKOLA NTONI		3418 NORTHERN BLVD SUITE 5-27LONG ISLAND CITY NY 11101	12/13/2024	12/13/2029

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DOL	NYC	*****6971	NN CONSTRUCTION, INC.		2349 BRAGG STREET BROOKLYN NY 11229	04/22/2025	04/22/2030
DOL	NYC	*****5643	NYC LINE CONTRACTORS, INC.		402 JERICHO TURNPIKE NEW HYDE PARK NY 11040	08/10/2022	08/10/2027
DOL	DOL		PATRICK PENNACCHIO		2345 RT. 52 SUITE 2NHOPEWELL JUNCTION NY 12533	12/18/2023	12/18/2028
DOL	DOL		PATRICK PENNACCHIO		2345 RT. 52 SUITE 2NHOPEWELL JUNCTION NY 12533	12/18/2023	12/18/2028
DOL	DOL		PAULINE CHAHALES		935 S LAKE BLVD MAHOPAC NY 10541	03/02/2021	03/02/2026
DOL	DOL		PETER STEVENS		11 OLD TOWN ROAD SELKIRK NY 12158	02/02/2021	02/02/2026
DOL	DOL	*****4168	PHANTOM CONSTRUCTION CORP.		95-27 116TH STREET QUEENS NY 11419	07/12/2024	07/12/2029
DOL	DOL	*****4168	PHANTOM CONSTRUCTION CORP.		95-27 116TH STREET QUEENS NY 11419	05/28/2024	05/28/2029
DOL	DOL	*****4772	R.W. LOBDELL CONSTRUCTION LLC		635 WEST DRYDEN ROAD FREEVILLE NY 13068	01/31/2025	01/31/2030
DOL	DOL	*****2633	RAW POWER ELECTRIC CORP.		3 PARK CIRCLE MIDDLETOWN NY 10940	07/11/2022	07/11/2027
DOL	DA	*****7559	REGAL CONTRACTING INC.		24 WOODBINE AVE NORTHPORT NY 11768	10/01/2020	10/01/2025
DOL	DOL		ROBBYE BISSESAR		89-51 SPRINGFIELD BLVD QUEENS VILLAGE NY 11427	01/11/2003	01/11/3003
DOL	DOL		ROMEO WARREN		161 ROBYN RD MONROE NY 10950	07/11/2022	07/11/2027
DOL	DOL	*****7172	RZ & AL INC.		198 RIDGE AVENUE VALLEY STREAM NY 11581	06/06/2022	06/06/2027
DOL	DOL		SAL FRESINA MASONRY CONTRACTORS, INC.		1935 TEALL AVENUE SYRACUSE NY 13206	07/16/2021	07/16/2026
DOL	DOL		SAL MASONRY CONTRACTORS, INC.		(SEE COMMENTS) SYRACUSE NY 13202	07/16/2021	07/16/2026
DOL	DOL	*****9874	SALFREE ENTERPRISES INC		P.O BOX 14 2821 GARDNER RDPOMPEI NY 13138	07/16/2021	07/16/2026
DOL	DOL		SALVATORE A FRESINA A/K/A SAM FRESINA		107 FACTORY AVE P.O BOX 11070SYRACUSE NY 13218	07/16/2021	07/16/2026
DOL	DOL		SAM FRESINA		107 FACTORY AVE P.O BOX 11070SYRACUSE NY 13218	07/16/2021	07/16/2026
DOL	DA	*****0476	SAMCO ELECTRIC CORP.		3735 9TH ST LONG ISLAND CITY NY 11101	01/05/2023	01/05/2028
DOL	DA		SILVANO TRAVALJA		3735 9TH ST LONG ISLAND CITY NY 11101	01/05/2023	01/05/2028
DOL	DOL	*****0440	SOLAR GUYS INC.		8970 MIKE GARCIA DR MANASSAS VA 20109	07/16/2021	07/16/2026
DOL	NYC	*****3661	SPANIER BUILDING MAINTENANCE CORP		200 OAK DRIVE SYOSSET NY 11791	03/14/2022	03/14/2027
DOL	DOL		STANADOS KALOGELAS		485 RAFT AVENUE HOLBROOK NY 11741	10/19/2021	10/19/2026
DOL	DOL	*****3496	STAR INTERNATIONAL INC		89-51 SPRINGFIELD BLVD QUEENS VILLAGE NY 11427	08/11/2003	08/11/3003
DOL	DOL	*****9528	STEEL-IT, LLC.		17613 SANTE FE LINE ROAD WAYNESFIELD OH 45896	07/16/2021	07/16/2026
DOL	DOL	*****3800	SUBURBAN RESTORATION CO. INC.		5-10 BANTA PLACE FAIR LAWN PLACE NJ 07410	03/29/2021	03/29/2026
DOL	DOL	*****9150	SURGE INC.		8269 21ST STREET BELLEROSE NY 11426	12/22/2022	12/22/2027
DOL	DOL		SYED MUHAMMAD S. JAFRI A/K/A SHARRUKH JAFRI		4307 28TH AVE ASTORIA NY 11103	10/11/2024	10/11/2029
DOL	DOL		SYED RAZA		198 RIDGE AVENUE NY 11581	06/06/2022	06/06/2027
DOL	DOL		TARLOK SINGH		95-27 116TH STREET QUEENS NY 11419	05/28/2024	05/28/2029
DOL	DOL		TARLOK SINGH		95-27 116TH STREET QUEENS NY 11419	07/12/2024	07/12/2029
DOL	DOL	*****9733	TERSAL CONSTRUCTION SERVICES INC		107 FACTORY AVE P.O BOX 11070SYRACUSE NY 13208	07/16/2021	07/16/2026
DOL	DOL		TERSAL CONTRACTORS, INC.		221 GARDNER RD P.O BOX 14POMPEI NY 13138	07/16/2021	07/16/2026
DOL	DOL		TERSAL DEVELOPMENT CORP.		1935 TEALL AVENUE SYRACUSE NY 13206	07/16/2021	07/16/2026

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DOL	DOL	*****2426	THE MATRUKH GROUP, INC.		4307 28TH AVE PO BOX 9082ASTORIA NY 11103	10/11/2024	10/11/2029
DOL	DOL		THOMAS LOBDELL		635 WEST DRYDEN ROAD FREEVILLE NY 13068	01/31/2025	01/31/2030
DOL	DOL		TIMOTHY PERCY		29807 ANDREWS ROAD BLACK RIVER NY 13612	10/17/2023	10/17/2028
DOL	DA	*****1050	TRI STATE CONSTRUCTION OF NY CORP.		50-39 175TH PLACE FRESH MEADOWS NY 11365	03/28/2022	03/28/2027
DOL	DA	*****4106	TRIPLE H CONCRETE CORP		2375 RAYNOR STREET RONKONKOMA NY 11779	08/04/2021	08/04/2026
DOL	DOL	*****8210	UPSTATE CONCRETE & MASONRY CONTRACTING CO INC		449 WEST MOMBSHA ROAD MONROE NY 10950	06/06/2022	06/06/2027
DOL	DOL	*****6418	VALHALLA CONSTRUCTION, LLC.		796 PHLEPS ROAD FRANKLIN LAKES NJ 07417	12/01/2020	12/01/2025
DOL	DOL		VINCENT CORRAO		PO BOX 393 NANUET NY 10954	09/17/2024	09/17/2029
DOL	DOL	*****8266	WILLIAM CHRIS MCCLENDON	MCCLENDON ASPHALT PAVING	1646 FALLS STREET NIAGARA FALLS NY 14303	05/01/2023	05/01/2028
DOL	DOL		WILLIAM CHRIS MCCLENDON		1646 FALLS STREET NIAGARA FALLS NY 14303	05/01/2023	05/01/2028
DOL	DOL		WILLIAM G. PROERFRIEDT		85 SPRUCEWOOD ROAD WEST BABYLON NY 11704	01/19/2021	01/19/2026
DOL	DOL	*****5924	WILLIAM G. PROPHY, LLC	WGP CONTRACTING, INC.	54 PENTAQUIT AVE BAYSHORE NY 11706	01/19/2021	01/19/2026
DOL	DOL		WILLIAM SCRIVENS		4192 SIR ANDREW CIRCLE DOYELSTOWN PA 18902	07/18/2024	07/18/2029
DOL	DOL		XENOFON EFTHIMIADIS		29-10 38TH AVENUE LONG ISLAND CITY NY 11101	10/11/2023	10/11/2028

DIVISION 01 – GENERAL REQUIREMENTS

SECTION 010000 – GENERAL REQUIREMENTS

PART 1 – SCHEDULES AND REPORTS

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1. Summary of the Work
2. Laws, Ordinances, Taxes, and Permits
3. Plan of Operations and Progress Schedule
4. Sequence of Work
5. Contractor's Examination
6. Notification of Owner and Architect
7. Access and Movement of Materials and Personnel
8. Job Meetings
9. Equal Opportunity
10. Wage Rates

1. SUMMARY OF THE WORK

A. All work as shown on the drawings and as specified herein.

2. LAWS, ORDINANCES, TAXES, AND PERMITS

A. Taxes and Permits:

1. Exempt from New York State Sales Tax.

2. Exempt from Federal Excise Tax.

3. Not subject to building permit fees.

B. Laws and Ordinances:

The Project is subject to and Contractor shall comply with:

1. New York State Wage Rate Requirements.

2. Federal Occupational Safety and Health Administration Standards.

3. Applicable local, state, and other governing safety regulations.

3. PLAN OF OPERATIONS AND PROGRESS SCHEDULES

A. In order to facilitate coordination and fitting, the Contractor shall prepare a "Plan of Operations and Progress Schedule" which shall show concisely the manner in which work will be started, prosecuted, and completed.

B. After approval of the above document, the Contractor shall be responsible for seeing that it is adhered to and for ascertaining that proper coordination is maintained between work of all Contracts.

4. SEQUENCE OF WORK

A. It is intended that the work under this Contract be executed without interruption of and with minimum interference with school operations.

B. Notify utility companies as required by local ordinance and State Law.

C. Ascertain location of utilities inside and outside of building before commencing demolition work of any kind.

D. Take precautions to protect the adjacent spaces and surfaces from flying or falling debris. Prevent dust and dirt from rising and clean any dust created by this work.

E. Contractor shall not employ any labor, materials, or means whose employment or utilization during the course of the work tend to or in any way cause or result in strikes, work stoppages, delays, suspension of work, or similar troubles by workmen under his employ, his Subcontractors, or any of the trades working in or about the premises where work of this Contract is being performed.

F. The work shall be done with due care; the Contractor will be held responsible for any damage which may be caused thereby to any part or parts of existing structures, site, or items designated to remain. Before proceeding with demolition work, ascertain need for and accomplish any required protection measures. Embedded anchorage and attachments shall be removed to permit proper patching. Contractor will be liable for damage caused to any parts of existing structure or work designated to remain.

G. Where removal work occurs or where new and old work join, the immediate adjacent surfaces or so much thereof as is required by the involved conditions shall be cut, removed, patched, repaired, or refinished, and left in as good a condition as existed prior to the commencing of the work. The materials and workmanship employed shall conform to that of the original work.

H. The Contractor shall establish and maintain a rate of work progress so as to insure completion of the construction operations within the time stipulated in the Agreement.

I. Where materials or construction are to be applied or attached to existing surfaces or construction and to have included in his bid all costs for preparatory work on such surfaces or construction as necessary to permit the proper execution of the required work.

J. Upon completion of all work under this Section, the Contractor shall remove all tools, materials, plant, apparatus, and rubbish of any sort. The premises shall be left clean, neat, and orderly to the entire satisfaction of the Architect.

5. CONTRACTOR'S EXAMINATION

A. Contractor shall take all field measurements as required and shall satisfy himself as to the nature of equipment and facilities required for and the conditions under which he will be obliged to carry out the execution of the work in every particular which might in any way affect the cost thereof. The submission of a Proposal will be construed as conclusive evidence that such an examination has been made, and no subsequent claims for additional costs of labor, materials, appliances, equipment, etc., or for difficulties encountered which could have been foreseen has such an examination been made, will be recognized.

6. NOTIFICATION OF OWNER AND ARCHITECT

A. Before starting any work relating to existing utilities or school services, the Contractor will be required to give 24 hours notice to the Architect and Owner and obtain their approval in writing before proceeding with such work.

B. All work involving active utility or school service shall be performed with the utmost dispatch and without discontinuance or disruption of such services except as and when approved by the Owner.

7. ACCESS AND MOVEMENT OF MATERIALS AND PERSONNEL

A. The direction of the Owner as to access to the existing building and the limits within which each Contractor shall control the movements of his personnel and materials shall be strictly followed. Generally, the movement of Contractor's personnel within the premises shall be restricted to the minimum necessary for the performance of required work. Under no circumstances shall Contractor's personnel at any time enter upon any portions of the building or premises where such entry is not strictly necessitated by the work required under this Contract. The Contractor shall rigidly enforce these restrictions; violation thereof shall be cause for dismissal of the offender.

B. Delivery of equipment and materials shall be confined to the limits designated, and storage shall be where directed by the Owner. Temporary enclosures necessary for such storage shall be provided by the Contractor and shall be removed when no longer required.

C. All work in the existing building shall be performed with the least possible annoyance to the occupants of the building.

8. JOB MEETINGS

A. Pre-Construction Conference: Upon receiving notice that he has been awarded the Construction Contract for the project, and within ten (10) days of such notice, the Contractor shall make an appointment to meet with the Architect and his representative(s), and shall also instruct his Subcontractors or their representatives to be made personally known to each other and to plan and initiate the most favorable course of the upcoming construction work.

B. Regular Job Meeting: The Contractor, Architect, and those Subcontractors whose presence is necessary, shall attend periodic meetings for the purpose of discussing the progress and execution of the work. These meetings shall be held at a time and place designated by the Owner’s Representative. The proceedings of these meetings will be recorded by the Owner’s Representative and a copy will be subsequently furnished the Contractor for his use. It will be the Contractor's responsibility to distribute copies, as may be required, to his Subcontractors.

9. EQUAL OPPORTUNITY (LABOR LAW SECTION 220-e)

A. The Contractor shall not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin. The Contractor shall take affirmative action to insure that applicants are employed and that employees are treated during employment without regard to their race, color, religion, sex, or national origin. such action shall include, but not be limited to, the following: employment, upgrading, demotion or transfer, recruitment or recruitment advertising, layoff or termination, rates of pay or other forms of compensation, and selection for training including apprenticeship. The Contractor agrees to post, in conspicuous places available to employees and applicants for employment, notices to be provided setting forth the provisions of the non-discrimination clause.

B. The Contractor shall, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, or national origin.

C. The Contractor shall send to each labor union or representative of workers with which he has a collective bargaining agreement or other Contract or understanding a notice to be provided advising the said labor union or worker's representatives of the Contractor's commitments under this section and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

D. The Contractor shall comply with Executive Order 11246, Federal Equal Employment Opportunity, unless exempt, in accordance with Section 203 of this order.

10. WAGE RATES

A. The Labor Law of New York State provides, among other things, that it shall be the duty of the fiscal officer to make a determination of the schedule of wages to be paid to all laborers, workmen, and mechanics employed on public work projects including supplements for welfare, pension, retirement, vacation, and other benefits, in accordance with prevailing practice in the locality. The Contractor shall comply with all requirements of this law as it applies to this project and locality.

B. The rates of wages determined by the New York State Industrial Commissioner pursuant to the Labor Law are set forth as per the schedule contained within this Project Manual.

END OF SECTION

DIVISION 01 – GENERAL REQUIREMENTS

SECTION 010100 – CONDITIONS OF THIS CONTRACT

A. Before attempting to deliver materials to the site, the Contractor shall inform the Owner's Representative so that arrangements can be made for places of entrance and inspection of materials being delivered.

B. The Contractor shall provide written guarantee of the complete installation to be free from defects in materials and workmanship in accordance with Section 017000. Any portion of the work judged inferior shall be replaced by the Contractor at no additional cost to the Owner.

C. The Contractor shall maintain operational exits, exit lights, danger signs, open trench markings, fire emergency equipment, night lights, and proper storage facilities for equipment and materials as directed through the length of the Contract.

D. The Contractor shall be totally responsible for general site clean up and removal of all materials and equipment related to this Contract at the end of the Contract.

E. The Contractor shall take over and maintain the site immediately after receiving the order to start work. Provide protection of property and utilities until work of the Contract is complete and accepted. The Contractor shall be responsible for the safety of any adjoining property, including paving, utility mains, pipes conduit, etc., and shall, at his own expense, protect and maintain same in at least as good a condition as that in which they were found.

F. All seeded areas, pavements, walks, curbs, and approaches shall be always kept clear and, if disturbed by this construction work, shall be repaired and restored with materials to match existing.

G. Before commencing any work, the Contractor shall verify all coverage, and conditions prevalent at the job sites. If no discrepancies are found, the contractor shall report all corrections in writing. If no corrections are brought to the attention of the School District and the Architect/Engineer before starting installation, the Contractor will be totally responsible for this installation providing complete coverage of the area designated.

H. Upon completion of the work, the Contractor shall furnish as-built drawings showing the exact locations of every new item.

I. It is assumed that Contractor's prices are based on scope of work complete and as confirmed by site(s) inspections prior to bidding.

J. Contractor shall be responsible for all incidental electric and plumbing work required to complete work under this Contract.

K. All repair and patching work shall be done in a professional manner. The Contractor shall take care to match new and existing surfaces and materials as closely as possible for a continuous finish where duplication is impossible.

L. Equivalents: Where, in these specifications, kinds, types, brands, or manufacturers of materials are named, they shall be regarded as the required standard of quality. Where two or more are named, these are presumed to be equal, and the Contractor may select one of those items. If the Contractor desires to use any kind, type, brand, or manufacturer of material other than those named in the specifications as the basis of the bid, the Contractor shall indicate in writing with the bid, within 72 hours after the bid, or prior to award of contract, what kind, type, brand, or manufacturer is included in the base bid for the specified items, and submit information describing in specific detail wherein it differs from the quality and performance required by the base specifications and such other

information as may be required by the Owner. The Contractor may, at any time, propose to use in the work an equivalent item in lieu of that specified with no change in the bid amount.

M. All prospective bidders shall be required to provide proof of demonstrated competence and experience in this type of work as outlined in these specifications, and each bidder must submit names and addresses of previous jobs completed by his firm, which involved the type of work outlined in the specifications. Bidders are required to complete the “Statement of Bidders Qualifications” form contained herein and submit it with their bids.

N. At least three letters of reference for this type of work completed in the last five years shall be provided upon request, with pertinent company names and addresses of the firms for which the work was done indicating type of work, scope of work, and complete work. The district has the right to verify these letters as well as examine other aspects of the bidder’s work record.

O. As is usual with capital project payments, the district will retain five percent of each payment issued on verified requisitions for payment submitted by the Contractor. This retainage total will be paid upon satisfactory completion of all the work.

P. The maximum gross weight of vehicles used shall not exceed 2,500 lbs. per wheel in the area of playgrounds and athletic fields. The equipment shall be equipped with flotation type tires. On the front lawns, the pounds per square inch exerted on the turf-grass shall not exceed 15 lbs. per square inch and on the back athletic area shall not exceed 32 lbs. per square inch.

Q. The Contractor shall be required to conform to all OSHA requirements regarding Lock-out/Tag-out procedures. This shall include, but not be limited to, disconnecting the power to any equipment to be serviced via a disconnect switch or breaker, locking out this power source, and tagging this lockout with appropriate wording as per OSHA requirements. This shall apply to any power source associated with this project.

R. Certificate of Occupancy: During construction, school district personnel shall monitor the occupied portion of any school building to assure that it complies with the minimum requirements necessary to maintain a Certificate of Occupancy.

S. Complaints: Boards of Education and BOCES shall follow procedures established under Section 155.4 (d) (7) for the investigation and disposition of complaints relating to health and safety received as a result of construction and maintenance activities.

T. Health and Safety Committee: Boards of Education and BOCES shall establish procedures for involvement of the health and safety committee to monitor safety during school construction projects.

U. Emergency Plan: The district emergency plan shall be updated to reflect any changes necessary to accommodate the construction process.

V. Fire Drills: Fire drills shall be held to familiarize students and staff with temporary exits and revised emergency procedures.

W. Notification: Boards of Education and BOCES shall establish procedures for notification of parents, staff, and the community in advance of a construction project of $10,000 or more.

X. Fire and Hazard Prevention: The following shall be strictly enforced:

1. During construction, daily inspection of district occupied areas shall be conducted by school district personnel to assure that construction materials, equipment, and debris do not block fire exist or emergency rescue windows.

2. Proper operation of fire extinguishers, fire alarm, and smoke/fire detection systems shall be maintained throughout the project.

Y. Radon: Districts shall take responsibility to be aware of the geological potential for high levels of radon and test and mitigate as appropriate.

Z. Post Construction Inspection: The school district or BOCES shall provide the opportunity for a walk-through inspection by the Health and Safety committee members to confirm that the area is ready for occupancy.

AA. In accordance with the applicable provisions of AHERA (40 CFR §763.84.d) all contractor's are notified that district's buildings do contain asbestos containing building materials (ACBM) and asbestos regulated areas. In addition to the work specified in these project documents, contractors are to review the district's Asbestos Management Plan (AMP) and applicable AHERA Reinspection/Surveillance report for the applicable buildings/work areas prior to performing any work in the school buildings. If your proposed work requires the handling or disturbance of any ACBM, assumed ACBM, any unlisted suspect ACBM, or requires entrance into any asbestos labeled/regulated areas you are required to contact the district's asbestos designated person at the facilities office prior to any work being performed. Any disturbance/handling of ACBM must be performed in accordance with the Asbestos section of these specifications.

Please advise your staff of this requirement and ensure that they sign the short-term worker notification sheet located in the custodian's office prior to the start of any work. If you need any assistance in reviewing the information in this report, please contact the owner or owner's representative.

BB. Some of the proposed work may require various contractors to enter crawlspace or pipe tunnel areas, and/or access plenum spaces associated with the existing ceiling and wall systems (typical throughout). Please be advised that these spaces contain asbestos containing and/or asbestos contaminated materials. The contractor is responsible for all compliance with applicable OSHA regulations pertaining to any occupational exposures to asbestos fibers.

Specifically, certain crawlspaces and pipe tunnels have been identified and placarded by the district as Regulated Areas in accordance with 29 CFR 1910 (OSHA). The contractor must perform the following entry/exit procedures for all Regulated Areas identified by the school district.

1. All persons entering the regulated area (i.e. crawlspace) shall don protective coveralls including shoe coverings, prior to entry.
2. Each person exiting the crawlspace shall, while still inside the crawlspace, remove the protective coveralls, immediately before stepping out of the crawlspace onto a walk-off pan/pad. All protective coveralls shall remain in the crawlspace for future disposal as asbestos contaminated waste.
3. All personnel shall ensure that the areas outside the crawlspace are visibly free of sand, dust, etc. subsequent to their exit.
4. The contractor shall notify the owners representative when work will be undertaken in these areas so that an independent monitoring firm can be available to monitor the activities within these spaces.

CC. If the contractor encounters damaged or inadvertently disturbs any ACBM, work should stop immediately, and the contractor notify the owner/owners representations. Any abatement/disturbance of these materials must be performed in accordance with the Asbestos section of these specifications.

END OF SECTION

DIVISION 01 – GENERAL REQUIREMENTS

SECTION 010200 – INSURANCE REQUIREMENTS

CONTENTS:

1. General Requirements
2. Certificates of Insurance
3. Types of Coverage and Minimum Limits
4. Continuity

1. GENERAL REQUIREMENTS

A. In addition to the requirements specified under Article 11 of the General Conditions and the insurance required by law, the Contractor shall, before commencing work under this Contract and during the period of construction to the date of final acceptance by the Owner, purchase, effect, and maintain insurance coverage as described in this section.

B. No Subcontractor shall be permitted to undertake any portion of this Contract without first having presented to the Contractor certification attesting to similar coverages as are required of the Contractor under this section. Such certification shall be issued to and in a form acceptable to the Contractor.

C. Notwithstanding any terms, conditions or provisions, in any other writing between the parties, the Contractor agrees to effectuate the naming of the Owner, the Architect and the Construction Manager (when applicable) as Additional Insureds on the Contractor's insurance policies, with the exception of Workers' Compensation and NY State Disability.

D. Each policy naming the Owner, the Architect and the Construction Manager (when applicable) as additional insureds shall:

1. Be an insurance policy from an A.M. Best A- rated or better insurer, licensed and admitted to conduct business in New York State. A New York licensed and admitted insurer is required.
2. State that the organizations coverage shall be primary and non-contributory coverage for the Owner, its Board of Education, employees and volunteers including a waiver of subrogation in favor of the Owner for all coverages including Workers Compensation.
3. Additional Insured status for General Liability coverage shall be provided by standard or other endorsements that extend coverage to the Owner, the Architect and the Construction Manager (when applicable) for both on-going operations (CG 20 38 or equivalent) and products and completed operations (CG 20 37 or equivalent), latest version. The decision to accept an endorsement rests solely with the Owner. A completed copy of the endorsements must be attached to the Certificate of Insurance to include General Liability, Auto Liability and Umbrella/Excess coverages. A copy of the Acord 855 Form is required to be sent for review. Contracts with subcontractors shall require them to provide the same additional insured coverages and documents.

2. CERTIFICATES OF INSURANCE

A. Certificates of Insurance shall be transmitted in duplicate to the Architect for forwarding to the Owner, and any Certificate found to be incomplete or not according to the proper form will be returned as being unsatisfactory. A letter of transmittal from each insurance company involved must be submitted certifying that the certificate is issued pursuant to their authorization.

B. The certificate of insurance must describe **all services** provided by the contractor (ie. roofing, carpentry or plumbing, etc.) that are covered by the liability policies.

C. At the Owner's request, the Contractor shall provide a copy of the declaration page of the liability and umbrella/excess policies with a list of endorsements and forms. If requested, the Contractor will provide a copy of the policy endorsements and forms.

D. There will be no coverage restrictions and/or exclusions involving New York State Labor Law statutes or gravity related injuries.

E. No policies containing escape clauses or exclusions contrary to the Owners interests will be accepted.

F. A fully completed New York Construction Certificate of Liability Insurance Addendum (ACORD 855 2014/05) must be included with the certificates of insurance. For any "Yes" answers on Items G through L on this form - additional details must be provided in writing. Policy exclusions may not be accepted.

E. The Contractor agrees to indemnify the Owner for any applicable deductibles and self-insured retentions.

G. Certificates shall contain:

1. Name and address of the insured.
2. Job location and title of the Contract.
3. Policy number and expiration date.
4. Issuance date of Certificate.
5. Types of coverage included.
6. Limit of Liability for each type used.
7. Types of operations covered (Classifications).
8. Types of operations or of coverages specifically excluded.
9. Thirty (30) day cancellation or non-renewal notice.
10. Owner, Architect or Owner representatives as additional insured.
11. Hold Harmless Clause indemnifying Owner, Architect or Owner representatives.
12. Name of Insurance Company.

H. The delivery of Certificates of Insurance authorizes the Owner or Architect to make direct inquiry of and to receive direct response from the insurance carrier regarding questions arising during the performance of the Work which are pertinent to the coverages under the policies.

3. TYPES AND MINIMUM LIMITS OF COVERAGE

A. The Contractor will obtain and keep in full force and effect during the term of the Contract, at the Contractor's sole cost and expense, the following insurance:

B. Commercial General Liability Insurance
- $1,000,000 per occurrence/ $2,000,000 aggregate
- $2,000,000 Products and Completed Operations
- $1,000,000 Personal and Advertising Injury
- $100,000 Fire Damage
- $10,000 Medical Expense
- The general aggregate must apply on a per-project basis. Products and completed operations coverage must remain in effect for three years after project completion and acceptance of the work performed.

C. Automobile Liability
- $1,000,000 combined single limit for owned, hired and borrowed and non-owned motor vehicles.

D. Workers' Compensation and NYS Disability Insurance
   - Statutory Workers' Compensation (C-105.2 or U-26.3); and New York State Disability Insurance (DB-120.1) for all employees (per NYS WC and Disability Laws). Proof of coverage must be on the approved specific form, as required by the New York State Workers' Compensation Board. ACORD certificates are not acceptable. A person seeking an exemption must file a CE-200 form with New York State. The form can be completed and submitted directly to the Workers' Compensation Board online.

E. Builders Risk
   - Must be purchased and maintained by the Owner of the property. The limit must reflect the total completed value – all material and labor costs, and provide coverage for fire, lightning, explosion, extended coverage, vandalism, malicious mischief, windstorm, hail and/or flood. Coverage will remain in effect until the project is completed and/or the property occupied and put to its intended use.

F. Umbrella/Excess Liability Insurance
   - Umbrella/Excess coverage shall be on a follow-form basis or provide broader coverage over the General Liability and Auto Liability coverages.

   - $5 million each Occurrence and Aggregate for general construction work and no work at elevation (1 story or 10 feet) and project values less than or equal to $1,000,000.

   - $10 million each Occurrence and Aggregate for high-risk construction, work at elevation (>1 story or 10 feet) and project value greater than $1,000,000.

G. Asbestos/Lead Abatement/Pollution Liability Insurance
   - $2,000,000 per Occurrence/$2,000,000 Aggregate, including products and completed operations. Such insurance shall include coverage for the Contractors operations including, but not limited to, removal, replacement, enclosure, encapsulation and/or disposal of asbestos, or any other hazardous material, along with related pollution events, including coverage for third-party liability claims for bodily injury, property damage and clean-up costs. If a retroactive date is used, it shall pre-date the inception of the Contract.

   - If the Contractor is using motor vehicles for transporting hazardous materials, the Contractor must maintain pollution liability broadened coverage (ISO Endorsement CA 9948 or CA 01 12) as well as proof of MCS 90. Coverage shall fulfill all requirements of these specifications and shall extend for a period of three (3) years following acceptance by the Owner of the Certificate of Completion.

   - Testing Company Errors and Omission Insurance: $1,000,000 per Occurrence/$2,000,000 Aggregate for the testing and other professional acts of the Contractor under the Contract with the Owner.

H. Owners Contractors Protective (OCP) Insurance: The Contractor will obtain and keep in full force and effect during the term of this Contract, at the Contractor's sole cost and expense, Owners Contractors Protective (OCP) Insurance. The Owner will be the Named Insured on all OCP policies and there will be no additional insureds.

   1. For projects less than or equal to $1,000,000 and work on one (1) story (10 feet) only; $1 million per occurrence, $2 million aggregate with the Owner as the Named Insured.
   2. For projects greater than $1,000,000 and/or work over one (1) story (10 feet); $2 million per occurrence, $4 million aggregate with the Owner as the Named Insured.
   3. The OCP Policy must be with a NYS licensed and admitted carrier.

I. Cyber: The contractor must carry coverage applicable to the first- and third-party claims, arising from a cyber incident that could impact the Owners data the contractor may have in their possession. Limits shall be the greater of those carried by the Contractor or $250,000 per incident and $250,000 in the aggregate. If coverage is on a claims-made basis, coverage must have a retroactive date no later than the date of agreement with the Owner and provide coverage for two years following the date of Final Completion of the project. **The Cyber policy must be with a NYS licensed carrier.**

J. Contractor's Contingent Liability: The Contractor shall procure, pay for, and maintain such insurance as will protect the Contractor from his contingent liability for damages and for injury to the person or property of another which may arise from the operations of all Subcontracts under this Contract.

K. Contractor's and Employees' Equipment: The Contractor assumes responsibility for all injury to or destruction of the Contractor's materials, tools, machinery, equipment, appliances, shoring, scaffolding, false and form work, and personal property of Contractor's employees from whatever cause arises.

4. CONTINUITY

A. Contractor acknowledges that failure to obtain the foregoing insurance on behalf of the Owner constitutes a material breach of contract and subjects it to liability for damages, indemnification and all other legal remedies available to the Owner. The Contractor is to provide the Owner with a certificate of insurance, evidencing the above requirements have been met, prior to the commencement of work. The failure of the Owner to object to the contents of the certificate or the absence of same not be deemed a waiver of any rights held by the Owner.

In addition, the Contractor shall be responsible for the indemnification to the Owner and the Architect, of all costs associated with such lapse in coverage, including but not limited to reasonable attorney's fees.

B. Subcontractors are subject to the same terms and conditions as stated herein and must submit to the Owner for approval prior to the start of any work.

C. In the event the General Contractor fails to obtain the required certificates of insurance from the Subcontractor and a claim is made or suffered, the General Contractor shall indemnify, defend and hold harmless the Owner, its Board, employees, volunteers, the Architect and the Construction Manager (when applicable) from any and all claims for which the required insurance would have provided coverage. **This indemnity obligation is in addition to any other indemnity obligation provided in the contract.**

D. The Contractor assumes responsibility for all injury or destruction of the Contractor's materials, tools, machinery, equipment, appliances, shoring, scaffolding, false and form work, and personal property of the Contractor's employees from whatever cause arises. Any policy of insurance secured covering the Contractor or Subcontractors leased or hired by them and any policy of insurance covering the Contractor or Subcontractors against physical loss or damage to such property shall include an endorsement waiving the right of subrogation against the Owner for any loss or damage to such property.

E. The Owner in good faith may adjust and settle a loss with the Contractor's insurance carrier.

F. The Owner and the Contractor waive all rights against each other and any of their Subcontractors, Sub-subcontractors, agents and employees for damages caused by fire or other perils to the extent of actual recovery of any insurance proceeds under any property insurance policy procured or other property insurance applicable to the Contractor's Work.

G. Before commencement of its Work, the Contractor shall obtain and pay for such insurance as may be required to comply with its obligations pursuant to the Contract, including, but not limited to any indemnification and hold harmless provisions.

H. Review and acknowledgment of the Certificate of Insurance or other proof of insurance by the Owner or the Architect shall not relieve or decrease the liability of the Contractor hereunder.

I. If the terms of policies expire before the Contract is completed or during the period of completed operations coverage, and the Contractor fails to maintain continuance of such insurance, the Owner is entitled to provide protection for itself, to pay premiums therefor, and to charge the cost thereof to the Contractor.

J. In the event of loss by fire or other insured hazard during the term of the Contract, the Contractor shall cooperate with the Owner and Architect and the insurance adjusters in all procedure's incidental to the expeditious adjustment of the loss and shall during this period maintain progress of construction. The Contractor will not be relieved from his obligations for the proper execution of his Contract except that the time of completion may be extended for such number of days as may have been delayed by reason of such loss, as determined by the Architect.

END OF SECTION

DIVISION 01 – GENERAL REQUIREMENTS

SECTION 010300 – GOVERNING LAWS

GOVERNING LAWS

This project is governed by, but not limited to, the following laws:

- General Municipal Law, § 101, regarding separate contracts when total project exceeds $1,500,000
- General Municipal Law, § 103-d, regarding non-collusive bidding clause.
- General Municipal Law, § 106-b, regarding payment of contractors and subcontractors.
- General Municipal Law, § 108, regarding Worker's Compensation Insurance.
- General Municipal Law, § 109, regarding non-assignment of public contract.
- Labor Law, § 220, subdivision 2, regarding 40-hour week, 8-hour day.
- Labor Law, § 220-d, regarding wage rates and supplements.
- Labor Law, § 220-e, regarding anti-discrimination.
- Labor Law, § 222-a, regarding elimination of dust hazard.

SECTION 011200 - MULTIPLE CONTRACT SUMMARY

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. Section Includes:

1. Project information.
2. Work covered by Contract Documents.
3. Construction schedule.
4. Requirements and assignments for each Contract.
5. Owner-furnished products.
6. Access to site.
7. Coordination with occupants.
8. Work restrictions.

B. Section includes a summary of each contract, including responsibilities for coordination and temporary facilities and controls.

C. Each prime contractor is responsible for reviewing all Drawings and Specifications for every contract to gain a complete understanding and knowledge of the entire Project, to determine how the work of each contract is to interface with every other contract.

1.3 DEFINITIONS

A. The terms contract(or) and prime contract(or) are used interchangeably throughout this document.

B. Permanent Enclosure: As determined by Architect, the condition at which roofing is insulated and weathertight; exterior walls are insulated and weathertight; and openings are closed with permanent construction or substantial temporary closures equivalent in weather protection to permanent construction.

1.4 PROJECT INFORMATION

A. Project Identification: Millbrook Central School District – Bond Projects, Phase 1B at

Millbrook Middle School

B. Project Locations:

1. Millbrook Middle School, 43 Alden Pl, Millbrook, NY 12545

C. Owner: Millbrook Central School District.

1. Address: 43 Alden Place, Millbrook NY 12545

D. Architect: BBS Architects, Landscape Architects, Engineers

1. Address: 100 Great Oaks Blvd, Suite 115, Albany New York 12205.

E. Construction Manager: The Palombo Group

1. Address: 22 Noxon Street, Poughkeepsie New York 12601.

2. Construction Manager has been engaged for this Project to serve as an advisor to Owner and to provide assistance in administering the Contract for Construction between Owner and each Contractor, according to a separate contract between Owner and Construction Manager.

F. Project Representative: Project Representative will be appointed by Owner.

1. Project Representative will assist with administering the Contract for Construction between Owner and each Contractor, according to provisions of Division 01 Section "Project Management and Coordination".

G. Building Code in Effect for Project: New York State Uniform Fire Prevention and Building Code, Energy Conservation Construction Code of New York State and New York State Education Department.

1. Comply with the following: New York State Energy Conservation Code and the building standards of the New York State Education Department.

1.5 WORK COVERED BY CONTRACT DOCUMENTS

A. The Project will be constructed under a multiple prime contracting arrangement with the Owner awarding and holding the separate Contracts. Each contractor shall furnish all labor, material, tools, equipment, supervision, layout, delivery, trucking, shop drawings, submittals, coordination, etc. necessary to complete the work described in the Division of Work of their respective Contracts and based upon a complete set of Contract Documents.

B. Each Contractor has been given the opportunity prior to bid to inspect the entire Project site (interior & exterior) for interferences with their Contract work and agrees to accept the site as it exists on the date of the bid opening.

1. It is the Owner's intention to continue to occupy the existing buildings and site for normal School operations during the Construction process. The Contractors all agree to:

a. Cooperate with the Owner's personnel in maintaining and facilitating access to the school buildings and its facilities by the school staff, Students, Owner's agents, service consultants and the public, throughout the construction process.

b. Keep driveways and entrances serving the occupied School buildings clear and available to the Owner, the Owner's employees, the public, and to emergency vehicles. Do not obstruct access to, or use areas for parking, staging of equipment or materials. All access through these existing areas must be coordinated in advance and in accordance with the Owner's usage and occupancy schedule. Minimal on-site storage will be available on site, see staging plan.

c. Schedule construction operations to avoid conflicts or interruptions to the daily school functions. Coordinate any necessary interruptions with the designated project representative.

d. All existing Owner-occupied areas of buildings remain operational. Contractors are responsible for maintaining all systems, such as but not limited to: fire alarm, clocks, electric, public address system, heat, gas, water etc.

e. This project will include second shift work hours during the school year and standard hours during the summer. Additionally, overtime and weekend work as required to maintain the project schedule will also be required. During the school year, occupied areas must be left at the end of the shift as they were at the beginning of the shift. Any "communal" spaces must be in a finished condition for the owners' daily program.

C. Each Prime Contractor shall:

1. Provide field-engineering services, where required within the contract documents.
2. Coordinate construction schedule information to formulate one master schedule for the entire Project. Master Schedule will require updates as per Division 1 specifications.
3. Provide PPE to comply with all necessary NYS Labor Law, OSHA and other Federal, State & Local regulations. Parties that do not abide by this requirement will be warned and then removed from the project.
4. Provide OSHA 10-hour training certificate for all employees prior to starting work on the site. In addition, these certificates must be sent in with certified payroll as new employees are hired in accordance with NYS DOL.
5. Provide potable drinking water for its own employees.
6. Provide access to all concealed systems as required for system maintenance and repair for items installed in their Prime Contract. This specifically talks to access panels needed for future maintenance by the district.
7. Provide material lifting equipment required for the completion of Contract requirements, in compliance with NYS Labor Laws, OSHA Regulations, and other Federal, State, and local laws. All lifting operations will require a **written lift plan** submitted for record two weeks in advance of the planned lift date.
8. Provide Fire Prevention materials and equipment for fire protection related to the work of their own Prime Contract. Provide fire extinguishers, fire blankets, and fire-watch during all "Hot Work" operations and as required by OSHA regulations.
9. Provide any supplemental lighting required to install the work of its own Contract, beyond the minimum OSHA levels provided under the Electrical Work Prime Contract.
10. Provide close coordination with the construction manager for deliveries needed to perform the work of their own Prime Contract.
11. Provide protection of its own finished work after installation and until accepted by the Owner.
12. Provide fire stopping / caulking for any penetration related to the work for its own Prime Contract.

13. Provide accommodation for storage of tools & equipment. This site has limited staging and lay down area therefore each contractor should deliver materials accordingly. All deliveries should be coordinated with the Palombo Group.
14. Provide progress and final cleaning as specified. Each contractor shall be responsible to legally dispose of trash & debris for its own contract work.
15. Provide a thorough final cleaning of the site, building, and equipment provided under their Prime Contract immediately before the final inspection. Each Prime Contractor is responsible for cleaning and dust and debris generated from the work of their own Contract.

    a. Maintain areas in a clean condition until the Owner occupies the space.
    b. Personnel: Experienced workman or professional cleaners approved by the Construction Manager.

1.6 WORK UNDER SEPARATE CONTRACTS

A. The work will be constructed under multiple prime contracts. One set of contract documents is issued covering the multiple prime contracts. Each Prime Contract is defined as:

1. CONTRACT No. 1 – GENERAL CONSTRUCTION (GC)
2. CONTRACT No. 2 – MECHANICAL CONSTRUCTION (MC)
3. CONTRACT No. 3 – ELECTRICAL CONSTRUCTION (EC)
4. CONTRACT No. 4 – PLUMBING CONSTRUCTION WORK (PC)

B. Cooperate fully with separate contractors so work on those contracts may be carried out smoothly, without interfering with or delaying work under other contracts. Coordinate the Work of this Contract with work performed under separate contracts.

C. One set of documents is issued covering all multiple prime contracts. Each prime contractor is responsible for reviewing **ALL** drawings and specifications for complete understanding and knowledge of the work.

D. Extent of Contract: Unless the Contract Documents contain a more specific description of the Work of each Contract, requirements indicated on Drawings and in Specification Sections determine which contract includes a specific element of Project.

1. Unless otherwise indicated, the work described in this Section for each contract shall be complete systems and assemblies, including products, components, accessories, and installation required by the Contract Documents.
2. Provide all cutting and patching associated with the Work of its Prime Contract, comply with Section 01 73 29 for further requirements.
3. Each Prime Contractor is responsible for coordination and associated drawings. See specification section 01 31 00 for additional information.
4. Each Prime Contractor shall, within 5 days of receiving a ***Notice of Award***, prepare a complete submittal schedule for all items requiring a submittal per the specifications, inclusive of all closeout requirements.
5. Equipment pads for the work of each contract shall be provided by the contractor requiring the pad unless noted otherwise.
6. Penetration Firestopping shall be provided by each contract for its own Work and shall comply with Division 7 Sections 07 84 13.

7. Lead-based paint precautions shall be provided by each contract for its own work. Each Prime Contractor is to provide procedures for OSHA Lead precautions.
8. Each Prime Contractor shall designate a full-time **on-site nontrade working superintendent** to supervise the work of the Prime Contractor, who shall always be present on the job site when work is being performed; this person shall be familiar with the Project and authorized to conclude matters relating to progress. This person shall also represent their company at weekly contractor meetings. A working trade foreman will not be acceptable in place of this superintendent requirement.
9. All contractors shall provide detailed 2-week look-ahead schedules while actively working on site. Failure to comply with this requirement will have a negative cumulative monetary effect on the contractor payment.

E. Temporary Facilities and Controls: In addition to specific responsibilities for temporary facilities and controls indicated in this Section and in Division 1, Section 01 50 00 "Temporary Facilities and Controls," each Prime Contract is responsible for the following:

1. Installation, operation, maintenance, and removal of each temporary facility necessary for its own normal construction activity, and costs and use charges associated with each facility, except as otherwise provided for in this Section.

2. Generators, plug-in electric power cords and extension cords, supplementary plug-in task lighting, and special lighting necessary exclusively for its own activities.
3. Temporary enclosures, storage and fabrication containers / shed for its own construction activities.

4. General hoisting facilities for its own construction activities.
5. Labor force adequate to provide progress cleaning of work areas affected by its operations. Each Prime Contractor is to compile its own debris **daily** and place it in a dumpster for proper disposal. A cluttered and dirty work area (interior or exterior) will **NOT** be tolerated.
6. Secure lockup of its own tools, materials, and equipment.
7. Construction aids and miscellaneous services and facilities necessary exclusively for its own construction activities.
8. Safety Procedures as dictated by the owner, OSHA and the NYS Department of Labor. Staging area and access is limited. Contractor(s) shall load the project accordingly.

1.7 CONTRACT No. 1 – GENERAL CONSTRUCTION (GC)

A. The Work of the General Construction Contract includes but is not limited to the Work that is specified in the Project Manual(s) and as shown on the drawings that together form the contract documents. The Contractor is directed to examine **ALL** drawings and specifications since certain details and/or notes may appear anywhere therein that apply to his/her particular work.

1. This prime contract is defined as, and includes, Drawings and Specifications as indicated by reference, and any other construction operations traditionally recognized as General Construction Work.

a. Drawings:

1) Cover Sheet
2) All “CS” Civil Drawings
3) All “A” Series Drawings (Architectural)
4) All “S” Series Drawings (Structural)
5) All other series drawings as it pertains to and relates to the work of this contract.

b. Specifications:

1) Division 0 – Procurement and Contracting Requirement, all Sections.
2) Division 1 – General Requirements, all Sections.
3) Division 2 – Existing Conditions, all Sections.
4) Division 3 – Concrete, all Sections.
5) Division 4 – Masonry, all sections
6) Division 5 – Metals, all Sections
7) Division 6 – Woods and Plastics & Composites, all sections
8) Division 7 – Penetration & Joint Firestopping
9) Division 8 – Openings, all Sections
10) Division 9 – Finishes, all Sections
11) Division 10 – Specialties, all sections. “M” (Mechanical)
12) Division 12 – Furnishings, all sections.
13) Division 14 – Conveying Equipment, all sections.
14) Division 31 – Earthwork, all sections.
15) Division 32 – Exterior Improvements, all sections.
16) Division 33 - Utilities, all sections.
17) Division 22, 23, 26 – all sections as they relate to integration and coordination of work with this contract.

2. Coordination:

a. Coordination with the work of all other contractors including but not limited to:
1) MEP Work
2) Ceiling & soffits

b. There will be **MANDATORY** coordination required by **all** contractors for this project to ensure proper and timely installation of the proposed work. If additional work is required for any aspect of work due to lack of coordination, the contractor(s) that caused the issue will be responsible for the costs of any corrective action required. If corrective action is required it must be done in accordance with all local codes having jurisdiction and approved by the Owner, Construction Manager & Architect prior to starting.

c. Careful coordination will be required to install new plumbing storm drains into existing pipe tunnel and out to exterior drainage per the “CS” drawings. Work will require both the General Contractor and the Plumbing Contractor to work in conjunction with each other to complete this task. Refer to Key Notes 7, 8 & 9 on drawing P2.01.

3. Demolition:

a. Removal and disposal of all items as indicated by contract documents inclusive of all existing items and/or equipment not shown if impacting work to be demolished. Contractor shall reference notes on MEP drawings to capture various GC required work.

b. Complete Abatement of flooring and PCB window caulking within the limits of corridor A&B in accordance with Code Rule 56. Any window that is not immediately removed and infilled shall be temporarily caulked until final work is scheduled to be completed.

c. Complete demolition activities to ensure there is no interruption in utility service. Contractor to take additional precautions in and around existing pipe tunnel which includes requirements to support existing piping. Any required shutdowns will need to be coordinated in advance with the Palombo Group and the owner.

d. Removed items that can be salvaged shall be turned over to the owner. If the owner does not want them, they shall be legally disposed of. Removed items that are to be salvaged shall be removed in a manner appropriate to retain said items for reuse / reinstallation per the documents.

e. Provide and maintain temporary protection to any finished areas not scheduled for replacement including but not limited to ceilings, walls, floors or any item slated to remain prior to any demolition starting. Any item impacting the work area that is not specifically to be removed by another trade is to be removed by the General construction work contractor.

f. At all removals by this contract, disturbed areas beyond the immediate replacement area shall be restored to a condition equal to or better than the original condition.

4. Temporary Facilities:

a. Provide debris removal for the work of this contract inclusive of self-performed work and any subcontractors or vendors. The General Work contractor will also be responsible for providing dumpsters for all trades and their subcontractors within renovation areas. The window Contractor will be responsible for their own dumpsters.

b. Provide dust & debris protections per SED 155.5 as necessary during renovation work until renovated space is in a “Clean” condition. Temporaray protection is to be installed and maintained from the ceiling to the floor at all access points to the work area to mitigate making a mess outside of the work area. Any mess or damage that occurs due to inadequate protection will be the responsibility of the General Work contract.

c. During construction of Corridor A & B, code required emergency egress will be impacted between the renovation areas. This will require Classroom 21 to be vacated and turned into temporary emergency egress as indicated on the Sequence Plan, until work in the renovation areas are substantially completed. Work required to create a temporary emergency egress in classroom 21 includes the following;

1) Remove and store corridor door to classroom.

2) Remove partial existing window system closest to the door and install a temporary door with lock and panic bar to egress out. At contractors' option, removed doors from renovation area could be modified and reused OR provide temporary HM steel door and knockdown frame. Created opening must we secure and weather tight.
3) Upon substantial completion or when temporary emergency egress is no longer required, re-install previously removed classroom door and any temporary signage to return space back to Classroom 21.

d. Provide portable toilet facilities for all workers on the site. Owner toilet facilities are not to be used by workers on the site. Location for portable toilet facilities must be approved by the CM and owner.

e. See phasing & logistics plans for additional temporary measures that will be required by the General Construction work contractor as follows:

1) Temporary Fencing (install, maintain & remove).
2) Temporary Covered Walkway (install, maintain & remove).
3) Temporary "ground mats" around building (install & maintain only).

f. See section 1.9A 4b of this specification for additional information on available temporary power for construction.

g. Provide Temporary Facilities indicated as work of this contract in Division 1 Section 015000, "Temporary Facilities and Controls".

5. Construction:

a. Review Sequence & Logistics Plan(s) to understand timing of work and expected completion dates.

b. Provide ALL mock-ups as indicated by the specifications in a timely manner so as not to hold up construction progress.

c. Provide Utility locating service to mark out underground utilities including a GPR sweep in the excavation locations. Maintain any markings until excavation operations are completed.

d. Provide survey and layout of proposed work by a NYS Licensed surveyor. Maintain layout and elevations until it is no longer needed.

e. Provide all Civil scope indicated on the "CS" series drawings. The plumbing contractor shall provide all piping both interior and exterior. Both contractors should work together to verify existing and new invert elevations and points of connection.

f. Provide all excavation, dewatering, shoring, and bracing to accommodate new concrete foundation(s) inclusive of legal disposal of excess soil.

g. Provide all concrete underpinning, footings, walls and slabs stair pan infills including but not limited to reinforcement, anchoring and water stop strip.

h. Provide new masonry CMU, bond beams, beam pockets and brick at corridor A&B including toothing of same as required to complete new work into existing. Include all ancillary masonry materials for a complete finished system. Upon completion, provide proper wash down of new and existing effected masonry areas.

i. Provide structural steel beams and roof opening support framing. Additionally provide miscellaneous metals items including but not limited to stair assemblies and roof ladders.

j. Provide damp proofing, waterproofing, insulation board, air barriers, flashings, vapor retarders, firestopping, sealants and all other ancillary items as detailed within the contract documents.

k. Provide new roofing system over new corridor A & B inclusive of blocking, facia work, flashings and expansion joints. Provide proper watertight connection to existing roofing where indicated. Related to various penetrations in new roof, the MEP trade requiring the penetration shall coordinate size and location with the General Contractor who shall install steel reinforcement accordingly. The MC will furnish any necessary equipment or duct curbs for installation as part of the work of this contract. Roof drains, pitch pockets or pipe boots are to be provided by the General Contractor.

l. Provide interior and exterior doors and frames inclusive of hollow metal, flush wood, Aluminum storefront, glazing and all associated hardware as indicated by contract documents. Door holders furnished under this contract, Electrical Contractor to install and wire. Coordinate locations and mounting in advance. Due to lead times, this contractor shall be prepared to provide a complete submittal within **20 days of receiving a Notice of Award**.

m. Provide partitions, wall infill, rough carpentry and solid blocking, as indicated or required by the contract documents.

n. Provide new finishes in accordance with contract documents including but not limited to drop ceilings, flooring, painting and fire extinguishers. Where new flooring is required, provide floor preparation and moisture mitigation to accept new flooring in compliance with flooring manufacturer warranty.

o. The General Construction work contractor is to install access doors supplied by MEP trades for future access to MEP systems. Layout for any required access doors is to be by the trade requiring the access and should be completed timely.

6. Provide a thorough final cleaning of all spaces including but not limited to wiping down all effected horizontal and vertical surfaces, glazing and floors. Cleaning activities shall be done by a qualified ***professional cleaner*** and shall be maintained until owner occupancy.

7. General Requirements, including but not limited to additional items specifically indicated as the Work of this Contract.

8. Working hours for this project will be second shift during the school year (3 to 11pm) and standard hours (7 to 3:30pm) during the summer months. Additional overtime work to maintain the schedule will be required as needed.

1.8 CONTRACT No. 2 –MECHANICAL CONSTRUCTION (MC)

A. The Work of the Mechanical Construction Contract includes but is not limited to the Work that is specified in the Project Manual(s) and as shown on the drawings that form the contract documents. The Contractor is directed to examine **ALL** drawings and specifications since certain details and/or notes may appear anywhere therein that apply to his/her particular work.

1. This prime contract is defined as, and includes, Drawings and Specifications as indicated by reference, and any other construction operations traditionally recognized as Plumbing and Mechanical construction work.

   a. Drawings:

      1) Cover Sheet
      2) All "M" Series Drawings (Mechanical)
      3) All other series drawings as it pertains to and relates to the work of this contract.

   b. Specifications:

      1) Division 0 –Procurement and Contracting Requirement, all sections.
      2) Division 1 –General Requirements all sections.
      3) Division 2 – Section 024119, Selective Demolition as required for the Work of this Contract.
      4) Division 7 – Section 078413, Penetration Firestopping as required for the Work of this Contract.
      5) Division 23 – Mechanical, all sections.
      6) All other specifications sections related to integration and coordination of work with this contract.

2. Coordination:
   a. Coordination with the work of all other contractors including but not limited to:
      1) MEP Work
      2) Existing Casework / Countertops
      3) Ceiling & soffits

   b. There will be **MANDATORY** coordination required by **all** contractors for this project to ensure proper and timely installation of the proposed work. If additional work is required for any aspect of work due to lack of coordination, the contractor(s) that caused the issue will be responsible for the costs of any corrective action required. If corrective action is required it must be done in accordance with all local codes having jurisdiction and approved by the Owner, Construction Manager & Architect prior to starting.

c. This project is sequenced in a specific order. Each contractor shall plan, investigate and coordinate their work and the work of other trades accordingly. Failure to actively participate in this required coordination will have a negative result.

3. Demolition:

   a. Removal and disposal of all items as indicated by contract documents inclusive of all existing items and/or equipment not shown if impacting work to be demolished. Contractor shall reference key notes on "A", "P" & "E" drawings for additional required scoping.

   b. Complete demolition activities to ensure there is no interruption in utility service. Contractor to take additional precautions in and around existing pipe tunnel which includes requirements to support existing piping. Any required shutdowns will need to be coordinated in advance with the Palombo Group and the owner.

   c. Removed items that can be salvaged shall be turned over to the owner. If the owner does not want them, they shall be legally disposed of. Removed items that are to be salvaged shall be removed in a manner appropriate to retain said items for reuse / reinstallation per the documents.

4. Temporary Facilities:

   a. Provide debris removal for the work of this contract inclusive of self-performed work and any subcontractors or vendors. The General Work contractor will also be responsible for providing dumpsters for all trades and their subcontractors within renovation areas. The window Contractor will be responsible for their own dumpsters.

   b. See section 1.9A 4b of this specification for additional information on available temporary power for construction.

   c. Provide Temporary Facilities indicated as work of this contract in Division 1 Section 015000, "Temporary Facilities and Controls".

5. Construction:

   a. Review Sequence & Logistics Plan(s) to understand timing of work and expected completion dates.

   b. The Mechanical contractor is to provide their own rough openings /penetrations in walls and floors for piping with appropriate sleeves and firestopping as part of their own Prime Contract. Where access above ceiling is required to complete new work in a location not scheduled for full or partial ceiling replacement or where mechanical work needs to happen out of sequence to keep schedule or for required investigative purposes, this contractor shall assume removal, reinstallation, or replacement of ceiling tiles to complete their work.

   c. Provide Mechanical equipment as indicated by the contract documents. Submittals, shop drawings & color samples for equipment will be required within **20 calendar days from receipt of *Notice of Award*** to ensure units will be on site for

installation in the Fall of 2026**.** The equipment warranty shall begin from the date units are fully operational and accepted and **NOT** from the purchase or received date.

d. Provide new piping to points of connection of existing HWS/R lines within pipe tunnels. This work should include installation of **new valves** installed during demolition to avoid having to shut down the heating system a second time. If new valves are not installed, contractor should figure to make connections during off hours and to be responsible for shutting down, filling, bleeding and having system fully functional for school operations.

e. Provide HWS/R piping, hangers, insulation, valves, auto vents, labeling, BMS controls and all other ancillary items required for complete functioning equipment. Provide self-certification testing for all newly installed mechanical piping installed and witnessed by the Construction Manager.

f. Provide duct work, curbs, dampers, fire/smoke dampers, gravity vents, grilles, BMS controls and any other ancillary items needed for fully functioning air systems.

g. Related to roof work, this contractor shall coordinate size and location of penetrations with GC who shall install steel accordingly. MC to furnish and turnover roof curbs to GC for installation timely so as not to hold up roofing work. If equipment is not set on the curb's same day, this contractor shall provide a temporary weathertight cap to the GC.

h. Refer to drawing A1.01 key note 2 for disconnect of UV's to accommodate window replacement work. This contractor shall coordinate work with the window contractor to disconnect and reconnect UV's

i. Provide General Commissioning, Testing, Adjusting and Balancing of equipment per the contract documents. Upon completion of these items, provide appropriate owner training for all newly installed equipment.

j. Provide construction filters for startup and final replacement filters prior to TAB and / or owner occupancy.

k. This contractor shall timely furnish access doors to the General Contractor for Mechanical components where required to allow future access to system components. Access doors will be installed by the General construction contractor.

6. General Requirements, including but not limited to additional items specifically indicated as the Work of this Contract.

7. Working hours for this project will be second shift during the school year (3 to 11pm) and standard hours (7 to 3:30pm) during the summer months. Additional overtime work to maintain the schedule will be required as needed.

1.9 CONTRACT No. 3 – ELECTRICAL CONSTRUCTION (EC)

A. The Work of the Electrical Construction Contract includes but is not limited to the Work that is specified in the Project Manual(s) and as shown on the drawings that form the contract documents. The Contractor is directed to examine **ALL** drawings and specifications since certain details and/or notes may appear anywhere therein that apply to his/her particular work.

1. This prime contract is defined as, and includes, Drawings and Specifications as indicated by reference, and any other construction operations traditionally recognized as Electrical Construction work.

   a. Drawings:

      1) Cover Sheets
      2) All "E" (Electrical)
      3) All other series drawings as it pertains to and relates to the work of this contract.

   b. Specifications:

      1) Division 0 – Procurement and Contracting Requirement, all Sections.
      2) Division 1 – General Requirements all Sections.
      3) Division 2 – Section 024119, Selective Demolition as required for the Work of this Contract.
      4) Division 7 – Section 078413, Penetration Firestopping as required for the Work of this Contract.
      5) Division 26 – Electrical, all Sections.
      6) All other specifications sections related to integration and coordination of work with this contract.

2. Coordination:
   a. Coordination with the work of all other contractors including but not limited to:
      1) MEP Work
      2) Existing Casework / Countertops
      3) Ceiling & soffits

   b. There will be **MANDATORY** coordination required by **all** contractors for this project to ensure proper and timely installation of the proposed work. If additional work is required for any aspect of work due to lack of coordination, the contractor(s) that caused the issue will be responsible for the costs of any corrective action required. If corrective action is required it must be done in accordance with all local codes having jurisdiction and approved by the Owner, Construction Manager & Architect prior to starting.

   c. This project is sequenced in a specific order. Each contractor shall plan, investigate and coordinate their work and the work of other trades accordingly. Failure to actively participate in this required coordination will have a negative result.

   d. The electrical contractor shall specifically review Mechanical drawings and compare them to Electrical drawings related to HVAC equipment connections. Notify Architect and construction manager of any differences.

3. Demolition:

    a. Removal and disposal of all items as indicated by contract documents inclusive of all existing items and/or equipment not shown if impacting work to be demolished. Reference Key Notes on drawing A1.01 for additional scope that is part of the Electrical scope of work.

    b. Disconnect and support existing ceiling mounted devices as indicated by contract documents to be reinstalled within new ceiling configuration. These items include but are not limited to occupancy sensors, FA devices, WAP's, cameras etc. Removed items that are to be salvaged shall be removed in a manner appropriate to retain said items for reuse / reinstallation per the documents.

    c. Complete demolition activities to ensure there is no interruption in utility service. This contractor should coordinate removals prior to commencing work to assure other portions of the building that need to remain active are not affected by removal activities. This is particularly important when working with the fire alarm system. Shutdowns for utilities will need to be coordinated in advance with the Palombo Group and the owner.

4. Temporary Facilities:

    a. Provide debris removal for the work of this contract inclusive of self-performed work and any subcontractors or vendors. The General Work contractor will also be responsible for providing dumpsters for all trades and their subcontractors within renovation areas. The window Contractor will be responsible for their own dumpsters.

    b. Provide temporary power and lighting sufficient to allow work to be performed safely in each space in accordance with minimum OSHA requirements. Temporary power for construction should be limited to (1) each 20-amp quad receptacle box to serve each corridor. Any contractor needing additional power for specialty tools or equipment beyond the above rated circuits or locations will need to provide their own power.

    c. See General Construction scope item 1.7A4c and Sequence Plan related to creating temporary emergency egress withing classroom 21. The electrical scope shall include providing (2) Two lighted "EXIT" signs. The first one will be installed in the corridor ceiling adjacent to the door opening to classroom 21 and the other is to be located over the temporary installed egress door along the exterior wall. Power for each "EXIT" sign should be taken from the nearest available circuit. When space is to be turned back over to a classroom, disconnect and remove both devises and turn over to owner.

    d. Provide Temporary Facilities indicated as work of this contract in Division 1 Section 015000, "Temporary Facilities and Controls".

5. Construction:

    a. Review Sequence & Logistics Plan(s) to understand timing of work and expected completion dates.

b. The Electrical contractor is to provide their own rough openings / penetrations in walls and floors with appropriate sleeves and firestopping as part of their own Prime Contract. Where access above ceiling is required to complete new work in a location not scheduled for full or partial ceiling replacement or where electrical work needs to happen out of sequence to keep schedule or for required investigative purposes, this contractor shall assume removal, reinstallation, or replacement of ceiling tiles to complete their work.

c. Reference Key Notes on drawing A2.01 for additional scope that is part of the Electrical scope of work. Coordinate with Window contractor prior to re-installing. Additionally, figure to disconnect and reconnect UV's for the same purpose.

d. Provide panel LP-4 and associated circuits and connections to new HVAC equipment, elevator devices, motorized dampers, door hardware power supplies and exhaust fans. Contractor is to modify existing lighting circuits as necessary for installation of new lighting.

e. Reinstall all removed devices to be reused including modification to wiring as necessary for installation.

f. Modify the existing Fire Alarm System including compatible devices (existing & new), wiring, testing and all ancillary items required for a complete working system. Provide certified test report with substantial completion. Devises taken offline should be coordinated with the district and fire alarm vendor to ensure the system **remains active for occupied areas of the building** throughout construction.

g. Related to door access control, the General Contractor shall provide control box above ceiling and all associated wiring and connections within door and frame. The Electrical contractor will be responsible for powering control box and auto operators and electric strikes including raceway for access control wiring.

h. This contractor shall timely furnish access doors to the General Contractor for electrical components where required to allow future access to the system. Access doors will be installed by the General construction contractor.

i. Provide owner training for new Fire Alarm and Lighting systems.

j. Provide all electrical permits, testing and inspections along with associated fees to satisfy authorities having jurisdiction.

6. General Requirements, including but not limited to additional items specifically indicated as the Work of this Contract.

7. Working hours for this project will be second shift during the school year (3 to 11pm) and standard hours (7 to 3:30pm) during the summer months. Additional overtime work to maintain the schedule will be required as needed.

1.10 CONTRACT No. 4 –PLUMBING CONSTRUCTION (PC)

A. The Work of the Plumbing Construction Contract includes but is not limited to the Work that is specified in the Project Manual(s) and as shown on the drawings that together form the contract documents. The Contractor is directed to examine **ALL** drawings and specifications since certain details and/or notes may appear anywhere therein that apply to his/her particular work.

1. This prime contract is defined as, and includes, Drawings and Specifications as indicated by reference, and any other construction operations traditionally recognized as Roofing Construction Work.

    a. Drawings:

        1) Cover Sheet
        2) All “P” (Plumbing).
        3) All “CS” (Civil) as it pertains to storm piping.
        4) All other series drawings as it pertains to and relates to the work of this contract.

    b. Specifications:

        1) Division 0 – Procurement and Contracting Requirement, all Sections.
        2) Division 1 – General Requirements, all Sections.
        3) Division 7 – Section 078413, Penetration Firestopping as required for the Work of this Contract.
        4) Division 22 – Plumbing, all Sections.
        5) All other specifications sections related to integration and coordination of work with this contract.

2. Coordination:
    a. Coordination with the work of all other contractors including but not limited to:
        1) MEP Work
        2) Ceiling & Soffits

    b. There will be **MANDATORY** coordination required by **all** contractors for this project to ensure proper and timely installation of the proposed work. If additional work is required for any aspect of work due to lack of coordination, the contractor(s) that caused the issue will be responsible for the costs of any corrective action required. If corrective action is required it must be done in accordance with all local codes having jurisdiction and approved by the Owner, Construction Manager & Architect prior to starting.

    c. This project is sequenced in a specific order. Each contractor shall plan, investigate and coordinate their work and the work of other trades accordingly. Failure to actively participate in this required coordination will have a negative result.

3. Demolition:

    a. Connection of new piping to existing within pipe tunnels should be planned to avoid any disruption to the building.

4. Temporary Facilities:

    a. Provide debris removal for the work of this contract inclusive of self-performed work and any subcontractors or vendors. The General Work contractor will also be responsible for providing dumpsters for all trades and their subcontractors within renovation areas. The window Contractor will be responsible for their own dumpsters.

    b. Provide temporary means to allow storm water on the roof to exit the work area until all piping is fully connected.

    c. See section 1.9A 4b of this specification for additional information on available temporary power for construction.

    d. Provide Temporary Facilities indicated as work of this contract in Division 1 Section 015000, “Temporary Facilities and Controls”.

5. Construction:

    a. Review Sequence & Logistics Plan(s) to understand timing of work and expected completion dates.

    b. The Plumbing Contractor is to provide their own rough openings /penetrations in walls and floors for piping with appropriate sleeves and firestopping as part of their own Prime Contract. Where access above ceiling is required to complete new work in a location not scheduled for full or partial ceiling replacement or where mechanical work needs to happen out of sequence to keep schedule or for required investigative purposes, this contractor shall assume removal, reinstallation, or replacement of ceiling tiles to complete their work.

    c. Provide piping, hangers, sleeves, valves, insulation, sealants, clean outs and deck plates for all storm and elevator sump piping. Provide self-certified “head” testing of connected piping in the presence of the construction manager for all installed piping.

    d. Related to the Civil scope indicated on the “CS” series drawings. The plumbing contractor shall provide all piping both interior and exterior. The General Contractor will excavate bed and backfill piping trenches. Both contractors shall work together to verify existing and new invert elevations and points of connection prior to beginning any work.

    e. Related to roof penetrations in new roof, the MEP trade requiring the penetration shall coordinate size and location with the General Contractor who shall install steel reinforcement accordingly. Roof drains will be provided by the General Contractor.

    f. Provide oil separating elevator sump pumps complete with panel and wiring. Coordinate work with GC & EC.

6. General Requirements, including but not limited to additional items specifically indicated as the Work of this Contract.

7. Working hours for this project will be second shift during the school year (3 to 11pm) and standard hours (7 to 3:30pm) during the summer months. Additional overtime work to maintain the schedule will be required as needed.

1.11 ADDITIONAL SCOPING – EACH PRIME CONTRACT

A. Definition of Extent of Prime Contract Work; Additional Prime Contract Work not previously described.
   1. All Prime Contractors are responsible for reviewing plans and specs as it pertains to their scope of work mentioned in the contract documents. Scopes of work referenced may be found in multiple locations throughout the plans and specifications.
   2. Local custom and trade union jurisdictional settlements do not control the scope of work included in each prime contract. When a potential jurisdictional dispute or similar interruption of work is first identified or threatened, the affected prime contracts shall promptly negotiate a reasonable settlement to avoid or minimize the pending interruption and delays.
   3. All OSHA safety and hazardous materials regulations will be enforced on this project. All Contractors must submit a safety program, a hazardous materials program, (all required data must be maintained at the job site) and attend safety meetings. Toolbox talks will be required from each prime contractor weekly uploaded to Procore.
   4. All Contractors are responsible for any debris caused by their work. Daily clean-up and disposal is required by each Contractor for the periods which that Contractor is performing work on site, on a day selected by the Construction Manager. Each trade will assign at least one person to the weekly clean-up; the name of this person is to be submitted to the Construction Manager. Any Contractor not providing personnel will be "back-charged" for labor provided by the Construction Manager.
   5. Each prime contractor is responsible for cutting and patching as required to complete their work unless noted otherwise. Review contract documents for all requirements associated with cutting and patching. All exposed finishes must be ready to receive paint, etc.; all concealed openings (piping, ductwork, conduit, etc.) must be repaired to comply with specified wall or deck conditions.
   6. To maintain project schedule, multiple crews and shifts may be necessary. It will be each prime contractor's responsibility to provide adequate staff. Each crew is to be furnished with its own supervision, tools, and other means necessary to maintain the Project Schedule.
   7. Supervision: The proposed project manager and field superintendent for the project is to have at least five years experience in the proposed position. Each successful bidder shall submit resumes to the Construction Manager for the proposed project manager and field superintendent for the project. This information will be reviewed with the Owner, Architect and Construction Manager for approval. Should the Project Manager and/or Superintendent prove unqualified for the position at any point in the project, the Construction Manager shall issue a letter stating that the person is to be removed from involvement in the project. Action by the contractor must be made within seven working days of receipt of such letter.
   8. Each prime contractor shall return areas disturbed by their work activities to condition prior to start of work.
   9. Each prime contractor shall maintain within its field office a complete and current set of Contract Documents (including any Addenda, Change Orders, and Modifications thereto), approved shop drawings, samples, color schedules and other data pertinent to the Project.

10. Each prime contractor is to provide **photo and video documentation of existing conditions** as indicated by the contract documents. Submit to the Construction Manager a list of damaged areas (i.e. plaster walls, woodwork, equipment etc.) prior to commencing work. Any damaged areas not identified prior to the work shall be the responsibility of the contractor / contractors working in that area.
11. Unless a specific item or material is noted as to remain the Owner's property or to become the Contractor's property (or similar words), any material having salvage or reuse value shall be inspected by the Owner. If the Owner wishes to retain this material, it shall be turned over to him on the site where directed. If the Owner designates the material as scrap, it shall become the Construction Manager's property. Material having salvage value shall be carefully removed. If the Construction Manager designates the material as scrap, it shall become the contractor's property and removed from the site by the contractor.
12. All personnel on site shall have a visible photo ID displayed at all times. Those without will be removed from site at once. If the same individual fails to have the ID a second time they will be removed from site and not be allowed back on site.

1.12 TESTING

A. Required testing and test procedures are indicated under each Division of the Technical Specifications. Other testing shall be performed per generally accepted standards.

B. The Architect shall reserve the right to require additional information as is deemed necessary to fully evaluate testing results.

1.13 WORK SEQUENCE

A. The Work will be conducted to provide the least possible interference to the activities of the Owner's personnel.

B. A Construction Manager Superintendent must always be on site when work is being performed. **If a contractor fails to maintain the progress as indicated by the schedule by no other fault but its own and requires overtime to complete the work; the contractor shall arrange with the Construction Manager 24 hours in advance and pay for a Construction Manager's superintendent at $125.00 per hour.** If the cause for delay is multi-contract, then the costs shall be distributed evenly among contracts. Advise the Construction Manager a minimum of 24 hours prior to commencing work inside the building.

C. Coordination of any utility and/or power interruption must be done with the Construction Manager. Shutdowns must occur during off-hours and on days when the building is not occupied by the owner.

D. Construction access to the site shall be limited to those designated for contractor's personnel, equipment and deliveries by the Owner. Contractors' staging, parking and storage shall be coordinated with the staging plan attached at the end of this section and the Construction Manager.

1.14 OCCUPANCY REQUIREMENTS

A. The General Construction Work Contractor shall provide indoor air quality management as specified by the Department of Labor and OSHA for the building, when the building is enclosed, as determined by the Construction Manager.

1. Provide an exhaust air system for the project indoor areas that could produce fumes, VOC's off-gasses, gasses, dusts, mists, or other emissions.
2. Exhaust air system for the project areas that could produce emissions listed in Paragraph 1 shall be utilized.
3. Provide temporary partitions and air seals to prevent the migration of airborne contaminants from unoccupied areas to occupied areas when applicable.

B. Quality Assurance:

1. Maintain a negative pressure between the work area and the space surrounding the work area.
2. Before start of work, submit a design for the exhaust air system. Do not begin work until approval of the Owner is obtained.

    a. The number of machines required.
    b. Location of the machines in the work space.
    c. Description of the methods used to test air flow and pressure differential.

C. System operation:

1. A sufficient quantity of exhaust fans in existing window openings or other approved locations shall be operated in accordance with the following applicable standards.
2. Exhaust air system shall operate for a minimum of 72 hours after work is completed, or until all materials have cured sufficiently as to stop out gassing of fumes or odors and area has been ventilated to remove all detectable traces of odors and fumes.
3. Maintain twenty-five (25) feet clearance from all temporary exhaust outlets to all active building outdoor air intakes.

1.15 PROJECT SCHEDULE

A. Contractors should refer to the Sequence plan for an overall understanding of work duration. It is the contractor's responsibility to carry out all work required within the dates set forth by the sequence plan.

B. The General Construction contractor is required to submit a detailed Master Project Schedule based on the Sequence Plan and input from the other prime contractors. The first draft shall be issued to the Construction Manager for review and comment no later than **2 weeks after the project "kick off" meeting.** This Master Project Schedule shall be complete prior to work starting and shall be maintained and updated **monthly** with input from all prime contractors.

Any contractor that does not participate in scheduling activities inclusive of 2 week look ahead and progress updates within stipulated timeframes will be subject to a monetary reduction in contract.

END OF SECTION 01 12 00This article describes one way to divide Project among contracts. This method is an example only, not a recommendation. Revise name and scope of the Contract below to suit

Project. Architect should coordinate scope of this Contract with other contracts to ensure that no gaps or overlaps exist.

SUBMITALL SCHEDULE INSTRUCTIONS (09/02/2025) - SEE 2ND TAB FOR FORM

Contractors required to provide submittal schedule. To be generated based off a thorough review of all specifications to itemize all expected submittals and closeout documents.

Submittal Type, Type Group, and Status Information Below:

The Contractor may utilize Procore's "List of specifications" Report in Procore reports tool (.csv / excel file) to be able to copy and paste list of specification Titles and Numbers into Submittal Schedule for aid in producing the Submittal Schedule.

SUBMITTAL TYPE INFORMATION

- Project Start / Preconstruction Submittals (SUBMITTAL TYPE GROUP 1):
  - (1A) Product Data: Includes all Product data for that section, if separate components of a section are being submitted, indicated in the Submittal Title.
  - (1B) Shop Drawing: If locations are being broken out or if different equipment tags are being submitted, indicate this information in the Title.
  - (1C) Samples (Product or Color Samples): Color selection Samples to be submitted separately from Product Data. If a physical sample is sent, include selection chart in submittal. To be used for record approval of Mock Ups.
  - (10) Contract Start (Bonds, Ins., SOV, Submittal Schedule): For Miscellaneous Project Start up Submittals such as: Bonds, Insurance Packages, W9, SOV, Qualifications Packages, Submittal Schedule, Prime/Sub Wage Rate Package, Contact Lists, PreCon Photos, List of Employees with OSHA cards, Site Specific Safety Plan
- Closeout Submittals (SUBMITTAL TYPE GROUP 2):
  - (2A) Test / Start Up Report: Includes either Contractor Field Test Reports (Piping, System, material testing) or Equipment Start Up Reports.
  - (2B) Operation and Maintenance Manual: Includes all Operations and Maintenance Manuals.
  - (2C) Material Turnover Transmittal: Signed Transmittals, separated by spec section.
  - (2D1) Training Agenda: Provide Training Session Agenda. Seperate Training Sessions per Spec Section.
  - (2D2) Training Sign In Sheet / Video: Provide Sign in Sheet and video. Sign in Sheet must indicate start / end times /duration.
  - (2E) Warranty: Provide warranties specific to the Project and indicate start date, end date, duration, and provide any information required to make a warranty claim (receipts, invoices; if applicable)
  - (2F) Record Document / As built: Submit Project Record Documents as required per specifications.
- Closeout Packages (SUBMITTAL TYPE GROUP 3):
  - (3) Close Out Package (Complete): See “Closeout Package Instructions”. For complete packages only containing all O&M’s, Record Documents, Warranties, etc.
- (4) Other: For all other unclassified Submittals.

SUBMITTAL STATUS INFORMATION
•Open Statuses: oClosed & Provide Additional Submittal Submittal has been accepted but a separate follow submittal is required. When follow up submittal has been accepted, then change this status to closed. oOpen: Defined as open with Construction Manager or Architect. oOpen w/ Contractor oRevise and Resubmit (Open) The architect has not accepted this submittal and is requiring a resubmittal. Change this status to “Void, See Revised Submittal” when the revised submittal has been accepted.
•Closed Statuses: oClosed: Submittal has been accepted. No further action required, oRejected, No resubmittal needed.: Submittal is not part of project or not applicable and no resubmittal is required. oVoid, See Revised Submittal: When a rejected or R&R submittal has been revised and accepted, then the original rejected submittal is to be changed to this status, so these items are not mixed with the

CONTRACTOR SUBMITTAL SCHEDULE - (REPLACE WITH CONTRACTOR NAME) - (REPLACE WITH SCHEDULE SUBMISSION DATE)
(See instructions on second Tab)

Division No.	Spec Section Number	Spec Section Description	Submittal Number	Revision	Submittal Title	Type	Type Group (1,2, or 3)	Priority	Status	Due Date for Contractor Submission	Submittal Closing Date	Responsible Contractor (Prime Contractor Name)

APPLICATION FOR PAYMENT - SUBCONTRACTOR BILLING SUMMARY SHEET

PRIME CONTRACTOR:							**BILLING START DATE:**		
PAYMENT APPLICATION NUMBER:			**BILLING PERIOD MONTH - YEAR**				**BILLING END DATE:**		
#	**SUBCONTRACTOR NAME**	**WORKED ONSITE PREVIOUS PERIOD? (Y, N)**	**WORKED ONSITE CURRENT PERIOD? (Y, N)**	**CURRENT CONTRACT AMOUNT INCLUDING CHANGE ORDERS**	**SUM OF PREVIOUS PAYMENTS RECEIVED**	**CURRENT APPROVED PAYMENT REQUESTED THIS PERIOD**	**BALANCE TO FINISH**	**LIEN WAIVER INCLUDED THIS PERIOD? (Y, N)**	**CERTIFIED PAYROLL INCLUDED THIS PERIOD? (Y, N)**
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TOTALS:				$ -	$ -	$ -	$ -		

CONTRACTOR CERTIFICATION THAT ALL INFORMATION ON THIS FORM IS CORRECT.

PRINT NAME SIGNATURE DATE

Waiver and Release on Progress Payment

Waiver and Release Number: Payment Application Number:

IDENTIFYING INFORMATION

Prime Contractor: Work (Type):
Subcontractor: Project:
Customer: Property:
Property Owner:

This Waiver and Release on Progress Payment (for the current payment only) is effective only on the Contractor's receipt of payment as described below. A person should not rely on this document (for the current payment only) unless satisfied that the Contractor has received payment.

By execution of this Waiver and Release on Progress Payment, Contractor acknowledges that it has been paid, and has previously received, progress payment(s) in the sum of $ _____, for all Work furnished to the Project (prior to the current payment), except as indicated below. This amount is not conditional upon the Contractor's receipt of payment for the Current Progress Payment.

Except as listed in the Exceptions section below, Contractor conditionally waives and releases any (i) liens and encumbrances, (ii) right to assert a lien or encumbrance, (iii) common law or statutory payment bond right, (iv) stop payment notices, (v) claim for payment, and (vi) rights under any similar ordinance, rule, or statute related to claim or payment that Contractor has or may have with respect to the (1) Work, (2) Project or Property and improvements thereon, (3) labor, services, materials, fixtures, apparatus, equipment, or machinery furnished for the Project or Property, and (4) monies, funds, or other considerations due or to become due arising out of the Work.

Contractor represents that all debts owed to any third party relating to the goods or services covered by this Waiver and Release on Progress Payment have been paid or will be timely paid.

This Waiver and Release on Progress Payment (for the current payment only) is effective only on Contractor's receipt of payment in accordance with the following payment terms:

Describe method by which payment will be made to the Contractor: _____
Maker of payment: _____
Amount of payment: _____
Identify party to whom full or partial payment will be made, if other than Contractor: _____

1. Original Contract Sum:		6. Total earned less Retainage:	
2. Net Change by Executed Change Orders:		7. Total sum of previous payments received:	
3. Total Contract Sum to Date:		8. Amount of Current Payment:	
4. Total Completed and Stored to Date:		9. Balance to Finish including Retainage:	
5. Retainage (%):			

EXCEPTIONS

This Waiver and Release on Progress Payment covers a progress payment for Work furnished for the Project or the Property and the improvements thereon through _____ ("Effective Date"). This Waiver and Release on Progress Payment does not cover (i) Work furnished after the Effective Date, (ii) unpaid retention, (iii) extras for which Contractor has not received payment, (iv) pending modifications and changes, (v) disputed claims in the total amount of $ _____, and other exceptions described below, if any:
Other exceptions:

Supporting documents attached hereto, if any:

_____ _____
(Signature of Contractor's authorized representative) *(Print name and title of Contractor's authorized representative)*

_____
(Date)

THIS DOCUMENT HAS IMPORTANT LEGAL CONSEQUENCES, AND ITS USE IS GOVERNED BY STATE LAW. STATUTORY AND LEGAL REQUIREMENTS APPLICABLE TO THIS DOCUMENT AND ITS USE MAY CHANGE WITHOUT NOTICE. BEFORE EACH USE, USERS SHOULD CONSULT WITH AN ATTORNEY WITH RESPECT TO ITS COMPLETION OR USE.

Waiver and Release on Final Payment

Waiver and Release Number: Payment Application Number:

IDENTIFYING INFORMATION

Prime Contractor: Work (Type):
Subcontractor: Project:
Customer: Property:
Property Owner:

This Waiver and Release on Final Payment (for the current payment only) is effective only on the Contractor's receipt of payment as described below. A person should not rely on this document (for the current payment only) unless satisfied that the Contractor has received payment.

By execution of this Waiver and Release on Final Payment, Contractor acknowledges that it has been paid, and has previously received, progress payment(s) in the sum of $ _____, for all Work furnished to the Project (prior to the current payment), except as indicated below. This amount is not conditional based on Contractor's receipt of payment for the Current Progress Payment.

Except as listed in the Exceptions section below, Contractor conditionally waives and releases any (i) liens and encumbrances, (ii) right to assert a lien or encumbrance, (iii) common law or statutory payment bond right, (iv) stop payment notices, (v) claim for payment, and (vi) rights under any similar ordinance, rule, or statute related to claim or payment that Contractor has or may have with respect to the (1) Work, (2) Project or Property and improvements thereon, (3) labor, services, materials, fixtures, apparatus, equipment, or machinery furnished for the Project or Property, and (4) monies, funds, or other considerations due or to become due arising out of the Work.

Contractor represents that all debts owed to any third party relating to the goods or services covered by this Waiver and Release on Final Payment have been paid or will be timely paid.

This Waiver and Release on Final Payment (for the current payment only) is effective only on Contractor's receipt of payment in accordance with the following payment terms:

Describe method by which payment will be made to the Contractor: _____
Maker of payment: _____
Amount of payment: _____
Identify party to whom full or partial payment will be made, if other than Contractor: _____

1. Original Contract Sum:		6. Total earned less Retainage:	
2. Net Change by Executed Change Orders:		7. Total sum of previous payments received:	
3. Total Contract Sum to Date:		8. Amount of Current Payment:	
4. Total Completed and Stored to Date:		9. Balance to Finish including Retainage:	
5. Retainage (%):			

EXCEPTIONS

This Waiver and Release on Progress Payment covers a Final Payment for Work furnished for the Project or the Property and the improvements thereon through _____ ("Effective Date"). This Waiver and Release on Final Payment does not cover (i) disputed claims in the total amount of $ _____, (ii) and other exceptions described below, if any:
Other exceptions:

Supporting documents attached hereto, if any:

_____ _____
(Signature of Contractor's authorized representative) *(Print name and title of Contractor's authorized representative)*

_____
(Date)

THIS DOCUMENT HAS IMPORTANT LEGAL CONSEQUENCES, AND ITS USE IS GOVERNED BY STATE LAW. STATUTORY AND LEGAL REQUIREMENTS APPLICABLE TO THIS DOCUMENT AND ITS USE MAY CHANGE WITHOUT NOTICE. BEFORE EACH USE, USERS SHOULD CONSULT WITH AN ATTORNEY WITH RESPECT TO ITS COMPLETION OR USE.

CONTRACT #:		CLOSEOUT PACKAGE SUBMISSION DATE:		REVIEW DATE:				REVIEW STATUS:				SUBMISSION METHOD:				PROJECT #:	
SPECIFICATION INFORMATION:				REQUIRED CLOSEOUT ITEMS: (PRECON SUBMITTALS NOT LISTED)					REVIEW OF CONTRACTOR CLOSEOUT PACKAGE:								ARCHITECT:
Division No.	Spec No.	Spec Description	RESPONSIBLE CONTRACTOR	Special O&M Required?	Special Warranty Required?	Required Warranty Duration?	Test Reports Required?	Notes, and Other Closeout Items required (Attic Stock, Training, Special Testing, Delegated Design, etc.)?	Precon. Submitals Included (PD, SD's, etc.)	Special O&M Included?	Special Warranty Included?	Submitted Warranty Start Date?	Warranty Compliant / Approved?	Test Reports Included?	Notes, and Other Closeout Items Included?	All Items Complete?	Architect Comments:
1	17700	Submittal Coversheet for Complete Closeout Package	ALL	NA	NA	NA	NA	PROVIDE ITEM	NA	NA	NA	NA	NA	NA			
1	17700	Table of Contents of All Items	ALL	NA	NA	NA	NA	PROVIDE ITEM	NA	NA	NA	NA	NA	NA			
1	17700	Package Contains Items Grouped by Spec Section in Sub Folders.	ALL	NA	NA	NA	NA	PROVIDE ITEM	NA	NA	NA	NA	NA	NA			
1	17700	Contract Record Drawings	ALL	NA	NA	NA	NA	PROVIDE ITEM	NA	NA	NA	NA	NA	NA			
1	17700	Compiled Record Shop Drawings	ALL	NA	NA	NA	NA	PROVIDE ITEM	NA	NA	NA	NA	NA	NA			
1	17700	Contract Record Specifications	ALL	NA	NA	NA	NA	PROVIDE ITEM	NA	NA	NA	NA	NA	NA			
1	17700	Generic O&M requirements for all items listed in Div. 1 O&M Spec.	ALL	NA	NA	NA	NA	PROVIDE ITEM	NA	NA	NA	NA	NA	NA			
1	17700	Prime Contract 1 Year Warranty	ALL	NA	NA	NA	NA	PROVIDE ITEM	NA	NA	NA	NA	NA	NA			
1	17700	Generic Demonstration and Training Requirements.	ALL	NA	NA	NA	NA	PROVIDE ITEM	NA	NA	NA	NA	NA	NA			
1	17700	Mechanical Valve Tag Schedule	ALL	NA	NA	NA	NA	PROVIDE ITEM	NA	NA	NA	NA	NA	NA			
1	17700	Plumbing Valve Tag Schedule	ALL	NA	NA	NA	NA	PROVIDE ITEM	NA	NA	NA	NA	NA	NA			
INSERT LIST OF SPECIFICATIONS FROM PROCORE SPECIFICATIONS REPORT BELOW (DIV 2-34)																	

DIVISION 01 – GENERAL REQUIREMENTS

SECTION 012100 – ALLOWANCES

1.01 WORK INCLUDED

A. The Contractor shall provide all labor, materials, equipment and services so as to perform all work of this section and related work indicated on the Construction Drawings and as specified herein, including, but not limited to, the following:

B. Inclusion of the Allowances herein.

C. In addition to the work indicated on the Construction Drawings and elsewhere in this Project Manual and specification, the Contractor shall perform additional work as may be ordered by the Owner's Representative, Owner, or Architect.

D. The following amounts are for any additional work as may be required or ordered by the Owner, Owner's Representative, or Architect or required due to field related conditions. Any additional work relative to these allowances will be authorized and instituted through the Change Order process. Any unused portion in whole or in part of the allowance shall be refunded to the Owner, also through the Change Order process.

E. The Contractor's costs for unloading and handling at the site, overhead, profit and other expenses contemplated for the stated allowance amounts shall be included in its contract sum and not in the allowances.

1.02 RELATED WORK

A. Refer to the related and associated divisions of the Project Manual and Specification for related additional or supplementary details and information.

1.03 CONTRACT DOCUMENTS

A. Applicable provision of the Conditions of the Contract shall govern all work under this section.

1.04 ALLOWANCES

A. The General Contractor shall include in Base Bid MS-1 the sum of Fifty Thousand Dollars ($50,000).

B. The Mechanical Contractor shall include in Base Bid MS-2 the sum of Fifty Thousand Dollars ($50,000).

C. The Electrical Contractor shall include in Base Bid MS-3 the sum of Twenty-Five Thousand Dollars ($25,000).

D. There is no allowance to be carried in Base Bid HS-1.

END OF SECTION

DIVISION 01 – GENERAL REQUIREMENTS

SECTION 012300 – ALTERNATES

1. GENERAL REQUIREMENTS

A. Each Contractor shall state in its Proposal the amount to be added or deducted from his Base Bid for the difference in cost between the work described under each Alternate and the corresponding work specified under the Base Bid.

B. Owner may determine the lowest bid by adding one base bid to other base bid(s) and/or by adding to or deducting from those base bid(s), additive or deduct alternates, or substitutions, if any, which the Owner elects to accept after the opening of bids.

C. Alternate bids shall reflect the increase or decrease in cost of all work of every nature which may be affected thereby, and no subsequent claims for extras by reason of the Contractor's failure to observe this requirement will be considered.

D. Except as otherwise described or approved, material and workmanship required by the Alternates differ from the requirements shown on the drawings or specified for corresponding items, the Alternate's construction and materials will be subject to the approval of the Architect.

E. Submit shop drawings and samples of the work under each accepted Alternate as per "General Conditions" requirements.

END OF SECTION

DIVISION 01 – GENERAL REQUIREMENTS

SECTION 012600 – CONSTRUCTION PHASE CLARIFICATIONS REQUESTS FOR INFORMATION FROM ARCHITECT'S OFFICE

PART 1 – GENERAL

1.01 SUBMISSION OF ARCHITECT'S RFI FORM:

A. In addition to the requirements of General Conditions of the Contract for Construction and the Supplementary General Conditions of the Contract, each Contractor shall comply with the following wherever it applies to the work of his contract:

1. Each Contractor shall prepare and submit, on the Architect's attached form (see last page of this specification section), an original Request For Information (RFI) to Architect's Office, for all questions which may arise during post-bid award activities which are to be directed to the office of the Architect. This form shall be submitted before commencement of any work, which may be in question. (Commencement of work in question shall constitute complete acceptance of field conditions and necessary remedial repairs as directed by the Architect, and work shall be conducted at no additional charges to the Owner.) The RFI form shall indicate, at the bare minimum, the following information:

a. Date of Request and RFI number.

b. Project Name and Project Number: reflecting title sheet information, including SED number.

c. Attention of: Name of Architect in Charge/Project Director/Project Manager.

d. From: Name of submitting Contractor representative, including his project title, office or field office phone number, email address and fax number.

e. Trade: The Contract, which is being represented.

f. Date Information Required By: Fill in exact date information is required. "ASAP" or "IMMEDIATELY" will not be acknowledged by the Architect's office.

g. Detailed description of requested item.

2. Note to the Contractors: Request For Information forms shall be used for requests, clarifications, or questions on contract drawings and specifications, not contract terms, scheduling items, or general correspondence, or as a means to describe or request approval of alternate construction means and methods, concepts, substitutions, materials, or systems. Each individual Contractor is to fill out the Architect's RFI form completely (leaving no blanks) and send them DIRECTLY via fax to the Architect's Office, with a concurrent copy to the Construction Manager's office; if applicable. Neither the Architect nor the Construction Manager, if applicable, will be filling out these forms on your behalf, but they will be working with each other and the Owner to answer such RFIs. Incomplete RFI forms will not be logged in, and will be discarded. It shall not be the Architect's responsibility to contact any Contractor submitting RFIs to verify their completeness or accuracy.

B. RFI Log: Each Contractor shall be responsible to generate an RFI log, to be updated and submitted weekly to the Architect and the Construction Manager, if applicable. Examples of acceptable log format can be obtained from the office of the Owner's Representative or the Construction Manager, if applicable. Log shall include, at bare minimum, the following items:

1. Date of submittal to Architect's office, and method of transmittal.

2. Date of response from Architect's office.

3. If not yet responded to, number of days since submittal.

4. In Contractor's opinion, list of affected trades impacted by the results.

1.02 LIMITATIONS:

A. Requests for information shall be made in full accordance with General Conditions of the Contract for Construction. The Architect agrees to the following actions with regard to "Requests For Information" which are received by his office:

1. The Architect shall review properly prepared, timely requests by the Contractor for additional information about the contract documents. A properly prepared Request for Additional Information about the Contract Documents shall be in a form prepared or approved by the Architect, and shall include a detailed written statement that indicates the specific drawings or specifications in need of clarification and the nature of the clarification requested.

2. If deemed appropriate by the Architect, the Architect shall, on the Owner's behalf, prepare, reproduce, and distribute supplemental drawings and specifications in response to Request For Information by the Contractor.

   a. The Architect shall interpret and decide matters concerning performance of the Owner and Contractor under, and requirements of, the contract documents on written request of either the Owner or Contractor. The Architect's response to such requests shall be made in writing within any time limits agreed upon or otherwise with reasonable promptness.

3. Based upon the amount of RFIs received, and their content, unless otherwise so indicated on the RFI, the Architect shall establish the level of importance of said RFIs, and shall be allowed sufficient time in the Architect's professional judgement to permit adequate review. Prior to submitting any RFIs, each Contractor shall use their individual discretion in determining whether or not an RFI format or verbal format be used to resolve said situation.

4. In the event of multiple sequential RFIs received same day at the Architect's office, unless they are specifically numbered by the Contractor for their order of relative importance, they will be reviewed either: a) in the time order in which they were received by the Architect's office, b) in their natural progressive order of construction placement, or c) in order of preference, as determined by the Architect.

5. As a result of multiple sequential RFI submission, no delays in time, or Contractor hard or soft costs shall be implied or imposed onto the Architect. It is the Contractor's complete responsibility to adhere to the prepared Construction Schedule at all costs, including extended delays, which may be incurred by time required for RFI responses from the Architect's office.

6. Should an answer be required 'immediately', the Contractor shall simply place an asterisk by the date required to call attention to such a fact. He shall coordinate his own work forces accordingly to allow the Architect proper review and analysis time for resolution of such 'immediate' problems.

7. It shall be the Contractor's complete responsibility to document any verbal responses, into either follow-up RFI submittals or formal letters (on company logo stationery) to the Architect's office. Upon receipt, the Architect will review and make modifications to the correspondence if it varies in content from the Architect's interpretation. This will eliminate confusion or misunderstandings made in verbal form.

8. The Architect shall be the sole interpreter of all RFI validity, as the RFI is based on products of service produced by the Architect's office. The Architect reserves the right to reject any and all RFIs deemed frivolous or trivial.

9. As work in question is directed to the Architect for his sole response, only the attached Architect's RFI form will be considered as final and binding.

1.03 LOG-IN PROCEDURE FOR ALL RFI REQUESTS

A. Log-in procedures are based on the normal business hours of the Architect's office, and ***will not be modified for any reason***. The Architect's normal business hours are 8:00 a.m. to 5:00 p.m., EST, Monday through Friday***. All RFIs shall be reviewed by the Architect's office during normal business hours***. The Architect's office is closed on the following legal holidays: New Year's Day, President's Day, Memorial Day, Labor Day, Thanksgiving Day and the day following, and Christmas Day. ***Under no circumstances shall the Architect's office be considered or assumed as open for business on Saturdays, Sundays, or legal holidays***.

B. Any RFIs, which are received between 8:00 a.m. and 2:59:59 p.m. on a normal business day, will be received and logged in as received on that business day. Any RFIs, which are received and logged in by the Architect's Office at 3:00 p.m. or later (Eastern Standard Time) on a normal business day shall be considered as received at 8:00 a.m. the following business day. Any RFIs received by the Architect's office at or after 3:00 p.m. on Fridays will be logged in as received at 8:00 a.m. on the next following business day (Monday), In the case of the following calendar day being a holiday, the RFI shall be considered as received on the next non-holiday business day at 8:00 a.m. ***All receipt times shall be as determined by the received time stamped and signed in by the Architect's office***.

1.04 PROPER SEQUENCING OF RFI SUBMISSIONS

A. It is the Contractor's sole responsibility to fully coordinate submission of RFI forms with shop drawing and technical data submittals made or yet to be made. The Contractor must coordinate each RFI with requirements of work and the contract documents.

B. The Contractor's responsibility for deviations in submissions from requirements of contract documents is not relieved by Architect/Engineer's review of RFIs or associated submissions, unless the Architect gives written acceptance of specific deviations.

C. The Contractor's responsibility for errors and omissions in submissions or RFIs is not relieved by the Architect's review of submissions or RFIs.

D. In conformance with Section 013300 – Submittal Procedures, notify the Architect in writing at time of shop drawing/technical data submission of deviations in submissions from requirements of contract documents. Do not wait until RFI is prepared to inform the Architect's office of planned deviations.

E. Similar to Section 013300 – Submittal Procedures, no portion of the work requiring RFI clarifications shall be started, fabricated, or installed until return of Architect's formal response, including any supplemental information the Architect deems relevant for clarification.

F. After response to RFI, the affected Contractor shall distribute copies of the RFI responses to all parties requiring same for coordinating all subsequent work. The Architect's only responsibility shall be to supply one copy of each RFI resolution to: the Construction Manager, if applicable, the Owner, and the affected Contractor who initiated the RFI.

G. The affected Contractor shall make required copies of all RFI resolutions for distribution to all affected parties immediately upon receipt and review of same.

1.05 AFFECT OF RFI RESPONSES ON THE CONTRACTOR'S CONSTRUCTION SCHEDULE

A. All Contractors shall note well that the Architect is not legally bound to their approved construction schedules; the Contractors are the only parties legally bound therein. The Architect is not required to expedite any reviews or comments in the effort to expedite the Contractors' submission and/or construction schedules. Therefore, time delays created by the Architect's required review time of each RFI shall be absorbed into the Contractor's work schedule accordingly. This may necessitate such Contractor measures as: multiple work crews, off-hour or weekend construction by the affected Contractor(s), to be completed at no additional costs to the Owner. For this reason, it is imperative that each Contractor carefully review all documents as early as possible, in order to issue RFIs by the earliest possible date.

B. Any RFIs which are relative to an alteration, to the approved contractual details, or specifications will be specifically referred to the Architect's office with relative time differences noted. Any additional time required for alterations, if RFIs are approved, shall have all additional costs (if any) absorbed directly by the Contractor affected. ***Should other Contractors be directly affected in either labor, material, or equipment costs, their additional costs shall be borne by the Contractor who initiated the RFI***.

1.06 AFFECT OF RFI FORMS ON CONTRACTOR PREPARATION, AND PREPARATION OF SHOP DRAWINGS, SAMPLES, MANUFACTURER'S DATA, ETC.

A. It is the responsibility of the Contractor furnishing and/or installing materials and/or systems to these projects to field verify all existing and/or as-built conditions, as well as all conditions presently under construction that are interrelated in whole or in part to the furnishing and/or installing of such materials and/or systems. Submissions of RFI forms are at the sole discretion of each Contractor.

B. It is the responsibility of each Contractor to coordinate such field verification and be ultimately responsible for the accuracy of same prior to the submission of any RFI forms or shop drawings for design intent review by the Architect/Engineer.

C. Similar to submittal information indicated in Section 013300 – Submittal Procedures, all RFIs initiated by any subcontractor and/or supplier of the Contractor and/or supplier of the Contractor or by the Contractor themselves shall be reviewed by and shall be deemed officially submitted by the Contractor. All RFIs shall be thoroughly checked by the Contractor prior to the submission of same to the Architect's office for: contract document accuracy, validity and/or equivalency (if applicable); total quantity of material provided; all dimensioning systems related; alteration to same if necessary to accommodate accepted field changes built or pending; interaction with other materials and/or systems furnished and/or installed by this Contractor or their subcontractors (i.e., field measurements for space allocation, accuracy to previous submittals of this Contractor, etc.); and interaction with materials and/or systems provided by other Contractors.

D. After the completion of applicable RFIs, when submitting subsequent revised technical data or revised shop drawings, the Contractor shall signify same on subsequent submittal by having the following information on each and every submittal:

- Name of Contractor
- Date of Review by Contractor
- Note: This submittal has been reviewed by (Name of Contractor) in accordance with the contract documents describing and defining the requirements of such review, with affected RFI number attached.
- Copy of approved RFI, indicating Architect's final comments.
- Signature of Contractor's reviewer.
- Name of Contractor's reviewer (printed).
- Title of Contractor's reviewer (printed).

E. The Contractor shall submit in writing to the Architect and Construction Manager, if applicable, prior to their relevant revised or initial submissions, the name and title of the reviewer who shall be an employee of the Contractor for review and acknowledgment of same, along with the recommended RFI from the Architect's office.

F. If this project has a Construction Manager who is acting on the Owner's behalf and who has full-time construction site representation, the scheduling of all RFIs, submissions, the coordination, and interaction of other contractors, field conditions that affect the submission of, fabrication of, or installation of another Contractor's submission, fabrication, or installation shall be made known to the Owner's Representative. Refer to Section 013300 – Submittal Procedures for additional relevant information.

G. Any resultant construction field condition that arises that is contrary to an RFI or submission made, that is conflicting with another Contractor's submission, the schedule for construction, or with another Contractor's constructed work shall be immediately identified by the Contractor(s) and made known to the Owner's Representative. If such condition causes any construction schedule delay, "rereview" by the Architect/Engineer, additional work of the Architect/Engineer (such as field review, "redesign" or document preparation); or "reconstruction" of any work already built and/or accomplished by another Contractor, the connection to such conditions (and any associated costs to accomplish same) shall be the sole responsibility of the Contractor found negligent in causing such conditions.

H. Any RFI not containing complete information outlined and required as indicated within the above subsections will not be reviewed by the Architect for design intent, but rather rejected and discarded, so all Contractors must insure that no blanks are left on their submitted RFIs. All time lost as a result of this error will be the sole responsibility of the Contractor who made the error.

I. Any RFI submitted by the Contractor that requires subsequent coordination with another material and/or system provided by this Contractor or another Contractor that has been reviewed, by that Contractor and previously submitted to the Architect may be rejected in whole or part by the Architect, or held in abeyance by same until the corresponding and coordinating submittals are submitted as the concurrent review of all such submittals for design intent, may be deemed important by the Architect. Any release given any entity other than the Architect to fabricate, furnish, and install any material or system not reviewed by the Architect for design intent shall become the sole responsibility of the releasing entity as well as the resolution of construction related issues or conflicts, relative to approved or disapproved RFIs.

J. In addition, the Contractor shall not utilize nor refer to any schedule of work not created nor provided by the Architect. The Contractor's method in establishing, defining, and/or substantiating their ability to maintain the schedule presented in these contract documents and as prepared by the Owner's representative shall be exclusive of a defined time period of submittal review, and shall not be dependent upon RFI approval or time delays incurred.

K. Similar to Item 1.09L of Section 013300 – Submittal Procedures, the rejection or abeyance noted in the above subparagraph shall not be considered a delay or a reason for an extension of time in the construction schedule to the contract, as such cause for same shall have been brought upon by the Contractor not providing the "pre-coordination" necessary for such submissions.

PART TWO – PRODUCTS

Not Applicable.

PART THREE – EXECUTION

Not Applicable.

END OF SECTION

BBS ARCHITECTS
LANDSCAPE ARCHITECTS
ENGINEERS

244 EAST MAIN STREET | PATCHOGUE | NEW YORK 11772 | T. 631.475.0349 | F. 631.475.0361
187 WOLF ROAD, SUITE 205 | ALBANY | NEW YORK 12205 | T. 518.621.7650 | F. 518.621.7655
www.BBSARCHITECTURE.COM

REQUEST FOR INFORMATION

RFI No.:	
Date:	

Project:		BBS Project No.:	
Location:			
To The Attention of :			
Company:		**Requested BY:**	
Trade:			
Phone:		**Fax:**	
Date Information Required By:			

Description:	**Spec Section/ Dwg:**

Reply:

BY:	**FIRM:**	BBS Architects, Landscape Architects & Engineers, P.C.	**DATE:**

If a "Request for Information" is deemed relevant and appropriate by the Architect, the Architect's response to such requests shall be made in writing within any time limits agreed upon or otherwise with reasonable promptness. Upon evaluation of the Prime Contractor's request and if deemed necessary, the Architect's response may include supplemental drawings and specifications.

SECTION 01 27 00

CONTRACT MODIFICATION PROCEDURES

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.

B. Allowance Specification Section.

C. Payment Procedures Specification Section.

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements for handling and processing Contract modifications.

1. The provisions of this section apply to the work of each Prime Contract.

1.3 MINOR CHANGES IN THE WORK

A. The Architect will issue supplemental instructions authorizing Minor Changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, as an "Architect's Supplemental Instruction" or “Architect Clarification”.

1.4 POTENTIAL CHANGE ORDER PROCEDURES

A. No additional work to be performed without written approval of costs or written direction to proceed per Time and Material Procedures: The Prime Contractor shall not under any circumstances, perform any work outside the contract sum that incurs additional costs without notifying the Architect and Construction Manager and receiving corresponding written directive to proceed with the presumed additional work. Any additional costs for work that was performed without a written directive to proceed will not be processed. This includes costs included in the Base Bid for Unit Price Quantities.

B. Owner-Initiated Proposal Requests: The Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.

1. Proposal Requests issued by Architect are for information only. Do not consider a proposal request as instructions either to stop work in progress or to execute the proposed change.

2. Within 7 calendar days after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.

C. Contractor-Initiated Proposals: If latent or unforeseen conditions require modifications to the Contract, Contractor may propose changes by submitting a Potential Change Order Proposal.

D. Potential Change Order Proposal Documentation Requirements (for Owner-Initiated Proposal Request responses or Contractor-Initiated Proposals:)

1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change along with potential equipment and material lead time. Indicate the effect of the proposed change on the Contract Sum and the Contract Time. Indicate equipment and material delivery lead time information.

2. Include the following supporting documentation with each Potential Change Order Proposal:

    a. Labor cost data: Provide labor, quantity.
        1). Provide labor hour quantity, hourly labor rates, and extended total labor cost per each labor rate classification.
        2). Group Labor hours by specific tasks for each portion of the referenced work to justify labor hour quantity.
        3). Provide calculations, supporting documentation, and prevailing wage back up to determine all cost components of the hourly labor rate for each labor classification.
        4). Additional Contractor Supervision may not be charged if supervision is already scheduled for Contract Work.
        5). Overtime, nightshift, or premium labor rates shall not be charged unless mandatory.
    b. Material cost data: Include a list of quantities of products required or eliminated and unit costs. Provide quotations from vendors for all material costs.
    c. Equipment cost data: Provide Equipment costs for both owned (in accordance with Blue Book rates) or rented (per the actual invoice) for hours associated with referenced work.
    d. Proposals from subcontractors shall be itemized with the same level of detail for Labor, Materials, and Equipment, with no overhead and profit included in initial cost data. Subtotal of net costs to be provided. See “Overhead and Profit (OH&P)” for subcontractor Overhead and Profit procedures.
    e. Include copies of any issued Proposal Requests, Clarifications, emails, related drawings, sketches, and photographs associated with the reference work with Potential Change Order.
    f. All costs for these components shall be calculated at net costs without Overhead and Profit included.
    g. Provide a subtotal of all net costs without any Overhead and Profit, or Bonding costs included.
    h. Provide a Grand Total of Costs for the Potential Change Order with Prime and Subcontractor Overhead and Profit and Bonding costs included. See General Conditions for additional bonding cost procedures.

3. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.

4. All Contractor Submitted Potential Change Order Proposals shall be presumed to include work that is compliant with the Contract Documents, Details, Specifications, General Conditions, and as defined on Proposal Requests unless specifically noted otherwise. Deviations from requirements shall be clearly and specifically indicated as exclusions which must be specifically acknowledged during the review process.

5. Comply with requirements in Division 1 Section "Product Requirements" if the proposed change requires substitution of one product or system for product or system specified.

E. Overhead and Profit (OH&P): A Prime Contractor and their subcontractor(s) will be authorized to include overhead, and profit applied to Change Order work as follows:

1. Additional Work self-performed by a Prime Contractor will be allowed a maximum of 15% combined OH&P on sub-totaled net cost of additional work.

2. Additional Work performed by subcontractors or multiple-tier subcontractors under a Prime Contractor will be allowed a total maximum of:

   a. Subcontractor allowed 10% OH&P on net cost of additional work.
   b. Additional 5% OH&P allowed for the Prime Contractor on the net cost of subcontractor's cost (Subcontractor's net costs does not include Subcontractor's overhead and profit).
   c. Combined maximum of 15% total for Overhead and Profit.

3. See Allowance Specification for Prime Contractor and Subcontractor Overhead and Profit maximum allowed percentages for Potential Change Orders processed as Allowance Authorizations.

4. When the Contract Sum is being adjusted with a combination of additional and deduct costs, the additional overhead and profit is to be applied to the final net increase costs only.

5. Additional Bond Costs to only apply to final net increase costs only.

F. Time and Material Procedures: When a price has not been mutually agreed upon between the Contractor and the Owner/Construction Manager/Architect for the cost of additional work or cost of disputed contract work has not currently accepted and work must proceed to maintain schedule, the Construction Manager/Architect may direct work to proceed and be tracked on daily Time and Material Tickets witnessed by the Construction Manager, and Contractor provided Time and Material Tickets for Construction Manager Signature.

1. The Prime Contractor shall be responsible to provide 48 Hour notification of all Time and Material work and the Construction Manager must be present to witness the Time and Material work and provide signature of Contractor's Time and Material Tickets.

2. At the end of each day, the contractor shall provide a daily Time and Material Ticket indicating the date, description of work and quantities of labor, materials, and equipment used to perform the work, and present for daily signature by the Construction Manager. Utilize Carbon Copy physical tickets to provide copies to the Construction Manager for record.

3. The owner or their representatives reserves the right to establish the quantity of work in place by independent quantity survey, measures, or counts.

4. The Construction Manager may require the Contractor to provide a Maximum Not-to-Exceed Proposal cost prior to authorizing work to be performed via Time and Material Procedures. Upon completion and of additional work, the Potential Change Order Proposal shall be processed at costs per the actual quantities utilize but shall not be processed for a cost greater than the Maximum Not-To-Exceed Proposal Cost.

5. The Construction Manager's signature on any Time and Material Tickets will be used for verification of quantities only and does not verify or confirm that the Labor, Materials, or Equipment costs were required for work being performed. The Construction Manager's Signature on any Time and Material ticket shall not be construed as:

    a. Agreement that items and costs listed on the ticket represent additional Work or a change in the Scope of Work;
    b. Agreement that the Contractor shall be compensated for the items and costs listed on the ticket; or
    c. Agreement that the Construction Manager shall issue and approve a Change Order for the items and costs listed on the ticket.

1.5 CONTINGENCY ALLOWANCE

A. When a Contingency Allowance is included in the Contractor's base bid, the Construction Manager/Architect will determine if a Potential Change Order Proposal will be processed as either a Change Order or an Allowance Authorization utilizing the Contractors Contingency Allowance.

1.6 UNIT PRICE PROCEDURES

A. When a Unit Price Quantity is included in the Contractor's base bid, the Contractor shall submit a Unit Price Quantity Proposal indicated the anticipated quantity required to support the work of the Contractor. When the Unit Price Quantity Proposal is accepted and a written direction to proceed has been given, Time and Material Procedures shall be followed to determine the actual quantity utilized for the work performed. Once Time and Material Procedures have been completed, submit a revised Proposal that includes the actual quantities installed.

1.7 CHANGE ORDER PROCEDURES

A. On Owner's approval of a Contractors Potential Change Order Proposal, the Construction Manager/Architect will issue a Change Order for signatures of Architect, Construction Manager, Owner, and Contractor on the Change Order form.

1.8 CONSTRUCTION CHANGE DIRECTIVE

A. Construction Change Directive: Architect or Construction Manager may issue a Construction Change Directive via an email, letter, or document similar to AIA Document G714. The Construction Change Directive instructs the Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.

1. Construction Change Directive contains a complete description of change in the Work. It also designates a method to be followed to determine change in the Contract Sum or the Contract Time.

B. Prime Contractor Documentation: The Contractor is to maintain detailed records on a per Time and Material Procedures for work required by Construction Change Directive or Direction to Proceed via Time and Material Procedures.

1. After completion of change, submit Time and Material Documentation with Potential Change Order, to substantiate cost and time adjustments to the Contract.

1.9 BACK CHARGES

A. The Owner reserves the right to back charge a Contractor, via a Deductive Change Order, for the cost of total and complete remedy due to the failure of Contractor to comply with any provision(s) of the Contract Documents.

1. Contractor Signature of Deductive Change Order for Back Charges is not required. Deductive Change Order for Back Charges are to be considered executed to be once signed by Owner, Architect, and Construction Manager.

2. Deductive Change Orders for Back Charges are to be listed on subsequent Applications for Payment once issued.

3. If a Back Charge Deductive Change Order remains in dispute by the Contractor, then the Contractor shall follow claim procedures in General Conditions of Contract.

1.10 CREDITS FOR ALTERNATES RECINDED POST AWARD

A. Alternates that were accepted during Contract Award may be rescinded after the Contract is awarded via deduct change order. If no work has been performed or materials provided, then the Total Cost of the Alternate shall be returned including any Overhead and Profit that was included with the associated Alternate being rescinded.

1. If a portion of the Alternate has been completed, then the Contractor will be entitled to payment of the costs associated with the portion that has been completed including an equitable portion of Overhead and Profit for the completed work.

END OF SECTION 012600

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DIVISION 01 – GENERAL REQUIREMENTS

SECTION 013000 – SPECIAL PROCEDURES AND PROVISIONS

PART 1 - GENERAL

1.01 CONTRACTOR'S SUPERINTENDENT

A. The Contractor must devote his time and personal attention to the work and shall employ and retain at the building from the commencement until the entire completion of the work a Contractor's Superintendent competent and capable of maintaining proper supervision and care of the work and acceptable to the Architect, who, in the absence of the Contractor and irrespective of any superintendent or foreman employed by any Subcontractor, shall see that the instructions of the Owner are carried out.

B. The Contractor shall employ a competent senior superintendent. Such superintendent may not be replaced during the duration of the Project, including the completion of Punch List, unless approved by the Architect.

C. The Contractor is to provide a resume of the Contractor's Superintendent to the Owner's Representative.

D. The Contractor shall, at all times during the work, have a representative on site who communicates in English.

1.02 REPAIRING

A. The Contractor shall do all repairing of work that becomes damaged by his workmen or the workmen of any of his subcontractors during the progress of his work or prior to its acceptance.

B. All existing work that is damaged or disturbed during the alteration and finish work to the building shall be left in the condition as originally found.

C. Any exterior areas damaged or disturbed by work of this Contract shall be properly repaired and left in sound condition and the premises shall be left clean and orderly.

1.03 CONTRACTOR'S RESPONSIBILITY

A. The Contractor will be held responsible for all work and materials provided for by the plans and specifications until the work is completed and accepted. The Contractor will be held responsible also for any and all damages which may arise or occur to any party whomsoever by reason of work of this project, delivery and storing of materials, the opening or blocking of streets and walks or by neglecting to provide proper lights, guards, barriers, any other safeguards to prevent damage to property or injury to persons.

B. Where openings cause exposure to outside elements, the Contractor shall provide necessary protection and coverings to prevent damage from frost or water.

C. Provide and maintain temporary dustproof partitions to enclose spaces used by the Owner and relocate as required. Remove when no longer needed.

D. The Contractor assumes responsibility for all injury to or destruction of or loss by theft or pilferage of the Contractor's materials, tools, machinery, equipment, appliances, shoring, scaffolding, false and form of work and personal property of his employees regardless of the cause.

E. Each Contractor shall be responsible for their own material and equipment until completely installed, inspected for completeness and correctness, and signed off by the Architect or his duly appointed representative.

F. The Contractor shall provide written guarantee of the complete installation to be free from defects in materials and workmanship in accordance with Section 017000. Any portion of the work judged inferior shall be replaced by the Contractor at no additional cost to the Owner.

G. The cost/value of required repair/replacement of any non-conforming items as documented by the Architect's subject to inclusion in the Architects "Record of Unacceptable or Non-Conforming Work" and will be the subject of a fixed dollar amount of credit due to the Owner, prior to project closeout in enforcement of AIA Document A201, Item 12.3, "Acceptance of Non-Conforming Work". If the contractor delays resolution of non-conforming work, the fixed dollar amount of credit is subject to a proportional cost increase at the discretion of the Architect.

H. The Contractor shall maintain operational exits, exit lights, danger signs, open trench markings, fire emergency equipment, night lights, and proper storage facilities for equipment and materials as directed through the length of the contract.

I. The Contractor shall take over and maintain the site immediately after receiving the order to start work. Provide protection of property and utilities until work of the Contract is complete and accepted. The Contractor shall be responsible for the safety of any adjoining property, including paving, utility mains, pipes, conduit, etc., and shall, at his own expense, protect and maintain same in at least as good a condition as that in which they were found.

J. All seeded areas, pavements, walks, curbs, and approaches shall be kept clear at all times and, if disturbed by this construction work, shall be repaired and restored with materials to match existing.

K. Before commencing any work, the Contractor shall verify all dimensions, coverage and conditions prevalent at the job sites. If discrepancies are found, the Contractor shall report all discrepancies in writing. If no corrections are brought to the attention of the Owner and the Architect/ Engineer before starting installation, the Contractor will be totally responsible for the installation providing complete coverage of the area designed as intended by the Architect.

L. For Additions to Existing Buildings: The General Contractor is responsible for correct finish floor alignment between existing building and proposed addition. At each finish floor, General Contractor shall utilize a licensed New York State surveyor to check all finish floor elevations shown for accuracy and shall be responsible for establishing said elevations prior to shop drawing submittal. The General Contractor's submission of steel and or concrete shop drawings shall contain said information and be the final basis for all other established elevations. The architect will accept said elevations as final, as the submission will include a licensed surveyor's certification of same.

M. Upon completion of the work, the Contractor shall furnish as-built drawings showing the exact locations of every new item.

N. It is assumed that Contractor's prices are based on scope of work complete and as confirmed by site(s) inspections prior to bidding.

O. The Contractor shall be responsible for all incidental electric and plumbing work required to complete work under this Contract.

P. The Contractor shall be required to conform to all OSHA requirements regarding Lock-out/Tag-out procedures. This shall include, but not be limited to, disconnecting the power to any equipment to be serviced via a disconnect switch or breaker, locking out this power source, and tagging this lockout with appropriate wording as per OSHA requirements. This shall apply to any power source associated with this project.

Q. Safety and Security during Construction Statements: Refer to Specification Section 013500 - Commissioner Regulations (Part 155.5) and Safety Standards – Part 2 Items C1 through C5.

R. Additional Requirements of the Contractor:

1. No drinking of alcoholic beverages or use of controlled substances allowed on the grounds. No reporting to work impaired by alcohol or controlled substances is allowed. The Contractor bears the responsibility of determining if its, or its subcontractors, employees are in any way impaired which would jeopardize the safety of the public, the employees of other Contractors and their Subcontractors, the Owner, Architect, and Construction Manager.

2. All Contractors are to refrain from conversing with school personnel and students. Any construction employees found doing so will be removed from the site.

3. All Contractors are to refrain from using indecent language. All doing so will be removed from the site. Art work or decoration found on vehicles belonging to the Contractor's or Subcontractor's employees parked on or near the school property which contain indecent language or pictures shall either be covered or removed from the location.

S. Separation of Construction Statement: Refer to Specification Section 013500 - Commissioner Regulations (Part 155.5) and Safety Standards – Item E.

1. A specific stairwell and/or elevator should be assigned for construction worker use during work hours. In general, workers may not use corridors, stairs, or elevators designated for students or school staff.

2. Large amounts of debris must be removed by using enclosed chutes or a similar sealed system. There shall be no movement of debris through halls of occupied spaces of the building. No material shall be dropped or thrown outside the walls of the building.

3. All occupied parts of the building affected by renovation activity shall be cleaned at the close of each workday. School buildings occupied during a construction project shall maintain required health, safety, and educational capabilities at all times that classes are in session.

T. Fire Prevention: There is no smoking allowed anywhere on school property per New York State law. Violators are subject to a $1,000 fine and/or banishment from the property.

1. Any holes in floors or walls should be sealed with a fire-resistant material.

U. Construction Noise: Refer to Specification Section 013500 - Commissioner Regulations (Part 155.5) and Safety Standards – Part 1 - Item H.

V. Construction Fume Control: Refer to Specification Section 013500 - Commissioner Regulations (Part 155.5) and Safety Standards – Part 1 - Item I.

W. Off-Gassing Control: Refer to Specification Section 013500 - Commissioner Regulations (Part 155.5) and Safety Standards – Part 1 - Item I.

X. Asbestos Code Rule 56: Refer to Specification Section 013500 - Commissioner Regulations (Part 155.5) and Safety Standards – Part 1 - Item K.

Y. Asbestos TEM: Refer to Specification Section 013500 - Commissioner Regulations (Part 155.5) and Safety Standards – Part 1 - Item J.

Z. Lead Abatement Projects: Refer to Specification Section 013500 - Commissioner Regulations (Part 155.5) and Safety Standards – Part 1 - Item K.

1.04 CLEANING

A. Upon completion of all work, the Contractor shall be totally responsible for general site clean up and shall provide all labor and material required to thoroughly "broom clean" the premises throughout. This cleaning shall include, but not be limited to, the removal of all surplus material from all radiators, pipes, ducts, gypsum boards, metal work, woodwork, stairs, floors, ceilings, glass and other material and surfaces, and all surfaces which are finished shall be left in a clean and suitable condition.

1.05 REMOVAL OF TEMPORARY WORKS

A. All temporary work such as guards, shoring, staging, etc., provided or erected by the Contractor shall be removed and shall become the property of the Contractor when such temporary work is no longer required, or when directed, or at completion of the contract.

1.06 MATERIALS, LABOR, TOOLS, WORKMANSHIP

A. The Contractor will provide and furnish at his own expense any and all material, labor, scaffolding, tools, implements, molds, models, and cartage of every description necessary or proper to or for the duty and performance of said work and the faithful execution of his contract.

1.07 ORDERING OF SPECIFIED MATERIALS

A. All specified materials are available from the manufacturers and some items require more time for delivery to the job than others. Therefore, to avoid the necessity of last minute substitutions because of late ordering, it will be the responsibility of the General Contractor to see that items that will require a substantial waiting period before delivery are ordered soon after the Contract is awarded.

1.08 SHUT-DOWNS

A. The Contractor shall perform the work in a manner which will minimize shut-downs of existing operating items or systems. When the performance of the work requires the shut-down of an existing operation item or system, such shut-down shall take place only after the Contractor has given at least five working days notice and has obtained written authorization for the shut-down from the Owner. All shut-downs shall take place only on overtime, at no additional cost. This provision shall apply to all work, including testing of newly installed or altered systems.

1.09 DELIVERIES AND STORAGE

A. All deliveries of materials or equipment must be done in conjunction with the Owner's representatives, to insure the least disruption of the facility. Storage of all materials must be approved by the Owner prior to delivery. The Owner will not accept any deliveries on behalf of the Contractor. A Contractor's representative must be on site to accept such deliveries.

B. Before attempting to deliver materials to the site, the Contractor shall inform the designated Owner’s Representative so that arrangements can be made for places of entrance and inspection of materials being delivered.

C. Storage of materials in the occupied building shall not be allowed unless otherwise agreed upon by the Owner’s Representative. The Contractor shall be responsible for providing all storage trailers and security of same.

1.10 SPECIAL PROVISIONS

A. Contractor Representation at Construction Project Meetings:

1. Each Contractor shall provide qualified representation at all construction project meetings which will be held on a bi-weekly basis for the review of construction progress and coordination of all building trades. Failure of the Contractor to abide by these provisions may cause delays and incur additional expenses due to coordination difficulties.

B. Any existing items (whether or not specified or shown on the drawings) requiring removal in order to properly complete the new work shall be removed by the Contractor performing the work and disposed of off-site at no additional charge to the Owner.

C. Unless a specified item of removal, relocation, or installation (which appears to be in conflict with the actual site conditions) is brought to the attention of the Architect during the bidding period, the Contractor shall be responsible for the execution of said work and any related expenses incurred.

D. Should any work or material be required which is not denoted in the Plans and Specifications, either directly or indirectly, but which is necessary for the proper execution of the intent thereof, it shall be understood and agreed that the same is implied and required and that the Contractor shall furnish all labor and material as if they were completely delineated and prescribed.

E. Should a conflict occur between the drawings and specification and/or existing conditions, the Contractor shall be deemed to have estimated the more expensive way of accomplishing the work unless during the bidding period a clarification was requested by the Contractor and obtained in writing from the Architect, as to which method and material is to be used.

F. Where, in these specifications, one certain kind, type, brand, or manufacture of material is named, it shall be regarded as the required minimum standard of quality and performance. Where two or more are named, these are presumed to be equal and the Contractor may select one of these items. If the Contractor desires to use any other kind, type, brand, or manufacture of material that those named in the specification, he shall submit information describing in detail where it differs from base specifications and other information as required by the Owner.

    1. The burden of proof of equivalence rests with the bidder. Adequate supporting information must accompany proposed substitution. The Owner or Architect reserves the right to accept or reject proposed substitutes.

G. Any item shown on the plans but not specified or conversely specified but not shown on the plans, shall be treated as if shown or mentioned respectively in both.

H. Alignment and adjustment of all erected steel shall be accomplished by a registered professional or land surveyor at the Contractor's expense and to the satisfaction of the Inspector.

I. Inspection of all welded and high strength bolted field connections shall be accomplished by one of the following approved independent testing laboratories or an alternate testing company acceptable by the Owner. The Contractor shall arrange for and the Owner shall pay for all testing other than testing revealing failed results:

    1. All Island Testing.

    2. Soil Mechanics Environmental Services.

    3. Long Island Materials Testing Laboratories, Inc.

J. Unless otherwise noted, each Contractor shall be responsible for their own cutting and rough patching. The General Construction Contractor shall be responsible for all finish patching and painting. All repair and patching work shall be done in a professional manner. The Contractor shall

take care to match new and existing surfaces and materials as closely as possible for a continuous finish where duplication is impossible.

K. Each Contractor shall be responsible for their own material and equipment until completely installed, inspected for completeness and correctness, and signed off by the Architect or his duly appointed representative.

L. The General Construction Contractor shall be the lead contractor, responsible for all coordination between the General Construction, Mechanical, and Electrical trades.

M. The General Construction Contractor shall be responsible for cutting and patching all masonry work, insulated panels, etc. to accommodate any required thru-wall piping, conduit, equipment, or ductwork penetrations by other trades.

N. The General Contractor shall be responsible for provision of any required temporary roof drainage, protective fencing, plywood enclosure of all window and door masonry openings, etc., until new construction or material is permanently and completely in place.

O. The General Contractor shall provide and install all flashing, counterflashing, and pitch pockets for all roof equipment and roof penetrations and install all required roof curbs provided by others in accordance with the manufacturer's approved methods.

P. Changes to the Contract:

1. Should any changes be requested or required over and above the original contract scope, the Contractor shall be compensated as follows:

    a. For the actual and reasonable net costs for all materials and wages of applied labor required for such extra work.

    b. Rental costs for all machinery and equipment (other than small tools) required and approved for such extra work.

    c. 10% overhead and 5% profit as compensation for all other items of profit and cost or expense, including administration, overhead, supervision, etc. (Contractor is limited to 5% overhead for work performed by his subcontractor on changes.)

    d. A maximum of 2% for any increase in bonds and insurance's due to the adjusted contract sum.

Q. As is usual with capital project payments, the Owner will retain 5 percent of each payment issued on verified requisitions for payment submitted by the Contractor. This retainage total will be paid upon satisfactory completion of all work.

R. Contractor's proposals for any additional work (whether a field condition or program change) shall be submitted for consideration as follows:

1. Labor - Number of men
    Wage per hours
    Number of hours

2. Material - Unit costs (no lump sums)
    Unit measure (l.f., s.f., cu.ft., etc.)

3. Rental costs for machine, equipment, driver, etc.

4. 2% for bonds and insurance.

5. Upon request, the Contractor shall furnish satisfactory proof of all labor performed, materials furnished, and equipment used in performance of the extra work.

S. Whenever inclement weather (rain, hail, sleet, snow, etc.) causes an interruption in the day to day execution of the Contract work, each Contractor must fully mobilize their forces (with the necessary manpower and equipment) to immediately continue with Contract operations the very first day that such weather has subsided.

1. Contractor shall provide all necessary excavation and dewatering equipment to remove any standing water from open holes, ditches, trenches, and other excavations.

T. The maximum gross weight of vehicles used shall not exceed 2,500 lbs. per wheel in the area of any playground or ballfields. The equipment shall be fitted with flotation type tires. On lawns, the pounds per square inch exerted on the turf-grass shall not exceed 15 lbs. per square inch and on athletic areas shall not exceed 32 pounds per square inch.

U. See attached “Record of Unacceptable or Non-Conforming Work”.

END OF SECTION

BBS ARCHITECTS
LANDSCAPE ARCHITECTS
ENGINEERS

244 EAST MAIN STREET | PATCHOGUE | NEW YORK 11772 | T. 631.475.0349 | F. 631.475.0361
187 WOLF ROAD, SUITE 205 | ALBANY | NEW YORK 12205 | T. 518.621.7650 | F. 518.621.7655

RECORD OF UNACCEPTABLE and NON-CONFORMING WORK DOCUMENT

PROJECT NAME: _____ **LOCATION:** _____ **FILE No.:** _____

OWNER/DISTRICT: _____ **CON MGR or CLERK:** _____ **INITIALS:** _____

CONTRACTOR: _____ **CONTRACTOR REP:** _____ **TRADE:** _____

PROJECT MANAGER: _____ INITIALS: _____ **BBS CONST ADMIN:** _____ **INITIALS:** _____

BBS REVIEW ARCH: _____ INITIALS: _____ **BBS REVIEW ENG:** _____ **INITIALS:** _____

THIS DOCUMENT MAY NOT REPRESENT ALL WORK THAT IS CONSIDERED UNACCEPTABLE OR NON-CONFORMING. IT IS INTENDED TO TRACK SPECIFIC WORK IDENTIFIED TO A CORRECTED CONDITION. THE CONTRACTOR SHALL STILL BE REQUIRED TO MEET THE FULL UIREMENTS OF QUALITY & PERFORMANCE NOTED IN THE CONTRACT DOCUMENTS.

ITEM No.	DESCRIPTION OF DEFICIENT OR UNCOMPLETE WORK ITEMS	INITIALS OF REVIEW REP	DATE INDENTIFIED	WORK CORRECTED OR ACCEPTED AS NON-CONFORMING	INITIALS OF BBS REP/ OWNER/ CONTRACTOR	COST AS DETERMINED BY BBS	COMMENTS

BBS ARCHITECTS
LANDSCAPE ARCHITECTS
ENGINEERS

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RECORD OF UNACCEPTABLE and NON-CONFORMING WORK DOCUMENT

Please note that this document will be a running list of Unacceptable and Non-conforming Work for each building and will be issued after each site review if warranted. It is noted by the Architect/ Engineer that the project is on going, the review and decisions will be made with that information in mind. Once the item indicated has been reviewed and approved by the Architect/ Engineer it will be marked as 'Item is Closed' with the date attached.

SECTION 013115 – COORDINATION DRAWINGS BETWEEN MULTIPLE PRIME CONTRACTORS

1.1 SUMMARY

A. This Section includes preparation of coordination drawings for architectural, structural, mechanical, plumbing, fire protection, fire alarm, lighting, information technology, security, and electrical Work.

B. Related Sections include the following:

1. Division 01 Section "Project Management and Coordination" for administrative provisions for coordinating construction operations.
2. Division 01 Section “Closeout Procedures” for project record drawing requirements.

1.2 DEFINITION AND INTENT

A. The Contract Drawings are diagrammatic only and are not intended to show the alignment, exact physical locations, or configurations of such Work. Performance by the Contractor shall be required to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the intended results. When possible, the Contractor shall take field measurements and verify field conditions and shall carefully compare such field measurements and conditions and other information known to the Contractor with the Contract Documents before commencing coordination drawings.

B. Coordination drawings are drawings prepared by Contractor that superimpose Work of multiple trades involved in the construction process. Coordination drawings indicate systems and components to be installed by the Contractor with the intention to maximize clear height and free area in Ceiling Cavities, Mechanical Rooms, Electrical Rooms, Boiler Rooms, and Plumbing/Water Rooms; to allow for proper and adequate equipment service clearances, minimize space required by shafts and chases and provide the most efficient functioning and use of materials possible while complying with the final performance and finished appearance required by the Contract Documents.

C. Coordination drawings are intended to show the relationship and integration of different construction elements that require coordination during fabrication or installation to fit in the space provided, to function as intended, and to present the intended final finished appearance.

D. The Contractor shall manage the process so that each trade/ sub-contractor 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 Division 01 Section “Construction Progress Documentation” shall 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.

E. Contractor shall maintain equipment access and pathways as indicated on the Drawings. Floor space in MEP equipment rooms shall be maintained as indicated on the Architectural Drawings. Contractor shall clearly indicate access and floor space to be maintained in coordinated shop drawings submitted to the Owner and Architect as per the Specifications.

F. Definitions:
1. Building Information Model (BIM): A digital representation of physical and functional characteristics of a facility.
2. Coordination Model: Building Information Model(s) that demonstrates and communicates the facility data necessary to procure, fabricate, schedule, or construct the Project.
3. Coordination Report: A report developed to communicate and demonstrate that the facility elements have been properly coordinated and identify areas where issues may still exist.
4. Design Intent Model: Building Information Model(s) that demonstrates and communicates the creative objectives of the designer.
5. Fabrication/Shop Drawing: Drawing generated by the contractor from a Coordination Model based on the contract documents that communicates the information necessary to fabricate facility elements. Fabrication/Shop Drawings typically contain one system and are intended for use of trade personnel to fabricate, assemble, and install facility elements.
6. Facility Breakdown Structure: a system-oriented hierarchical decomposition of a facility into smaller components. Typically, the facility breakdown structure is based on disciplines, trades, described by Master Format.
7. Interference: Spatial conflict between facility elements.

1.3 CONTRACTOR'S USE OF ARCHITECT'S CAD FILES

A. Refer to Division 01 Section “Submittal Procedures” for availability of and use of Architect’s CAD Background Drawings.

1.4 COORDINATION RESPONSIBILITIES OF EACH PRIME CONTRACTOR

A. **Each Prime Contractor** is required to engage a **qualified drafting agency** capable of producing coordination drawings and models utilizing various industry standards and file formats including but not limited to: (Revit, AutoCAD, etc.). Each Prime Contractor is responsible for providing their own clash detection process for items of their work and any work shown on the Coordination Model from previous iterations by other Prime Contractors.

B. In **Renovation Construction** (where no new walls or floors are being constructed):
1. Each Contractor is required to provide field verification of all scheduled work to confirm installation fitment within existing conditions.
2. Each Contractor is required to submit coordination drawings depicting items listed in 013115: 3.2. Locations to be referenced using field marked reference points in the existing building in lieu of building column lines.
3. Each Contractor is to provide coordination drawings/models in existing spaces to confirm fitment/access and class detection between other Contractors prior to release of material installation.
4. Contractors providing equipment to be powered by existing power are to verify in field the existing power supplied meets the requirements of the new equipment. The Electrician providing new power for equipment is to provide field verification of existing power conditions with respect to the new equipment and power scheduled on the Contract Drawings/Approved Equipment Submittals.

C. **For <u>ALL</u> Construction: Each Contractor is required to provide a field mark out of their work** to be followed by other Contractors who are to provide openings, penetrations, wiring connections, structural support, trench layout, and any other work needed by a following Contractor. Layout to be based off the approved Shop Drawings generated from the Multi Trade signed off Coordination Model. Any openings/steel support required to be installed shall be marked out on the underside of the Roof Deck by the contractor installing the items requiring the opening/support.

D. The **Mechanical Contractor** will take on the additional responsibility of overseeing the

coordination modeling/drawing process and provide additional clash detection reports of all models by other Prime Contractors using the BIM Modeling Software for New Construction Building Work. The Mechanical Contractor is to communicate any issues that arise from other Contractors not fulfilling their obligations to the Construction Manager.

E. The **Construction Manager** will provide direction and communications between each Prime Contractor and schedule coordination meetings as required.

F. **Coordination Model(s):** Each Contractor is to prepare and submit Coordination Drawings/Model(s) as scheduled on the Project Milestone Schedule. Coordination Model(s) are to be based on the facility breakdown structure of the Contract Drawings and/or Design Intent Model. Contractors are to perform all work utilizing 3D modeling software in order to facilitate seamless coordination with BIM workflows. All design elements should be produced three-dimensionally in programs that can output file formats supported by Autodesk Navisworks. Coordination Model(s) are to be submitted using Autodesk Navisworks with all disciplines.

1. Coordination Model(s) are to be submitted prior to fabrication, and installation of any element within the area represented within the Coordination Model(s).
2. Fabrication/Shop Drawings and Construction Model(s) are to be integrated into the Coordination Model(s) or otherwise referenced in the Coordination Model(s).

G. Coordination Drawings. Each Prime Contractor is to export Coordination Drawings documents from the BIM authoring application in a (.pdf) for distribution and review by the Construction Manager/Architect/Engineer.

H. Coordination Meetings: Contractors are to attend coordination meetings bi-weekly or as required by the construction manager until the Coordination process is complete. Each Contractor is to provide details of the status of their respective portions of the coordination drawings and provide a list of any current conflicts or clash detection items at each meeting.

I. Coordination Drawing Sequence in **New Construction** (or as directed by the Construction Manager):

1. The Architect **may, when available,** provide the Design Intent Model (.RVT) but does not alleviate the responsibility of each Contractor to provide their own self-generated model.
2. The General Contractor shall provide the structural coordination model/coordination drawing depicting the Structural Elementals of the building (Steel, Concrete, Masonry, Floors, Roofs.
3. The General Contractor shall add to the coordination model, separate layers for the Architectural Contract work for partitions, walls, ceilings, soffits and other items as applicable. The General Contractor shall self-perform their own clash detection between the Structural and Architectural Items prior to sending the model to the next Contractor.
4. The coordination model shall then be sent to the Mechanical Contractor who will be designated the responsible Contractor to incorporate the models of the following trades and provide dedicated clash detection of all Models. The Mechanical Contractor will then detail the Mechanical items (Piping, Ductwork, and Equipment) and self-perform clash detection between Mechanical and General Contractor's Items. Mechanical Contractor to resolve clashes prior to passing the model to the Plumbing Contractor.
5. The Plumbing Contractor will then detail the Plumbing items onto the coordination model, self-perform their own clash detection, and then return to the Mechanical Contractor for final Clash detection.
6. The Electrical Contractor will then detail the Electrical items onto the coordination model, self-perform their own clash detection, and then return to the Mechanical Contractor for final Clash Detection.
7. Any other specialty Contractor will then detail their respective new work items onto the model and then return to the Mechanical Contractor for Clash Detection.

1.5 SUBMITTALS

A. Coordination Drawings are not a replacement for shop drawings specified in the technical specifications or the Record Drawings required in Division 01. Once the Coordination model is complete and all conflicts are resolved, each Contractor is responsible to submit Shop Drawings of their respective work for final approval. Circle and clearly note deviations from Contract Documents with reason for deviation stated. Contractor failure to identify deviations from the Contract Documents does not alleviate the Contractors responsibility to provide installations per the Contract Documents.

B. Coordination Clash Detection Report:

1. Prepare and submit a written Coordination Report generated from the Coordination Model(s) prior to fabrication, and installation of any facility element within the area represented within the Coordination Model(s). Develop Coordination Reports identifying outstanding issues after the development of the Coordination Model(s), including but not limited to:
    - Clashes:
        - Itemize number of clashes.
        - Clash Category
        - Describe clashes.
        - Describe the resolution of clashes and other conflicts.
    - Design changes.
    - Differing site conditions.
    - Hazardous, Maintenance Accessibility, or Safety related issues.
2. The report shall be organized by CSI Master Format 2016 specification section or by trade.
3. The issues identified within the Coordination Clash Detection Report are to be addressed by the **Contractor** in consultation with the Construction Manager and the Architect / Engineer prior to installation of facility elements. The Construction Manager may direct the Contractor to submit the issues in the Coordination Clash Detection Report as an RFI to the Architect/Engineer.
4. The Contractor is solely responsible for the cost of remedying any clashes that could have been discovered during the clash detection process.

1.6 PROJECT CONDITIONS

A. Maintain marked up set of coordination drawings at Project site available for reference by Owner and Architect.

B. Failure to submit coordination drawings or indicate work to be installed on coordination drawings will result in no changes to contract sum for necessary corrections to uncoordinated work not shown in coordination drawings.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PREPARATION OF COORDINATION DRAWINGS IN NEW CONSTRUCTION.

A. The intent of the Coordination Model(s) is to communicate the necessary information to construct the facility including size, location, and arrangement of both existing to remain and new elements and to incorporate the as-built conditions.
B. Develop Coordination Model(s) based upon Contract Documents, Design Intent Model(s), and verified existing conditions.
C. Coordination Model(s) are to have a consistent origin that can be referenced to a real-world datum or benchmark.
D. Prepare coordination drawings for Project using BIM: Revit or similar coordination documentation overlay drawings indicating coordination of the project.
E. The Construction Manager will review and direct coordination responsibilities for the preparation of the coordination drawings.

1. The Construction Manager will direct each Prime Contractor for the addition of trade-specific information to coordination drawings by multiple contractors in a sequence that best provides for coordination of the information and resolution of conflicts between installed components.

3.2 INFORMATION REQUIRED IN COORDINATION DRAWINGS/MODEL(S) - The coordination Model(s) will include, but not be limited to, the following elements with all necessary intelligence included to produce plans, sections, elevations, riser diagrams, and schedules as applicable:

(Locations (center points and edges of coordination element) to be depicted with locations referencing Column Lines and heights referencing Above Finish Floor Heights).

A. Structural Work Information Required in Coordination Drawings by General Construction Contractor:
   1. All Structural Steel and Miscellaneous Steel.
   2. Concrete, Masonry, and Foundation Walls. (Depict Sleeves and Structural Support for all utilities, piping, and conduit passing through the concrete/masonry walls).
   3. Floor Assembly (Including Slab edge locations and locations of sleeves dimensioned from building lines and floor lines).
   4. Roof Assembly (Include Roof Drains depicted and coordinated with Tapered insulation).
   5. Structural Support for Roof Mounted Equipment by this Contract and Other Prime Contractors.
   6. Structural Support for Floor/Roof Opening and sleeve locations including required openings not indicated on Contract Documents.
B. Architectural Work Information Required in Coordination Drawings by General Construction Contractor:
   1. Exterior Wall Layout for Building enclosure.
   2. Interior Wall and Partition Layout. Incorporate Concrete and Masonry Walls.
   3. Depict Wood blocking and Access Doors.
   4. Doors, including door swing area.
   5. All Ceilings Systems including support for support system. Depict final ceiling grid layout for Acoustical Ceiling.

C. Plumbing Work Information Required in Coordination Drawings by Plumbing Construction Contractor:
   1. Sizes, bottom elevations, locations of above ground piping with insulation thickness included. Include Piping Supports and Hangers.
   2. Sizes, bottom elevations, locations of underground piping. Indicate Point of Connection for Site Utility Piping Connections and sleeve locations through building foundation/exterior walls.
   3. Support of all roof-mounted plumbing piping and equipment.
   4. Depict all Plumbing Valves, Drains, Vents Specialty Items.
   5. Required space to install, service, access, and maintain all plumbing mechanical items and systems.
   6. Sizes and locations of Floor Drains, Floor Sinks, cleanouts, and any other items embedded in the Floor.
   7. Access Door locations required to support the work of this trade. Size, Layout, and type to be indicated.
   8. Wood Blocking Locations required to support the work of this trade (for Plumbing Fixtures and other wall mounted Plumbing items.
   9. Provide Sizes and Locations of concrete equipment pads for equipment supplied under this contract.

D. Mechanical Work Information Required in Coordination Drawing by Mechanical Construction Contractor
   1. Sizes and bottom elevations of ductwork, piping with insulation thickness, flanges, supports, and hangers included.
   2. Depict all Volume, Motorized, Fire Dampers, and Ductwork Access Doors.
   3. Sizes, bottom elevations, locations of above ground piping with insulation thickness included. Include Piping Supports and Hangers.
   4. Depict all HVAC Valves, Drains, Vents Specialty Items.
   5. Indicate Size and Layout of all floor/roof openings and sleeves for this contract. Indicate size of duct/pipe chase partition sizes.
   6. Indicate Size and Layout of all Interior/Exterior Wall Openings and Sleeves for this contract.
   7. Locations for support of all roof-mounted HVAC piping, ductwork, and equipment. (Depict all HVAC Equipment: Sizes, support, layout, access/service area, and Provide HVAC roof curb sizes and locations including Pipe Portals, Duct Curbs, Roof Rails, and other Roof Top Items.)
   8. Provide Sizes and Locations of concrete equipment pads for equipment supplied under this contract.
   9. Power and Wiring Connection Locations for Equipment.
   10. Access Door locations required to support the work of this trade. Size, Layout, and type to be indicated.
   11. Wood Blocking Locations required to support the work of this trade.

E. Electrical Work Information Required in Coordination Drawings by Electrical Construction Contractor (including telecommunications, data, security, lighting, and fire alarm systems scoped under the Electrical Contract):
   1. Runs of vertical and horizontal conduits 1-1/4-inch diameter and larger, and all cable trays, indicate bottom and sizes of horizontal conduit and cable trays.
   2. Sizes, bottom elevations, locations of underground conduits. Indicate Point of Connection for Site Utility Conduit Connections and sleeve locations through building foundation/exterior walls.
   3. Location of pull boxes and junction boxes, dimensioned from column centerlines. All to

be placed in accessible locations.
4. Light fixture locations and sizes.
5. Wall and Ceiling Mounted Device Layout.
6. Panelboard, switchboard, transformer Layout.
7. Depict all roof mounted conduits/supports and equipment under this trade. (Coordinate with other Contractors to share pipe portals and equipment electrical raceways.)
8. Required space to install, service, access, and maintain all electrical items and systems.
9. Power and Wiring Connection Locations for Equipment.
10. Provide Sizes and Locations of concrete equipment pads for equipment supplied under this contract.
11. Access Door locations required to support the work of this trade. Size, Layout, and type to be indicated.
12. Wood Blocking Locations required to support the work of this trade (Including Door Holders and other surface mounted equipment).

F. Fire Protection System Information Required in Coordination Drawings by Contractor responsible for providing Fire Protection:
1. Locations of standpipes, valves, mains piping, branch lines, pipe drops, building entry piping, Inspection Test Locations, Fire Protection Specialty Piping, and sprinkler heads.
2. Bottom elevation of main and branch lines, including Hangers and Supports.
3. Wood Blocking Locations required to support the work of this trade.
4. Access Door locations required to support the work of this trade. Size, Layout, and type to be indicated.

G. Building Automation Controls Work Information Required in Coordination Drawings by Contractor Responsible for providing Building Automation Controls.
1. Thermostats and wall/ceiling mounted controls devices.
2. Wall Mounted Panels and controllers.
3. Wood Blocking Locations required to support the work of this trade.
4. Access Door locations required to support the work of this trade. Size, Layout, and type to be indicated.

H. Casework and Furniture Work Information Required in Coordination Drawings by Contractor Responsible for providing Casework and Furniture.
1. All Casework shown on Contract Drawings.
2. Depict all connections for Electrical and Communications work.
3. Depict all Plumbing Connections and Cut outs for Plumbing items to be installed in casework.
4. Depict all other connections by other Contractors to be installed in casework.
5. Wood Blocking Locations required to support the work of this trade.

I. Telecommunication/Low Voltage Work Information Required in Coordination Drawings by Contractor Responsible for providing Telecommunication/Low Voltage Work.
1. Wall Mounted Devices.
2. Sleeve Locations for all Floor/Roof Openings.
3. Access Door locations required to support the work of this trade. Size, Layout, and type to be indicated.

J. Security Work Information Required in Coordination Drawings by Contractor Responsible for providing Telecommunication/Low Voltage Work.
1. Wall mounted panels and controllers.
2. Wall mounted devices.
3. Wood Blocking Locations required to support the work of this trade.

K. Equipment Work Information Required in Coordination Drawings by Contractor Responsible for providing Equipment Work.

1. Wall and Ceiling mounted devices, panels, and controllers.
2. Access Door locations required to support the work of this trade. Size, Layout, and type to be indicated.
3. Wood Blocking Locations required to support the work of this trade.
4. Power and Wiring Connection Locations for Equipment.

3.3 SITEWORK COORDINATION

A. The Contractor responsible for providing Sitework shall prepare Coordination Drawings depicting all sitework and utility work that is to be coordinated between other Contractors.

B. Items to be provided the following in the Coordination Drawings/Model:
1. Utilities to be shown by the Sitework Contractor include but not limited to: Storm Piping, Footing Drains, Sanitary/Sewer Piping, Watermain piping, Fire Protection Piping, Concrete Structures, Electrical and Low Voltage Conduit, Conduit Duct Banks, Concrete Structures. Indicate Tops/Bottoms, and sizes of utilities.
2. Depict Utility Point of Connection locations.
3. Sitework Contractor to confirm heights/depths of utilities will be at correct elevations with respect to the finished grade and finished sitework.
4. Provide drawings coordinating concrete sidewalks and stairs with connection to the building or other existing concrete pathway connections.

3.4 ELECTRICAL POWER AND WIRING COORDINATION

1. All Prime Contractor's providing equipment and devices to be wired and connected to by the Electrician shall provide the contractor designated of wiring the equipment/devices with wiring diagrams and power requirements.
2. The Electrician shall not release or install materials to power any equipment until the electrician has reviewed and confirmed the power requirements of the engineer approved equipment submittal submitted by the equipment installer and verified the power supplied from the panel/breaker will meet the requirements of the approved equipment.
3. The Equipment supplier will indicate on the coordination drawings the proposed locations of any wall or ceiling devices.
4. The Contractor furnishing Electrified Door Hardware, or Doors/Frames scheduled to receive electrified Door hardware or Door Controls/Security shall provide in new storefronts/door frames; internal raceway and drag wire from all electrified hardware devices to a concealed location above the ceiling in the building. The Door/Frame installer shall also notify the Construction Manager and Contractor responsible for providing hardware wiring when storefront/door frames installation is to be scheduled prior to wiring installation.

3.5 CONFLICTS IN COORDINATION DRAWINGS

A. The issues identified within the Coordination Clash Detection Report are to be addressed by the Contractor in consultation with the Construction Manager and the Architect / Engineer prior to installation of facility elements. The Construction Manager may direct the Contractor to submit the issues in the Coordination Clash Detection Report as an RFI to the Architect/Engineer.
1. Each Prime Contractors shall revise their respective portions of the Coordination Drawings to eliminate the collisions and interferences identified.
2. Each Prime Contractor shall determine that all work can be installed without interference.
3. Each Prime Contractor shall approve the revised Coordination Drawings in writing indicating approval of installation coordination and clearances.

3.6 CONTRACTOR COORDINATION PARTICIPATION REQUIREMENT

A. All Contractors are required to provide information and fulfill coordination obligations identified in this specification section.

B. Failure to submit coordination drawings or indicate work to be installed on coordination drawings will result in no changes to contract sum for necessary corrections to uncoordinated work not shown in coordination drawings. Additional costs by other Contractors to change other Contractors conflicting work if required will be the responsibility of the Contractor that failed to provide their obligated coordination responsibilities.

C. If a contractor fails to perform coordination services under this specification section when scheduled and within 7 days upon notice and request by the Construction Manager, in which results in a delay to another contractors scheduled release of work, then the Owner retains the right to hire an outside detailing services/surveying services to review the work of the Contract and provide coordination services to other Contractors and deduct costs from the Contractor who has failed to provide the contractual scheduling services. If the Construction Manager must perform these services on behalf of the Contractor after the Contractor has failed to provide the required coordination information/services after notification and allotted time, then the Contractor will be required to pay the Construction Manager $125.00 per hour via deduct change order to provide the coordination administrative services on behalf of the Contractor.

END OF SECTION 013115

DIVISION 01 – GENERAL REQUIREMENTS

SECTION 013200 – PROJECT SCHEDULE

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:

1. Work sequence.

2. Contractor use of premises.

3. Owner occupancy.

1.02 WORK SEQUENCE

A. Project Start:

1. Commence construction activity at the site as soon after contract award, unless specified otherwise, as required to comply with specified Construction Schedule.

2. Schedule material deliveries to correspond with starting dates so that materials are on site on required start date.

B. Coordination:

1. Schedule all construction activities at the site with Architect, Construction Manager (if applicable) Owner, and other prime contractors to avoid, to maximum extent, interference with Owner's operations and to meet specified completion dates.

a. It is the responsibility of all Prime Contractors to meet the Completion Schedule within the Owner's Educational Schedule.

b. Coordinate construction activities with school calendar issued by Owner to each Prime Contractor to avoid interference with normal educational process by Owner.

c. Review requirements of Contract Documents for each Prime Contract in relationship to requirements for other Prime Contractors and the Owner's Educational Schedule.

2. Coordinate all interruptions of building services or shut-down of building systems with Architect, Construction Manager (if applicable) and Owner, and obtain written approval of proposed schedule for interruptions or shut-down from Architect, Owner, and/or Construction Manager (if applicable).

a. If, in the opinion of the Owner or Construction Manager (if applicable), any such interruption or shut-down will affect life or safety of building occupants, schedule interruption of shut-down at a time acceptable to the Owner, when classes are not in session, or after normal working hours.

b. Extra payment for overtime outside normal working hours required by any such interruption or shut-down will not be made by Owner. Prime Contractor requiring overtime shall do so at his own cost and shall be responsible for extra costs incurred by other Prime Contractors as a result.

c. Insure all equipment, fittings, pipe, and similar items required are on hand before interrupting or shutting down existing systems.

d. Notify all inspectors and representatives of utility companies, village officials, Architect, Construction Manager (if applicable), Owner, and similar parties by letter in advance of required changeovers, tie-ins, removals, and similar operations.

1.03 CONTRACTOR USE OF PREMISES

A. Access to Building:

1. All Prime Contractors are directed to schedule all construction activities with Owner to allow Owner's full use of building areas and systems for normal educational process. Owner acknowledges Prime Contractors will require access to Owner-occupied areas, rooms, and systems, and intends to cooperate in making rooms and systems available for construction activities.

2. Notify Project Representative in advance of any requirements for access to any existing building outside normal working hours and days.

B. Building Security:

1. Owner will maintain building security at all times for his sole benefit. Each Prime Contractor shall retain full responsibility for security and protection of work of his Prime Contract until final acceptance by the Owner.

C. Maintenance of Building Circulation and Exits:

1. Maintain circulation corridors, exits, and exit stairs unobstructed from equipment and materials, except in areas of construction activity closed by temporary partitions.

1.04 OWNER OCCUPANCY

A. Normal School Year: Owner intends to maintain full education program during the normal school year throughout duration of project, and will make full use of buildings and sites, unless otherwise specified.

1. School and special activities may be conducted within buildings and on sites after regular school hours and on weekends during the normal school year.

2. Free access by Owner's personnel to building and site areas not scheduled for alteration or dimensional change shall be maintained by all Prime Contractors.

3. Owner's personnel will perform normal custodial and maintenance services for building areas and systems not involved in construction activities, unless otherwise indicated.

B. Summer School:

1. Owner will staff the buildings with at least administrative, custodial, and maintenance personnel during the scheduled Summer Recess.

PART 2 – PRODUCTS – (NOT APPLICABLE)

PART 3 – EXECUTION – (NOT APPLICABLE)

END OF SECTION

DIVISION 01 – GENERAL REQUIREMENTS

SECTION 013300 – SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.01 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.

1.02 SUMMARY

A. Section Includes:

1. Submittal schedule requirements.
2. Administrative and procedural requirements for Shop Drawings, Product Data, Samples and other submittals.

B. Related Sections:

1. Section 012600 – Construction Phase Clarifications
2. Section 013200 – Project Schedule
3. Section 016000 – Product Requirements
4. Section 017000 – Contract Closeout
5. Section 017839 – Project Record Documents

1.03 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

A. Submittal Log: Prepare and submit, with construction schedule, a separate schedule for shop drawings, product data, and samples submittals, which shall be herein referred to as a “Submittal Log”. This log shall list all required submittals specific to your trade as detailed in the various sections of the Project Specifications. Submittal log shall be submitted within one (1) calendar week of Notice to Proceed, before submitting first payment application. Submittal log shall show the following:

1. Section number.
2. Item of shop drawing, product data, and samples.
3. Date to be submitted.

B. Submittal Cover Sheet: All submissions must be provided with a Submittal Cover Sheet. The Submittal Cover Sheet follows this specification section.

1. An electronic form of the submittal cover sheet is available in PDF format upon request from the Architect.
2. The Submittal Cover sheet shall be the first page of each individual submission and/ or individual PDF file.

a. Each product submitted within a specification section shall have an individual Submittal Cover sheet attached. Combined submittals with one cover sheet will not be accepted.
b. All fields within each Submittal Cover sheet shall be completed providing the following information:

1) Name of Contractor
2) Project Name

3) Date
4) Architect's Project Number
5) Items Submitted
6) Manufacturer
7) Model Numbers
8) Submission Number
9) Specification Section
10) Acknowledgement by Contractor

3. Submissions that are provided without a Submittal Cover Sheet or not filled in correctly will not be reviewed. The Architect will advise the Contractor that the submission is incomplete. Submissions that are not corrected will be returned to the contractor REJECTED.

C. Architect's Electronic Drawing Files: Electronic digital data files of the Contract Drawings may be provided at the discretion by the Architect for Contractor's use in preparing submittals for a cost of $25.00 per drawing.

1. Architect makes no representations as to the accuracy of completeness of digital drawing files as they relate to the Contract Drawings.
2. Digital Drawing Software Program: The Contract Drawings are available in the most current version of AutoCAD.
3. Contractors requesting this service will be required to sign a disclaimer. Contractor shall fully execute a disclaimer agreement and pay a fee for preparation of the electronic files prior to their release.
4. Request for electronic files must be made in writing to the Architects office. This request must include a specific list of drawings required in this format.

D. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
3. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
4. Delays associated with the above are not the Architects responsibility and rests solely with the Contractor.

E. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.

1. The architect will not be responsible for project delays due to the contractor's failure to submit the required submittal information in time to allow for review based on the stipulated review time and to meet the project schedule.
2. Initial Review: Allow (10) ten working days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
3. Re-submittal Review: Allow (10) ten working days for review of each re-submittal.
4. Submittals requiring Architect's Consultant review such as Structural Steel Shop Drawings will require longer review periods. Contractor shall submit such reviews in a timely manner to coordinate with the project schedule accordingly.

5. Where submittal are required to be approved that are part of an assembly or for items such as finishes where color selections are required. The submittal will be retained until all of the information related to these systems and color selections is provided and accepted.
6. Products with multiple submittals may be held until all necessary information has been submitted for architect to make a complete review. Submittals dependent on coordinating information from related or dependent products; or products with critical interface with other products may be held until all information is submitted for architect to make a complete review and coordinate all required information.

F. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:

1. Prepare submittals as PDF package, incorporating complete information into each PDF file, including Submittal Cover Sheet. Name PDF file with submittal number.

    a. File name shall use project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g., LNHS-061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., LNHS-061000.01.A).

2. Transmit to Architect by sending via email or utilize other web-based software such as Procore or Submittal Exchange when provided by the Construction Manager, if applicable or Owner.
3. Include Submittal number within Subject Line as requested by Architect.
4. Architect will return annotated file. Annotate and retain one copy of file as a digital Project Record Document file.

1.04 SUBMITTAL SCHEDULE

A. Submittal Schedule: Submit a list of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Architect and additional time for handling and reviewing submittals required by those corrections.

1. Submittal Schedule: Submit, as an action submittal, a list of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Architect and additional time for handling and reviewing submittals required by those corrections.

B. The information is required to be submitted under the Submittal section from each respective Specification Section. With each item listed, the Contractor shall provide anticipated dates for submission to the Architect. The Architect will review and accept or request that corrections be made for subsequent acceptance. This acceptance will constitute a review for the submittal, shop drawings and sample submissions may commence. No Submittals or Shop Drawings will be reviewed by the Architect until an approved Submittal Schedule is in place.

1. The Submittal Schedule shall be coordinated with the overall Project Schedule to ensure that submittals are submitted and reviewed so as not to delay the Project Schedule.
2. The Architect will not be responsible for ensuring that all required Shop Drawings, Product Data, Samples or similar submittals that are required to be submitted and reviewed under the Contract Documents are submitted by the Contractor. Submissions of Shop Drawings, Product Data, Samples or similar submittals are the Contractor’s sole responsibility. Delays associated with the Contractor’s failure to provide the required submittals are the Contractor's responsibility.
3. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.

4. Initial Submittal Schedule: Submit concurrently with startup construction schedule. Include submittals required during the first (30) thirty days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
5. Final Submittal Schedule: Submit concurrently with the first complete submittal of Contractor's construction schedule.

    a. Submit revised submittal schedule as required to reflect changes in current status and timing for submittals.

6. Format: Arrange the following information in a tabular format:

    a. Scheduled date for first submittal.
    b. Specification Section number and title.
    c. Submittal Category: Action; informational.
    d. Name of subcontractor.
    e. Description of the Work covered.
    f. Scheduled date for Architect's final release or approval.
    g. Scheduled dates for purchasing.
    h. Scheduled date of fabrication.
    i. Scheduled dates for installation.

C. Submit the following submittals: Within (14) fourteen days of contract award.

1. Submittal Schedule including dates of anticipated review and approval.

    a. No submittals will be reviewed without an approved Submittal Schedule in place.

2. Subcontractor List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:

    a. Name, address, telephone number and email address of entities performing subcontract or supplying products.
    b. Number and title of related Specification Section(s) covered by subcontract.

3. Submit the required submissions from the following submittals:

    a. Section 010000 – General Requirements
    b. Section 010200 – Insurance Requirements
    c. Section 013000 – Special Procedures and Provisions
    d. Section 013200 – Project Schedule
    e. Section 013310 – Product Approval Standard
    f. Section 014529 – Testing Laboratory Services
    g. Section 015000 – Temporary Facilities and Controls
    h. Section 024119 – Selective Demolition
    i. Section 028200 – Asbestos Abatement
    j. Section 040100 – Masonry Restoration and Cleaning
    k. Section 040140 – Natural Stone Repair and Repointing
    l. Section 042000 – Unit Masonry
    m. Section 042150 – Thin Brick Masonry
    n. Section 042223 – Interior Glazed Masonry Units
    o. Section 042300 – Glass Unity Masonry
    p. Section 044000 – Belgian Block
    q. Section 047200 – Architectural Cast Stone
    r. Section 047300 – Manufactured Stone Veneer

D. Submit within the first (28) twenty-eight days after Contract Award.

1. Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Section 014523 – Test, Inspections, and Special Inspections.
2. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
3. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
4. All remaining required submissions required for the project.

E. Submit a minimum (30) thirty days prior to Project Closeout:

1. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Section 017000 – Contract Closeout.

1.05 SUBMITTAL PROCEDURES

A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.

1. Submit electronic submittals via email as PDF electronic files or utilize other web-based software such as Procore or Submittal Exchange when provided by the Construction Manager, if applicable or Owner.

a. Architect will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.
b. Provide a digital signature with digital certificate on electronically submitted certificates and certifications where indicated.

2. Provide (6) six hard copies of submittals when requested by the Architect.

3. Transmittal Form for Electronic Submittals: Use electronic form acceptable to Owner, containing the following information:

a. Project name.
b. Date.
c. Name and address of Architect.
d. Name of Construction Manager, if applicable.
e. Name of Contractor.
f. Name of firm or entity that prepared submittal.
g. Names of subcontractor, manufacturer, and supplier.
h. Category and type of submittal.
i. Submittal purpose and description.
j. Specification Section number and title.
k. Specification paragraph number or drawing designation and generic name for each of multiple items.
l. Drawing number and detail references, as appropriate.
m. Location(s) where product is to be installed, as appropriate.
n. Related physical samples submitted directly.
o. Indication of full or partial submittal.
p. Transmittal number, numbered consecutively.
q. Submittal and transmittal distribution record.

r. Other necessary identification.
s. Notification of deviations from contract documents.
t. Remarks

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment. Each product within a specification section shall have a separate submittal cover.

1. If information must be specially prepared for submittal because standard published data are unsuitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable. Send full submittals for each product. Partial submittals will not be reviewed until all required submittal information is received. The Architect will not be responsible for project delays due to the Contractor's failure to submit the required submittal information in a complete package.
3. Include the following information, as applicable:

a. Manufacturer's catalog cuts.
b. Manufacturer's product specifications.
c. Standard color charts.
d. Statement of compliance with specified referenced standards.
e. Testing by recognized testing agency.
f. Application of testing agency labels and seals.
g. Notation of coordination requirements.
h. Availability and delivery time information.

4. For equipment, include the following in addition to the above, as applicable:

a. Wiring diagrams that show factory-installed wiring.
b. Printed performance curves.
c. Operational range diagrams.
d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.

5. Submit Product Data before Shop Drawings, and before or concurrently with Samples.

C. Shop drawings: Original drawing, prepared by the Contractor, subcontractor, supplier, or distributor, which illustrates some portion of the work; showing fabrication, layout, setting or erection details. Prepare project-specific information for each shop drawing. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data, unless submittal based on Architect's digital data drawing files is otherwise permitted.

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:

a. Identify details by reference to sheet and detail numbers shown on contract drawings.
b. Identification of products.
c. Schedules.
d. Compliance with specified standards.
e. Notation of coordination requirements.
f. Notation of dimensions established by field measurement.
g. Relationship and attachment to adjoining construction clearly indicated.
h. Description any conflicts with other trades.
i. Seal and signature of professional engineer if specified.

2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches, but no larger than 30 by 42 inches.

3. Submit Shop Drawings in the following format:

    a. PDF electronic file.

D. Samples: Physical examples to illustrate materials, equipment, or workmanship, and to establish standards by which completed work is judged. Submit Samples for review of type, color, pattern, and texture for a check of these characteristics with other materials.

1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.

2. Identification: Attach label on unexposed side of Samples that includes the following:

    a. Generic description of Sample.
    b. Product name and name of manufacturer.
    c. Sample source.
    d. Number and title of applicable Specification Section.
    e. Specification paragraph number and generic name of each item.

3. For projects where electronic submittals are required, provide corresponding electronic submittal of Sample transmittal, digital image file illustrating Sample characteristics, and identification information for record.

4. Disposition: Maintain sets of approved Samples at Project site, available for quality- control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
    a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
    b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor

5. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units, showing the full range of colors, textures, and patterns available. Samples to be sufficient size and quantity to clearly illustrate:

    a. Functional characteristics of product or material, with related parts and method of attachment.
    b. Number of Samples: Submit (1) one full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.

6. Field samples and mock-ups, as specified in technical sections.

    a. Erect on project site at location acceptable to Architect/Engineer.
    b. Construct samples or mock-up complete, including work of all trades required in finish work.

7. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.

a. Number of Samples: Submit (3) three sets of Samples. Architect will retain (2) two Sample sets; remainder will be returned. Mark up and retain one returned Sample set as a project record Sample.

1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least (3) three sets of paired units that show approximate limits of variations.

E. Manufacturer's Warranties:

1. The Contractor shall include in his submissions samples of all manufacturer's warranties indicating the correct time duration of the warranty as specified in the contract documents. If the documents do not specify a specific time duration, the manufacturer's standard time duration shall apply, but in no event shall it be less than the contractor's guarantee as specified in Section 017000.

F. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of Engineers and owners, and other information specified.

G. Certificates:

1. Certificates and Certifications Submittals: Submit a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity. Provide a notarized signature where indicated.
2. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
3. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
4. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
5. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
6. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.

H. Test and Research Reports:

1. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
2. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
3. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

4. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
5. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
6. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:

    a. Name of evaluation organization.
    b. Date of evaluation.
    c. Time period when report is in effect.
    d. Product and manufacturers' names.
    e. Description of product.
    f. Test procedures and results.
    g. Limitations of use.

1.06 DELEGATED DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

    1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF electronic file paper copies of certificate, signed and sealed by the responsible design professional, licensed in the State of New York, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

    1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

1.07 ARCHITECT'S SHOP DRAWING STAMP ACTIONS

A. Submittals: Architect will review each submittal, make marks to indicate corrections or revisions required, and return it. Architect will respond to each submittal indicating one of the following actions required:

    1. FURNISH AS SUBMITTED (FAS): Architect takes no exception to the submittal. This part of the Work covered by the submittal may proceed provided it complies with requirements of the Contract Documents; final acceptance will depend upon that compliance.

    2. REJECTED (REJ): The submittal is rejected. See Architects comments on why submittal was rejected. Resubmit in accordance with the requirements of the Contract Documents.

        a. Submittal has not been reviewed by the Contractor and so noted.
        b. Submittal has been prepared without due regard for information called for or logically implied by the Contract Documents.
        c. Information is not sufficiently complete or accurate to verify that work represented is in accordance with the Contract Documents.

d. Do not permit submittals marked “Rejected” to be used at the Project Site, or elsewhere where Work is in progress.

3. FURNISH AS CORRECTED (FAC): No exceptions taken except what is identified by the Architect. The part of the Work covered by the submittal may proceed provided it complies with notations or corrections on the submittal and requirements of the Contract Documents; final acceptance will depend on that compliance. Furnish any additional related information as requested.

4. REVISE AND RESUBMIT (RAR): Revise the submittal based on the Architects comments and resubmit the submittal. Do not proceed with that part of the Work covered by the submittal, including purchasing, fabrication, delivery, or other activity. Revise or prepare a new submittal in accordance with the notations; resubmit without delay. Repeat if necessary to obtain a different action mark.

   a. Do not permit submittals marked “Revise and Resubmit” to be used at the Project Site, or elsewhere where Work is in progress.

5. RESUBMISSION NOT REQUIRED (RNR): Resubmission of the submittal is not required based on Architect’s comments.

1.08 CONTRACTOR RESPONSIBILITIES

A. All submissions are to be made directly to the Architect’s office. Each Contractor shall completely review, stamp, and sign his shop drawings, product data, and samples prior to submission to Architect. The Architect will not review any shop drawings unless first reviewed by the Contractor.

B. The Contractor's responsibility for errors and omissions in submissions is not relieved by Architect/Engineer's review of submissions.

C. The Contractor's responsibility for deviations in submissions from requirements of contract documents is not relieved by Architect/Engineer's review of submissions unless Architect/Engineer gives written acceptance of specific deviations.

D. All submissions shall be accompanied by a Letter of Transmittal, signed by the Contractor’s project manager. Notify Architect/Engineer, in writing at time of submission of deviations in submissions from requirements of contract documents. In addition, all submittals shall be accompanied by a signed and dated “Submittal Cover Sheet” for each item, which acknowledges the Contractors review for completeness, correctness and accuracy of each submitted item.

E. No portion of the work requiring submissions shall be started, fabricated, or installed until return of approved submissions to the contractor.

F. After Architect review, distribute copies of submissions to parties requiring same for coordinating of work.

G. Make required copies for distribution of shop drawings, and product data, that has been stamped and signed by the Architect.

1.09 CONTRACTOR PREPARATION, REVIEW, AND SUBMISSION OF SHOP DRAWINGS, SAMPLES, MANUFACTURER'S DATA, ETC.

A. It is the responsibility of the Contractor furnishing and/or installing materials and/or systems to these projects to field verify all existing and/or as-built conditions, as well as all conditions presently under construction that are interrelated in whole or in part to the furnishing and/or installing of such materials and/or systems.

B. It is the responsibility of the Contractor, to coordinate such field verification and be ultimately responsible for the accuracy of same prior to the submission of shop drawings for design intent review by the Architect/Engineer.

C. All submittals of shop drawings, materials, samples, etc. prepared by any subcontractor and/or supplier of the Contractor or by the Contractor themselves shall be reviewed by the Contractor, prior to the submission of same to the Architect/Engineer, for: contract document accuracy and equivalency (if applicable); total quantity of material provided; all dimensioning systems related; alteration to same if necessary to accommodate accepted field changes built or pending; interaction with other materials and/or systems furnished and/or installed by this Contractor or their subcontractors (i.e., field measurements for space allocation, accuracy to previous submittals of this Contractor, etc.); and interaction with materials and/or systems provided by other Contractors.

D. After the completion of such review as stated in 1.09C above, the Contractor shall signify same by having the following information on each and every submittal:

- Name of Contractor
- Date of Review by Contractor
- Note: This submittal has been reviewed by (Name of Contractor) in accordance with the contract documents describing and defining the requirements of such review.
- Signature of reviewer.
- Name of reviewer (printed).
- Title of reviewer (printed).

E. In compliance with 1.09D above, the Contractor shall submit in writing to the Architect/Engineer and Owner's representative (if any), prior to their first submission, the name and title of the reviewer who shall be an employee of the Contractor for review and acknowledgment of same.

F. If this project has a Construction Manager who is acting on the Owner's behalf and who has full-time construction site representation, the scheduling of submissions, the coordination, and interaction of other contractors, field conditions that affect the submission of, fabrication of, or installation of another Contractor's submission, fabrication, or installation shall be made known to the Owner's Representative.

G. Any resultant construction field condition that arises that is contrary to a submission made, that is conflicting with another Contractor's submission, the schedule for construction, or with another Contractor's constructed work shall be immediately identified by the Contractor(s) and make known to the Owner's Representative, and, if such condition causes any construction schedule delay, "rereview" by the Architect/Engineer, additional work of the Architect/Engineer (such as field review, "redesign" or document preparation); or "reconstruction" of any work already built and/or accomplished by another Contractor, the connection to such conditions and associated costs to accomplish same shall be the sole responsibility of the Contractor found negligent in causing such conditions.

H. No submission to the Architect/Engineer shall contain or utilize directly portions whole or in part of the contract documents, such as the reproduction of drawings, portions of the Project Manual, etc.

I. The Architect's office reserves the right to retain any submitted technical data and shop drawings in abeyance if: submissions are incomplete, improper number of samples are submitted, if submissions are not accompanied by a properly-executed submittal cover sheet/letter of transmittal, or until all associated/interrelated shop drawings or interrelated technical data are submitted. See "K" below.

J. Any submission not containing the information outlined and required in 1.09D above will not be reviewed by the Architect/Engineer for design intent, but rather rejected and sent back to the Contractor for review by same.

K. Any submission by the Contractor that requires coordination with another material and/or system provided by this Contractor or another Contractor that has been reviewed, by that Contractor and previously submitted to the Architect/Engineer may be rejected in whole or part by the Architect/Engineer, or held in abeyance by same until the corresponding and coordinating submittals are submitted as the concurrent review of all such submittals for design intent, may be deemed important by the Architect/Engineer. Any release given any entity other than the Architect/Engineer to fabricate, furnish, and install any material or system not reviewed by the Architect/Engineer for design intent shall become the sole responsibility of the releasing entity as well as the resolution of construction related issues or conflicts.

L. In addition, the Contractor shall not utilize nor refer to any schedule of work not created nor provided by the Architect/Engineer. The Contractor's method in establishing, defining, and/or substantiating their ability to maintain the schedule presented in these contract documents and as prepared by the Owner's representative shall be exclusive of a defined time period of submittal review.

M. The rejection or abeyance noted in the above subparagraph shall not be considered a delay or a reason for an extension of time in the construction schedule to the contract, as such cause for same shall have been brought upon by the Contractor not providing the "pre-coordination" necessary for such submissions.

N. The Architect is not legally bound to the approved construction schedule; only the Contractors are bound to the approved construction schedule. The Architect is not required to expedite reviews or comments in the effort to expedite any Contractors' submissions and/or construction schedule.

1.10 DISTRIBUTION OF SUBMISSIONS:

A. The Contractor shall distribute copies of shop drawings, product data, and/or samples which carry the Architect/Engineer approval stamp to:

1. Contractor's file (as required).
2. Job site file (as required).
3. Record document file (as required).
4. Other contractors, as required for coordination (as required).
5. Subcontractor (as required).
6. Suppliers and Fabricators (as required)
7. The Construction Manager, if applicable (2 copies).

B. Distribute samples as directed, by Architect/Engineer.

C. The Contractor will be responsible for the distribution of their approved drawings/cuts in a timely manner to other Contractors (and subcontractors) for coordination with their work. Any additional costs generated due to the lack of transfer information will be borne by the Contractor responsible for distribution. In the event the Contractor fails to distribute shop drawings/product information to other Contractors (and their subcontractors), the Owner reserves the right to have the Architect make the necessary copies and Federal Express to the parties involved. All costs incurred by the Architect will be back-charged to the Contractor responsible for distributing the shop drawings/product information.

D. Shop drawings/submittals returned to the Contractors for second resubmission will require a two (2) day turnaround on resubmission. Submittals requiring a second resubmission will result in charges for additional Architect/Engineer review time.

1.11 ARCHITECT/ENGINEER:

A. Review for:

1. Design concept of project.
2. Compliance with contract documents.

B. Review of separate items does not constitute review of an assembly in which item functions.

C. Stamp and initial or sign to review of submission.

D. Return submissions to Contractor for distribution.

E. Note: Based upon the amount of multiple submittals received in one day, and their content, unless they are specifically numbered by the Contractor for their order of relative importance on his Letter of Transmittal, the Architect shall establish the level of importance of each submittal, and shall be allowed sufficient time (in the Architect's professional judgement) to permit adequate review. Such submissions will be reviewed either: a) in the time order in which they were received by the Architect's office, b) in their natural progressive order of construction placement, or c) in order of preference, as determined by the Architect. As a result of multiple/sequential submissions, no delays in time, or Contractor hard or soft costs shall be implied or imposed onto the Architect. It is the Contractor's complete responsibility to adhere to the prepared Construction Schedule at all costs, including extended delays which may be incurred by time required for adequate review from the Architect's office.

F. Architect's Stamp: The Architect's stamp (indicating initials and date), affixed to any shop drawing, manufacturer's specification cut or sample is only for design concept conformance, and general compliance with the content of the contract documents. This does not relieve the Contractor of his/her responsibility to comply with the requirements of the Contract Documents.

PART TWO – PRODUCTS

NOT APPLICABLE

PART THREE – EXECUTION

NOT APPLICABLE

END OF SECTION

BBS ARCHITECTS
LANDSCAPE ARCHITECTS
ENGINEERS

244 EAST MAIN STREET | PATCHOGUE | NEW YORK 11772 | T. 631.475.0349 | F. 631.475.0361
187 WOLF ROAD, SUITE 205 | ALBANY | NEW YORK 12205 | T. 518.621.7650 | F. 518.621.7655
www.BBSARCHITECTURE.COM

Submittal Cover Sheet

Name of Contractor: _____

Project Name: _____

District Name: _____

Date: _____ Architect's Project No.: _____

Items Submitted: _____

Manufacturer: _____

Model No's: _____

Submission Number: _____ Spec Section: _____

Acknowledgement by Contractor: This submittal has been reviewed by the above named contractor in accordance with the contract documents describing and defining the requirements of such review

*Signature:*_____ *Title of reviewer (print)*_____

Name (print): _____ *Date of review:* _____

Notes:

CA-CCI-2018

DIVISION 01 – GENERAL REQUIREMENTS

SECTION 013500 – COMMISSIONER REGULATIONS (PART 155.5) AND SAFETY STANDARDS

PART 1 – COMMISSIONER REGULATIONS (PART 155.5)

A. Monitoring of construction and maintenance activities:
The occupied portion of any school building shall always comply with the minimum requirements necessary to maintain a certificate of occupancy and shall be monitored during construction or maintenance activities for safety violations by school district personnel. It is the responsibility of the board of education or board of cooperative educational services to assure that these standards are continuously maintained when the building or any portion thereof is occupied.

B. Investigation and disposition of complaints relating to health and safety received as a result of construction and maintenance activities.
Boards of education and boards of cooperative educational services shall follow procedures established under section 155.4(d)(7) of this Part.

C. Pre-construction testing and planning for construction projects.

1. Boards of education and boards of cooperative educational services shall assure that proper planning is made for safety of building occupants during construction. For all construction projects for which bids are issued on or after September 30, 1999, such boards shall assure that safety is addressed in the bid specifications and contract documents before contract documents are advertised for bid. All school areas to be disturbed during renovation or demolition shall be tested for lead and asbestos. Appropriate procedures to protect the health of building occupants shall be included in the final construction documents for bidding.

2. Boards of education and boards of cooperative educational services shall establish procedures for involvement of the health and safety committee to monitor safety during school construction projects. The health and safety committees in school districts other than in cities with one million inhabitants or more shall be expanded during construction projects to include the project architect, construction manager, and the contractors. Such committee shall meet periodically to review issues and address complaints related to health and safety resulting from the construction project. In the case of a city school district in a city of one million inhabitants or more, the board of education shall submit procedures for protecting health and safety during construction to the commissioner for approval. Such procedures shall outline methods for compliance with this section.

3. The district emergency management plan shall be updated to reflect any changes necessary to accommodate the construction process, including an updated emergency exit plan indicating temporary exits required due to construction. Provisions shall be made for the emergency evacuation and relocation or release of students and staff in the event of a construction incident.

4. Fire drills shall be held to familiarize students and staff with temporary exits and revised emergency procedures whenever such temporary exits and revised emergency procedures are required.

D. Pre-construction notification of construction projects.
The board of education or board of cooperative educational services shall establish procedures for notification of parents, staff and the community in advance of a construction project of $10,000 or more to be conducted in a school building while the building is occupied. Such procedures shall provide notice at least two months prior to the date on which construction is scheduled to begin, provided that in the case of emergency construction projects, such notice shall be provided as far

in advance of the start of construction as is practicable. Such notice shall include information on the district's obligations under this section to provide a safe school environment during construction projects. Such notice requirement may be met by publication in district newsletters, direct mailings, or holding a public hearing on the project to inform parents, students, school personnel and community members.

E. General safety and security standards for construction projects.
1. All construction materials shall be stored in a safe and secure manner.
2. Fences around construction supplies or debris shall be maintained.
3. Gates shall always be locked unless a worker is in attendance to prevent unauthorized entry.
4. During exterior renovation work, overhead protection shall be provided for any sidewalks or areas immediately beneath the work site or such areas shall be fenced off and provided with warning signs to prevent entry.
5. Workers shall be required to wear photo identification badges at all times for identification and security purposes while working at occupied sites.

F. Separation of construction areas from occupied spaces.
Construction areas which are under the control of a contractor and therefore not occupied by district staff or students shall be separated from occupied areas. Provisions shall be made to prevent the passage of dust and contaminants into occupied parts of the building. Periodic inspection and repairs of the containment barriers must be made to prevent exposure to dust or contaminants. Gypsum board must be used in exit ways or other areas that require fire rated separation. Heavy duty plastic sheeting may be used only for a vapor, fine dust or air infiltration barrier, and shall not be used to separate occupied spaces from construction areas.

1. A specific stairwell and/or elevator should be assigned for construction worker use during work hours. In general, workers may not use corridors, stairs or elevators designated for students or school staff.

2. Large amounts of debris must be removed by using enclosed chutes or a similar sealed system. There shall be no movement of debris through halls of occupied spaces of the building. No material shall be dropped or thrown outside the walls of the building.

3. All occupied parts of the building affected by renovation activity shall be cleaned at the close of each workday. School buildings occupied during a construction project shall maintain required health, safety and educational capabilities at all times that classes are in session.

G. Maintaining exiting and ventilation during school construction projects.
The following information shall be included in all plans and specifications for school building projects:

1. A plan detailing how exiting required by the applicable building code will be maintained during construction. The plan shall indicate temporary construction required to isolate construction equipment, materials, people, dust, fumes, odors, and noise during the construction period. Temporary construction details shall meet code-required fire ratings for separation and corridor enclosure. At a minimum, required exits, temporary stairs, ramps, exit signs, and door hardware shall be provided at all times.

2. A plan detailing how adequate ventilation will be maintained during construction. The plan shall indicate ductwork which must be rerouted, disconnected, or capped in order to prevent contaminants from the construction area from entering the occupied areas of the building. The plan shall also indicate how required ventilation to occupied spaces affected by construction will be maintained during the project.

H. Fire and hazard prevention.

Areas of buildings under construction that are to remain occupied shall maintain a certificate of occupancy. In addition, the following shall be strictly enforced:

1. No smoking is allowed on public school property, including construction areas.
2. During construction daily inspections of district occupied areas shall be conducted by school district personnel to assure that construction materials, equipment or debris not block fire exits or emergency egress windows.
3. Proper operation of fire extinguishers, fire alarm, and smoke/fire detection systems shall be maintained throughout the project.

I. Noise abatement during construction and maintenance activities.

Construction and maintenance operations shall not produce noise in excess of 60 dba in occupied spaces or shall be scheduled for times when the building or affected building spaces are not occupied or acoustical abatement measures shall be taken. Noise level measurements (dba) shall be taken with a type 2 sound level meter in the occupied space in a location closest to the source of the noise. Complaints regarding excessive noise shall be addressed through the health and safety committee. The district should anticipate those times when construction noise is unacceptable and incorporate “no work” periods into the bid specifications.

J. Control of chemical fumes, gases, and other contaminants during construction and maintenance projects.

The bid specifications and construction contracts for each construction project shall indicate how and where welding, gasoline engine, roofing, paving, painting or other fumes will be exhausted. Care must be taken to assure fresh air intakes do not draw in such fumes.

1. The bid specifications shall require schedules of work on construction and maintenance projects which include time for off-gassing of volatile organic compounds introduced during construction before occupancy is allowed. Specific attention is warranted for activities including glues, paint, furniture, carpeting, wall coverings, and drapery. Manufacturers shall be contacted to obtain information regarding appropriate temperatures and times needed to cure or ventilate the product during use and before safe occupancy of a space can be assured. Building materials or furnishings which off-gas chemical fumes, gases, or other contaminants shall be aired out in a well ventilated heated warehouse before it is brought to the project for installation or the manufacturer's recommended off-gassing periods must be scheduled between installation and use of the space. If the work will generate toxic gases that cannot be contained in an isolated area, the work must be done when school classes and programs are not in session. The building must be properly ventilated and the material must be given proper time to cure or off-gas before re-occupancy.

2. Manufacturer's material safety data sheets (MSD) shall be maintained at the site for all products used in the project. MSDS must be provided to anyone who requests them. MSDS indicate chemicals used in the product, product toxicity, typical side effects of exposure to the product and safe procedures for use of the product.

K. Asbestos abatement protocols.

All asbestos abatement projects shall comply with all applicable Federal and State laws including but not limited to the New York State Department of Labor industrial code rule 56 (12 NYCRR 56), and the Federal Asbestos Hazard Emergency Response Act (AHERA), 40 CFR part 763 (Code of Federal Regulations, 1998 Edition, Superintendent of Public Documents, U.S. Government Printing Office, Washington, DC 20402; 1998; available at the Office of Facilities Planning, Education Building Annex, Room 1060, State Education Department, Albany, NY 12234). Large and small asbestos projects as defined by 12 NYCRR 56 shall not be performed while the building is occupied. Minor asbestos projects defined by 12 NYCRR 56 as an asbestos project involving the removal, disturbance, repair, encapsulation, enclosure or handling of 10 square feet or less of asbestos or asbestos material, or 25 linear feet or less of asbestos or asbestos material may be

performed in unoccupied areas of an occupied building in accordance with the above referenced regulations.

L. Lead paint.
Any construction or maintenance operations which will disturb lead based paint will require abatement of those areas pursuant to protocols detailed in the "Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing" (June 1995; U.S. Department of Housing and Urban Development, Washington, D.C. 20410; available at the Office of Facilities Planning, Education Building Annex, Room 1060, State Education Department, Albany, NY 12234). All areas scheduled for construction as well as areas of flaking and peeling paint shall be tested for the presence of lead and abated or encapsulated in accordance with the above noted guidelines.

M. Radon.
Districts shall take responsibility to be aware of the geological potential for high levels of radon and to test and mitigate as appropriate. This information is available from the New York State Department of Health Radon Measurement Database.

N. Post construction inspection.
The school district or board of cooperative educational services shall provide the opportunity for a walk-through inspection by the health and safety committee members to confirm that the area is ready to be reopened for use.

PART 2 – ADDITIONAL SAFETY STANDARDS

A. Certificate of Occupancy Statement: The existing building will be occupied during construction. Throughout the duration of construction, the contractor shall maintain the integrity of the existing structure. The occupied portion of any school building and required exits shall always comply with the minimum requirements necessary to maintain a certificate of occupancy.

B. Asbestos / Lead / Polychlorinated Biphenyls Test Letter: All existing school areas to be disturbed during renovation or demolition (existing facilities building envelope components, interior finishes and concealed utility infrastructure) have been tested for lead, asbestos and Polychlorinated Biphenyls containing materials in accordance with OSHA, EPA, DEC and DOH requirements. Material test results are provided within the Project Manual. If negative for asbestos, Item J below does not apply. If negative for Lead, Item K below does not apply. If negative for Polychlorinated Biphenyls (PCB) item L does not apply.

C. Safety and Security Standards for Construction Projects: Throughout the duration of this construction project, the following general safety and security standards shall be maintained by all Contractors on site:

1. All construction materials shall be delivered during the times as stipulated by the School District. Locations for on-site storage shall be coordinated with the Owner's Representative.

2. Temporary construction fencing shall be erected around construction activity areas in accordance with Specification Section 015000. When indicated in the drawings, construction fencing will be shown on the Construction Implementation Plans. All fencing around construction activity areas shall be maintained to restrict unauthorized access and prevent students from entering site. Fencing around construction supplies or debris shall be maintained.

3. Gates securing construction activity areas shall be secured and locked at all times unless manned by contractor personnel to prevent unauthorized access. Signs stating "Caution –

Construction Activity Area Construction Personnel Only, Unauthorized Access Prohibited" shall be posted at all entry points and 75' intervals along security fence.

D. Provisions shall be made to prevent the passage of dust and contaminants into occupied parts of the building in accordance with Specification Section 015000.

1. Contractors shall remove large amounts of construction debris and rubbish from the building using enclosed chutes or other similar sealed system to contain dust and other particulate. No material shall be dropped or thrown outside the walls of the building. Removal of construction debris and rubbish shall be through construction areas only, there shall be no movement of debris through halls of occupied spaces of the building.

2. Dust and debris generated by construction activities in occupied parts of the building shall be cleaned by the Contractor at the close of each workday in accordance with the General Requirements of Division 01, Specification Sections 013200 and 015000. The Contractor is responsible to maintain all health, safety, public address systems and educational capabilities of occupied areas within the school building at all times that classes are in session.

E. Exiting Plan: A plan showing how exits required by NYS Building Code will be maintained. This is typically shown within CIP and/or Code Compliance Plans.

F. Ventilation During Construction: A plan showing how required ventilation will be maintained during construction. This is typically shown within CIP and/or Code Compliance Plans.

G. Construction Noise: Construction and maintenance operations shall not produce noise in excess of 60 DBA in occupied spaces, or shall be scheduled for times when the building or affected building spaces are not occupied or acoustical treatments shall be placed so as to abate the excessive noise levels. Acoustic treatments shall be prescribed by the Architect and supplied and installed by the Contractor.

H. Construction Fume Control: The Contractor shall be responsible for the control of chemical fumes, gasses and other contaminates produced by welding, gasoline or diesel engines, roofing, paving, painting, etc., to ensure they do not enter occupied portions of the building or air intakes.

I. Off-Gassing Control: The Contractor shall be responsible for ensure that activities and materials which result in "off-gassing" of volatile organic compounds such as glues, paints, furniture, carpeting, wall covering, drapery, etc. are scheduled, cured, or ventilated in accordance with manufacturer's recommendations before a space can be occupied.

J. Asbestos Code Rule 56 Compliance: Where so indicated by positive test results, portions of the project may entail the removal of asbestos containing material as defined by 12NYCRR56. Large and small asbestos abatement projects (as defined by 8 NYCRR 155.5(k)) shall not be performed while the building is occupied. (Definition of "building", as referenced in this section, means a wing or major section of a building that can be completely isolated from the rest of the building with sealed non-combustible construction.) The isolated portions (the occupied portion and the portion under construction) of the building must contain separate code compliant exits. The ventilation systems must be physically separated and sealed at the isolation barrier(s).

Removal of asbestos containing material shall only be performed when the building, as defined above, is unoccupied. The Contractor shall verify that the building has been vacated prior to commencing asbestos abatement work. If the building is configured such that the affected area can be completely isolated from the unaffected areas with sealed non-combustible construction barriers, then the unaffected areas can remain occupied provided required exits are maintained independently in both areas.

Removal of asbestos containing materials on the exterior of the building such as flashing, roofing, siding or soffit and caulking may be performed on occupied buildings provided all variances have been granted and the occupants have been notified of the intention to remove asbestos containing material. Complete isolation of ventilation systems supplying the occupied spaces and windows must be maintained throughout the removal duration.

Asbestos TEM: Where so indicated by positive test results, the asbestos abatement area shall be completely sealed off from the rest of the building and completely cleaned and tested by TEM prior to re-entry by the public.

K. Lead Abatement Projects: At interior painted surfaces which have tested Positive for Lead: Portions of walls that will be disturbed as a requirement of this contract shall be removed in accordance with the Lead Safety Plan included within the Project Manual. This section clearly references OSHA regulations to be followed, and clean-up and testing associated with lead abatement must be done in strict conformance with HUD protocol. Locations where construction activity requires the removal of lead containing materials shall be completely isolated from occupied portions of the building using a construction barrier. The Contractor shall have all surrounding areas tested for lead levels prior to commencing work and after work has been completed to ensure that surrounding areas have not been contaminated by removals.

L. PCB Projects: Any window caulking tested and found to contain PCBs must be removed in accordance with U.S. EPA regulations under the Toxic Substances Control Act (40 CFR 761.62). Soil areas adjacent to windows containing PCBs must follow the 40 CFR 761.62 criteria. A site-specific abatement plan must be developed to address potential environmental and public health concerns. Steps for abating contamination and preventing contamination of nearby areas must be done in accordance with HUD Technical Guidelines for the Evaluating and Control of Lead Based Paint Hazards in Housing.

Removal of PCB containing materials on the exterior of the building such as caulking may be performed on occupied buildings provided all variances have been granted and the occupants have been notified of the intention to remove PCB containing material. Complete isolation of ventilation systems supplying the occupied spaces and windows must be maintained throughout the removal duration.

M. Fire Prevention: Any holes in floors or walls shall be sealed with a fire-resistant material whose rating meets or exceeds that of the construction to which it is attached.

END OF SECTION

DIVISION 01 – GENERAL REQUIREMENTS

SECTION 014213 – ABBREVIATIONS AND SYMBOLS

PART 1 - GENERAL

1.01 DESCRIPTION

A. This Section lists and defines various common abbreviations which are used throughout the Contract Documents.

B. Abbreviations of organizations and federal agencies which publish standards, codes, and regulations are defined in Section 014219 – Applicable Standards.

C. Other abbreviations and symbols may be found in legends and elsewhere on the Drawings. Piping material abbreviations are contained in the piping sections.

D. Should an abbreviation or symbol not be specifically defined, it shall carry the standard definition commonly used in the industry.

E. Whenever any doubt arises as to what an abbreviation or symbol means, notify Engineer and he will issue a definition in writing.

1.02 ABBREVIATIONS

A. The following is a list of commonly used abbreviations which may be found in the Contract Documents, and the meanings ascribed to them:

A.C. or ac	Alternating Current
a or A	Amperes
AFF	Above Finished Floor
amp or Amp	Amperes
Alum.	Aluminum
Asph.	Asphalt
AWG.	American Wire Gauge
Aux.	Auxiliary
Bit. Conc.	Bituminous Concrete
CB	Circuit Breaker
Cl.	Class
cm	Centimeter
C.O.	Clean out
Conc.	Concrete
Cont.	Continuous
Cu.	Cubic
cc	Cubic Centimeters
C.F.	Cubic Feet
CFM or cfm	Cubic Feet Per Minute
CFS or cfs	Cubic Feet Per Second
C.Y.	Cubic Yards
CT	Current Transformer
D.C. or dc	Direct Current
DFT.	Dry Film Thickness
Dia.	Diameter
DWG. or Dwg.	Drawing
Dr.	Drive

Ea. or ea.	Each
EF	Each Face
EW	Each Way
Eff. or eff.	Efficiency
El. or Elev.	Elevation
Fin. Gr.	Finished Grade
fps	Feet Per Second
Ft. or ft.	Feet
ftg.	Footing
g.	Grams
Ga. or ga.	Gauge
Gal. or gal.	Gallon
Galv.	Galvanized
GPD or gpd	Gallons Per Day
GPM or gpm	Gallons Per Minute
H-O-A	Hand-off-automatic
Hz. or hz	Hertz
I.D.	Inside Diameter
Inv.	Invert
KVA or kva	Kilovolts-amperes
Kw or kw	Kilowatts
kwh or KWH	Kilowatt-hours
Lbs. or lbs.	Pounds
L.F.	Linear Feet
LPA	Lighting Panel "A"
L.S.	Lump Sum
m.	Meters
mA	Milliamperes
Max. or max.	Maximum
MCC	Motor Control Center
mg.	Milligrams
MGD or mgd	Million Gallons Per Day
mi.	Miles
Min. or min	Minimum
mm	Millimeters
No. or no.	Number
nom.	Nominal
N.T.S.	Not To Scale
O.D.	Outside Diameter
O & M	Operations and maintenance
Oz. or oz.	Ounce
pb	Pushbutton
PPD	Pounds Per Day
P/B	Pullbox
pri.	Primary
psf	Pounds Per Square Foot
psi	Pounds Per Square Inch,
psig	Pounds Per Square Inch, Gauge Pressure
PT	Potential Transformer
Pvt. or Pvmt.	Pavement
R.	Radius
R.O.W.	Right-of-Way
Sch.	Schedule
sec.	Secondary or Seconds
S.F.	Square Feet
S/S/P/	Stop-start-pilot Station

Std. or std.	Standard
S.Y.	Square Yards
T&B	Top and Bottom
Typ.	Typical
U.O.N.	Unless Otherwise Noted
U.V.	Ultraviolet
V or v	Volts
Vac or VAC	Alternating current Voltage
Vdc or VDC	Direct Current Voltage
V.F.	Vertical Feet
Vol.	Volume
W or w	Watts
Yd. or yd.	Yards

1.03 SYMBOLS

A. The following is a list of commonly used symbols which may be found in the Contract Documents, and the meanings ascribed to them:

P	Phase, Diameter, or Round (as applicable)
D	Degrees (F. = Fahrenheit C. = Centigrade)
'	Feet or Minutes
"	Inches or Seconds
#	Number or Pound
/	Per or Divided by

PART 2 - EXECUTION

(NOT UTILIZED)

PART 3 - EXECUTION

(NOT UTILIZED)

END OF SECTION

DIVISION 01 – GENERAL REQUIREMENTS

SECTION 014219 – APPLICABLE STANDARDS

PART 1 - GENERAL

1.01 GENERAL

A. Work included:

1. Throughout the Contract Documents, reference is made to codes and standards which establish qualities and type of workmanship and materials, and which establish methods for testing and reporting on the pertinent characteristics.

2. Where materials or workmanship are required by these Contract Documents to meet or exceed the specifically named code or standard, it is the Contractor's responsibility to provide materials and workmanship, which meet or exceed the specifically named code or standard.

3. It is also the Contractor's responsibility, when so required by the Contract Documents or by written request from the Architect, to deliver to the Architect all required proof that the materials or workmanship, or both, meet or exceed the requirements of the specifically named code or standard. Such proof shall be in the form requested in writing by the Architect, and generally will be required to be copies of a certified report of tests conducted by a testing agency approved for that purpose by the Architect.

B. Related Documents:

1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 INDUSTRY STANDARDS

A. Applicability of Standards: Unless 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 standards in effect as of date of the Contract Documents unless otherwise indicated.

C. Copies of Standards: Each entity engaged in construction on Project should 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, obtain copies directly from publication source.

D. Rejection of non-complying items: The Architect reserves the right to reject items incorporated into the Work, which fail to meet the specified minimum requirements. The Architect further reserves the right, and without prejudice to other recourse the Architect may take, to accept non-complying items subject to and adjustment in the Contract Amount as approved by the Architect and the Owner.

1.03 ABBREVIATIONS AND ACRONYMS

A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Gale's "Encyclopedia of Associations: National Organizations of the U.S." or in Columbia Books' "National Trade & Professional Associations of the United States. “

B. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

C. Applicable standards listed in these Specifications include, but not necessarily limited to, standards promulgated by the following agencies and organizations:

1. AABC - Associated Air Balance Council; www.aabc.com.
2. AAMA - American Architectural Manufacturers Association; www.aamanet.org.
3. AASHTO - American Association of State Highway and Transportation Officials; www.transportation.org.
4. AATCC - American Association of Textile Chemists and Colorists; www.aatcc.org.
5. ABMA - American Bearing Manufacturers Association; www.americanbearings.org.
6. ABMA - American Boiler Manufacturers Association; www.abma.com.
7. ACI - American Concrete Institute; (Formerly: ACI International); www.concrete.org.
8. ACPA - American Concrete Pipe Association; www.concrete-pipe.org.
9. AEIC - Association of Edison Illuminating Companies, Inc. (The); www.aeic.org.
10. AF&PA - American Forest & Paper Association; www.afandpa.org.
11. AGA - American Gas Association; www.aga.org.
12. AHAM - Association of Home Appliance Manufacturers; www.aham.org.
13. AHRI - Air-Conditioning, Heating, and Refrigeration Institute (The); www.ahrinet.org.
14. AI - Asphalt Institute; www.asphaltinstitute.org.
15. AIA - American Institute of Architects (The); www.aia.org.
16. AISC - American Institute of Steel Construction; www.aisc.org.
17. AISI - American Iron and Steel Institute; www.steel.org.
18. AITC - American Institute of Timber Construction; www.aitc-glulam.org.
19. AMCA - Air Movement and Control Association International, Inc.; www.amca.org.
20. ANSI - American National Standards Institute; www.ansi.org.
21. AOSA - Association of Official Seed Analysts, Inc.; www.aosaseed.com.
22. APA - APA - The Engineered Wood Association; www.apawood.org.
23. APA - Architectural Precast Association; www.archprecast.org.
24. API - American Petroleum Institute; www.api.org.
25. ARI - Air-Conditioning & Refrigeration Institute; (See AHRI).
26. ARI - American Refrigeration Institute; (See AHRI).
27. ARMA - Asphalt Roofing Manufacturers Association; www.asphaltroofing.org.
28. ASCE - American Society of Civil Engineers; www.asce.org.
29. ASCE/SEI - American Society of Civil Engineers/Structural Engineering Institute; (See ASCE).
30. ASHRAE - American Society of Heating, Refrigerating and Air-Conditioning Engineers; www.ashrae.org.
31. ASME – ASME International; (American Society of Mechanical Engineers); www.asme.org.
32. ASSE - American Society of Safety Engineers (The); www.asse.org.
33. ASSE - American Society of Sanitary Engineering; www.asse-plumbing.org.
34. ASTM - ASTM International; www.astm.org.
35. ATIS - Alliance for Telecommunications Industry Solutions; www.atis.org.
36. AWEA - American Wind Energy Association; www.awea.org.
37. AWI - Architectural Woodwork Institute; www.awinet.org.
38. AWMAC – Architectural Woodwork Manufacturers Association of Canada; www.awmac.com.
39. AWPA - American Wood Protection Association; www.awpa.com.

40. AWS - American Welding Society; www.aws.org.
41. AWWA - American Water Works Association; www.awwa.org.
42. BHMA - Builders Hardware Manufacturers Association; www.buildershardware.com.
43. BIA - Brick Industry Association (The); www.gobrick.com.
44. BICSI - BICSI, Inc.; www.bicsi.org.
45. BIFMA - BIFMA International; (Business and Institutional Furniture Manufacturer's Association); www.bifma.org.
46. BISSC - Baking Industry Sanitation Standards Committee; www.bissc.org.
47. BWF - Badminton World Federation; (Formerly: International Badminton Federation); www.bissc.org.
48. CDA - Copper Development Association; www.copper.org.
49. CE - Conformite Europeenne; http://ec.europa.eu/growth/single-market/ce-marking/.
50. CEA - Canadian Electricity Association; www.electricity.ca.
51. CEA - Consumer Electronics Association; www.ce.org.
52. CFFA - Chemical Fabrics and Film Association, Inc.; www.chemicalfabricsandfilm.com.
53. CFSEI - Cold-Formed Steel Engineers Institute; www.cfsei.org.
54. CGA - Compressed Gas Association; www.cganet.com.
55. CIMA - Cellulose Insulation Manufacturers Association; www.cellulose.org.
56. CISCA - Ceilings & Interior Systems Construction Association; www.cisca.org.
57. CISPI - Cast Iron Soil Pipe Institute; www.cispi.org.
58. CLFMI - Chain Link Fence Manufacturers Institute; www.chainlinkinfo.org.
59. CPA - Composite Panel Association; www.pbmdf.com.
60. CRI - Carpet and Rug Institute (The); www.carpet-rug.org.
61. CRRC - Cool Roof Rating Council; www.coolroofs.org.
62. CRSI - Concrete Reinforcing Steel Institute; www.crsi.org.
63. CSA - CSA Group; www.csagroup.com.
64. CSA - CSA International; www.csa-international.org.
65. CSI - Construction Specifications Institute (The); www.csinet.org.
66. CSSB - Cedar Shake & Shingle Bureau; www.cedarbureau.org.
67. CTI - Cooling Technology Institute; (Formerly: Cooling Tower Institute); www.cti.org.
68. CWC - Composite Wood Council; (See CPA).
69. DASMA - Door and Access Systems Manufacturers Association; www.dasma.com.
70. DHI - Door and Hardware Institute; www.dhi.org.
71. ECA - Electronic Components Association; (See ECIA).
72. ECAMA - Electronic Components Assemblies & Materials Association; (See ECIA).
73. EIA - Electronic Industries Alliance; (See TIA).
74. EIMA - EIFS Industry Members Association; www.eima.com.
75. EJMA - Expansion Joint Manufacturers Association, Inc.; www.ejma.org.
76. ESD - ESD Association; (Electrostatic Discharge Association); www.esda.org.
77. ESTA - Entertainment Services and Technology Association; (See PLASA).
78. EVO - Efficiency Valuation Organization; www.evo-world.org.
79. FIBA - Federation Internationale de Basketball; (The International Basketball Federation); www.fiba.com.
80. FIVB - Federation Internationale de Volleyball; (The International Volleyball Federation); www.fivb.org.
81. FM Approvals - FM Approvals LLC; www.fmglobal.com.
82. FM Global - FM Global; (Formerly: FMG - FM Global); www.fmglobal.com.
83. FRSA - Florida Roofing, Sheet Metal & Air Conditioning Contractors Association, Inc.; www.floridaroof.com.
84. FSA - Fluid Sealing Association; www.fluidsealing.com.
85. FSC - Forest Stewardship Council U.S.; www.fscus.org.
86. GA - Gypsum Association; www.gypsum.org.
87. GANA - Glass Association of North America; www.glasswebsite.com.
88. GS - Green Seal; www.greenseal.org.
89. HI - Hydraulic Institute; www.pumps.org.
90. HI/GAMA - Hydronics Institute/Gas Appliance Manufacturers Association; (See AHRI).

91. HMMA - Hollow Metal Manufacturers Association; (See NAAMM).
92. HPVA - Hardwood Plywood & Veneer Association; www.hpva.org.
93. HPW - H. P. White Laboratory, Inc.; www.hpwhite.com.
94. IAPSC - International Association of Professional Security Consultants; www.iapsc.org.
95. IAS - International Accreditation Service; www.iasonline.org.
96. ICBO - International Conference of Building Officials; (See ICC).
97. ICC - International Code Council; www.iccsafe.org.
98. ICEA - Insulated Cable Engineers Association, Inc.; www.icea.net.
99. ICPA - International Cast Polymer Alliance; www.icpa-hq.org.
100. ICRI - International Concrete Repair Institute, Inc.; www.icri.org.
101. IEC - International Electrotechnical Commission; www.iec.ch.
102. IEEE - Institute of Electrical and Electronics Engineers, Inc. (The); www.ieee.org.
103. IES - Illuminating Engineering Society; (Formerly: Illuminating Engineering Society of North America); www.ies.org.
104. IESNA - Illuminating Engineering Society of North America; (See IES).
105. IEST - Institute of Environmental Sciences and Technology; www.iest.org.
106. IGMA - Insulating Glass Manufacturers Alliance; www.igmaonline.org.
107. IGSHPA - International Ground Source Heat Pump Association; www.igshpa.okstate.edu.
108. ILI - Indiana Limestone Institute of America, Inc.; www.iliai.com.
109. Intertek - Intertek Group; (Formerly: ETL SEMCO; Intertek Testing Service NA); www.intertek.com.
110. ISA - International Society of Automation (The); (Formerly: Instrumentation, Systems, and Automation Society); www.isa.org.
111. ISAS - Instrumentation, Systems, and Automation Society (The); (See ISA).
112. ISFA - International Surface Fabricators Association; (Formerly: International Solid Surface Fabricators Association); www.isfanow.org.
113. ISO - International Organization for Standardization; www.iso.org.
114. ISSFA - International Solid Surface Fabricators Association; (See ISFA).
115. ITU - International Telecommunication Union; www.itu.int/home.
116. KCMA - Kitchen Cabinet Manufacturers Association; www.kcma.org.
117. LMA - Laminating Materials Association; (See CPA).
118. LPI - Lightning Protection Institute; www.lightning.org.
119. MBMA - Metal Building Manufacturers Association; www.mbma.com.
120. MCA - Metal Construction Association; www.metalconstruction.org.
121. MFMA - Maple Flooring Manufacturers Association, Inc.; www.maplefloor.org.
122. MFMA - Metal Framing Manufacturers Association, Inc.; www.metalframingmfg.org.
123. MHIA - Material Handling Industry of America; www.mhia.org.
124. MIA - Marble Institute of America; www.marble-institute.com.
125. MMPA - Moulding & Millwork Producers Association; www.wmmpa.com.
126. MPI - Master Painters Institute; www.paintinfo.com.
127. MSS - Manufacturers Standardization Society of The Valve and Fittings Industry Inc.; www.mss-hq.org.
128. NAAMM - National Association of Architectural Metal Manufacturers; www.naamm.org.
129. NACE - NACE International; (National Association of Corrosion Engineers International); www.nace.org.
130. NADCA - National Air Duct Cleaners Association; www.nadca.com.
131. NAIMA - North American Insulation Manufacturers Association; www.naima.org.
132. NBGQA - National Building Granite Quarries Association, Inc.; www.nbgqa.com.
133. NCAA - National Collegiate Athletic Association (The); www.ncaa.org.
134. NCMA - National Concrete Masonry Association; www.ncma.org.
135. NEBB - National Environmental Balancing Bureau; www.nebb.org.
136. NEC - National Electrical Code (See NFPA).
137. NECA - National Electrical Contractors Association; www.necanet.org.
138. NeLMA - Northeastern Lumber Manufacturers Association; www.nelma.org.
139. NEMA - National Electrical Manufacturers Association; www.nema.org.
140. NFHS - National Federation of State High School Associations; www.nfhs.org.

141. NFPA - National Fire Protection Association; www.nfpa.org.
142. NFPA - NFPA International; (See NFPA).
143. NFRC - National Fenestration Rating Council; www.nfrc.org.
144. NHLA - National Hardwood Lumber Association; www.nhla.com.
145. NLGA - National Lumber Grades Authority; www.nlga.org.
146. NOFMA - National Oak Flooring Manufacturers Association; (See NWFA).
147. NOMMA - National Ornamental & Miscellaneous Metals Association; www.nomma.org.
148. NRCA - National Roofing Contractors Association; www.nrca.net.
149. NRMCA - National Ready Mixed Concrete Association; www.nrmca.org.
150. NSF - NSF International; www.nsf.org.
151. NSPE - National Society of Professional Engineers; www.nspe.org.
152. NSSGA - National Stone, Sand & Gravel Association; www.nssga.org.
153. NTMA - National Terrazzo & Mosaic Association, Inc. (The); www.ntma.com.
154. NWFA - National Wood Flooring Association; www.nwfa.org.
155. PCI - Precast/Prestressed Concrete Institute; www.pci.org.
156. PDI - Plumbing & Drainage Institute; www.pdionline.org.
157. PLASA - PLASA; (Formerly: ESTA - Entertainment Services and Technology Association); www.plasa.org.
158. RCSC - Research Council on Structural Connections; www.boltcouncil.org.
159. RFCI - Resilient Floor Covering Institute; www.rfci.com.
160. RIS - Redwood Inspection Service; www.redwoodinspection.com.
161. SAE - SAE International; www.sae.org.
162. SCTE - Society of Cable Telecommunications Engineers; www.scte.org.
163. SDI - Steel Deck Institute; www.sdi.org.
164. SDI - Steel Door Institute; www.steeldoor.org.
165. SEFA - Scientific Equipment and Furniture Association (The); www.sefalabs.com.
166. SEI/ASCE - Structural Engineering Institute/American Society of Civil Engineers; (See ASCE).
167. SIA - Security Industry Association; www.siaonline.org.
168. SJI - Steel Joist Institute; www.steeljoist.org.
169. SMA - Screen Manufacturers Association; www.smainfo.org.
170. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association; www.smacna.org.
171. SMPTE - Society of Motion Picture and Television Engineers; www.smpte.org.
172. SPFA - Spray Polyurethane Foam Alliance; www.sprayfoam.org.
173. SPIB - Southern Pine Inspection Bureau; www.spib.org.
174. SPRI - Single Ply Roofing Industry; www.spri.org.
175. SRCC - Solar Rating & Certification Corporation; www.solar-rating.org.
176. SSINA - Specialty Steel Industry of North America; www.ssina.com.
177. SSPC - SSPC: The Society for Protective Coatings; www.sspc.org.
178. STI - Steel Tank Institute; www.steeltank.com.
179. SWI - Steel Window Institute; www.steelwindows.com.
180. SWPA - Submersible Wastewater Pump Association; www.swpa.org.
181. TCA - Tilt-Up Concrete Association; www.tilt-up.org.
182. TCNA - Tile Council of North America, Inc.; www.tileusa.com.
183. TEMA - Tubular Exchanger Manufacturers Association, Inc.; www.tema.org.
184. TIA – Telecommunications Industry Association (The); (Formerly: TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance); www.tiaonline.org.
185. TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance; (See TIA).
186. TMS - The Masonry Society; www.masonrysociety.org.
187. TPI - Truss Plate Institute; www.tpinst.org.
188. TPI - Turfgrass Producers International; www.turfgrasssod.org.
189. TRI - Tile Roofing Institute; www.tileroofing.org.
190. UL - Underwriters Laboratories Inc.; www.ul.com.
191. UNI - Uni-Bell PVC Pipe Association; www.uni-bell.org.
192. USAV - USA Volleyball; www.usavolleyball.org.
193. USGBC - U.S. Green Building Council; www.usgbc.org.

194. USITT - United States Institute for Theatre Technology, Inc.; www.usitt.org.
195. WA - Wallcoverings Association; www.wallcoverings.org.
196. WASTEC - Waste Equipment Technology Association; www.wastec.org.
197. WCLIB - West Coast Lumber Inspection Bureau; www.wclib.org.
198. WCMA - Window Covering Manufacturers Association; www.wcmanet.org.
199. WDMA - Window & Door Manufacturers Association; www.wdma.com.
200. WI - Woodwork Institute; www.wicnet.org.
201. WSRCA - Western States Roofing Contractors Association; www.wsrca.com.
202. WWPA - Western Wood Products Association; www.wwpa.org.

D. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is believed to be accurate as of the date of the Contract Documents.

1. DIN - Deutsches Institut fur Normung e.V.; www.din.de.
2. IAPMO – International Association of Plumbing and Mechanical Officials; www.iapmo.org.
3. ICC - International Code Council; www.iccsafe.org.
4. ICC-ES - ICC Evaluation Service, LLC; www.icc-es.org.

E. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Information is subject to change and is up to date as of the date of the Contract Documents.

1. COE - Army Corps of Engineers; www.usace.army.mil.
2. CPSC - Consumer Product Safety Commission; www.cpsc.gov.
3. DHHS - Department of Health and Human Services; www.hhs.gov.
4. DOC - Department of Commerce; National Institute of Standards and Technology; www.nist.gov.
5. DOD - Department of Defense; www.quicksearch.dla.mil.
6. DOE - Department of Energy; www.energy.gov.
7. EPA - Environmental Protection Agency; www.epa.gov.
   Part 61, Sub-Part M
   National Air Emissions Standards for Hazardous
   Air Pollutants (NESHAP)
   40 CFR Paret 763, Subpart E
   Asbestos Hazard Emergency Response Act (AHERA)
8. FAA - Federal Aviation Administration; www.faa.gov.
9. FG - Federal Government Publications; www.gpo.gov/fdsys.
10. GSA - General Services Administration; www.gsa.gov.
11. HUD - Department of Housing and Urban Development; www.hud.gov.
12. LBL - Lawrence Berkeley National Laboratory; Environmental Energy Technologies Division; www.eetd.lbl.gov.
13. NIOSH – National Institute for Occupational Safety & Health; www.cdc.gov/niosh/index.htm.
14. OSHA - Occupational Safety & Health Administration; www.osha.gov.
15. SD - Department of State; www.state.gov.
16. TRB - Transportation Research Board; National Cooperative Highway Research Program; The National Academies; www.trb.org.
17. USDA - Department of Agriculture; Agriculture Research Service; U.S. Salinity Laboratory; www.ars.usda.gov.
18. USDA - Department of Agriculture; Rural Utilities Service; www.usda.gov.
19. USDOJ - Department of Justice; Office of Justice Programs; National Institute of Justice; www.ojp.usdoj.gov.
20. USP - U.S. Pharmacopeial Convention; www.usp.org.
21. USPS - United States Postal Service; www.usps.com.

F. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.

1. CFR - Code of Federal Regulations; Available from Government Printing Office; www.gpo.gov/fdsys.
2. DOD - Department of Defense; Military Specifications and Standards; Available from DLA Document Services; www.quicksearch.dla.mil.
3. DSCC - Defense Supply Center Columbus; (See FS).
4. FED-STD - Federal Standard; (See FS).
5. FS - Federal Specification; Available from DLA Document Services; www.quicksearch.dla.mil.
   a. Available from Defense Standardization Program; www.dsp.dla.mil.
   b. Available from General Services Administration; www.gsa.gov.
   c. Available from National Institute of Building Sciences/Whole Building Design Guide; www.wbdg.org.
6. MILSPEC - Military Specification and Standards; (See DOD).
7. USAB - United States Access Board; www.access-board.gov.
8. USATBCB - U.S. Architectural & Transportation Barriers Compliance Board; (See USAB).

G. State Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.

1. CBHF - State of California; Department of Consumer Affairs; Bureau of Electronic and Appliance Repair, Home Furnishings and Thermal Insulation; www.bearhfti.ca.gov.
2. CCR - California Code of Regulations; Office of Administrative Law; California Title 24 Energy Code; www.calregs.com.
3. CDHS - California Department of Health Services; (See CDPH).
4. CDPH - California Department of Public Health; Indoor Air Quality Program; www.cal- iaq.org.
5. CPUC - California Public Utilities Commission; www.cpuc.ca.gov.
6. SED/SLD - State Education Department and State Labor Department; www.nysed.gov & dol.ny.gov.
7. SCAQMD - South Coast Air Quality Management District; www.aqmd.gov.
8. TFS - Texas A&M Forest Service; Sustainable Forestry and Economic Development; www.txforestservice.tamu.edu.

PART 2 – PRODUCTS

(Not Used)

PART 3 – EXECUTION

(Not Used)

END OF SECTION

DIVISION 01 – GENERAL REQUIREMENTS

SECTION 014523 – TESTS, INSPECTIONS & SPECIAL INSPECTIONS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to Work of this Section.

1.02 SCOPE / SUMMARY

A. Scope: This project will require both general inspections and special inspections coordinated with all required testing and certifications throughout the Project Manual and/or the Building Code of the State of New York, as listed below. The Project Manual shall be carefully reviewed by the Prime Contractors for actual and detailed descriptions concerning responsibilities with regard to testing parameters. All testing which is assigned to a Prime Contractor shall be borne as a part of their submitted Base Bid for this project, and shall not be subject to additional costs to the Owner. There are specific general inspections, as well as coordination of inspections, which are to be included in each Prime Contractor's Base Bid submitted; refer to each specification section for complete information. ***Note: The cost of all General and Special Inspections performed by the independent testing laboratory/laboratories retained by the Owner shall be directly borne by the Owner, implemented by and coordinated through the Owner's Representative and/or the Construction Manager.***

B. Summary:

1. This Section includes responsibilities relating to quality control services and extent of quality control services to be performed.

2. Related Work Specified Elsewhere

    a. Section 014529 – Testing Laboratory Service.

3. Definitions: Quality control services include inspections and tests, special inspections and actions related thereto including reports, but do not include contract enforcement activities performed directly by Architect/Engineer. Quality control services include those inspections and tests, special inspections and related actions performed by independent agencies and governing agencies as well as directly by Contractor.

    a. Testing service is required to immediately notify the Architect and the Construction Manager of discrepancies observed in the Work performed and to be performed to the Contract Documents.

4. Inspections, tests, special inspections and related actions specified in this Section and elsewhere in Contract Documents are not intended to limit a Contractor's quality control procedures which facilitate compliance with requirements of Contract Documents.

5. Requirements for quality control services by Contractor, as requested or to be requested by Architect/Engineer, Owner, governing authorities, or other authorized entities are not limited by provisions of this Section.

6. Contractors shall review and become familiar with the requirements of Article 13.5, Tests and Inspections, of the General and Supplementary Conditions covering the provisions for testing of the Work.

1.03 RESPONSIBILITIES

A. Contractor shall coordinate with independent testing agency performing inspections, tests, and quality control services.

1. Construction Manager will schedule services of independent testing agency to perform services so specified. When no Construction Manager is hired by the Owner, it will be the Contractor's contractual responsibility to schedule the services of independent testing.

2. The Owner will pay for services of the independent testing laboratory, awarded through the Owner's Representative. Source of services as well as payment and rates of payments will be as directed by the Owner's Representative. Testing specified herein shall be performed at a minimum. Construction Manager or Architect may request additional testing; payment for additional testing is subject to the provisions of the General Conditions.

B. Retest Responsibility: Where results of required inspection, test, or similar service are unsatisfactory (do not indicate compliance of related work with requirements of Contract Documents), retests are responsibility of Contractor. Retesting of work revised or replaced by Contractor is Contractor's responsibility, where required tests were performed on original work. Retesting shall be performed by testing laboratory as directed by the Owner's Representative.

C. Responsibility for Associated Services: Contractor is required to cooperate with independent agencies performing required inspections, tests, and similar services. Provide auxiliary services as reasonably requested, including access to work, the taking of samples or assistance with the taking of samples, delivery of samples to test laboratories, and security and protection for samples and test equipment at project site.

D. Coordination: Contractor and each engaged independent agency performing inspections, tests, and similar services for project are required to coordinate and sequence activities so as to accommodate required services with minimum delay of work and without the need for removal/replacement of work to accommodate inspections and tests. It is the contractual responsibility of the Contractor to continually notify the Owner's Representative of all scheduling of times for inspections, tests, taking of samples, and similar activities.

1.04 SAMPLING AND TESTING (GENERAL)

A. Sampling and testing are required for the following Sections of Work and, unless otherwise indicated, shall be performed by an independent testing lab and paid for by the Owner through the Owner's Representative. ***Note: Certain sections indicated under this item also have specific BCNYS Special Testing & Inspection requirements, which shall be conducted in conformance with BCNYS Chapter 17 guidelines; all special testing & inspection costs shall be borne by the Owner. Refer to item 1.22 for the listing of special inspections required. Where an item may be duplicated under both general and special inspections, only one set of testing is required; special inspection requirements shall prevail.***

1. Section 033000 – Cast-in-Place Concrete: Inspection of reinforcing steel placement; field quality control of concrete; tests for concrete materials and mix design tests (slump, air content, temperature, compression test, compressive strength tests (cylinders) taken at 7 & 28 days. Testing of FF/FL floor tolerances.

2. Section 033000 – Cast-in-Place Concrete: Curbs: Random batch testing shall be made. Refer to 03311, 2.01.C.2 for additional information. ***Note: this item also has specific BCNYS***

Special Testing & Inspection requirements, which shall be conducted in conformance with BCNYS Chapter 17 guidelines; all special testing & inspection costs shall be borne by the Owner.

3. Section 035416 – Self Leveling Cementitious Underlayment: Field quality control slump testing and cubes tested in accordance with ASTM C109. Refer to 035416 for additional information.

4. Section 042000 – Unit Masonry: Field quality control of unit masonry and masonry assemblies.

5. Section 051200 – Structural Steel Framing: Field quality control for welds; field quality control for high strength steel torqued bolted connections; field quality control for structural steel alignment.

6. Section 051200 – Structural Steel Framing: Source quality control (per 051200) materials and fabrication procedures; Per 015200 – Inspection of high-strength bolted connections, shop and field welding.

7. Section 052100 – Steel Joist Framing: Source quality control SJI (Steel Joist Institute) certifications through steel fabricator. Inspection of high-strength bolted connections, shop and field welding.

8. Section 053000 – Metal Decking: GC to supply certified shop drawings per Section 053000.

9. Section 054000 – Cold Formed Metal Framing: for field quality control.

10. Section 078100 – Spray-Applied Fire Resistive Materials: Conduct testing per 078100 requirements.

11. Section 078413 – Penetration Firestopping: Conduct testing per 078413 requirements.

12. Section 078443 – Joint Firestopping: Conduct testing per 078443 requirements.

13. Section 085113 – Aluminum Windows: Field quality control testing per 085113.

14. Section 099000 – Paints: Field quality control for painting.

15. Section 221000 – Plumbing Domestic Water Piping System: Plumbing Contractor to conduct testing per 221000.

16. Section 221316 – Plumbing Sanitary Piping System: Plumbing Contractor to conduct testing per 221316.

17. Section 221400 – Plumbing Storm Water Piping System: Plumbing Contractor to conduct testing per 221400.

18. Section 230593 – Inspection, Testing & Balancing: HVAC Contractor to conduct testing per 230593.

19. Section 260500 – General Provisions – Electrical Contractor to conduct testing per 260500 requirements.

20. Section 262416 – Panelboards: Electrical Contractor to conduct testing per 262416 requirements.

21. Section 284613 – Fire Alarm System: Electrical Contractor to conduct testing per 284613 requirements.

22. Section 310000 – Earthwork – Daily testing of in-situ soil, submitted to the Owner's Representative.

23. Section 310000 – Earthwork: Soil testing and inspection service during earthwork operations for subgrades and fill.

24. Section 310000 – Earthwork – Excavating, Backfilling & Compacting for Utilities: Testing at intervals not exceeding 200'-0" of trench for first and every other 8" lift of compacted trench backfill.

25. Section 310000 – Earthwork – Excavating, Backfilling & Compacting: Testing at intervals not exceeding 200'-0" of trench for first and every other 8" lift of compacted trench backfill. Refer to 02224, 3.09A for additional information.

26. Section 321216 – Asphalt Paving: Field density testing, moisture & density relationship, mechanical analysis, plasticity index, base material, thickness and compaction, source testing. Refer to 02230, 3.02A-D for additional information.

27. Section 321216 – Asphalt Paving: Testing paid for by General Contractor – Per 02602, 3.04B, testing of finished surface of the base course shall be accomplished by the GC; utilizing a 16 foot straight edge (a 10 foot straight edge used on vertical curves).

28. Section 321216 – Asphalt Paving: Quality control testing of uncompacted asphalt concrete mix and in-place compacted pavement.

Note: For those projects utilizing a Construction Manager, the Construction Manager's involvement with testing shall be limited to coordinating, documenting (recording the date, time, location and type of test being performed), witnessing, filing copies of reports prepared by the testing agency, and transmitting copies of the reports to the Owner. The reports shall be prepared by the testing agency in accordance with criteria established by 1.04 of this Section and BCNYS Chapter 17 and in a format approved by, the Architect/Engineer. Where no Construction Manager is retained, the coordination and documentation of all required tests shall be the complete and sole responsibility of the Prime Contractor responsible for the work being tested in conjunction with the testing agency.

Note: The Construction Manager will coordinate and document (recording the date, time, location and type of test being performed) all special inspections or testing as required by BCNYS Chapter 17 requirements.

B. Additional Information: All Prime Contractors shall review all specifications of their disciplines for additional information concerning general testing services necessary for this project. The list provided above shall not be considered mutually exclusive.

C. Test procedures to be used shall be submitted for approval of the Owner's Representative where other than those specified are recommended by the testing agency.

1.05 QUALIFICATION OF LABORATORY

A. Shall meet "Recommended Requirements of Independent Laboratory Qualifications," published by American Council of Independent Laboratories. For concrete and steel the laboratory shall comply with the basic requirements of ASTM E 329, "Standards of Recommended Practice for Inspection and Testing Agencies for Concrete and Steel as Used in Construction."

B. Submit copy of report of inspection of facilities made by Materials Reference Laboratory of National Bureau of Standards during most recent tour of inspection; with memorandum of remedies of deficiencies reported by inspection.

C. Testing equipment shall be calibrated at maximum 12 month intervals by devices of accuracy traceable to either:
   1. National Bureau of Standards.
   2. Accepted values of natural physical constants.
   3. Submit copy of certificate of calibration, made by accredited calibration agency.

D. Refer to Section 014529 – Testing Laboratory Service for additional requirements.

E. Laboratory is not authorized to:

   1. Release, revoke, alter or enlarge on requirements of Contract documents.
   2. Approve or accept portion of work.
   3. Perform duties of the Contractor.

1.06 SUBMITTALS

A. Testing document submittal procedures shall be as requested by the Construction Manager and the Architect.

B. Promptly submit two (2) copies to the Owner's Representative one (1) to be turned over to the Owner), two (2) copies directly to the Architect/Engineer, and one (1) to the Contractor of reports of inspections and test, including the following information, as applicable:

   1. Date issued.

   2. Project title and number.

   3. Testing laboratory name and address.

   4. Name and signature of field inspector.

   5. Date of inspection or sampling.

   6. Record of temperature and weather.

   7. Name and signature of laboratory inspector.

   8. Identification of product and specification section.

   9. Location in project.

   10. Designation of the work and test method.

   11. Observations regarding compliance with Contract Documents.

   12. Complete inspection or test data.

   13. Test results and interpretation of test results.

   14. Recommendation on retesting.

1.07 SOIL COMPACTION TESTING

A. The Contractors for the Work of Division 31 specification – “Earthwork” shall cooperate and coordinate with the soil testing and inspection service for quality control testing during earthwork operations as follows:

1. Field density test reports.

2. One optimum moisture-maximum density curve for each type of soil encountered.

3. The Contractor shall arrange for Soils Engineer to be on the site for observation and testing during times when the following operations are being performed:

   a. Proofrolling.

   b. Compaction of subgrades and fill. During compaction operations, the Soils Engineer shall carefully monitor existing foundations to detect possible foundation movements. If movement is detected, Work shall be stopped and the Architect immediately notified.

B. Percentage of Maximum Density Requirements: Provide not less than following percentages of maximum density of soil material compacted at optimum moisture content, for the actual density of each layer of soil material in place.

1. Foundations: Compact top 12 inches of subgrade and each 8-inch layer of backfill or fill material to 95 percent Modified Proctor maximum dry density.

2. Building Slabs and Steps: Compact top 12 inches of subgrade and each 8 inch layer of backfill or fill material to 95 percent Modified Proctor maximum dry density.

3. Lawn, Unpaved Areas, and Borrow Pit: Compact top 6 inches of subgrade and 8 inch layer of backfill or fill material to 90 percent Modified Proctor maximum dry density.

4. Walkways: Compact top 6 inches of subgrade and each 8-inch layer of backfill or fill material to 95 percent Modified Proctor maximum dry density.

5. Pavements: Compact top 12 inches of subgrade and each 8-inch layer of backfill or fill material to 95 percent Modified Proctor maximum dry density.

6. Underground Utilities: Provide the preceding requirements for the respective utility location(s).

7. Underground Piping and Conduit Outside Building:

   a. Bedding shall begin by placing 4 to 6 inch bedding of the approved backfill material and compacting to between 85 to 90 percent of the Modified Proctor Maximum Dry Density. The width of the bedding shall be the diameter of the pipe plus 2 feet.

   b. Haunching shall consist of placing the approved backfill material to the spring line of the pipe and conduit and compacting between 85 to 90 percent of the Modified Proctor Maximum Dry Density. This lift shall not exceed 9 inches loose. The pipe and conduit bedding and flow line shall not be disturbed as a result of the haunching operation.

   c. Initial backfill shall consist of placing the approved backfill material to the top of the pipe and conduit and compacting to between 85 and 90 percent of the Modified Proctor Maximum Dry Density. This lift shall not exceed 9 inches loose. Crushed or buckled pipe and conduit as a result of the backfilling operations will be removed and replaced with no additional payment.

d. Initial backfill shall continue in 6-inch lifts with the approval backfill material to a depth of 12 inches above the pipe.

e. Finish backfilling of the trench shall consist of placing the approved backfill or material from the trench excavation in 6-inch lifts to the grade of the trench. Finish backfilling within paved areas shall continue to the base of the compacted aggregate with the approved backfill material.

8. Retaining Walls: Compact each 8 inch layer of backfill or fill material to 95 percent Standard Proctor Maximum Dry Density.

C. Quality Control Testing During Construction: Testing service must inspect and approve subgrades and fill layers before further construction work is performed thereon. Tests of subgrades and fill layers will be taken as follows:

1. Footing Subgrade: For each strata of soil on which footings will be placed, conduct at least one test to verify required design bearing capacities. Subsequent verification and approval of each footing subgrade may be based on a visual comparison of each subgrade with related tested strata, when acceptable to Architect, except that a minimum of one test shall be performed for each 15,000 sq.ft. of building area.

2. Paved areas and Building Slab Subgrade: Make at least on field density test of subgrade for every 2,000 sq.ft. of paved area or building slab, but in no case less than 3 tests.

3. Foundation and Retaining wall Backfill: Take at least 2 field density tests, at locations and elevations as directed.

4. Trench Backfill: For each compacted backfill layer make one field density test between each drainage structure.

D. If, in the opinion of the Architect, based on reports of testing service and inspection, subgrade or fills which have been placed are below specified density, additional compaction work and testing shall be provided by the Contractor for the Section of Work involved at no additional expense, until subgrades or fills meet or exceed specified density.

1.08 BITUMINOUS PAVING TESTING

A. The Contractor for the Work of Division 32 specification “Asphalt Pavement” shall cooperate and coordinate with the testing laboratory to perform field inspection of the pavement work, unless specifically noted otherwise.

B. Field quality control testing shall be performed during paving operations. Perform the following sampling and testing of asphalt concrete mixtures for quality control during paving operations. Record the locations where samples are taken to correlate with subsequent testing.

C. Test uncompacted asphalt concrete mix and report the following:

1. Sampling: AASHTO T168 (ASTM D979).

2. Asphalt Cement Content: AASHTO T164 (ASTMD2172).

3. Perform at least one initial test for paving, unless otherwise specified or directed.

D. Test in-place, compacted pavement for density and thickness, as herein specified. Perform one test for each 500 sq.yds. but not less than one test per day, unless otherwise specified or directed.

E. The Contractor shall pay for and perform additional Work and testing as may be required if any of the previous tests indicate insufficient values or if directed by the Architect. Continue Work and testing until specified values have been attained.

F. Asphalt concentrate material not complying with specified requirements will not be acceptable. The Contractor shall repair or remove and replace defective paving as directed by the Architect, at no additional cost to the Owner.

1.09 INSPECTION OF REINFORCING STEEL PLACEMENT

A. The Contractor for the Work of Division 03 specifications for "Cast-In-Place Concrete", shall cooperate and coordinate with the testing laboratory to perform field inspection of the placement of reinforcing steel prior to, and in some specified instances during the placement of concrete structures, unless specifically noted otherwise.

B. Inspection shall include the following:

1. All structures:

    a. Size of all reinforcing bars.
    b. Measurement of bar laps.
    c. Spacing of reinforcing bars.
    d. Measurement of reinforcing concrete cover.
    e. Adequacy of reinforcement ties to prevent movement during concrete placement.
    f. Placement of reinforcing chairs, bolsters, and concrete blocks supporting reinforcement.
    g. Condition of reinforcing free of corrosion scale, grease, oil, and other foreign materials which would reduce bond of concrete to reinforcement.

2. Slabs-on-Grade:

    a. Nominal size of welded wire fabric.
    b. Measurement of fabric lap.
    c. Type, size, and spacing of supports for welded wire fabric.
    d. Adequacy of maintaining welded wire fabric in correct position during the concrete placement. If concrete workers walk on fabric during concrete placement, is fabric lifted back in to correct position prior to set of concrete. (THE TESTING LABORATORY SHALL BE PRESENT DURING THE PLACEMENT OF SLABS-ON-GRADE, WHICH USE WELDED WIRE FABRIC OR REINFORCING STEEL BARS).
    e. Slabs-on-grade with fibrous reinforcement do not require this inspection.

C. The Testing Laboratory shall report inspection results in writing to the Architect, Construction Manager, and Contractor the same day that tests are made. Reports shall indicate the specific structural items inspected and the location, with column grid references, where possible to clearly identify the inspected items.

D. Additional Inspections: Where inspections indicate deficiencies and concrete placement of any structural item is made without this required inspection, the testing laboratory shall conduct additional tests, including concrete coring, magnetic detection devices, sonic testing devices, and other methods as required to verify the conformance of the reinforcing steel placement to the Contract Documents. The Contractor shall pay for such inspections conducted and other additional inspections as may be required when unacceptable or un-inspected reinforcing steel placement is verified.

1.10 CONCRETE TESTING

A. The Contractor for the Work of Division 03 specification for “Cast-In-Place Concrete”, shall cooperate and coordinate with testing laboratory to perform field quality control testing during concrete work under Division 03.

B. Quality Control Testing During Construction: Perform sampling and testing for field quality control during the placement of concrete, as follows:

1. Sampling Fresh Concrete: ASTM C172, except modified for slump to comply with ASTM C94.

2. Slump: ASTM C143, one test for each concrete load at point of discharge, and one for each set of compressive strength test specimens.

3. Air Content: ASTM C231, pressure method; one for every other concrete load at point of discharge or when the indication of change requires.

4. Concrete Temperature: Test hourly when air temperature is 40 degrees F. and below and when 80 degrees F. and above; and each time a set of compressive test specimens is made.

5. Compression Test Specimens: ASTM C31, one set of 4 standard cylinders for each compressive strength test, unless otherwise directed. Mold and store cylinders for laboratory cured test specimens except when field-cure test specimens are required.

6. Compressive Strength Tests: ASTM C39, one set for each day’s placement exceeding 5 cu. yds. plus additional sets for each 50 cu. yds. over and above the first 25 cu. yds. of each concrete class placed in any one day; one specimen tested at 7 days, two specimens tested at 28 days, and one specimen retained in reserve for later testing if required.

    a. When the frequency of testing will provide less than 5 strength tests for a given mix design, conduct testing strength tests for a given mix design, conduct testing from at least 5 randomly selected batches or from each batch if fewer than 5 are used.

    b. When the total quantity of a given mix design of concrete is less than 50 cu.yds., the strength tests may be waived by the Architect if, in his judgment, adequate evidence of satisfactory strength is provided.

    c. When the strength of field-cured cylinders is less than 85 percent of companion laboratory cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing the in-place concrete.

C. The testing laboratory shall report test results in writing to the Architect, Construction Manager, Contractor, and ready-mix supplier on the same day that tests are made. Reports of compressive strength tests shall contain the project identification name and number, date of concrete placement, name of Contractor, name of concrete supplier and truck number, name of concrete testing service, concrete type and class, location of concrete batch in the structure, design compressive strength at 28 days, concrete mix proportions and materials, type and amount of fibrous reinforcement, compressive breaking strength, and type of break for both 7 day tests and 28 day tests.

D. Additional Tests: The testing service will make additional tests of in-place concrete, as directed by the Architect, when test results indicate the specified concrete strengths and other characteristics have not been attained in the structure. The testing service shall conduct tests to determine the strength and other characteristics of the in-place concrete by compression tests on cored cylinders complying with ASTM C42 or by load testing specified in ACI 318 or other acceptable nondestructive testing methods, as directed. The Contractor shall pay for such tests conducted and other additional testing as may be required, when unacceptable concrete is verified.

E. Evaluation of Quality Control Tests: Do not use concrete delivered to the final point of placement, which has slump or total air content outside the specified values.

1. Compressive strength tests for laboratory-cured cylinders will be considered satisfactory if the averages of all sets of 3 consecutive compressive strength tests results equal or exceed the 28 day design compressive strength of the type or class of concrete; and no individual strength test falls below the required compressive strength by more than 500 psi.

2. Strength tests of specimens cured under field conditions may be required by the Architect to check the adequacy of curing and protecting of the concrete placed. Specimens shall be molded by the field quality control laboratory at the same time and from the same samples as the laboratory cured specimens.

   a. Provide improved means and procedures for protecting concrete when the 28 day compressive strength of field cured cylinders is less than 85 percent of companion laboratory cured cylinders.

   b. When laboratory cured cylinder strengths are appreciably higher than the minimum required compressive strength, field cured cylinder strengths need not exceed the minimum required compressive strength by more than 500 psi even thought the 85 percent criterion is not met.

   c. If individual tests of laboratory cured specimen produce strengths more than 500 psi below the required minimum compressive strength or if tests of field cured cylinders indicates deficiencies in protection and curing, provide additional measures to assure that the load-bearing capacity of the structure is not jeopardized. If the likelihood of low-strength concrete is confirmed and computations indicate the load-bearing capacity may have been significantly reduced, tests of cores drilled from the area in question may be required.

3. If the compressive strength tests fail to meet the minimum requirements specified, the concrete represented by such tests will be considered deficient in strength.

F. Deficient concrete shall be removed and replaced by the Contractor without additional cost to the Owner.

1.11 CONCRETE MATERIALS AND MIX DESIGN

A. Concrete Materials and Mix Design: The Contractor(s) for Division 03 specification “Cast-In-Place Concrete” shall provide the following in conformance with the requirements of the Division 03 specifications:

1. Ready-mixed concrete shall be mixed and delivered in accordance with ASTM C94.

2. Product Data: Submit copies of manufacturer’s specifications with application and installation instructions for proprietary materials and items, including admixtures, bonding agents, waterstops, joint systems, chemical floor hardeners, and dry shake finish materials.

3. Laboratory Test Reports: Submit copies of laboratory test reports for concrete materials and mix design tests. The Architect’s review will be for general information only. Production of concrete to comply with specified requirements is the Contractor’s responsibility.

4. Mix Design: Submit copies of concrete mix designs for each type of mix required by the Concrete Schedule indicating the amount of each ingredient (by weight) in one cubic yard of concrete, the calculated water/cement ratio, and the slump.

B. Tests for Concrete Materials:

1. For normal weight concrete, test aggregates by the methods of sampling and testing of ASTM C33.

2. For lightweight concrete, test aggregates by the methods of sampling and testing of ASTM C330.

    a. For portland cement, sample the cement and determine the properties by the methods of test of ASTM C33.

3. Submit written reports for each material sampled and tested, prior to the start of Work. Provide the project identification name and number, date of report, name of Contractor, name of concrete testing service, source of concrete aggregates, material manufacturer and brand name for manufactured materials, values specified in the referenced specification for each material, and test results. Indicate whether or not material is acceptable for intended use.

C. Submit signed statement from ready-mix plant that concrete furnished for the Project will exactly conform to the approved design mixes.

1.12 TESTS FOR FF/FL (Refer to Division 03 specification for “Cast-In-Place Concrete”)

1.13 TESTS FOR MORTAR

A. The Contractor for the Work of Division 04 – “Unit Masonry”, shall cooperate with a separate testing laboratory to perform field quality control testing during the masonry work under Division 04 – “Unit Masonry”, unless specifically noted otherwise.

B. For colored and noncolored mortars test for compressive strength by the methods of sampling and testing of ASTM C109 and ASTM C780.

1. Provide a minimum of one set of cubes for testing per 5,000 sq.ft. of masonry wall construction and as directed by Architect.

C. Submit written reports for each material sampled and tested. Provide the project identification name and number, date of report, name of contractor, name of testing service, source of aggregates, material manufacturer and brand name for manufactured materials, values specified in the referenced specification for each material, and test results. Indicate whether or not material is acceptable for intended use.

D. If the compressive strength tests fail to meet the minimum requirements specified, the mortar represented by such tests will be considered deficient in strength.

E. Deficient mortar shall be removed and replaced by the Contractor without additional cost to the Owner.

1.14 TESTS FOR GROUT

A. The Contractor for the Work of Division 04 – “Unit Masonry”, shall cooperate with a separate testing laboratory to perform field quality control testing during the masonry work under the Division 04 specification, which covers “Masonry Grout”, unless specifically noted otherwise.

B. Grout for filling reinforced or unreinforced concrete masonry cores or brick cavities test for compressive strength by methods as described in Division 04 section covering – “Masonry Grout”.

1. Provide a minimum of one set of 3 test specimens for testing per 5,000 square feet of masonry wall construction or for each ready-mix truck load of grout and as directed by the Architect.

C. Submit written reports for each material sampled and tested. Provide the project identification name and number, date of report, name of Contractor, name of testing service, source of aggregates, material manufacturer and brand name for manufactured materials, values specified in the reference specification for each material, specific location where material represented by sample is used, slump and compression test results. Indicate whether or not material is acceptable for intended use.

D. If the compressive strength tests fail to meet the minimum requirements specified, the grout represented by such tests shall be considered deficient in strength.

E. Deficient grout shall be removed and replaced by the Contractor without additional cost to the Owner.

1.15 TESTS OF CONCRETE MASONRY PRISMS

A. The Contractor for the work of Division 04 specification – "Unit Masonry", shall cooperate with a separate testing laboratory to perform field quality control testing during the masonry work under Division 04 specification – "Unit Masonry".

B. When required by the masonry plan, construct a set of 3 masonry prisms using mortar and concrete masonry units to be used in the masonry work. Unless otherwise noted, construct prisms 8 inches by 8 inches by 16 inches high (nominal) in compliance with ASTM E447, Method B.

C. When prism tests are required to establish the strength of masonry in lieu of Masonry Inspection, provide a minimum of one set of 3 masonry prisms for testing for each 5000 sq.ft. (gross) of masonry wall construction.

D. Submit written reports for each prism tested. Provide the project identification name and number, date of report, name of Contractor, name of testing service, name of material suppliers, specific location where masonry represented by the prism is used, compression test strength results, and specified required strength.

E. If the compressive strength tests fail to meet the minimum strength specified in the Plans, the masonry represented by the tests shall be considered deficient.

F. When tests indicating deficient masonry represent masonry already constructed, such masonry shall be removed and replaced by the Contractor without additional cost to the Owner. In lieu of removal and replacement, additional cores may be grouted as required and directed by the Architect without additional cost to the Owner.

1.16 MASONRY INSPECTION

A. Provide masonry construction inspection of concrete or brick masonry walls to insure that masonry construction is in conformance with the Contract Documents. Masonry inspection is required for those masonry elements, which must be constructed to attain high design strengths.

B. Qualification of Inspection Agency: Refer to Section 014529 – "Testing Laboratory Service". Individual inspector shall be certified as a masonry construction inspector by the National Concrete Masonry Association or by a qualified state Masonry Institute or Association.

C. Inspection shall use NCMA-TEK 18-3 Quality Assurance as a guideline.

D. The individual or individuals who will perform the masonry inspection shall be present for the Pre-Masonry Conference.

E. The masonry inspector shall prepare a written report or reports for each day of inspection. The format for this report shall be furnished by the Owner's Representative upon request.

F. The masonry inspector shall be present and observe all masonry construction operations in walls requiring inspections. The masonry inspector shall be present at the project site within sufficient time, in advance of grouting operations, to inspect the construction to insure its conformance to the Contract Documents and that grouting may proceed. No grouting shall be permitted unless the masonry inspector is present and has indicated that the masonry construction is properly prepared for the grouting operation.

1.17 WELDING QUALITY CONTROL

A. Welding operators shall be qualified under the provisions of the AWS Structural Welding Code on test pieces in positions and with clearances equivalent to those actually to be encountered in construction. Welders shall make only those types of welds for which they are specifically certified.

B. Welds requiring inspection shall be so indicated in the Drawings.

1. Welds indicated as requiring visual inspection shall be visually inspected by an independent inspector, acceptable to the Architect, prequalified by the American Welding Society Qualification Test.

C. The Contractor performing the welding requiring visual inspection shall coordinate with an independent testing service, acceptable to the Architect to perform weld testing.

D. Submit written reports for each weld tested. Provide project identification and number, date of report, name of Welding Contractor, name of testing service, location of weld, type of weld, and test results. Indicate whether or not weld is acceptable for intended use.

E. If by inspection welds fail to meet minimum acceptable criteria, the welds shall be cut out and replaced at no additional cost to the Owner.

1.18 BOLTED STRUCTURAL CONNECTIONS QUALITY CONTROL

A. The Contractor for the work of the Division 5 specification for *"Structural Steel"* shall cooperate with a separate testing laboratory, to perform field quality control inspection of slip-critical and snug-tight bolted connections.

B. Inspection of slip-critical connections shall be visual. The inspector shall be present at the beginning of steel erection to insure that the erector is conforming to the Contract Documents and AISC Specifications. The inspector shall verify that the erector is marking the bolts and nuts prior to the turn-of-nut procedure. Ten percent of all slip-critical bolted connections shall be observed as they are installed. Any connections, which, in the opinion of the inspector, do not meet the tightening requirements of the Contract Documents, shall be corrected by the erector.

1. Inspection of snug-tight connections shall be made by use of a spud wrench. Ten percent of all snug-tight bolted connections selected randomly over the entire limits of the building structure shall be tested to verify tightness. If more than 20 percent of the bolts tested do not meet the General Requirements of the Contract Documents, the erector shall be required to retighten all snug-tight bolted connections on the Project.

1.19 STRUCTURAL STEEL ALIGNMENT QUALITY CONTROL

A. The Contractor for the Work of the Division 05 specification section "Structural Steel", shall cooperate with a separate testing laboratory, to perform field measurement of structural steel beams, columns, joist, and deck alignment.

B. Alignment shall be measured and compared to AISC “Code of Standard Practice for Steel Buildings and Bridges”.

C. The Testing Agency shall submit, to the Architect, a written report summarizing the measurements performed and the equipment used in the fieldwork. Where alignment fails to meet AISC requirements, the Contractor for the work in “Structural Metal Framing” shall make the required corrections.

1.20 COLD FORMED METAL FRAMING QUALITY CONTROL

A. The Contractor shall cooperate with a separate testing laboratory to perform field quality control inspections.

1. Test and inspect cold formed metal framing used for exterior curtain wall system to verify framing meets the following specified and indicated items:

a. Thickness of framing members (gauge).
b. Spacing of framing members.
c. Attachment details of framing members to structural substrate.
d. Supplemental bracing and reinforcement are correctly provided including spacing, size and type of bracing and thickness of bracing.

1.21 FIRE RESISTANT PENETRATIONS & JOINTS QUALITY CONTROL

A. The Contractor shall cooperate with a separate testing laboratory to perform field quality control inspections in accordance with NYS BC 1705.17.

1. A pre-construction meeting shall take place to discuss the application of firestop protection systems including the coordination of work among trades and each contractor’s responsibility of the installation of firestop systems for the penetrations and joints.

2. The pre-construction meeting should address the following:

a. Agree on all the penetrations to be protected in accordance with the approved construction plans.
b. Schedule the trades work in conjunction with the firestop installation work.
c. Schedule the firestop inspections and coordinate with the firestop contractor work.

3. The Contractor shall cooperate with a separate testing laboratory to perform field quality control inspections. Major elements of quality firestopping inspections are as follows:

a. Firestop systems must not be concealed from view before being inspected and approved.
b. Walk through visual inspections should be made during the firestop installation.
c. When necessary or required, destructive evaluation will be made on various types of firestop systems.
d. Flashlights, coring device and other appropriate tools make a proper inspection easier.
e. Proper depths, annular space and product types are critical to the effectiveness of the system.
f. Construction documents detailing the firestop locations and systems must be kept on site to assist in the conduct of the inspection.
g. Observe that empty containers, wrappings or boxes of the specified materials are in sufficient quantity to have been installed correctly.
h. Observe that the actual products, containers, wrappings or boxes are labeled with the approved testing agency marks and are as specified in the submitted details.

i. Measure the depth and width of materials as indicated in the details (sometimes density measurements are also required for products such as thermal insulation).
j. Observe that joints have been installed in such manner that the required movement can be achieved (temporary screws used to hold studs to ceiling runners must be removed).
k. Compare the installed firestop system with the approved submitted details.
l. Observe a reasonable degree of workmanship, which would indicate compliance with the specified designs.
m. Deficient installations must immediately be corrected and then re-inspected before concealment.

1.22 PAINTING QUALITY CONTROL

A. The Contractor for the Work of Section 099000 – "Painting", shall cooperate with a separate testing laboratory to perform field quality control testing of painted finishes.

B. Wet Film Thickness:

1. Wet film thickness shall be tested at the rate of one reading per 1000 sq. ft. of painted surface. Ten random locations for readings will be chosen throughout building.

2. Wet film thickness shall be as specified in Section 099000 – "Painting"; or if not specified, as specifically recommended by the paint manufacturer for the type of substrate, type of paint and system used, and application methods and coverage requirements.

3. Testing Instrument:

a. Wet Film Thickness Gage, KTA-Tator, Inc., Pittsburgh, PA.

C. Dry Film Thickness:

1. Dry film thickness shall be tested at the rate of 5 readings per 100 sq.ft. of painted surface. Twenty random locations for readings will be chosen throughout the building.

2. Average of all readings for a given area or surface area to be within the dry film thickness range specified in Section 099000 – Paints, and no individual reading should be more than 20 percent below the specified dry film thickness.

3. Testing instruments; shall be destructive or nondestructive type applicable for the type of substrate the coating is applied to. The following lists acceptable types of testing instruments:

a. Type I, (Magnetic Pull-Off) Dry Film Thickness Gage, KTA-Tator, Inc., Pittsburgh, PA.
b. Fixed Probe Dry Film Thickness gage – Elcometer 345 Basic, KTA-Tator, Inc., Pittsburgh, PA.
c. Fixed Probe Dry Film Thickness Gage – Elcometer 345 Top, KTA-Tator, Inc., Pittsburgh, PA.
d. Fixed Probe Dry Film Thickness Gage Elcometer 300F-P2, KTA-Tator, Inc., Pittsburgh, PA.
e. Type II – Fixed Probe Dry Film Thickness Gage – Minitest 200F, KTA-Tator, Inc., Pittsburgh, PA.
f. Fixed Probe Dry Film Thickness Gage – Positector 6000-F1, KTA-Tator, Inc., Pittsburgh, PA.
g. Fixed Probe Dry Film Thickness Gage – Positector 6000-F3, KTA-Tator, Inc., Pittsburgh, PA.
h. Fixed Probe Dry Film Thickness Gage – Quanix 2200, KTA-Tator, Inc., Pittsburgh, PA.
i. Fixed Probe Dry Film Thickness Gage – Quanix 2300, KTA-Tator, Inc., Pittsburgh, PA.
j. Destructive Dry Film Thickness – Tooke Gage, KTA-Tator, Inc., Pittsburgh, PA.

1.23 STRUCTURAL TESTING AND SPECIAL INSPECTION CONFORMANCE IN COMPLIANCE WITH BUILDING CODE OF NEW YORK STATE

A. General: In addition to the above Division 02-33 general testing requirements, the provisions of Chapter 17, "*Structural Tests and Special Inspections*" of the *Building Code of New York State (BCNYS)* additionally governs the quality, workmanship and requirements for all materials, as applicable. Materials of construction and tests shall conform to the applicable standards listed in the BCNYS.

B. New Materials: New building materials, equipment, appliances, systems or methods of construction not provided for in the *BCNYS*, and any material of questioned suitability proposed for use in the construction of a building or structure shall be subjected to the tests prescribed in Chapter 17 of the *BCNYS*.

C. Used Materials: The use of second-hand materials that meet the minimum requirements of Chapter 17 of the *BCNYS* shall be permitted.

D. Special Inspections – All special inspections shall conform to the requirements of Section 1704 of Chapter 17 of the *BCNYS*. The Owner shall employ one or more Special Inspectors to provide inspections during construction on the types of work listed under Section 1704 of Chapter 17 of the *BCNYS*. The Special Inspector shall be a qualified person who shall demonstrate competence to the satisfaction of the code enforcement official for inspection of the particular type of construction or operation requiring special inspection. **Refer to Specification Section 014529, "Testing Laboratory Service" for the specific qualifications of the Special Inspector.**

E. Report Requirements: Special inspectors shall keep records of all inspections, and shall furnish said records to the code enforcement official, to the Architect and the Owner. If a Construction Manager has been retained by the Owner, all test results shall be submitted in quadruplicate, via the Construction Manager. Reports shall indicate that work inspected was done in conformance to the approved Construction Documents. Discrepancies shall be brought to the immediate attention of the contractor for correction. If the discrepancies are not corrected, the discrepancies shall be brought to the attention of the code enforcement official and to the Architect, prior to the completion of that phase of the work. A final report of inspections documenting required special inspections and corrections of any discrepancies noted in the inspections shall be submitted periodically at a frequency agreed upon by the Owner, the Architect and the Construction Manager, prior to the start of the work.

F. Inspection of Fabricators: Where fabrication of structural load bearing members and assemblies is being performed on the premises of a fabricator's shop, special inspection of the fabricated items shall be required by Section 17, and as required elsewhere in the *BCNYS*.

G. Fabrication and Implementation Procedures: The special inspector shall verify that the fabricator maintains detailed fabrication and quality control procedures that provide a basis for inspection control of the workmanship and the fabricator's ability to conform to the approved construction documents and referenced standards. The special inspector shall review the procedures for completeness and adequacy relative to the code requirements for the fabricator's scope of work.

H. Fabricator Approval: Special inspections required by the *BCNYS* are not required where the work is done on the premises of a fabricator registered and approved to perform such work without special inspection. Approval shall be based upon the review of the fabricator's written procedural and quality control manuals and periodic auditing of fabrication practices by an approved special inspection agency. At the completion of fabrication, the approved fabricator shall submit a certificate of compliance to the code enforcement official, stating that the work was performed in accordance with the approved construction documents.

SPECIAL INSPECTIONS & TESTS – The table below summarizes the special inspections & testing requirements of the contract, in conformance with BCNYS 1704.1.1. The Owner shall pay for all Special Inspections & Tests indicated below. (Note: This chart includes all items indicated within the BCNYS as requiring special inspections. These inspections shall be performed for all work items that are included within the project scope of work. If there is testing indicated for a material or component that is not required on the project, then it follows that there is no testing required for that item on the particular project in question.)

A. Soils				**1704.7**
INSPECTION AND TESTING (Continuous & Periodic is as defined by the BCNYS) **(Table 1704.7 – Required Verification and Inspection of Soils)**	**CONTINUOUS**	**PERIODIC**	**REFERENCE STANDARD**	**BCNYS REFERENCE**
1. Verify materials below footings are adequate to achieve the design bearing capacity.		X		1704.7
2. Verify excavations are extended to proper depth and have reached proper material.		X		1704.7
3. Perform classification and testing of controlled fill materials.		X		1704.7
4. Verify use of proper materials, densities and lift thicknesses during placement and compaction of controlled fill.	X			1704.7
5. Prior to placement of controlled fill, observe subgrade and verify that site has been prepared properly.		X		1704.7
B. Foundation and Soil Investigations				**1802.2**
1. Questionable soil.	X			1802.2.1
2. Expansive soil.		X		1802.2.2
3. Groundwater table.		X		1802.2.3
4. Pile and pier foundations.	X			1802.2.4
5. Rock strata.		X		1802.2.5
6. Seismic Design Category C.		X		1802.2.6
7. Seismic Design Category D, E, F.		X		1802.2.7
C. Soil Classification		**X**		**1802.3**
D. Concrete Construction (per NYSBC Table 1704.4)				**1704.4**
INSPECTION AND TESTING (Continuous & Periodic is as defined by the BCNYS) **(Table 1704.4 – Required Verification and Inspection of Concrete Construction)**	**CONTINUOUS**	**PERIODIC**	**REFERENCE STANDARD** (where applicable, see also Section 1707.1, special inspections for seismic resistance)	**BCNYS REFERENCE**
1. Inspection of reinforcing steel, including prestressing tendons and placement.		X	ACI 318; 3.5, 7.1-7.7	1913.4
2. Inspection of reinforcing steel welding, in accordance with Table 1704.3, Item 5B of BCNYS.			AWS D1.4, ACI 318; 3.5.2	
3. Inspection of bolts to be installed in concrete prior to and during placement of concrete where allowable loads have been increased.	X			1911.5
4. Verify use of required design mix.		X	ACI 318; Ch.4, 5.2-5.4	1904.2.2, 1913.2, 1913.3

5. At the time fresh concrete is sampled to fabricate specimens for strength tests, perform slump and air content tests, and determine the temperature of the concrete.	X		ASTM C172, ASTM C31; ACI 318; 5.6, 5.8	1913.10
6. Inspection of concrete and shotcrete placement for proper application techniques.	X		ACI 318; 5.9, 5.10	1913.6, 1913.7, 1913.8
7. Inspection for maintenance of specified curing temperature and techniques.		X	ACI 318, 5.11, 5.13	1913.9
8. Inspection of prestressed concrete: a. Application of prestressing forces. b. Grouting of bonded prestressing tendons in the Seismic-force-resisting system.	 X X		 ACI 318; 18.20: ACI 318; 18.18.4	
9. Erection of precast concrete members.		X	ACI 318; Ch. 16	
10. Verification of in-situ concrete strength prior to stressing of tendons in posttensioned concrete and prior to removal of shores and forms from beams and structural slabs.		X	ACI 318; 6.2	
11. Inspect formwork for shape, location and dimensions of the concrete member being formed.		X	ACI 318; 6.1.1	
E. Pile Foundations: Installation and load tests.				1704.8
INSPECTION AND TESTING (Continuous & Periodic is as defined by the BCNYS) **(Table 1704.8 – Required Verification and Inspection of Pile Foundations)**	**CONTINUOUS**	**PERIODIC**	**REFERENCE STANDARD**	**BCNYS REFERENCE**
1. Verify pile materials, sizes and lengths comply with requirements.	X			
2. Determine capacities of test piles and conduct additional load tests, as required.	X			
3. Observe driving operations and maintain complete and accurate records for each pile.	X			
4. Verify placement locations and plumbness, confirm type and size of hammer, record number of blows per foot of penetration, determine required penetrations to achieve design capacity, record tip and butt elevations and document and pile damage.	X			
5. For steel piles, perform additional inspections in accordance with Section 1704.3.				1704.3
6. For concrete piles and concrete filled piles perform additional inspections in accordance with Section 1704.4				1704.4
7. For specialty piles, perform additional inspections as determined by the registered design professional in responsible charge.				
8. For augured uncased piles and caisson piles, perform inspections in accordance with Section 104.9				1704.9
F. Pier Foundations: Seismic Design Category C, D, E, F				1704.9

INSPECTION AND TESTING (Continuous & Periodic is as defined by the BCNYS) **(Table 1704.9 – Required Verification and Inspection of Pier Foundations)**	**CONTINUOUS**	**PERIODIC**	**REFERENCE STANDARD**		**BCNYS REFERENCE**
1. Observe drilling operations and maintain complete and accurate records for each pier.	X				
2. Verify placement locations and plumbness, confirm pier diameters, bell diameters (if applicable), lengths, embedment into bedrock (if applicable) and adequate end bearing strata capacity.	X				
3. For concrete piers, perform additional inspections in accordance with Section 1704.4					1704.4
4. For masonry piers, perform additional inspections in accordance with Section 1704.5					1704.5
G. Masonry Construction					
INSPECTION AND TESTING (Continuous & Periodic is as defined by the BCNYS) L1 = Level 1 Inspection required for empirically designed & nonessential facilities. (Per NYSBC Table 1704.5.1)	**CONTINUOUS**	**PERIODIC**	ACI 530/ASCE5 / TMS 402, BCNYS Ch. 35	ACI 530.1/ASCE6 / TMS 602, BCNYS Ch. 35	**BCNYS REFERENCE**
1. As masonry construction begins, the following shall be verified, to ensure compliance:					
a. Proportions of site-prepared mortar.		X		2.6A	
b. Construction of mortar joints.		X		3.3B	
c. Location or reinforcement, connectors, prestressing tendons and anchorages.		X		3.4, 3.6A	
d. Prestressing technique.		X		3.6B	
e. Grade and size of prestressing tendons and anchorages.		X		2.4B, 2.4H	
2. The Inspection Program shall verify:					
a. Size and location of structural elements.		X		3.3G	
b. Type, size, and location of anchors, including other details of anchorage of masonry to structural members, frames or other construction.		X	1.2.2(e), 2.1.4, 3.1.6		
c. Specified size, grade and type of reinforcement.		X	1.13	2.4, 3.4	
d. Welding of reinforcing bars.	X		2.1.10.7.2, 3.3.3.4(b)		
e. Protection of masonry during cold weather (temperature below 40°F) or hot weather (temperature above 90°F)		X		1.8C, 1.8D	2104.3, 2104.4
f. Application and measurement of prestressing force.		X		3.6B	
3. Prior to grouting, the following shall be verified to ensure compliance:					
a. Grout space is clean.		X		3.2D	
b. Placement of reinforcement and connectors and prestressing tendons and anchorages.		X	1.13	3.4	
c. Proportions of site prepared grout and prestressing grout for bonded tendons.		X		2.6B	
d. Construction of mortar joints.		X		3.3B	
4. Grout placement shall be verified to ensure compliance with code and construction document provisions.	X			3.5	
a. Grouting of prestressing bonded tendons.	X			3.6C	

5. Preparation of any required grout specimens, mortar specimens and/or prisms shall be observed.	X			1.4	2105.2.2, 2105.3
6. Compliance with required inspection provisions of the construction documents and the approved submittals shall be verified.		X		1.5	
INSPECTION AND TESTING (Continuous & Periodic is as defined by the BCNYS) L2 = Level 2 Inspection required for essential facilities. See 1704.5 for clarification. (Per NYSBC Table 1704.5.3)	**CONTINUOUS**	**PERIODIC**	ACI 530/ASCE5 / TMS 402, BCNYS Ch. 35	ACI 530.1/ASCE6 / TMS 602, BCNYS Ch. 35	**BCNYS REFERENCE**
1. From the beginning of masonry construction, the following shall be verified to ensure compliance:					
a. Proportions of site-prepared mortar, grout and prestressing grout for bonded tendons.		X		2.6A	
b. Placement of masonry units and construction of mortar joints.		X		3.3B	
c. Placement of reinforcement, connectors and prestressing tendons and anchorages.		X	1.13	3.4, 3.6A	
d. Grout space prior to grouting.	X			3.2D	
e. Placement of grout.	X			3.5	
f. Placement of prestressing grout.	X			3.6C	
2. The Inspection Program shall verify:					
a. Size and location of structural elements.		X		3.3G	
b. Type, size, and location of anchors, including other details of anchorage of masonry to structural members, frames or other construction.	X		1.2.2(e), 2.1.4, 3.1.6		
c. Specified size, grade and type of reinforcement.		X	1.13	2.4, 3.4	
d. Welding of reinforcing bars.	X		2.1.10.7.2, 3.3.3.4(b)		
e. Protection of masonry during cold weather (temperature below 40°F) or hot weather (temperature above 90°F)		X		1.8C, 1.8D	2104.3, 2104.4
f. Application and measurement of prestressing force.	X			3.6B	
3. Preparation of any required grout specimens, mortar specimens and/or prisms shall be observed.	X			1.4	2105.2.2, 2105.3
4. Compliance with required inspection provisions of the construction documents and the approved submittals shall be verified.		X		1.5	
H. Steel Construction (per NYSBC Table 1704.3)					
INSPECTION AND TESTING (Continuous & Periodic is as defined by the BCNYS) **(Table 1704.3 – Required Verification and Inspection of Steel Construction)**	**CONTINUOUS**	**PERIODIC**	**REFERENCE STANDARD** (where applicable, see also Section 1707.1, special inspections for seismic resistance)		**BCNYS REFERENCE**
1. Material verification of high-strength bolts, nuts & washers:					
a. Identification markings to conform to ASTM standards specified in the approved construction documents.		X	Applicable ASTM material specifications. AISC 360, Section a3.3		
b. Manufacturer's certificate of compliance required.		X			
2. Inspection of high-strength bolting:					
a. Bearing-type connections.		X	AISC 360, Section M2.5		1704.3.3

b. Slip-critical connections.	X	X		
3. Material verification of structural steel:				
a. Identification markings to conform to ASTM standards specified in the approved construction documents.			ASTM A6 or A568	1708.4
b. Manufacturer's certified mill test reports.			ASTM A6 or A568	
4. Material verification of weld filler materials:				
a. Identification markings to conform to AWS specification in the approved construction documents.			AISC 360, Section A3.5	
b. Manufacturer's certificate of compliance required.				
5. Inspection of welding.				
a. Structural Steel:				
1) Complete & partial penetration groove welds.	X		AWS D1.1	1704.3.1
2) Multi-pass fillet welds.	X			
3)Single-pass fillet welds > 5/16"	X			
4) Single-pass fillet welds < 5/16"		X		
5) Floor and deck welds.		X		
b. Reinforcing Steel:				
1) Verification of weldability of reinforcing steel other than ASTM A706.		X	AWS D1.4, ACI 318:3.5.2	
2) Reinforcing steel-resisting flexural & axial forces in intermediate and special moment frames, and boundary elements of special reinforced concrete shear walls & shear reinforcement.	X			
3) Shear Reinforcement.	X			
4) Other reinforcing steel.		X		
6. Inspection of steel frame joint details for compliance with approved construction documents: a. Details such as bracing & stiffening. b. Member locations. c. Application of joint details at each connection.		X		1704.3.2
I. Wood Construction: Fabrication of wood structural elements & assemblies.				1704.6, 1704.2
J. Sprayed Fire-Resistant Materials				**1704.10**
1. Structural member surface conditions.				1704.10.1
2. Application.				1704.10.2
3. Thickness.			ASTM E 605	1704.10.3
4. Density.			ASTM E 605	1704.10.4
5. Bond Strength.			ASTM E 736	1704.10.5
INSPECTION AND TESTING (Continuous & Periodic is as defined by the BCNYS)	**CONTINUOUS**	**PERIODIC**	**REFERENCE STANDARD**	**BCNYS REFERENCE**
K. Mastic and intumescent fire-resistant coatings			AWCI 12-B	**1704.11**
L. Exterior Insulation and Finish Systems (EIFS)				1704.12
M. Special Cases (unusual in it's nature)				1704.13
N. Smoke Control Systems (Ductwork)				1704.14
O. Special Inspections for Seismic Resistance: Applicable to specific structures, systems and components (Seismic Category C, D, E, F) **				**1707**
1. Structural steel (welding).	X		AISC 341	1707.2
2. Structural wood.	X	X		1707.3

3. Cold-formed steel framing.		X		1707.4
4. Pier Foundations a. During placement of reinforcement. b. During placement of concrete.	X	X		1707.5
5. Storage racks & access floors.		X		1707.6
6. Architectural components.		X		1707.7
7. Mechanical & electrical components.		X		1707.8
8. Designated seismic system verifications.				1707.9, 1708.5
9. Seismic isolation system.		X		1707.10
P. Structural Testing for Seismic Resistance: Applicable to specific structures, systems and components. (Seismic Category C, D, E, F) **				**1708**
1. Testing and verification of masonry materials and assemblies. (Level 1, 2 or 3)				1708.1
2. Testing for seismic resistance.				1708.2
3. Reinforcing and prestressing steel.			ACI 318, ACI 318:3.5.2	1708.3,
4. Structural steel.			AISC 341; AWS D1.1, ASTM A435, A898	1708.4
5. Mechanical & electrical equipment.				1708.5
6. Seismically isolated structures.			Section 17.8 ASCE 7	1708.6
INSPECTION AND TESTING (Continuous & Periodic is as defined by the BCNYS)	**CONTINUOUS**	**PERIODIC**	**REFERENCE STANDARD**	**BCNYS REFERENCE**
Q. Structural Observations: Applicable to specific structures. (Seismic Category C, D, E, F) **				**1709**
R. Design Strengths of Materials			All design strengths and permissible stresses of any structural materials shall conform to the specifications and methods of design of accepted engineering practice or the approved rules in the absence of applicable standards.	1710.1
a. New Materials			For materials that are not specifically provided for in this code, the design strengths and permissible stresses shall be established by tests as provided for in Section 1711.	1710.2; 1711
S. Alternative Test Procedures			Provide duly authenticated reports from approved agencies in respect to the quality & manner of use of new materials or assemblies as provided for in Section 104.11. Costs of all tests and other investigations required under the provisions of this code shall be borne by the Owner.	1711.1
T. Test Safe Load				1712.1
U. In-Situ Load Tests (Completed Building or Structure)				1713.1, NYSBC

				Chapter 35
V. Preconstruction Load Tests (Structural Adequacy)				**1714**, NYSBC Chapter 35
a. Load Test Procedures specified				1714.2
b. Load Test Procedures not specified				1714.3
c. Wall and partition assemblies				1714.4
d. Exterior window & door assemblies				1714.5
e. Test Specimens				1714.6
W. Material & Test Standards				**1715**
a. Joist Hangers & Connectors				1715.1
b. Concrete and Clay Roof Tiles				1715.2
X. Misc.				
1. Fire Resistant Penetrations & Joints Fire Stops Testing for Smoke Control		X	Ch.7 ASTM E119 UL 263	1705.17 1705.18
Y. Other (List)				
End				

**** - For Seismic Classification, see Code Analysis located within the Construction Drawings.**
Note: For projects utilizing a Construction Manager, the Construction Manager's involvement with Special Inspections and Testing shall be limited to documenting, witnessing, acquiring and filing copies of all reports prepared by the Special Inspectors and testing agencies, and sequentially transmitting copies of the reports to the Architect and the Owner. All reports shall be prepared and certified by the Special Inspector and Testing Agency in accordance with criteria established by, and in a format approved by, the Architect/Engineer, in complete conformance with the requirements of BCNYS Chapter 17, Section 1704. Where no Construction Manager is retained, coordination and documentation of tests shall be the sole responsibility of the Prime Contractor responsible for the work being tested, in conjunction with the testing agency's Special Inspector.

1.24 QUALITY ASSURANCE FOR WIND REQUIREMENTS

A. Each of the main wind force-resisting systems that are identified within the construction documents are subject to special inspections and testing, in accordance with Section 1704 and other applicable sections of the Building Code of New York State.

B. Wind force-resisting systems include the following; (refer to construction documents for more specific information concerning systems contained within a specific project.)

1. Roof cladding and roof framing connections;

2. Wall connections to roof and floor diaphragms and framing.

3. Roof and floor diaphragm systems, including collectors, drag struts and boundary systems.

4. Vertical windforce-resisting systems, including braced frames, moment frames and shear walls.

5. Windforce-resisting system connections to the foundation.

6. Fabrication and installation of components and assemblies required to meet the impact resistance requirements of Section 1609.1.4 of the *BCNYS*.

Exception: Fabrication of manufactured components and assemblies that have a label indicating compliance with the wind-load and impact-resistance requirements of the *BCNYS*.

C. Special inspections and testing, observations, frequency and distribution of reports shall be as indicated within other areas of this section.

D. Contractor Responsibility: Each contractor responsible for the construction of a main wind force-resisting component listed in the quality assurance plan shall submit a written contractor's statement of responsibility to the code enforcement official and to the Owner prior to the commencement of work on the system or component. The contractor's statement of responsibility shall contain the following:

1. Acknowledgement of awareness of the special requirements contained in the quality assurance plan;

2. Acknowledgement that control will be exercised to obtain conformance with the construction documents approved by the code enforcement official;

3. Procedures for exercising control within the contractor's organization, the method and frequency of reporting, and the distribution of the reports;

4. Identification and qualifications of the person(s) exercising such control and their position(s) in the organization.

1.25 SPECIAL INSPECTIONS FOR SEISMIC RESISTANCE (Section 1707 of *BCNYS*)

A. Special Inspections for Seismic Resistance: Special inspection as specified herein is required for the following, where required in Section 1704.1 of *BCNYS*. Special inspections itemized in Sections 1707.2 through 1707.8 of the *BCNYS* are required for the following:

B. The seismic-force-resisting systems in structures assigned to Seismic Design Category C, D, E or F, as determined in Section 1616 of the *BCNYS*.

C. Designated seismic systems in structures assigned to Seismic Design Category D, E or F.

D. Architectural, mechanical and electrical components in structures assigned to Seismic Design Category C, D, E or F that are required in Sections 1707.6 and 1707.7 of the *BCNYS*.

E. For Seismic Classification specific to this project, see Code Analysis located within the Construction Drawings.

PART 2 – PRODUCTS – (NOT APPLICABLE)

PART 3 - EXECUTION

3.01 REPAIR AND PROTECTION

A. General: Upon completion of inspection, testing, sample-taking and similar services performed on Work, repair damaged work and restore substrates and finishes to eliminate deficiencies including defects in visual qualities of exposed finishes. Except as otherwise indicated, comply with the requirements of the "Cutting and Patching" specification. Protect work exposed by or for service

activities and protect repaired work. Repair and protection is the Contractor's responsibility, regardless of assignment of responsibility for inspection, testing or similar service.

END OF SECTION

DIVISION 01 – GENERAL REQUIREMENTS

SECTION 014529 – TESTING LABORATORY SERVICE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to Work of this Section.

1.02 SUMMARY

A. The Owner will pay for services of the independent testing laboratory. Source of services as well as payment and rates of payments will be as directed by the Owner's Representative. Testing specified in the Project Manual shall be performed at a minimum. Construction Manager or Architect may request additional testing which will be compensated as agreed upon between the parties.

B. Inspections and testing required by laws, ordinances, rules, regulations, or order of public authorities and General Conditions.

C. Certification of products and mill test reports: Respective Specification Sections.

D. Test, adjust, and balance of equipment.

E. Inspection, sampling, and testing: Soils, asphalt, concrete, steel, masonry, mortar, and grout, etc. and specified elsewhere.

F. Inspections, test, and related actions specified in this section and elsewhere in Contract Documents are not intended to limit contractor's quality control procedures, which facilitate compliance with requirements of Contract Documents.

G. Related work specified elsewhere:

1. Refer to Section 014523 – Tests, Inspections, and Special Inspections.

1.03 QUALIFICATIONS OF LABORATORY AND SUBMITTALS

A. Meet requirements of ASTM E329, current edition "Standards of Recommended Practice for inspection and testing Agencies for Concrete, Steel, and Bituminous Materials as used in Construction".

1. The term "agency" as used in Section 4 of ASTM E329 shall mean the local or closest office of said agency.

B. Laboratory qualifications for inspection, sampling, and testing of soils and aggregates shall be comparable to the requirements of ASTM E329.

C. Testing Equipment

1. Calibrated at maximum 12-month intervals by devices of accuracy. Traceable to either:

a. National Bureau of Standards

b. Accepted Values of Natural Physical Constants.

c. Submit copy of Certificate of Calibration, made by accredited calibration agency.

D. Submit documentation of specified requirements. Submit 2 copies to the Owner's Representative.

E. All testing and inspection performed by the testing laboratory shall be under the direct supervision of a Professional Engineer licensed in the state of the construction activities. This Professional Engineer shall submit a letter certifying that all testing services are in conformance with the standards and specifications as specified in these Contract Documents. The letter shall also certify that all tested and inspected items and procedures conform to the Contract Documents, except where specifically noted on the inspection reports.

F. All inspectors shall have at least one (1) year of experience performing the type of inspections to be performed on this project. Qualifications and experience of proposed inspectors shall be submitted to the architect for approval prior to the beginning of any testing.

1.04 QUALIFICATION OF SPECIAL INSPECTOR

A. The special inspector must have the expertise necessary to ensure compliance with the approved Construction Documents and referenced standards.

B. The special inspector, if an individual, should be a registered Structural Engineer or Professional Engineer specializing in structural engineering. If the special inspector is an agency, the agency should be under the responsible direction of a registered Structural Engineer or Professional Engineer specializing in Structural Engineering.

C. Special inspector qualifications (New York State Department of State, Technical Bulletin January 2003).

1. Reinforced Concrete: New York State Licensed Professional Engineer (PE) with relevant experience.

2. Prestressed Concrete: Pre-tension tendons and post-tension tendons: PE with relevant experience.

3. Welding: Current AWS Certified Welding Inspector.

4. High Strength Bolting and Steel Frame Inspection: PE with relevant experience.

5. Masonry: Current ICC Structural Masonry Certification and one (1) year relevant experience.

6. Sprayed Fire Resistant Materials: PE with relevant experience.

7. Excavation and Filling; Verification of Soils and Bearing, Piling and Drilled Piers, Modular Retaining Walls and Related Geotech: PE with relevant experience.

8. Inspection of Fabricators: Bar joist, metal building and structural steel – see welding requirements.

9. Exterior and Interior Architectural Wall Panels: PE with relevant experience.

10. Exterior Insulation and Finish Systems: New York State Registered or Licensed Design Professional.

11. Smoke Control: Expertise in fire-protection engineering, mechanical engineering, and

certification as air balancers.

12. Seismic Resistance: Refer to the applicable categories of this list.

NOTE: The list includes the word 'relevant' to describe experience for persons not holding formal certifications.

1.05 LABORATORY RESPONSIBILITIES, LIMITATIONS OF AUTHORITY

A. Provide qualified personnel promptly on notice.

B. Perform special inspections, sampling, and testing of materials and methods of construction.

1. Comply with specified standards; ASTM, other recognized authorities and as specified.

2. Ascertain compliance with requirements of Contract Documents.

C. Promptly notify Architect, Construction Manager, and Contractor of irregularities in the work to be performed in accordance with the Construction Documents and deficiencies of work performed which are observed during performance of services.

D. Promptly submit two (2) copies to the Construction Manager (one (1) to be turned over to Owner), two (2) copies directly to the Architect/Engineer and one (1) to the Contractor of reports of inspections and test, including the following information, as applicable:

1. Date issued.

2. Project title and number.

3. Testing laboratory name and address.

4. Name and signature of field inspector.

5. Date of inspection or sampling.

6. Record of temperature and weather.

7. Name and signature of laboratory inspector.

8. Identification of product and specification section.

9. Location in project.

10. Designation of the work and test method.

11. Observations regarding compliance with Contract Documents.

12. Complete inspection or test data.

13. Test results and interpretation of test results.

14. Recommendation on retesting.

E. Laboratory is not authorized to:

1. Release, revoke, alter, or enlarge on requirements of contract documents.

2. Approve or accept portion of work.

3. Perform duties of the Contractor.

1.06 INSPECTOR RESPONSIBILITIES

A. Notify the contractor of their presence and responsibilities at the job site.

B. Observe assigned work. The inspector shall inspect all work for which they are responsible for conformance with the plans and specifications. Perform inspection in a timely manner to avoid delay of work.

C. Report non-conforming items. Inspector shall bring all nonconforming items to the immediate attention of the contractor for correction. If any such item is not resolved in a timely manner or is about to be incorporated into the work, the Construction Manager and the Architect shall be notified immediately, and the item noted in the inspector's written report. The inspector shall write a separate report to be posted at the job site regarding noted discrepancies that should contain, as a minimum, the following information about each nonconforming item:

1. Description and exact location.
2. Reference to applicable plan sheets, details and specifications.
3. Resolution of corrective action taken and the date.

D. Provide timely reports. The Inspector shall complete written inspection reports for each visit to the site. These reports shall be organized on a daily format and will be submitted to the Construction Manager, Architect, and Contractor at the approved times and frequency. In the reports the inspector should:

1. Describe inspections and tests made, with applicable locations.

2. Indicate how nonconforming items are to be or were resolved.

3. List unresolved items, parties notified, time and method of notification.

4. Itemize changes authorized by the Architect.

E. Submit final report. Inspector shall submit a final, signed report to the Construction Manager and Architect stating that all items requiring inspection and testing were fulfilled and reported, and to the best of their knowledge, in conformance with the approved plans and specifications. Items not in conformance, unresolved items, or any discrepancies in inspection coverage (i.e., missed inspections, periodic inspection when continuous inspection was required, etc.) should be specifically itemized in this report.

1.07 CONTRACTOR'S RESPONSIBILITIES

A. Contractor shall coordinate with independent testing agency performing inspections, tests, and quality control services.

1. Construction Manager will schedule services of independent testing to agency to perform services so specified.

B. Retest Responsibility: Where results of required inspection, test, or similar service are unsatisfactory (do not indicate compliance of related work with requirements of Contract Documents), retests are the responsibility of the Contractor. Retesting of work revised or replaced by the Contractor is the Contractor's responsibility, where required tests are performed on original

work. Retesting shall be performed by testing laboratory as directed by Construction Manager.

C. Responsibility of Associated Services: Contractor is required to cooperate with independent agencies performing required inspections, tests, and similar services. Provide auxiliary services as reasonably requested, including access to work, the taking of samples or assistance with the taking of samples, delivery of samples to test laboratories, and security and protection for samples and test equipment at project site.

D. Coordination: Contractor and each engaged independent agency performing inspections, tests, and similar services for project are required to coordinate and sequence activities so as to accommodate required services with minimum delay of work and without the need for removal/replacement of work to accommodate inspections and tests. Notify Construction Manager as required for all scheduling of times for inspections, test, taking of samples, and similar activities are contractor's responsibility.

PART 2 - MATERIALS

NOT APPLICABLE

PART 3 - EXECUTION

NOT APPLICABLE

END OF SECTION

SECTION 01 50 00

TEMPORARY FACILITIES & CONTROLS

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes requirements for temporary facilities and controls, including temporary utilities, support facilities, and security and protection.

B. Temporary utilities include, but are not limited to, the following:

1. Portable Chemical Toilet Facilities.
2. Dumpsters.
3. Temporary Electric Power.
4. Temporary Lighting.
5. Water service and distribution.
6. Temporary heat.
7. Temporary Barricades.
8. Temporary Storm Drainage.
9. Temporary Staging Area, Access Roads, Site Signage, and Site Fence
10. Building and Site Maintenance
11. Temporary Fire Extinguishers and Signage for Building Construction:

C. Support facilities include, but are not limited to, the following:

1. Field offices and storage sheds.
2. Architects/Engineers field office.
3. Telecommunication service.
4. Dewatering facilities and drains.
5. Temporary enclosures.
6. Hoists and temporary elevator use.
7. Rodent and pest control.
8. Construction aids and miscellaneous services and facilities.

D. Security and protection facilities include, but are not limited to, the following:

1. Environmental protection.

2. Tree and plant protection.

3. Pest control.

4. Security enclosure and lockup.

1.2 DIVISION OF RESPONSIBILITIES

A. General: Each prime contractor is specifically assigned certain responsibilities for temporary services and facilities to be used by other prime contractors, and other nonprime contractors and separate entities at the site, Owner's workforces, Construction Manager, Architect, testing agencies, personnel of governing authorities, and personnel authorized to be at project site during contract time.

1.3 USE CHARGES

A. General: Cost or use charges for temporary facilities are not chargeable to the Owner or the Architect. The Architect will not accept a prime contractor's cost or use charges for temporary services or facilities as a basis of claim for an adjustment in the Contract Sum or the Contract Time.

B. Water Service: Use water from the Owner's existing water system (when available) without metering and without payment of use charges. Access to water shall be designated by the Owner. If existing water supply system is not available, then provide water tanks as required and fill with potable water to supply the Temporary Water Distribution System.

C. Electric Power Service:

1. Use of electric power from the Owner's permanent power system (when available) will be granted to all prime contractors without payment of use charges. Temporary Heating shall not use electricity as primary heat source.

2. Use of electric power from Electrical Utility shall be paid for by the Owner when Owner's permanent power system is not available.

1.4 SUBMITTALS

A. Temporary Utilities: The prime contractor shall submit reports of tests, inspections, meter readings, and similar procedures performed on temporary utilities.

B. Implementation and Termination Schedule: Within 15 days of the date established for submittal of the Contractor's Construction Schedule, each prime contractor shall submit a schedule indicating implementation and termination of each temporary utility for which the Contractor is responsible.

C. Temporary Signage: Provide shop drawings, indicating the size and layout of the signs, color choices for Owner selection and installation details.

D. Submit Product Data and Shop Drawings of Proposed Temporary Facilities.

1.5 QUALITY ASSURANCE

A. Regulations: The prime contractor shall comply with industry standards and with applicable laws and regulations of authorities having jurisdiction including, but not limited to, the following:

1. Building code requirements.

2. Health and safety regulations.

3. Utility company regulations.

4. Police, fire department and rescue squad rules.

5. Environmental protection regulations.

B. Standards: The prime contractor shall comply with NFPA 241 "Standard for Safeguarding Construction, Alterations, and Demolition Operations," ANSI-A10 Series standards for "Safety Requirements for Construction and Demolition," and NECA Electrical Design Library "Temporary Electrical Facilities."

1. Local custom and trade union jurisdictional settlements do not control the scope of work included in each prime contract.

2. Electrical Service: Comply with NEMA, NECA and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

C. Inspections: Arrange for authorities having jurisdiction to inspect and test each temporary utility before use. Obtain required certifications and permits.

1.6 PROJECT CONDITIONS

A. Temporary Utilities: The prime contractor shall prepare a schedule indicating dates for implementation and termination of each temporary utility for which the Contractor is responsible. At the earliest feasible time, when acceptable to the Owner, change over from use of temporary service to use of permanent service.

1. Temporary Use of Permanent Facilities: The Installer of each permanent service shall assume responsibility for its operation, maintenance, and protection during use as a construction facility prior to the Owner's acceptance, regardless of previously assigned responsibilities.

B. Conditions of Use: Keep temporary services and facilities clean and neat in appearance. Operate in a safe and efficient manner. Relocate temporary services and facilities as the Work progresses. Do not overload facilities or permit them to interfere with progress. Take necessary fire-prevention measures. Do not allow hazardous, dangerous, or unsanitary conditions, or public nuisances to develop or persist on-site.

PART 2 PRODUCTS

2.1 MATERIALS

A. General: The prime contractor shall provide new materials. If acceptable to the Architect, undamaged, previously used materials in serviceable condition may be used. Provide materials suitable for use intended.

B. Lumber and Plywood:

1. For job-built temporary offices, shops, and sheds within the construction area, provide UL-labeled, fire-treated lumber and plywood for framing, sheathing, and siding.

2. For signs and directory boards, provide exterior-type, Grade B-B high-density concrete form overlay plywood of sizes and thicknesses indicated.

3. For fences and vision barriers, provide minimum 3/8-inch- thick exterior plywood.

4. For safety barriers, sidewalk bridges, and similar uses, provide minimum 5/8-inch-thick exterior plywood.

C. Insulation: Unfaced mineral-fiber blanket manufactured from glass, slag wool, or rock wool; with maximum flame spread and smoke developed indices of 25 and 50, respectively.

D. Gypsum Wallboard: Provide gypsum Type X wallboard on interior walls of temporary barricades or partitions.

E. Roofing Materials: Provide UL Class A standard-weight asphalt shingles or UL Class C mineral-surfaced roll roofing on roofs of job-built temporary offices, shops, and sheds.

F. Paint: Comply with requirements of Division 9 Section "Painting."

1. For job-built temporary offices, shops, sheds, fences, and other exposed lumber and plywood, provide exterior-grade acrylic-latex emulsion over exterior primer.

2. For sign panels and applied graphics, provide exterior-grade alkyd gloss enamel over exterior primer.

3. For interior walls, provide 2 coats interior latex eggshell wall paint.

G. Tarpaulins: Provide waterproof, fire-resistant, UL-labeled tarpaulins with flame-spread rating of 15 or less. For temporary enclosures, provide translucent, nylon-reinforced, laminated polyethylene or polyvinyl chloride, fire-retardant tarpaulins.

H. Water: Provide potable water approved by local health authorities.

I. Open-Mesh Fencing: Provide 0.12-inch- thick, galvanized 2-inch chain-link fabric fencing 8 feet high with galvanized barbed-wire top strand and galvanized steel pipe posts, 1-1/2 inches I.D. for line posts and 2-1/2 inches I.D. for corner posts.

2.2 EQUIPMENT

A. General: The prime contractor shall provide new equipment. If acceptable to the Architect, undamaged, previously used equipment in serviceable condition may be used. Provide equipment suitable for use intended.

B. Water Hoses: Provide 3/4-inch heavy-duty, abrasion-resistant, flexible rubber hoses 100 feet long, with pressure rating greater than the maximum pressure of the water distribution system. Provide adjustable shutoff nozzles at hose discharge.

C. Electrical Outlets: Provide properly configured, NEMA-polarized outlets to prevent insertion of 110- to 120-V plugs into higher voltage outlets. Provide 20AMP Quad receptacle outlets equipped with ground-fault circuit interrupters, reset button, and pilot light for connection of power tools and equipment. Each Quad Outlet to be connected to Temporary Electric Panel(s) with dedicated 20 Amp Circuits.

D. Electrical Power Cords: Provide grounded extension cords. Use hard-service cords where exposed to abrasion and traffic. Provide waterproof connectors to connect separate lengths of electric cords if single lengths will not reach areas where construction activities are in progress. Do not exceed safe length-voltage ratio.

E. Lamps and Light Fixtures: Provide service lamps of wattage required for adequate illumination per OSHA requirements. Provide guard cages or tempered-glass enclosures, when exposed to breakage. Provide lamps suitable for exterior conditions when lamps are exposed to exterior conditions or moisture.

F. Heating Units: Provide temporary heating units that have been tested and labeled by UL, FM, or another recognized trade association related to the type of fuel being consumed.

1. The use of indirect fired source heaters (Heat source placed outside the building, ducted into the building) shall be the primary source of temporary heat.

2. Use of gasoline-burning space heaters, direct fire, open flame, or salamander-type heating units is prohibited. Temporary heating sources utilizing electric power as energy source, shall not be used on this project.

G. Temporary Offices: Each contractor shall provide its own prefabricated or mobile units or similar job-built construction with lockable entrances, operable windows, and serviceable finishes. Provide heated and air-conditioned units on foundations adequate for normal loading.

H. Temporary Toilet Units: Provide self-contained, single-occupant toilet units of the chemical, aerated recirculation, or combustion type. Provide units properly vented and fully enclosed with a glass-fiber-reinforced polyester shell or similar nonabsorbent material.

I. Fire Extinguishers: Provide hand-carried, portable, UL-rated, Class A fire extinguishers for temporary offices and similar spaces. In other locations, provide hand-carried, portable, UL-rated, Class ABC, dry-chemical extinguishers, or a combination of extinguishers of NFPA-recommended classes for the exposures.

1. Comply with NFPA 10 and NFPA 241 for classification, extinguishing agent, and size required by location and class of fire exposure.

PART 3 EXECUTION

3.1 TEMPORARY FACILITIES RESPONSIBILITIES - DESIGNATED IN 011200 MULTIPLE CONTRACT SUMMARY.

See 011200 – Multiple Contract Summary for designated Contractor responsibility of temporary facilities indicated below.

1. Temporary Portable Chemical Toilet Facilities

a. Temporary Portable Chemical Toilet Facilities shall comply with regulations, CDC guidelines, and health codes for type, location, operation, and maintenance of fixtures and facilities.

b. Provide enough portable toilet facilities in suitable quantity to service all workers who are to utilize facilities.

c. Provide Portable Toilet Facility at Staging area and areas near building.
d. Provide enough portable toilet facilities in suitable quantity to service all workers who are to utilize facilities.

e. Provide toilet tissue, paper towels, paper cups, hand sanitizer, and similar disposable materials for each facility. Provide covered waste containers for used material.

f. Provide separate facilities for male and female personnel.

g. Provide portable handwash sink(s) with soap dispensers and paper towels.

h. Provide at minimum (1) portable handwash sink at staging area.
i. Install Portable Toilets and Portable Sinks. where facilities will best serve the Project's needs.

j. Replenish consumable materials as utilized. Provide cleaning of facilities when required.

k. Contractors are to not use owner’s existing restrooms or facilities.

2. Dumpsters:

a. Dumpsters are to be provided as needed to dispose of all materials needing to be removed from the building/site and waste materials associated with the new building/site work indicated on milestone schedule or when complete with their own work (whichever occurs later).

b. Dispose of materials lawfully.
c. Waste disposal facilities, including collection and legal disposal of its own hazardous, dangerous, unsanitary, or other harmful waste materials will be by the contractor designated responsible for removing the hazardous waste.
d. Surfaces/Pavement below dumpsters are to be protected and restored.

3. Temporary Electric Power Service:

a. **Temporary Electric Power Service** shall consist of main power hook-up and panel board for the new building and site. Temporary service shall be maintained during all workdays and shall comply with all codes and regulations. System shall be modified as required or as directed by the Construction Manager as work progresses.
b. Obtain temporary service from existing building service or local power pole. If practical, power to each location shall be tapped at transformer vault or main distribution panel, ahead of main breakers to minimize demand on service equipment from operations. Over-current protection shall be installed as required. Provide disconnect at connection to service.
c. The Contractor shall pay all fees to Utility Company for Temporary Electric Power Service Connection when an existing Power Source is not indicated to already be available for connection in the Contract Documents.
d. Minimum power characteristics: 240/120-volt, single phase.
e. Provide distribution equipment, feeders, and branch circuit panelboards to serve:
    1) **Temporary Lighting Service**.
    2) Temporary convenience receptacles.
        a) Quad 20AMP 120V Outlet boxes to allow for 25' extension cord with walls in place; enough to accommodate requirements of the entire building.
    3) To accommodate construction operations requiring power, use of power tools, and start up testing of permanent electric powered equipment prior to its permanent connection to electrical system.

b) Each Contractor shall provide his own extension lines, and other special equipment. Welding equipment shall run from generator trucks. Any specialty high voltage/amperage power required beyond what's provided by under the Temporary Electric Power Service is to be provided by the contractor requiring the specialty power.
c) The Contractor shall be responsible for initial connections and final demolition of all temporary fixtures and wiring at direction of the Construction Manager.
d) Provide Electric Service and connection to Trailers as shown on Staging and Logistics Plans. Each Trailer to receive 100 AMP Service.
e) For additional Trailers not indicated on Staging and Logistics plan, each Contractor will be responsible for hookup of their own project trailers by a

licensed electrician to existing service or temporary electric panel provided per Staging Area and Logistics Plan if indicated for Contractor Trailer Power. The Contractor shall erect poles safely and sufficient for site overhead power and telephone service. The Contractor shall disconnect all items and restore damaged areas upon project completion. If abused, power from temporary service will be disconnected.

4. **Temporary Lighting Service**:
   a) When an overhead floor or roof deck has been installed obstructing daylight from overhead, the Contractor shall provide temporary lighting with local switching suitable for exterior weather conditions within the building under the roof deck prior to building weathertight roof enclosure.
   b) Temporary lighting shall be maintained in accordance with OSHA standards for power and foot candle levels in all areas, rooms, and corridors while workers occupy the space. Temporary lighting shall be controlled by time clocks and lighting contactors; settings to be coordinated by the Construction Manager.
   c) Additional lighting beyond OSHA standards for specialty work is to be provided by **each contractor** performing specialty work requiring the additional lighting.
   d) As ceilings are installed, the Contractor is to move temporary lights as needed to maintain lighting in all work areas during working hours.
   e) Security lighting for building exteriors shall be continuously operational and maintained. The Contractor shall provide a minimum of (6) exterior temporary site lights at 10,000 Lumen each, ***ON SITE TO BE LOCATED by CM.***
   f) Temporary Site Lighting: The Contractor is to maintain existing exterior lighting to adequately light the entrances and exits of project site.
   g) Temporary lighting shall be controlled by time clocks and lighting contactors; settings to be coordinated by the Construction Manager.
5. **Temporary Water Service**:
   a) If existing water service is available by Owner, the Contractor shall provide and maintain temporary water service from Owner existing water source.
   b) If existing water service is not available, then the Contractor designated as responsible for the Temporary Water service shall supply potable water tank(s). The Contractor shall refill water tank(s) with potable water as other contractors utilize the supplied water until final water service is installed.
   c) Provide distribution piping of sizes and pressures adequate for construction and hose bibs on site as to provide service to all areas of construction activities as required throughout the construction period. (Allow for 50’ water extension hose to work areas.)
   d) **Each Contractor** shall provide temporary water as needed for their own work until Temporary Water Service is installed.
   e) Water service shall be potable and modified as required or as directed by the Construction Manager as work progresses.
   f) Sterilization: Sterilize temporary water piping.
   g) Wash Facilities: Install wash facilities supplied with potable water at convenient locations for personnel who handle materials that require wash up. Dispose of drainage properly.

6. **Winter Conditions and Temporary Heating Service:**
   a) Not Applicable for this Project.
7. **Temporary Barricades and Building Signage:**
   a) Provide Temporary lockable entrances / doorways and exits to the building, which is to be furnished, installed, and maintained.
      1) Exits shall be maintained for exiting in emergency conditions which include doors with lockable panic hardware and closers until permanent structures are in place. Maintain Doorways throughout construction to ensure all hardware functions, and closers automatically close doors.
      2) Provide copies of keys to Owner, Construction Manager, and each Contractor for temporary Doors.
      3) Provide copies of keys to Owner, Construction Manager, and each Contractor for temporary Doors.
   b) Provide Temporary Interior/Exterior Partitions, which shall be at minimum fire rated 1-hour constructed of: metal stud framing, acoustic insulation, sealant.
      1) For interior partitions utilize painted gypsum. For Exterior Partitions, utilize painted 5/8" Fire Retardant Plywood.
      2) Provide sealant of all seams to prevent migration of dust.
      3) Adjust and Reinstall Ceiling as required at Temporary Partitions for a finished appearance from the occupied side of partition.
      4) Temporary interior partitions and interior doorways shall be provided to separate construction areas from occupied areas.
   c) The Construction Manager may direct the **Contractor** to install and maintain Temporary Plastic Sheeting Partitions as needed to separate the construction areas from the occupied areas at no additional cost.
   d) Additional Temporary Barricades may be required due to delay of substantial completion for owner's use of section(s) of building(s) and are to be provided contractor responsible for the delay.
   e) The Contractor shall provide and maintain OSHA Minimum perimeter and stairwell barricades/railings at grade changes, multiple levels, and floor/roof openings.
      1) Provide Top & Mid railings, and Toe boards per OSHA requirements.
      2) Install posts as required to support railings.
      3) Provide fluorescent ribbons to accent floor/roof openings.
      4) If a Contractor should need to temporarily relocate barrier, same Contractor shall protect personnel in the area and replace barrier to original location.
   f. Each Contractor that creates any opening shall provide Temporary Opening Infills and Coverings including insulation and other materials required for weathertightness. Temporary Opening Infills and Coverings are to meet Structural requirements as per OSHA guidelines and are to be weathertight to allow building to remaining enclosed.
   g. Provide Temporary Sealed, Weathertight and Insulated Infills at new Window/Door openings until new Windows and Doors are installed to maintain building enclosure.

h. Provide Temporary Emergency Exit Signage within the new building to direct personnel to nearest emergency exits. Provide at all exits, stairwells, and areas where exit signs cannot be seen.

i. Provide Project Identification Signage at Building Entrance (Indicate Contact Names and Phone numbers of all Contractor, Construction Manager, and Owner Contacts.)

j. Restore all surfaces after removal of Temporary Barricades.

8. **Temporary Building Storm Drainage:**

a. Not Applicable for this Project, new buildings only.

9. **Temporary Staging Area, Access Roads, Site Signage, and Site Fence:**
   a. The Contractor shall provide construction of the temporary staging area, access roads, stabilized construction entrances, temporary site signage, and temporary construction fence as indicated on the Staging and Logistics Plans.
   b. Maintain and restore staging area and access roads that are disturbed throughout construction.
   c. Remove all temporary materials and restore all areas at completion of project.
   d. The Contractor responsible for Site Work (Site Contractor) shall maintain access roads for suitable parking areas as indicated on Site Logistics plans.
      1) Re-grade, re-seed and restore any areas disturbed by parking/staging.
      2) Parking Areas: Includes contractors' employees and construction vehicle parking. Minimum of 6" reference Item. #304.3 course installed over geotextile fabric.
      3) Temporary parking by construction personnel shall be allowed only in areas designated.
   e. Access Roads: Includes access roads for delivery through staging area to building work areas, and to equipment and storage areas and sheds. Minimum of 9" reference Item. #304.3 course installed over geotextile fabric.
      1) Stabilized Construction entrances: Minimum 6" Thick, 50FT Length x 24' Width, 2" Stone over geotextile fabric/filter cloth. Extend width of entrance to 32' width where entrance meets existing pavement to allow turning radius of vehicles pathway.
      2) Remove temporary paving not intended for or acceptable for integration into permanent paving. Where the area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil in the area. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at the temporary entrances, as required by the governing authority.
   f. Construction Fence: Provide Construction fence with lockable entrance gates. Locate where indicated or enclose the entire site or the portion determined sufficient to accommodate construction operations or as indicated on Staging Area and Logistics Plan. Install in a manner that will prevent people, dogs, and other animals from easily entering the site, except by the entrance gates.
      1) Provide at Construction Fence: open-mesh, 8-foot-high chain-link fencing with posts at 8-feet on center, set in a compacted mixture of gravel and earth.
         a) Provide movable fence panels with sandbags and fence clamps to prevent tampering with fence when required in areas that require adjustment during construction as approved by Construction Manager.

2) Provide maintenance of Temporary Construction Fence as disturbed throughout construction to ensure site and staging area security is maintained and all gates remain operational.
3) Provide minimum of (2) 4' man gate, and (3) 20' hinged double swing access gates. Each gate is to have a chain and padlock. Adjust gate hinges to prevent gating from dragging on surface.
4) Provide keys for each lock to the Construction Manager, Owner, and to each Contractor.

g. Temporary Site Signage: The Contractor shall provide all temporary Construction Signage, temporary traffic controls at junction of temporary roads with public roads.
1) Engage an experienced sign painter to apply graphics. Comply with details indicated.
2) Include warning signs for public traffic and "STOP" signs for entrance onto public roads.
3) Comply with requirements of authorities having jurisdiction.
4) Engage an experienced sign painter to provide the following signs to be installed by the Contractor in compliance with signage requirements (install all directional signage at all intersections):
a) To direct visitors (as required to reach visitor area)
b) For construction parking (as required to reach parking area)
c) To direct deliveries (as required to reach material delivery area) (List each Contractor)
d) "Construction Site – Authorized Personnel Only" (Perimeter of Construction Fence 40' Intervals)
e) Project Identification Signage at Entrance of Site (Indicate Contact Names and Phone numbers of all Contractor, Construction Manager, and Owner Contacts.)

10. **Temporary Building & Temporary Site/Road Maintenance:**

a. Temporary Site and Road Maintenance:
1) Maintain and restore roads over the period of construction.
2) Road Cleaning: Maintain roads and walkways in an acceptably clean condition. This includes the removal of debris daily.
3) If required, provide a minimum of once-a-week road cleaning for debris/dust accumulated.
a) Road cleaning equipment to be wet/vacuum type. Contractor will clean the roads affected by all contract work. The Contractor will maintain roads until project completion.
4) Snow Plowing: Provide snow/ice removal to building entrances, temporary access roads, parking areas, staging area, portable toilets, and a 5' walkway to all office trailers.
5) Provide Water Mist facilities for Site Dust Control as required.

b. Temporary Building Sidewalk Maintenance:
1) Provide snow/ice removal at sidewalk areas and entrances adjacent to building, ice/snow removal inside the building areas, and roofing areas for scheduled work.
2) Protect areas from snow/ice removal and restore any damaged surfaces.

11. **Temporary Fire Extinguishers for Building Construction:**
    a. The Contractor shall provide, until fire-protection needs are supplied by permanent facilities, install, and maintain temporary fire-protection facilities of the types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 10, "Standard for Portable Fire Extinguishers," and NFPA 241, "Standard for Safeguarding Construction, Alterations, and Demolition Operations."
        1) Locate fire extinguishers where convenient and effective for their intended purpose, but not less than one extinguisher on each floor at or near each usable stairwell.
        2) Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire-protection facilities, stairways, and other access routes for fighting fires. Prohibit smoking in hazardous fire-exposure areas.
12. **Temporary Building Exhaust Ventilation for Dust Control:**
    a. The Contractor shall provide indoor air quality management as specified by the Department of Labor and OSHA for the building, when the building is enclosed, as determined by the Construction Manager.
        1) Provide an exhaust air system for the project indoor areas that could produce fumes, VOC's off-gasses, gases, dust, mist, or other emissions.
        2) Provide temporary partitions and air seals to prevent the migration of airborne contaminants from unoccupied areas to occupied areas when applicable.
        3) Maintain a negative pressure between the work area and the space surrounding the work area.
    b. Quality assurance:
        1) Before the start of any work, submit a Shop Drawing submittal for the exhaust air system. Do not begin work until approval of the Owner is obtained. The following shall be included in submittal:
            a) The type and number of Exhaust Machines required.
            b) Location of the Exhaust Machines in the workspace.
            c) Temporary Exhaust Ducting Layout, materials, and duct supports.
            d) Methods used to test air flow and pressure differential.
    c. System Operation:
        1) Provide a quantity of Filtered Exhaust Fan Machines sufficient for spaces served to obtain sufficient negative differential pressure. Utilize existing window openings, doorways, or other approved locations.
        2) Exhaust air system shall operate for a minimum of 72 hours after work is completed, or until all materials have cured sufficiently to stop out-gassing of fumes or odors and area has been ventilated to remove all detectable traces of odors and fumes.
        3) Maintain twenty-five (25) feet clearance from all temporary exhaust outlets to all active building outdoor air intakes.
        4) Secure all openings at the end of each day for Building Security.
        5) Replace air filters and repair ductwork as required.

3.2 TEMPORARY TELECOMMUNICATIONS SYSTEMS (TO BE PROVIDED BY ALL CONTRACTORS)

A. General: The Contractor shall engage the appropriate local telecommunication, internet service provider, or utility company to install temporary telecommunication service or connect to existing service. Where the company provides only part of the service, the contractor shall provide the remainder with matching, compatible materials, and equipment. Comply with utility company recommendations.

B. Temporary Telephones: Each Prime Contractor shall provide temporary telephone service throughout the construction period for all personnel engaged in construction activities.

1. Contractors are required to lease or purchase a cellular telephone – to be used by their site superintendents for communication with the other contractors and the Architect.

3.3 TEMPORARY FACILITIES INSTALLATION (TO BE PROVIDED BY ALL CONTRACTORS)

A. Use qualified personnel for installation of temporary facilities. Locate facilities where they will serve the Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required.

B. The prime contractor shall provide each facility ready for use when needed to avoid delays. Maintain and modify as required. Do not remove until facilities are no longer needed or are replaced by authorized use of complete permanent facilities.

3.4 SUPPORT FACILITIES INSTALLATION (TO BE PROVIDED BY ALL CONTRACTORS)

A. Locate field offices, storage sheds, sanitary facilities, and other temporary construction and support facilities for easy access as directed by the Construction Manager.

1. Maintain support facilities until near Substantial Completion. Remove prior to Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to the Owner.

B. Provide incombustible construction for offices, shops, and sheds located within the construction area or within 50 feet of building. Comply with requirements of NFPA 241.

C. Field Offices: Each prime contractor shall provide an insulated, weathertight temporary office of sufficient size to accommodate required office personnel at the Project Site. Keep the office clean and orderly for use for small meetings. Furnish and equip offices as follows:

1. Furniture: Furnish with a desk and chairs, a 2-drawer file cabinet, plan table, plan rack, and a bookcase.

D. Storage and Fabrication Sheds/Containers: Install storage and fabrication sheds/containers sized, furnished, and equipped to accommodate materials and equipment involved, including temporary utility service. Sheds may be open shelters or fully enclosed spaces within the building or elsewhere on-site. Flammable liquids are not to be stored in buildings at any time and to be stored in proper rated containers.

3.5 SECURITY AND PROTECTION FACILITIES INSTALLATION (TO BE PROVIDED BY ALL CONTRACTORS)

A. Operations of the Contractor may not block, hinder, impede, or otherwise inhibit the safe and expeditious exiting of the building's occupants during an emergency.

B. In the event of an emergency, (designated by the sounding of the fire alarm system) all construction activities must immediately cease. Contractor's work force will evacuate themselves from work areas and remain outside of work areas until the "all clear" is given. No work operations will be tolerated during the evacuation of the building or during an emergency.

C. Temporary Facility Changeover: Except for using permanent fire protection as soon as available, do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion, or longer, as requested by the Architect.

D. Building Security Enclosure and Lockup: Provide locking entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security.

1. Storage: Where materials and equipment must be stored, and are of value or attractive for theft, provide a secure lockup. Enforce discipline in connection with the installation and release of material to minimize the opportunity for theft and vandalism.

E. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations, and minimize the possibility that air, waterways, and subsoil might be contaminated or polluted or that other undesirable effects might result. Avoid using tools and equipment that produce harmful noise. Restrict use of noise-making tools and equipment to hours that will minimize complaints from people or firms near the site.

3.6 OPERATION, TERMINATION, AND REMOVAL (TO BE PROVIDED BY ALL CONTRACTORS)

A. Supervision: Enforce strict discipline in use of temporary facilities. Limit availability of temporary facilities to essential and intended uses to minimize waste and abuse.

B. Maintenance: Maintain facilities and good operating condition until removal. Protect from damage by freezing temperatures and similar elements.

1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.

2. Protection: Prevent water-filled piping from freezing. Maintain markers for underground lines. Protect from damage during excavation operations.

C. Termination and Removal: Unless the Construction Manager requests that it be maintained longer, remove each temporary facility when the need has ended, when replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with the temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are the property of each prime contractor. The Owner reserves the right to take possession of project identification signs.

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DIVISION 01 – GENERAL REQUIREMENTS

SECTION 016000 – PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.01 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.

1.02 SUMMARY

A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.

B. Related Sections:

1. Section 002113 – Instructions to Bidders
2. Section 004200 – Proposed Equivalent Form
3. Section 004300 – Proposed Substitution Form
4. Section 012300 – Alternates
5. Section 014219 – Applicable Standards

1.03 DEFINITIONS

A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," “assembly methods,” “manufacturer,” “brand,” “tradename,” or "system," and terms of similar intent.

1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.

2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.

3. “Or Equal” Product: Product that is demonstrated and approved through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

4. Reference to be approved equal or similar terms mean that approval of the Architect is required.

B. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.

C. Basis-of-Design Product Specification: A specification in which a specific manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of additional manufacturers named in the specification. If the Contractor chooses to furnish an alternately named manufacturer or product, a substitution request must be made in accordance with Section 002113 and Section 004300.

1.04 SUBMITTALS

A. “Or Equal” Product Requests: Submit request for consideration of each comparable product. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Include data to indicate compliance with the requirements specified in "Or Equal” Section 2.02 in this Specification.

2. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Architect will notify Contractor of approval or rejection of proposed comparable product request within 10 days of receipt of request, or 7 days of receipt of additional information or documentation, whichever is later.

a. Form of Approval: As specified in Section – 013300 – Submittal Procedures.

b. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.

B. Basis-of-Design Product Specification Submittal: Comply with requirements in Section – 013300 – Submittal Procedures. Show compliance with requirements.

1.05 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.

1. Each contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.

2. If a dispute arises between contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.

1.06 PROOF OF COMPLIANCE

A. Whenever the Contract Documents require that a product be in accordance with Federal Specifications, ASTM Designation, ANSI Specification, or other Association Standard, the Contractor shall present an affidavit from the manufacturer of a proposed product certifying that it complies therewith.

B. Where requested or specified, submit supporting test data to substantiate compliance.

1.07 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.

B. Delivery and Handling:

1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
2. 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.

3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.

C. Storage:

1. Store products to allow for inspection and measurement of quantity or counting of units.
2. Store materials in a manner that will not endanger Project structure.
3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
4. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather- protection requirements for storage.
6. Protect stored products from damage and liquids from freezing.
7. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

1.08 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.

2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.

1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
2. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
3. Refer to other Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Section 017000 – Contract Closeout.

PART 2 - PRODUCTS

2.01 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.

1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.

2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
4. Where products are accompanied by the term "as selected," Architect will make selection.
5. Where products are accompanied by the term “as selected,” sample to be matched is the Architect’s.
6. Where products are accompanied by the term “match existing,” sample to be matched is material adjacent.
7. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
8. Or Equal: For products specified by name and accompanied by the term "or equal," or "or approved equal," or "or approved," comply with requirements in "Or Equal” Section 2.02 in this Specification to obtain approval for use of an unnamed product.

B. Product Selection Procedures:

1. Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience may not be considered.
2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience may not be considered.
3. Products:

    a. Restricted List: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will be considered if requested and documentation is submitted to Architect/ Engineer for review as required elsewhere in these specifications.
    b. Nonrestricted List: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with requirements in "Or Equal Products" Section 2.02 for consideration of an unnamed product.

4. Manufactures:

    a. Restricted List: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will be considered if requested and documentation is submitted to Architect/ Engineer for review as required elsewhere in these specifications.
    b. Nonrestricted List: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed, or a product by an unnamed manufacturer, that complies with requirements. Comply with requirements in "Or Equal Products" Section 2.02 for consideration of an unnamed manufacturer's product.

5. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Or Equal Products" Section 2.02 for consideration of an unnamed product by one of the other named manufacturers.

C. Visual Matching Specification: Where Specifications require "match Architect's sample", provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.

1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Instructions to Bidders Section "Substitution Procedures" for proposal of product.

D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

1. Architect is permitted to require a custom color, at no charge to the Owner, when a standard or premium finish does not align with an existing color match or with the intent of the Architect's color palette selections.

2.02 "OR EQUAL" PRODUCTS

A. Conditions for Consideration: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with these requirements:

1. Evidence that the proposed product does not require revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
3. Evidence that proposed product provides specified warranty.
4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
5. Samples, if requested.

2.03 INCLUSION IN SPECIFICATION OF NON-SPECIFIED PRODUCTS

A. If a Contractor has based his bid upon products, materials, or items not specifically described or named in the specifications, he may be required, prior to Award of Contract, to submit the names, types, brand, or manufacturer of products included in his bid for the specified items.

B. Supporting data documenting wherein the proposed materials, products, or equipment may vary from those specified may be required and will be the responsibility of the Contractor.

C. The risk of whether bid equivalents will be accepted will be borne by the Contractor.

2.04 CONSIDERATION OF EQUIVALENTS AFTER AWARD OF CONTRACT

A. Equivalent products will be considered after Award of Contract if:

1. Previously accepted or specified product is not available because of strike, lock out, bankruptcy, or discontinuance of its manufacture.

2. Specified performance or guarantee cannot be attained in the Contractor's judgement.

B. Additional products, when submitted for consideration, must be accompanied by documentation attesting to the foregoing and establish equivalency in the judgement of the Architect, the burden of proof for which shall be the Contractors.

C. Request for product changes, other than equivalents, if accepted, shall be affected by Change Order.

PART 3 - EXECUTION

Not used

END OF SECTION

DIVISION 01 – GENERAL REQUIREMENTS

SECTION 017000 – CONTRACT CLOSEOUT

1.01 CONTENTS

1. Scope
2. Punch List and Final Inspection
3. Operations and Maintenance Instructions
4. Project Closeout Documents
5. Emergency Repairs
6. Contractor's Guarantee

1.02 SCOPE

A. Prior to the release of final accrued retainage monies, the Contractor shall comply with the procedures for closing out the Construction Contract and to effect the project's transition to the Owner as summarized herein below.

1.03 PUNCH LIST AND FINAL INSPECTION

A. Preparation of Punch List:

1. When the Contractor determines that the project is substantially complete, he shall prepare a "Punch List" of the last items to be completed or corrected and shall notify the Owner in writing through the Architect that the project will be ready for a final inspection on a definite date which shall be stated in such notice. Such notification shall be given at least ten (10) days prior to the date stated for final inspection.

2. It shall be noted here, and emphasized, that preparation of the "Punch List" is a responsibility of the Contractor and not the Architect. The Architect's sole role will be that of an observer to assure that the design intent is carried out, and as an administrator of the Construction Contract.

3. The Contractor’s failure to include an item of deficiency on the punch list issued to the Contractor shall not relieve the Contractor of its responsibility to perform its work in accordance with the Drawings and/or Specifications, and as such, the punchlist may be revised, updated, and/or reissued at any time.

B. Review and Substantial Completion:

1. The Architect will review the Contractor's "Unacceptable and Non-Conforming Work List / Punch List" and on the basis of his inspection will verify the condition of substantial completion and prepare the Certificate of Substantial Completion.

C. Completion and Final Inspection:

1. Written notice shall also be given to the Architect by the Contractor upon completion of any work which, on the above stated final inspection, was determined to be incomplete, incorrect, or unsatisfactory and not to the stage of substantial completion. On receipt of such notice, additional inspection(s) will be made until completion of all contract requirements are effected. If the Architect is required to inspect the Contractor’s work more than twice, the Contractor shall be liable to the Owner for the services performed by the Architect as a result of additional inspections.

2. The final inspection is intended to be a last review to determine that the work included in the contract has indeed been executed in accordance with all of the Contract Documents. Requests to render a final inspection of an incomplete building or to prepare the Contractor's "Punch List" will not be honored.

1.04 OPERATIONS AND MAINTENANCE INSTRUCTIONS

A. The Contractor shall start up, test, adjust, balance and otherwise place in a satisfactory working condition all items of mechanical and electrical systems, and shall fully instruct representatives of the Owner in the care and operation of such systems.

B. Instruction of the Owner's Maintenance Supervisor in the proper methods of cleaning and maintaining all the finished surfaces and the proper methods of replacement of the consumable items such as filters, light bulbs, washers, etc., shall be a part of this work.

1.05 CONTRACT CLOSEOUT DOCUMENTS

A. Prior to submittal of Final Application for Payments, the Contractor shall submit the following documents to the Architect:

1. Contractor's notarized affidavit that all payrolls, bill and materials, equipment, and other indebtedness connected with the work have been paid (AIA G706).

2. Notarized Certificates of Waiver of Liens for himself (AIA G706a), each Subcontractor, each material supplier or person furnishing materials or services to the project (AIA G706).

3. List of subcontractors and major material suppliers including address, telephone number, and name of individual to contact (AIA G705).

4. Validated warranties and notarized copies of all guarantees for equipment and materials specifically called for in the Contract Documents.

5. Consent of Surety to Final Payment (AIA G707).

6. Conformed Construction Drawings (As-builts), per section 017839.

7. Record digital copy of each shop drawing or installation diagram.

8. Operating manual (three (3) sets) assembled and bound, each containing:

    a. Explanatory brochures of all equipment.
    b. Catalog cut.
    c. Wiring diagrams.
    d. Instruction sheets for operation and maintenance.

9. Guarantees:

    a. Standard guarantee as per attached form.
    b. Additional specific guarantees required by Technical Section of Contract Documents.
    c. Manufacturer's warranties together with list of all items of equipment of material carrying warranty.

10. Attic Stock Receipts (where applicable). Refer to individual Specification Sections for requirements.

11. Fire Underwriters Certification (where applicable).

12. Asbestos Documents including Asbestos License, Transport, Manifest, Notifications & Logs (where applicable). Refer to Specification Section 028000.

13. In addition, Contractors shall refer to the Closeout Checklist following this section for additional requirements. Following the award of the contract the Architect will use this checklist to identify what items are required for Closeout of this project.

14. Contractor to submit a digital copy of all of the above documents in addition to hard copies as depicted.

B. Package all items properly indexed and deliver to Architect for review and transmittal to Owner.

1.06 EMERGENCY REPAIRS

A. During a valid warranty period, if the Contractor is unable or unwilling to respond immediately to make emergency repairs under conditions which the Owner may determine to be an emergency situation, the Owner reserves the right, and the Contractor recognizes such right, to make such emergency repairs and then to bill the Contractor for a fair and reasonable amount in reimbursement for such repairs.

1.07 CONTRACTOR'S GUARANTEE

A. The following two pages are the Contractor's Guarantee and shall be submitted along with the required Closeout Documents.

END OF SECTION

CONTRACTOR'S GUARANTEE

CONTRACTOR'S NAME AND ADDRESS

_____

_____

_____

OWNER'S NAME AND ADDRESS

_____

_____

PROJECT: _____

LOCATION: _____

CONTRACT FOR: _____

CONTRACT DATE: _____

The Contractor hereby guarantees that all Work performed and/or materials installed under the above referenced contract is of the quality that will comply with all specific requirements of the contract documents and hereby insures the Owner against all defects of material for two (2) years and workmanship for a period of two (2) years from and after the date of Final Payment. This does not waive stipulation of other clauses which specify guarantee periods in excess of the obligations herein.

It is further agreed that if, after due inspection, the Architect, as provided in the General Conditions of the Contract for Construction, shall decide that the replacement or repair of any of the Work is, in his opinion, necessary, such defective Work will be repaired or removed and replaced with New Work, meeting all requirements of the Contract Documents, same being done promptly and without expense to the Owner. Repairs and replacements are to include all costs of replacing or repairing other work damaged by the removal and replacements of the work covered by this guarantee and all costs necessary for restoring any portion of the building and its contents which are damaged due to defects in this Contractor's Work or materials.

The Contractor agrees to perform all corrective work necessary promptly upon receipt of written notification from the Owner unless the Owner has previously given the Contractor a written acceptance of such condition.

The Contractor stipulates and agrees that if he fails or neglects to carry out promptly the provisions of this guarantee or any part thereof, the Owner may cause all defects to be remedied and all repairs to be made without further notice to the Contractor and shall charge to and recover the expense thereof from the Contractor and/or Sureties.

Such decisions as the architect shall render in connection with this guarantee are subject to the provisions of the General Conditions.

CONTRACTOR: CORPORATE SEAL:

BY: _____

DATED: _____

STATE OF NEW YORK, COUNTY OF _____ ss:

On the _____ day of _____, 20___, before me personally came _____ _____, to me known, who being by me duly sworn, did depose and say that he resides at _____ _____, that he is the _____ of _____, 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 it was so affixed by order of the Board of said corporation, and that he signed his name thereto by like order.

STATE OF NEW YORK, COUNTY OF _____ ss:

On the _____ day of _____, 20___, before me personally came _____ _____, to me known, and known to me to be the individual described in, and who executed the foregoing instrument, and _____ acknowledged to me that _____ executed same.

_____

NOTARY PUBLIC, State of New York

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CLOSEOUT CHECKLIST

Line	Item	Required	Responsible	Date Complete
1	Change Orders & Allowances Fully Executed	☒	BBS	
2	UNC/Punch List Issued	☒	BBS	
3	SED Certification of Substantial Completion Issued	☒	BBS	
4	Final Inspection Performed	☒	BBS	
5	DOL Wage Rate Completion Form	☒	BBS	
6	Final Payment Application	☒	Contractor	
7	Release of Liens from Prime Contractor (AIA G706a)	☒	Contractor	
8	Affidavit of Payment Prime Contractor (AIA G706)	☒	Contractor	
9	List of Subcontractors and Suppliers (AIA G705)	☒	Contractor	
10	Release of Liens from Subs & Suppliers (AIA G706a)	☒	Contractor	
11	Consent of Surety to Final Payment (AIA G707)	☒	Contractor	
12	Contractor's Guarantee (017000)	☒	Contractor	
13	As-Built Drawings (017839)	☐	Contractor	
14	O&M Manuals (017000)	☐	Contractor	
15	Record Copy Submittals (017000)	☐	Contractor	
16	Attic Stock Receipt (various individual sections)	☐	Contractor	
17	Maintenance Bond (General Conditions)	☐	Contractor	
18	Electrical Inspection Certificate (017000/260810)	☐	Contractor	
19	Fire Alarm NFPA 72 System Record of Completion (284613/E0.01)	☐	Contractor	
20	Equipment Guarantees/Warranties (017000)	☐	Contractor	
21	Demonstration/Training Proof (various individual sections)	☐	Contractor	
22	HVAC Testing & Balancing (230593)	☐	Contractor	
23	Elevator Inspection (142100/142200)	☐	Contractor	
24	Cx Report (230800)	☐	Contractor	
25	Asbestos License, Transport, Manifest, Notifications, Logs (028000)	☐	Contractor	
26	Lead Renovation, Repair & Painting (RRP) Certification (029000)	☐	Contractor	
27	NYSDEC 375 Clean Fill Certification (310000)	☐	Contractor	
28	Public School Fire Safety Report	☐	Third Party	
29	Controlled/Special Inspection Results	☐	Third Party	
30	Asbestos License, Clean-Air, CoC, Location Plans, Lab Accreditations	☐	Third Party	
31	Lead Clearance Wipe Tests	☐	Third Party	
32	Lead in Water Test (New Faucets)	☐	Third Party	
33	SWPPP Notice of Termination	☐	Third Party	
34	Certificate of Occupancy	☐	AHJ	

Notes:

DIVISION 01 – GENERAL REQUIREMENTS

SECTION 017423 – FINAL CLEANING

PART 1 - GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

A. Each Contractor shall at all times during the progress of the work keep the building and site free from accumulation of rubbish.

1. This includes broom sweeping with compound, vacuuming as required and removal of all trash daily. All Contractors shall provide this daily cleanup. Failure to comply with cleaning requirements will initiate the Owner to provide cleaning as required, all costs associated with this expense shall be backcharged to the individual Contractor or Contractors.

B. Each Contractor shall provide final cleaning of those areas of site and structure (exterior and interior) involved in the work of his respective contract immediately before final inspection.

1.02 PROTECTION AND CONTROL

A. Fire Protection:

1. Store volatile waste removed in final cleaning in covered metal containers, and remove from premises to comply with local and/or state ordinances and OSHA.

2. Gasoline and fuel oil storage facilities shall be located and maintained in full compliance with local and/or state ordinances and OSHA.

B. Pollution Control:

1. Conduct clean up and disposal operations to comply with local ordinances and/or state ordinances and OSHA anti-pollution laws.

2. Burning or burying of rubbish and waste materials on the project site is not permitted.

3. Disposal of volatile fluid wastes (such as mineral spirits, oil, or paint thinner) in storm or sanitary sewer systems or into streams or waterways is not permitted.

PART 2 - PRODUCTS

2.01 CLEANING MATERIALS

A. Use only cleaning materials recommended by manufacturer or surface to be cleaned.

B. Use cleaning materials only on surfaces recommended by cleaning material manufacturer.

PART 3 - EXECUTION

3.01 PREPARATION

A. Post signs to advise building occupants if wet and/or slippery floor conditions exist during cleaning operations.

3.02 FINAL CLEANING

A. General:

1. Use experienced workmen, or professional cleaners, for final cleaning.

2. Maintain cleaning until the building, or portion thereof, is occupied by the Owner.

B. Remove grease, dirt, dust, stains, labels, fingerprints, paint drips and runs, plastic coverings, tape, glue and other foreign materials, from interior and exterior surfaces.

C. Do not move dust from spot to spot. Remove directly from the surface on which it lies by the most effective mean such as appropriately treated dusting cloths or vacuum tools. When doing high cleaning, do not allow dust to fall from high areas onto furniture and equipment below.

D. Clean transparent and glossy materials to a polished condition; remove foreign substances. Polish reflective surfaces to a clear shine.

E. Clean resilient and hard surface floors as recommended by manufacturer.

F. Clean surfaces of equipment; remove excess lubrication.

G. Clean plumbing fixtures and toilet rooms to a sanitary condition.

H. Clean permanent filters of ventilating equipment and replace disposable filters when units have been operated during construction; in addition, clean ducts, blowers, and coils when units have been operated without filters during construction.

I. Remove waste, foreign matter, and debris from roofs, gutters and downspouts, areaways, and drainage systems.

J. Dismantle and remove all temporary structures, scaffolding, fencing, and equipment.

K. Remove waste materials, rubbish, lumber, block, tools, machinery, and surplus materials from site. Clean grounds; remove stains, spills and foreign substances from paved areas and sweep clean. Rake clean other exterior surfaces.

L. Perform the following prior to final payment:

1. Broom clean all exterior concrete surfaces and vacuum clean all interior concrete surfaces.
2. Dust and spot clean painted and vinyl covered walls.
3. Clean and polish all unpainted metal on doors such as trim, hardware, kickplates and doorknobs.
4. Vacuum clean carpets, mats and similar soft surfaces.
5. Vacuum clean acoustic ceilings.
6. Repair, patch, and touch-up marred surfaces to specified finish and to match adjacent surfaces.
7. Remove foreign material from exterior masonry.
8. Replace all broken and scratched glass and mirrors.
9. Replace all damaged insect screens.
10. Wash and clean interior and exterior window surfaces. All glass shall be clean and free of dirt, grime, streaks and excessive moisture. Wipe drippings and other marks from windowsills, sashes and woodwork. Do not use windowsills in lieu of ladders.
11. Clean furniture and equipment in accordance with manufacturers instructions.
12. Clean all paved roads, lots and drives which were paved as work under this Contract and all existing paved surfaces using a mechanical street cleaner.
13. Repair or repaint damaged pavement markings.

14. Vacuum and clean with a damp cloth light fixtures, including glass and plastic lenses, ceiling and wall mounted lights, cover panels, side panels, louvers, fixture frames and lamps.
15. Clean supply vents and exhaust grilles.
16. Remove all rust spots and stains from new and pre-existing concrete, painted surfaces, and all other surfaces.
17. Clean and polish all new toilet facilities constructed under this project.
18. Wash all existing floors that were in any way impacted by the construction operations.
19. Rake clean landscaped surfaces. Final mow all areas grassed and sodded during the work.
20. Inspect interior and exterior surfaces, and all work areas, to verify that the entire work is clean and ready for use by the Owner. The project will not be considered substantially complete until all final cleaning has been performed.
21. Fill in all holes in concrete that remain after temporary handrail is removed. Non-shrink grout shall be used.
22. Elevators: Clean all interior surfaces of the car including hoistway doors and services of the corridors on the side of the elevator. Polish all bright metal surfaces. Clean and spray buff resilient tiles. Dust and damp wipe elevator cab doors, walls and bright work.
23. Clean kitchens and kitchen equipment in accordance with Health Department requirements.

END OF SECTION

SECTION 01 77 00

CLOSEOUT PROCEDURES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, and other Division 1 Specifications.

B. Project Record Document Specification

C. Operation and Maintenance Data Specification

D. Demonstration and Training Specification

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:

1. Inspection Procedures.

2. Project Record Document Package.

3. Operation and Maintenance Data Package.

4. Warranty Package.

5. Demonstration and Training Documentation.

6. Final cleaning.

1.3 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. The Contractor is to identify any items that are not complete. **The Architect reserves the right to not certify the work as "Substantial Completion" if any of the following items have not been completed:**

1. Provide Copy of Operation and Maintenance Data Package with approved Submittal Coversheet for Operation and Maintenance Data Package.

2. Provide Copy of Warranty Package with approved Submittal Coversheet (pending Substantial Completion acceptance for Warranty Start Dates) for Warranty Package.

a. Warranty start dates shall be scheduled for the anticipated scheduled Date of Substantial Completion. If portion of the work for a referenced warranty is determined to not be substantially complete, provide updated warranty documents for portions of work that were not substantially complete at the

time of initial substantial completion inspection, revised warranty Documents shall have a start date for when that portion of work is certified as substantially complete during reinspection by the Architect/Construction Manager and no sooner.

3. Complete Start Up and Testing of Systems and Equipment. Provide all Start-up Reports and Quality Control Test Reports.

4. Submit Documentation of Engineer Approved complete HVAC Testing and Balancing Reports.

5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit Demonstration and Training video recordings, Training Agenda, and Training Sign-in Sheets as Specified in Division 1 Section "Demonstration and Training".

6. Provide Change-over information related to Owner's occupancy, use, operation, and maintenance.

7. Submit Maintenance material submittals specified in individual Specification Sections, including tools, spare parts, extra materials, and similar items to location designated by Owner. Contractor to provide a transmittal detailing all delivered maintenance materials and obtain Owner Signature confirming delivery of such; a copy of transmittal with Owner's signature shall be provided with Operation and Maintenance Data Package. Label with manufacturer's name and model number where applicable. All keys shall be tagged and labeled.

8. Complete all items on any Field Observation Reports and Construction Deficiency Reports and Submit a copy of the Reports to the Architect and Construction Manager identifying how each item was addressed in detail including the date of completion.

9. Submit Contractor provided Final Progress Photographs.

10. Advise Owner of pending insurance changeover requirements.

11. Prepare damage or settlement surveys, property surveys, and similar final record information.

12. Certificates of Release: Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, electrical inspection reports, Testing and Balancing Reports, and similar releases.

13. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.

14. Deliver temporary keys to Owner for Owner to replace cores.

15. Advise Owner of changeover in heat and other utilities.

16. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.

17. Complete final cleaning requirements, including touchup painting.

18. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

19. Contractor to Submit Contractor’s List of Incomplete Items.

B. Substantial Completion Inspection: No later than 14 days prior to the Contract-Scheduled Date of Substantial Completion or anticipated actual date of Substantial Completion (whichever date is later), submit a letter indicating written request for inspection for Substantial Completion. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Absent the Contractor letter confirming readiness of work, the Architect may elect to postpone the Substantial Completion Inspection. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect that must be completed or corrected before certificate will be issued.

1. Additional Substantial Completion Inspections: Request additional Substantial Completion inspections when the work that was not complete for the scheduled Substantial Completion inspection is now ready to inspect.

    a. Costs for such additional Substantial Completion Inspections will be deducted from sums otherwise due the Contractor by deduct Change Order.

2. Results of completed inspection will form the basis of requirements for Final Completion.

1.4 FINAL COMPLETION

A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:

1. Submit certified copy of Construction Manager and Architect's Substantial Completion inspection list of items to be completed or corrected. Supporting documents include Observation Report Action items, Construction Deficiency Report items, and any other issued Punchlist items. The copy of the list shall state each item has been completed or otherwise resolved for acceptance, what corrective action was taken, and the date of completion. Items in dispute shall have an explanation attached.

2. Submit evidence of final, continuing insurance coverage complying with insurance requirements. Warranty Coverage shall be extended to cover Contractor Warranty period.

3. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."

4. AIA Document G706A, "Contractor's Affidavit of Release of Liens."

5. AIA Document G707, "Consent of Surety to Final Payment."

6. Evidence that claims have been settled.

7. Contractor's No Asbestos Certification Letter

8. Evidence of completion of Project Closeout Requirements.

    a. Include Transmittals of Physical Closeout Documents turn over to the Owner with approved Submittal Coversheet for Physical Closeout Documents.

    b. Transmittal for Project Record Document Package Turnover with approved Submittal Coversheet for Project Record Document Package.

    c. Transmittal for Operation and Maintenance Data Package Turnover with approved Submittal Coversheet for Operation and Maintenance Data Package.

    d. Transmittal Warranty Package Turnover with approved Submittal Coversheet for Warranty Package.

9. Submit a Final Application for Payment according to Division 1 Section "Payment Procedures".

B. Final Inspection: No later than 14 days prior to the Contract-Scheduled Date of Final Completion or anticipated actual date of Substantial Completion (whichever date is later), submit a letter indicating written request for inspection for Substantial Completion. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. The Architect will review the final Certificate for Payment after the inspection or will notify the Contractor of the outstanding items that must be completed or corrected before the certificate will be processed.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected. The Owner and Architect and Construction Manager reserve the right to add items to the Substantial Completion and Final Completion inspection lists as long as it is a part of the Contractor's work. Complete all Contract Requirements prior to the final completion inspection to avoid any further re-inspection costs.

    a. Costs for such reinspections and any costs for extension of the Architect's and Construction Manager's services will be deducted from the sums otherwise due to the Contractor via a deduct change order.

1.5 CONTRACTOR'S LIST OF INCOMPLETE ITEMS

A. Preparation: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.

2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems. Each item is to have a unique identification item number for reference. Identify incomplete items that are pending due to incomplete work by Others.

3. The Contractor is to provide cost estimates for a 3rd party Contractor to complete or correct remaining incomplete work for each individual item.

4. Include the following information at the top of each page:

    a. Project Name
    b. Date
    c. Name of Architect and Construction Manager
    d. Name of Contractor
    e. "Page Number" of "Total Number of Pages"

2.2 WARRANTY SUBMITTAL PACKAGE

A. Warranty Submittal Package shall contain:

1. Submittal Coversheet of Warranty Package.

2. Warranty Summary Cover Sheet.

3. Subfolders for each "Specification Section Number – Specification Title" (only where Warranty Documents are required). Within each Subfolder, provide:

    a. All Special Warranty Documents required per specifications.
    b. All Standard Manufacturer Warranty Documents for all products installed.

B. Special Warranty Requirements:

1. Submit written Warranties to the Architect no later than 14 days prior to the date Scheduled for Substantial Completion.

2. Prepare a written document utilizing the appropriate form, ready for execution by the Contractor, or the Contractor and subcontractor, supplier, or manufacturer with Project Specific Information.

3. Organize Warranty documents into an orderly sequence based on the Table of contents of the Project Manual.

4. Provide additional copies of Warranties for inclusion with Operation and Maintenance Data Package.

5. Include Supplemental Documents such and invoices, receipts, or date of shipment/delivery documentation when required to confirm Warranty Start Dates and as required to support and process Warranty Claims made by the Owner and attach to reference Warranties.

6. Warranties for all equipment, materials, and systems on the Project are to start no sooner than the Date of Substantial Completion issued for the respective portion of completed work.

7. The Contractor shall adhere to all Request for Substantial Completion Inspection procedures per Closeout Procedures specification to ensure that the Date of Substantial Completion is scheduled for the Start Date of all Warranties. Contractor is to request for partial Substantial Completion Inspection when a portion of the work is complete prior to the Scheduled Substantial Completion Date for the entire project.

8. The Contractor shall order and release equipment and materials to be delivered when required to be installed and functional per the Contract Schedule to avoid manufacturer's Warranty start dates not being scheduled on the date of Substantial Completion due to extensive material storage. The Contractor shall purchase extended warranties as required to provide the complete durations required per specifications.

C. Warranty summary Cover sheet

1. The Contractor shall provide a Warranty Summary Cover Sheet that contains information compiled from the various individual warranties provided and compiled into a single summary. The Warranty Summary Cover Sheet shall contain the following information for each Warranty Line Item:

   a. Specification Section and Title of each individual Warranty. (Provide separate Warranty Line Items for Warranty components that contain varying durations).
   b. Subcontractor, Manufacturer, or Supplier Name and Contact Information.
   c. Actual Warranty Start Date confirmed by provider of warranty.
   d. Warranty End Date.
   e. Warranty Total Duration.
   f. Page Numbers for location of each Warranty within Warranty Submittal Package.

PART 2 PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 EXECUTION

3.1 FINAL CLEANING (PROFESSIONAL CLEANING)

A. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:

a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.

b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.

c. Rake grounds that are neither planted nor paved to a smooth, even textured surface.

d. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Remove surface dust and dirt from all vertical and horizontal painted surfaces. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.

e. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.

f. Sweep concrete floors broom clean in unoccupied spaces using sweeping compound that is compatible with new finishes.

g. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.

h. Remove snow and ice to provide safe access to building.

i. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Clean all frames inside and outside. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.

j. Sweep concrete floors broom clean in unoccupied spaces.

k. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.

l. Remove labels that are not permanent.

m. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.

1). Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.

n. Remove tools, construction equipment, machinery, and surplus material from Project site.

o. Wipe surfaces of mechanical, plumbing, and electrical equipment, elevator equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.

p. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.

q. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.

r. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection.

s. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.

t. Leave Project clean and ready for occupancy.

C. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

3.2 REPAIR OF THE WORK

A. Complete repair and restoration operations before inspection for determination of Substantial Completion.

B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to condition acceptable to Construction Manager.

1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.

2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that that already show evidence of repair or restoration.

a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.

3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.

4. Replace burned-out bulbs, bulbs noticeably dimmed by hours of use, and defective and noisy starters in fluorescent fixtures to comply with requirements for new fixtures.

END OF SECTION 017700

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SECTION 01 78 10

PROJECT RECORD DOCUMENTS

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for Project Record Documents.

1.2 SUBMITTALS

A. Project Record Document Package Submittal Requirements: Comply with the following:

1. Submit Project Record Document Package as follows:

a. Submittal: Submit one set of the electronic Project Record Document Package.

1). Electronic Media: uploaded as a compressed file or .zip file (containing submittal coversheet, sub folders, and .PDF Submittal Documents) to Contract Administration platform provided by Owner.

b. See Specification 017700 – Closeout Procedures for additional requirements on turnover of Project Record Documents after approval.

c. Each Preconstruction Submittal, Closeout Submittal, and any other documents/items required for the Project Record Document Package **must be submitted and approved individually as grouped by submittal specification number and Submittal Type or as specifically indicated otherwise in this Specification Section.** Each item is to be submitted with an individual Submittal Cover Sheet prior to incorporation into the Project Record Document Package for review and reviewer mark ups/comments.

B. Project Record Document Package (submitted as compressed file or .zip) (assemble with subfolders within compressed file for the Project Record Document Package for the following documents:

1. Submittal Coversheet for Complete Project Record Document Package.

2. Project Record Documents Table of Contents (Initially submitted as one independent Submittal).

3. Record Contract Drawings (Initially submitted as one independent Submittal).

a. Include Submittal Coversheet with Record Contract Drawing Submittal.

b. Include Record Contract Drawing Mark Up Schedule with Record Contract Drawings Submittal.

4. Record Contract Specifications. (Initially submitted as one independent Submittal).

    a. Include Submittal Coversheet for Record Contract Specifications.
5. Record Submittal Package (Subfolder):

    a. Submittal Coversheet for Record Submittal Package.

    b. Operation and Maintenance Data Submittal Package (Subfolder) (See Operation and Maintenance Data Specification)
        1). Submittal Coversheet of Operation and Maintenance Data Package.
        2). Table of Contents of Operation and Maintenance Data Submittal Package.
        3). Warranty Summary Cover Sheet.
        4). Equipment Label Schedule (if applicable).
        5). Maintenance and Test Interval Schedule of all new equipment or Products.
        6). Replaceable Maintenance Item Schedule.
        7). Finishes and Color Selection Schedule.
        8). Valve Tag Schedule (if applicable).
        9). Electrical Panel Schedule(s).
        10). Prime Contractor 1 Year Warranty.
        11). Subfolders for each "Specification Section Number – Specification Title" (only where Operation and Maintenance Data is required for each respective Specification Section)
        12). Copies of all Operation and Maintenance Data, Warranties, and Record Submittals for this Specification Section.

    c. Warranty Submittal Package (Subfolder) (See Closeout Procedures Specification)

    d. Subfolder for **each** "Specification Section – Specification Title"
        1). Record Product Data Submittal
        2). Record Shop Drawing Submittal
        3). Record Sample Selection Submittal
        4). Operation and Maintenance Data.
        5). Test/Start Up Report Documentation. (Including 3rd Party Testing or Commissioning Reports)
        6). Warranties.
        7). Training Agendas.
        8). Training Documentation Sign in Sheets, Training Instruction Videos, and Training Session Video Recordings.
        9). Material Turn Over Transmittals for Attic Stock, Spare Parts, and other Material Turn Over.
        10). Any other Miscellaneous Post Construction or other Miscellaneous Project Record Submittals as required by each specific Project Specification Sections.
6. Record Contract Modification Documents Package: (Subfolder)

a. Submittal Coversheet for Record Contract Modification Documents Package
b. Copies of all Addenda. (Subfolder with Documents)
c. Copies of Executed Change Orders or Construction Change Directives. (Subfolder with Documents)
d. Copies of Executed Allowances. (Subfolder with Documents)
e. Copies of Proposal Requests. (Subfolder with Documents)
f. Copies of Contract Document Clarifications (Subfolder with Documents)
g. Copies of RFI's. (Subfolder with Documents)
h. Copies of Project Schedules. (Subfolder with Documents)

7. Record BIM/CAD Coordination Models, CAD Files of Shop Drawings, and Survey Electronic Files. (Subfolder with Documents)

8. Record software configurations for custom programming applications. (Subfolder with Documents)

9. Contractor's Subcontractor and Supplier Directory Contact List. (Subfolder with Document)

10. Contractor's Certification of "No Asbestos Materials Installed". (Subfolder with Document)

PART 2 PRODUCTS

2.1 SUBMITTAL COVERSHEET FOR COMPLETE PROJECT RECORD DOCUMENT PACKAGE

A. Provide a Submittal Cover Sheet for review and approval of the final complete Project Record Document Package.

2.2 PROJECT RECORD DOCUMENTS TABLE OF CONTENTS

A. A Table of Contents of Project Record Documents Package shall be provided by the Contractor that lists all items, files, submittals, documents, and folders individually.

B. Files, Folders, and Subfolders listed on the Table of Contents are to have their titles and numbering match the folder/subfolder names of the items within the final Record Document Package. Abbreviate or simplify Specification Title text as needed for file name length software restrictions.

C. Each PDF Document or Submittal to be titled as per key below: (1-2-3-4-5)

1. Binder Tabulation Number. (Applied after all required documents are confirmed to be included in Project Record Document Package.)

2. "Submittal Number"

a. Composed of "Specification Section Number" "-" "Submittal Number"

3. "Specification Section Title" (Abbreviate as required)

4. “Submittal Type” or “Description Title” (Abbreviate as required)”

5. “Approval Status and Date”

    a. If the Specific Submittal has not been approved during submission of Final Closeout Package, indicate the item listed as “Not Reviewed” for items pending review.

    b. Inclusion of Documents not independently reviewed and approved into the closeout package shall be at the discretion of the Construction Manager and Architect, otherwise submit all items as independent Submittals.

D. Example Document File Names:

1. “#1 - 230000-06R0 - Roof Top Units – Warranty– APP-01.01.2020”

2. “#102 - 080000-05R2 – Door Hardware – O&M – AAN - 03.03.2020”

3. “#232 - 220000-03R5 – Sanitary Piping Record Drawings – APP – 03.03.2020”

E. Separate or Group sets of documents of Project Record Document Package to correspond with physical Binder Numbers.

1. Table of Contents to indicate Hard Copy Binder Numbers, and Binder Section Tabulation Numbers.

2. Binder Section Tabulation Numbers: Physical Binders shall have items separated by physical tabulated dividers for each individual Submittal or Document.

    a. Apply Binder Section Tabulation Numbers to Record Document Table of Contents after all items have been confirmed to have been included in Project Record Document Package.

    b. Tabulations within Operation and Maintenance Data Submittal Package, and Warranty Submittal Package are to have their own independent numbering sequence.

3. Binders to be divide into sections containing: 600 Sheets per binder maximum and 2-1/4” maximum thickness of sheets within 3” Binder.

4. Record Contract Drawing Large Format Physical Drawing Sets to be identified on Table of Contents.

F. Submittal Specific Table of Contents for Submittals that Contain Multiple Documents:

1. When multiple sets of documents are combined into 1 PDF file, provide a Submittal Specific Table of Contents listing all documents within submittal.

    a. Include page numbers that correspond to page numbers marked on all pages of the submittal. Page numbers added to documents must not obscure any information on the original document.

    b. The Contractor may opt to keep documents submitted separately to avoid the Submittal Specific Table of Contents requirement. Submittals of different Types or Specification Section Numbers are not to be combined.

2.3 RECORD CONTRACT DRAWINGS

A. Record Contract Drawings: Maintain set of Contractor provided Contract Drawings on site.

1. Preparation: Mark Record Contract Drawings to show the actual installation where installation varies from that shown originally.

    a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.

    b. Accurately record information in an acceptable drawing technique utilizing Electronic PDF drawing mark-up software. Use colors to distinguish between different categories of work.

    c. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.

2. Content: Types of items requiring marking include, but are not limited to, the following:

    a. Dimensional Changes to Drawings

    b. Revisions to details shown on Drawings.

    c. Revisions to routing and sizes of piping, conduits, and duct work.

    d. Revision to Electrical Circuitry. Include updated Panel Schedules for all modified Panels.

    e. Control or Equipment Panel Locations and functions.

    f. Locations of Concealed internal utilities.

    g. Locations of Valves, Control Valves, Dampers, Automatic Dampers, cleanouts and other major or specialty components of ductwork or piping systems.

    h. Locations and depths of Underground Utility Locations.

    i. All Partition Wall Blocking Locations.

    j. Revisions to Programmed Systems Sequence of Operations.

    k. Revisions to Programmed Systems User Interface Pages.

    l. Change Orders, Allowance Authorizations, and Unit Price Authorizations.

        1). (Indicate corresponding Proposal Requests or Clarifications if applicable)

    m. Proposal Requests

        1). (Indicate if Proposal Requests Contractor Proposals are approved or if proposal not accepted or not performed).

    n. Architect Contract Document Clarifications: Bulletins, Architectural Supplementals Instructions, Architectural Sketches, Change in Conditions, Information Bulletins, or Drawings/Sketches within Proposal Requests.

    o. Include copies of Drawings and Sketches included in Architect Clarifications and incorporate into Record Contract Drawings

p. RFI’s (Requests for Information) with RFI Numbers referenced on Mark Ups.

3. Include copies of Drawings and Sketches included in Architect Clarifications or Proposal Requests and incorporate into Record Contract Drawings Set.

4. Mark the Record Contract Drawings or reference Record Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. If Shop Drawings are referenced, include copies of Record Shop Drawings in Record Contract Drawing Set.

5. Mark important additional information that was either shown schematically or omitted from original Drawings.

B. Record Transparencies: Immediately before inspection for Certificate of Substantial Completion, the Contractor is to review marked-up Record Drawings with Architect.

1. Refer instances of uncertainty to Architect for resolution.

C. Format: Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING " in a prominent location. Identify Contractor Name on each Record Drawing.

1. Record electronic Drawings: Organize Record Drawing information into separate electronic files that correspond to each sheet of the Contract Drawings.

2. Identification: As follows:

a. Project name.
b. Date.
c. Designation "PROJECT RECORD DRAWINGS."
d. Name of Architect.
e. Name of Contractor.

D. Record Contract Drawing Mark Up schedule:

1. Contract Drawing Mark Up Schedule: Provide Mark Up Schedule for Record Contract Drawings. Mark Up Schedule to indicate a list of mark ups applied to the Record Contract Drawings and Drawing Numbers of the Drawings that the mark ups are marked on.

a. Include the following Mark Ups on Contract Drawing Mark Up Schedule:
1). Change Orders.
2). Allowance Authorizations.
3). Unit Price Authorizations.
4). Proposal Requests.
5). Architect Contract Document Clarifications.
6). RFI’s

2.4 RECORD CONTRACT SPECIFICATIONS

A. Provide Contract Specifications with Project Record Documents, including Addenda and Contract Modifications.

B. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.

2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.

3. Record the name of the manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.

4. Note related Change Orders, Record Drawings, and Product Data where applicable.

2.5 RECORD SUBMITTALS: RECORD PRECONSTRUCTION SUBMITTALS AND RECORD CLOSEOUT SUBMITTALS:

A. Record Submittal Types:

1. Record Preconstruction Submittal Types (To have been previously approved during preconstruction submittal process):

a. Record Product Data Submittals.

b. Record Shop Drawing Submittals.

c. Record Sample Selection Submittals.

d. Other Miscellaneous Preconstruction Submittals.

2. Record Closeout Submittal Types (Submit Independently as new Closeout Submittals):

a. Operation and Maintenance Data.

b. Test/Start Up Report Documentation. (Include Testing/Commissioning Reports from 3rd Party Inspection Agencies.)

c. Warranties.

d. Training Agendas.

e. Training Documentation Sign in Sheets, Training Instruction Videos, and Training Session Video Recordings.

f. Material Turn Over Transmittals for Attic Stock, Spare Parts, and other Material Turn Over.

g. Any other Miscellaneous Post Construction or other Miscellaneous Project Record Submittals as required by each specific Project Specification Sections.

h. All Documents required per 017820 - Operation and Maintenance Data.

B. Each Record Preconstruction Submittal is to have been previously submitted and approved independently prior to incorporation into the final Record Submittal Package.

1. Where installed conditions differ from what is described in original Preconstruction Submittal, update the Record Preconstruction Submittals to combine into one Submittal, and submit as a new Record Submittal for re-approval.

C. Each Record Closeout Submittal is to be submitted initially as independent Submittals with each submittal containing an independent Submittal Coversheet for each Record Closeout Submittal and approved independently prior to incorporation into the final Record Submittal Package. Include Closeout Submittals of all documents required per Operation and Maintenance Data Specifications, and Warranties required per Closeout Procedures Specification.

D. Within the Record Submittal Package: Provide Sub folders for each Specification Section and group all Record Submittals by Specification Section.

E. Sub Folders are to be labelled by Specification Section Number and Specification Title. Abbreviate or simplify Specification Title text as needed for file name length software restrictions.

F. When Record Submittals are associated with work that an Operation and Maintenance Data have been provided for (as identified or grouped by Spec Section Number), include a copy of the Record Submittals as an inserted document in the Operation and Maintenance Data.

G. Preparation: Resubmit Record Preconstruction Submittals to indicate the actual product installation where installation varies substantially from that indicated in original preconstruction submittal.

1. When Preconstruction Submittals under the same Specification Section and Submittal Type (Product Data, Shop Drawings, Sample Selections, etc.) have been submitted in separate submittals for phasing, scheduling, or any other reason: provide a compiled record submittal combining the separate submittals of the same type and specification section number into a complete Record Submittal.

2. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.

3. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.

4. Note related Contract Document Changes, and other Record Submittals where applicable.

2.6 WARRANTY SUBMITTAL PACKAGE

A. Warranty Submittal Package shall contain:

1. Submittal Coversheet of Warranty Package.

2. Warranty Summary Cover Sheet.

3. Subfolders for each "Specification Section Number – Specification Title" (only where Warranty Documents are required). Within each Subfolder, provide:

    a. All Special Warranty Documents required per specifications.

    b. All Standard Manufacturer Warranty Documents for all products installed.

B. Special Warranty Requirements:

1. Submit written Warranties to the Architect no later than 14 days prior to the date Scheduled for Substantial Completion.

2. Prepare a written document utilizing the appropriate form, ready for execution by the Contractor, or the Contractor and subcontractor, supplier, or manufacturer with Project Specific Information.

3. Organize Warranty documents into an orderly sequence based on the Table of contents of the Project Manual.

4. Provide additional copies of Warranties for inclusion with Operation and Maintenance Data Package.

5. Include Supplemental Documents such and invoices, receipts, or date of shipment/delivery documentation when required to confirm Warranty Start Dates and as required to support and process Warranty Claims made by the Owner and attach to reference Warranties.

6. Warranties for all equipment, materials, and systems on the Project are to start no sooner than the Date of Substantial Completion issued for the respective portion of completed work.

7. The Contractor shall adhere to all Request for Substantial Completion Inspection procedures per Closeout Procedures specification to ensure that the Date of Substantial Completion is scheduled for the Start Date of all Warranties. Contractor is to request for partial Substantial Completion Inspection when a portion of the work is complete prior to the Scheduled Substantial Completion Date for the entire project.

8. The Contractor shall order and release equipment and materials to be delivered when required to be installed and functional per the Contract Schedule to avoid manufacturers Warranty start dates not being scheduled on the date of Substantial Completion due to extensive material storage. The Contractor shall purchase extended warranties as required to provide the complete durations required per specifications.

C. Warranty summary Cover sheet

1. The Contractor shall provide a Warranty Summary Cover Sheet that contains information compiled from the various individual warranties provided and compiled into a single summary. The Warranty Summary Cover Sheet shall contain the following information for each Warranty Line Item:

    a. Specification Section and Title of each individual Warranty. (Provide separate Warranty Line Items for Warranty components that contain varying durations).
    b. Subcontractor, Manufacturer, or Supplier Name and Contact Information.
    c. Actual Warranty Start Date confirmed by provider of warranty.
    d. Warranty End Date.
    e. Warranty Total Duration.
    f. Page Numbers for location of each Warranty within Warranty Submittal Package.

PART 3 EXECUTION

3.1 RECORDING AND MAINTENANCE OF RECORD DOCUMENTS

A. Recording: The Contractor is to provide a printed (minimum) size 24" x 36" set of Contract Drawings (with all changes via addenda marked) prior to start of construction for record drawing mark ups only by the Contractor's personnel to record mark ups as soon as changes occur. Do not wait until the end of the Project.

B. Maintenance of Record Documents and Samples: Store Record Documents and Samples in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours.

3.2 TURNOVER OF APPROVED FINAL PROJECT RECORD DOCUMENT PACKAGE

A. Upon Approval of the Submittal Coversheet for the Final Project Record Document Package the Contractor shall provide via qualified print shop or approved equal: (2) Electronic Flash Drive Copies, (2) Hard Copy Binder Sets of Operation and Maintenance Data Submittal Package, (2) Hard Copy Binder Sets of the Dedicated Warranty Submittal Package, and (2) Printed Record Drawing Sets.

    1. The Contractor is to assemble an Electronic Flash Drive Copy of the Final Project Record Document Package onto (1) Single Flash Drive. Provide at least (2) duplicate Flash Drives that contain the Final Record Document Package to be turned over to the Construction Manager. (Flash Drive to possess enough memory capacity to contain entire Final Record Document Package on (1) Flash Drive.)

    2. The Contractor is to provide large format Printed Record Drawing Sets of Record Contract Drawings.

    3. The Contractor is to provide a transmittal of the physical items being turned over to be received initially by the Construction Manager, and then turned over to the

Owner. Include the Transmittal of the Project Record Document Package with the Final Application for Payment.

B. Hard Copy Binder Set of Project Record Document Package Requirements:

1. Binders to be sized as 3" Maximum Heavy Duty Binders with D Rings. (O ring Binders to not be used).

2. Binders to be divide into sections containing: 600 Sheets per binder maximum and 2-1/4" maximum thickness of sheets within 3" Binder.

3. Include a copy of the "Table of Contents of Record Document Package" in all Binders.

4. Provide Physical Numbered Binder Tabulations between each individual Submittal or Document within Binder which are visible with the binder closed. Reference Binder Tabulation Numbers on Table of Contents.

5. Provide Binder Labels on Face and Spine of Binder indicating:

   a. Binder Identification (Record Document Package)
   b. Binder Number ("Binder #" of "Total Number of Binders")
   c. Contractor Name
   d. Contractor Phone Number
   e. Contractor Address
   f. Contract Name
   g. Project Name
   h. Project Number
   i. Owner Name
   j. Owner Phone Number
   k. Owner Address
   l. Architect Name
   m. Construction Manager Name

C. Printed Record Drawing Set Requirements:

1. Provide Large Format 24" x 36" Printed Drawing Sets of Record Contract Drawings.

END OF SECTION 017810

SECTION 01 79 00

DEMONSTRATION AND TRAINING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract including General Conditions and other Division 01 Specifications, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:

1. Demonstration of operation of systems, subsystems, and equipment.

2. Instruction in operation and maintenance of systems, subsystems, and equipment.

3. Demonstration and Training Video Recordings.

1.3 SUBMITTALS

A. Instruction Program Traing Agenda: Submit one electronic copy of outline of instructional program for demonstration and training for each training module, including a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module. Include copies of any Operation and Maintenace Data and Sample Warranties for use as supplemental training materials.

1. At completion of training, submit final training manuals with Operation and Maintenance Data Package for Owner's use.

B. Qualification Data: For Instructor.

C. Attendance Record: For each training module, provide an Attendance Record Sign In Sheet to list of participants. Include a section for written questions and Answers to be submitted with the Attendance Record. For each Attendance Record, indicate:

1. Name of Project
2. Name of Architect
3. Name of Construction Manager.
4. Name of Contractor
5. Name of Service Representative providing Training
6. Name of Insutrctor
7. Training Date
8. Start Time

9. End Time
10. Training Duration

D. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.

E. Demonstration and Training Video Recordings: Submit Electronic Video recordings with Operation and Maintenance Data Package.

1. Video Recordings shall be taken on a tripod with a dedicated operator monitoring the video recording equipment. Video shall be taken in landscape format in 1080x920 Video Qualtity in Landscape Orientation. Provide Screen recordings for Software Demonstration and Training.

2. Video Recording Files shall be submitted as “MP4” or “MOV” file formats. “HEVC” (default Apple iPhone and Android recording format) will not be allowed as this format is not readable by default on Windows 10.

3. Failure to provide Demosntration and Training Video Recordings as required per specifications may result in the requirement to peform additional Demonstration and Training sessions to obtain proper Video Recordings.

1.4 QUALITY ASSURANCE

A. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Division 1 Section "Quality Requirements," experienced in operation and maintenance procedures and training.

1.5 COORDINATION

A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availibility of Owner’s personnel.

B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.

C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.

PART 2 PRODUCTS

2.1 INSTRUCTION PROGRAM

A. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections, and as follows where applicable:

1. Maintenance and cleaning of new interior and exterior Architectural finishes.
2. Door Hardware Adjustment procedures.
3. Motorized doors, including, overhead coiling doors, overhead coiling grilles and automatic entrance doors.
4. Conveying systems, including elevators, wheelchair lifts and cranes.
5. Fire-protection systems, fire pumps and fire-extinguishing systems.
6. Gas equipment, including medical gas equipment and piping.
7. Plumbing Fixtures.
8. Piping Systems, including HVAC and Plumbing piping.
9. Heat generation, including, boilers, feedwater equipment, pumps, steam distribution piping and water distribution piping.
10. Refrigeration systems, including chillers, cooling towers, condensers, pumps and distribution piping.
11. HVAC systems, including air-handling equipment, air distribution systems and terminal equipment and devices.
12. HVAC Instrumentation and Controls, provide a minimum of 3 sessions.
13. Electrical service and distribution, including transformers, switchboards panelboards, uninterruptible power supplies and motor controls.
14. Fire Alarm System.
15. Lighting equipment and controls.
16. Communication systems, including intercommunication, surveillance, clocks, programming voice and data and CCTV equipment.
17. Site Utility Piping Systems, including Sanitary, Water, and Storm Drainage.
18. Landscaping Maintenance.
19. Any other equipment or items that require operation or maintenance not specifically listed that is part of these construction documents.

B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following:

1. Basis of System Design, Operational Requirements, and Criteria: Include the following:

    a. System, subsystem, and equipment descriptions.
    b. Performance and design criteria if Contractor is delegated design responsibility.
    c. Operating standards.
    d. Regulatory requirements.
    e. Equipment function.
    f. Operating characteristics.
    g. Limiting conditions.
    h. Performance curves.

2. Documentation: Review the following items in detail:

    a. Emergency manuals.
    b. Operations manuals.
    c. Maintenance manuals.
    d. Project Record Documents.
    e. Identification systems.
    f. Warranties and bonds.
    g. Maintenance service agreements and similar continuing commitments.

3. Instructions on meaning of warnings, trouble indications, and error messages.

    a. Instructions on stopping.
    b. Shutdown instructions for each type of emergency.
    c. Operating instructions for conditions outside of normal operating limits.
    d. Sequences for electric or electronic systems.
    e. Special operating instructions and procedures.

4. Operations: Include the following, as applicable:

    a. Startup procedures.
    b. Equipment or system break-in procedures.
    c. Routine and normal operating instructions.
    d. Regulation and control procedures.
    e. Control sequences.

f. Safety procedures.
g. Instructions on stopping.
h. Normal shutdown instructions.
i. Operating procedures for emergencies.
j. Operating procedures for system, subsystem, or equipment failure.
k. Seasonal and weekend operating instructions.
l. Required sequences for electric or electronic systems.
m. Special operating instructions and procedures.

5. Adjustments: Include the following:

a. Alignments.
b. Checking adjustments.
c. Noise and vibration adjustments.
d. Economy and efficiency adjustments.

6. Troubleshooting: Include the following:

a. Diagnostic instructions.
b. Test and inspection procedures.

7. Maintenance: Include the following:

a. Inspection procedures.
b. Types of cleaning agents to be used and methods of cleaning.
c. List of cleaning agents and methods of cleaning detrimental to product.
d. Procedures for routine cleaning
e. Procedures for preventive maintenance.
f. Procedures for routine maintenance.
g. Instruction on use of special tools.

8. Repairs: Include the following:

a. Diagnosis instructions.
b. Repair instructions.
c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
d. Instructions for identifying parts and components.
e. Review of spare parts needed for operation and maintenance.

PART 3 EXECUTION

3.1 PREPARATION

A. Assemble educational materials and equipment necessary for instruction, including documentation and training module. Assemble training modules into a combined training manual.

B. Set up instructional equipment at instruction location.

3.2 INSTRUCTION

A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.

B. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

1. Owner will furnish Contractor with names and positions of participants.

C. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.

1. Schedule training with Owner, through Construction Manager, with at least seven days' advance notice.

D. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of a demonstration performance-based test.

E. Clean Up: Collect used and leftover educational materials and turn over to Owner. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

F. Demonstration and Training Video Recordings: Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice.

1. Video Recordings shall be taken on a tripod with a dedicated operator monitoring the video recording equipment. Video shall be taken in landscape format in 1080x920 Video Qualtity in Landscape Orientation. Provide Screen recordings for Software Demonstration and Training.

2. Video Recording Files shall be submitted as “MP4” or “MOV” file formats. “HEVC” (default Apple iPhone and Android recording format) will not be allowed as this format is not readable by default on Windows 10.

3. Failure to provide Demosntration and Training Video Recordings as required per specifications may result in the requirement to peform additional Demonstration and Training sessions to obtain proper Video Recordings.

END OF SECTION 01820

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DIVISION 02 – EXISTING CONDITIONS

SECTION 024119 – SELECTIVE DEMOLITION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provision of Contract, including General Conditions, Supplementary Conditions (if applicable), and Division 01 - Specification Sections, apply to work of this Section.

B. The work must comply with the requirements of the following related specifications sections when applicable:

1. Section 013500 – Commissioner's Regulations
2. Section 013563 – LEED Requirements (For LEED Certified Projects)
3. Section 017419 – Construction Waste Management (For LEED Certified Projects)

1.02 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. Extent of selective demolition work is indicated on drawings and/or specified herein.

1.03 DEFINITIONS

A. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged or removed and reinstalled.

B. Remove and Salvage: Carefully detach from existing construction, in a manner to prevent damage, and deliver to Owner ready for reuse.

C. Remove and Reinstall: Detach items from existing construction, prepare for reuse, and reinstall where indicated.

D. Existing to Remain: Existing items of construction that are not to be permanently removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.04 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 shall remain the property of Owner.

1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.05 PREINSTALLATION MEETINGS

A. Predemolition Conference: Conduct conference at Project site.

1. Inspect and discuss condition of construction to be selectively demolished.
2. Review structural load limitations of existing structure.
3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
5. Review areas where existing construction is to remain and requires protection.

1.06 INFORMATIONAL SUBMITTALS

A. Schedule: Submit schedule indicating proposed methods and sequence of operations for selective demolition work to Owner's Representative for review and approval prior to commencement of work.

B. See Section 013563 for additional submittal requirements for LEED Projects.

C. Qualification Data: For refrigerant recovery technician.

D. Proposed Protection Measures: Submit report, including drawings, that indicates the measures proposed for protecting the public, pedestrian access and circulation areas and property, for environmental protection, for dust control and, for noise control. Indicate proposed locations and construction of barriers.

E. 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 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.

F. Inventory: Submit a list of items that have been removed and salvaged.

G. Predemolition Photographs or Video: Show existing conditions of adjoining construction, including finish surfaces, that may be damaged during demolition.

H. 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.

I. Warranties: Documentation indicated that existing warranties are still in effect after completion of selective demolition.

1.07 QUALITY ASSURANCE

A. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program.

1.08 JOB CONDITIONS

A. Owner will be occupying areas of the building immediately adjacent to areas of selective demolition. Demolition work must be conducted in a manner to minimize disruption of normal Owner’s operations.

B. Exits: All exits must be kept clear and maintained.

C. Protection: Provide temporary barricades and other forms of protection as required to protect Owner's personnel, staff and General Public from injury due to selective demolition work and new construction.

1. Prevent dust and dirt from rising and entering the building.
2. Protect adjacent floor areas with suitable coverings.

D. All work in an Educational Facility must comply with the Commissioners Regulations and Uniform Safety Standards for School Construction and Maintenance Projects. Reference Section 013500 for additional information.

E. Project Waste: All project waste and rubbish to be disposed in containers provided by the Contractor for subsequent legal off site disposal. Container locations to be coordinated with the Owner. Off site disposal must be on a regular basis.

F. Damage: Promptly repair or replace areas that are to remain and are damaged by demolition or removal work.

G. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

H. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

I. Hazardous Materials: Hazardous materials are present in buildings and structures to be selectively demolished. A report on the presence of hazardous materials is on file for review and use and is included in Division 00 – Front End Documents of the Project Manual. Examine report and / or the appropriate specification section 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.

J. Storage or sale of removed items or materials on-site is not permitted.

K. 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.
2. Contractor shall provide a Fire Watch or other method acceptable to the authority having jurisdiction should the existing fire protection facilities be required to be shut down during construction work.
3. Do not disable or disrupt building fire or life safety systems without (1) one week prior written notice to Architect or Owner’s Representative.

1.09 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials utilizing approved contractors so as not to void existing warranties. Notify warrantor before proceeding. Notify warrantor on completion of demolition, and obtain documentation verifying that existing system has been inspected and warranty remains in effect. Submit documentation at Project Closeout.

PART 2 - PRODUCTS

2.01 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/ASSE A10.6 and NFPA 241.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that utilities have been disconnected and capped before starting selective demolition operations.

B. Examine the areas and conditions under which work of this Section will be performed for any interferences, or conditions which will be detrimental to timely and proper completion of the work.

C. Report any interferences or unsatisfactory conditions to the Architect in writing. Do not proceed until interferences or unsatisfactory conditions have been removed or corrected.

D. Review Project Record Documents of existing construction or existing conditions and hazardous material information provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in the Project Record Documents.

E. Survey existing conditions and reference scope of work on Drawings to determine extent of selective demolition required.

F. 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.

G. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs and/or video.

1. Inventory and record the condition of items to be removed and salvaged. Provide photographs of conditions that might be misconstrued as damage caused by salvage operations.

3.02 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 indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.

1. Arrange to shut off indicated utilities with utility companies. Provide 1 week notice to the Architect prior to any utility shut-downs.
2. 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.

3. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated to be removed.

    a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap, plug or reconnect 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. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect and make operational.
    e. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
    f. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material and leave in place.

3.03 PROTECTION

A. 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.

    1. Comply with requirements for access and protection specified in Section 015000 – Temporary Facilities and Controls.

B. 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. Maintain existing minimum required widths of egress pathways throughout.
    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. Erect and maintain dust-proof closures to prevent the spread of dust to adjacent areas.
    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

C. 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. Provide engineered signed and sealed drawings prepared by a Professional Engineer.
    1. Strengthen or add new supports when required during progress of selective demolition.

3.04 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, to minimize disturbance of adjacent surfaces. 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 2 hours 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. 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 designated by Owner or as indicated on Drawings.
5. Protect items from damage during transport and storage.

C. Removed and Reinstalled Items:
1. Clean and repair items to functional condition adequate for intended reuse.
2. Pack or create items after cleaning and repairing. Identify content 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.

D. 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

3.05 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

A. Concrete: Demolish in small sections. Using power-driven saw, cut concrete to a depth of at least 1 inch (25 mm) 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. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, then remove masonry between saw cuts.

C. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, then break up and remove.

D. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI's "Recommended Work Practices for the Removal of Resilient Floor Coverings." Do not use

methods requiring solvent-based adhesive strippers.

E. Roofing: Remove no more existing roofing than what can be covered in once day by new roofing and so that building interior remains watertight and weathertight. Refer to Roofing Specifications.

3.06 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Except for items or materials indicated to be recycled, reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.

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. Each day, remove debris, rubbish, and other materials resulting from demolition operations from building in accordance with Specifications Sections 013563 and 017419. Material to be disposed in containers provided by the Contractor. *(For LEED Certified Projects)*

B. Burning: Do not burn demolished materials.

3.07 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. Upon completion of demolition work, remove tools, equipment and all remaining demolished materials from site. Leave areas broom clean.

END OF SECTION

DIVISION 02 – EXISTING CONDITIONS

SECTION 024119 – SELECTIVE DEMOLITION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provision of Contract, including General Conditions, Supplementary Conditions (if applicable), and Division 01 - Specification Sections, apply to work of this Section.

B. The work must comply with the requirements of the following related specifications sections when applicable:

1. Section 013500 – Commissioner's Regulations
2. Section 013563 – LEED Requirements (For LEED Certified Projects)
3. Section 017419 – Construction Waste Management (For LEED Certified Projects)

1.02 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. Extent of selective demolition work is indicated on drawings and/or specified herein.

1.03 DEFINITIONS

A. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged or removed and reinstalled.

B. Remove and Salvage: Carefully detach from existing construction, in a manner to prevent damage, and deliver to Owner ready for reuse.

C. Remove and Reinstall: Detach items from existing construction, prepare for reuse, and reinstall where indicated.

D. Existing to Remain: Existing items of construction that are not to be permanently removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.04 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 shall remain the property of Owner.

1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.05 PREINSTALLATION MEETINGS

A. Predemolition Conference: Conduct conference at Project site.

1. Inspect and discuss condition of construction to be selectively demolished.
2. Review structural load limitations of existing structure.
3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
5. Review areas where existing construction is to remain and requires protection.

1.06 INFORMATIONAL SUBMITTALS

A. Schedule: Submit schedule indicating proposed methods and sequence of operations for selective demolition work to Owner's Representative for review and approval prior to commencement of work.

B. See Section 013563 for additional submittal requirements for LEED Projects.

C. Qualification Data: For refrigerant recovery technician.

D. Proposed Protection Measures: Submit report, including drawings, that indicates the measures proposed for protecting the public, pedestrian access and circulation areas and property, for environmental protection, for dust control and, for noise control. Indicate proposed locations and construction of barriers.

E. 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 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.

F. Inventory: Submit a list of items that have been removed and salvaged.

G. Predemolition Photographs or Video: Show existing conditions of adjoining construction, including finish surfaces, that may be damaged during demolition.

H. 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.

I. Warranties: Documentation indicated that existing warranties are still in effect after completion of selective demolition.

1.07 QUALITY ASSURANCE

A. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program.

1.08 JOB CONDITIONS

A. Owner will be occupying areas of the building immediately adjacent to areas of selective demolition. Demolition work must be conducted in a manner to minimize disruption of normal Owner’s operations.

B. Exits: All exits must be kept clear and maintained.

C. Protection: Provide temporary barricades and other forms of protection as required to protect Owner's personnel, staff and General Public from injury due to selective demolition work and new construction.

1. Prevent dust and dirt from rising and entering the building.
2. Protect adjacent floor areas with suitable coverings.

D. All work in an Educational Facility must comply with the Commissioners Regulations and Uniform Safety Standards for School Construction and Maintenance Projects. Reference Section 013500 for additional information.

E. Project Waste: All project waste and rubbish to be disposed in containers provided by the Contractor for subsequent legal off site disposal. Container locations to be coordinated with the Owner. Off site disposal must be on a regular basis.

F. Damage: Promptly repair or replace areas that are to remain and are damaged by demolition or removal work.

G. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

H. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

I. Hazardous Materials: Hazardous materials are present in buildings and structures to be selectively demolished. A report on the presence of hazardous materials is on file for review and use and is included in Division 00 – Front End Documents of the Project Manual. Examine report and / or the appropriate specification section 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.

J. Storage or sale of removed items or materials on-site is not permitted.

K. 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.
2. Contractor shall provide a Fire Watch or other method acceptable to the authority having jurisdiction should the existing fire protection facilities be required to be shut down during construction work.
3. Do not disable or disrupt building fire or life safety systems without (1) one week prior written notice to Architect or Owner’s Representative.

1.09 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials utilizing approved contractors so as not to void existing warranties. Notify warrantor before proceeding. Notify warrantor on completion of demolition, and obtain documentation verifying that existing system has been inspected and warranty remains in effect. Submit documentation at Project Closeout.

PART 2 - PRODUCTS

2.01 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/ASSE A10.6 and NFPA 241.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that utilities have been disconnected and capped before starting selective demolition operations.

B. Examine the areas and conditions under which work of this Section will be performed for any interferences, or conditions which will be detrimental to timely and proper completion of the work.

C. Report any interferences or unsatisfactory conditions to the Architect in writing. Do not proceed until interferences or unsatisfactory conditions have been removed or corrected.

D. Review Project Record Documents of existing construction or existing conditions and hazardous material information provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in the Project Record Documents.

E. Survey existing conditions and reference scope of work on Drawings to determine extent of selective demolition required.

F. 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.

G. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs and/or video.

1. Inventory and record the condition of items to be removed and salvaged. Provide photographs of conditions that might be misconstrued as damage caused by salvage operations.

3.02 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 indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.

1. Arrange to shut off indicated utilities with utility companies. Provide 1 week notice to the Architect prior to any utility shut-downs.
2. 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.

3. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated to be removed.

    a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap, plug or reconnect 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. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect and make operational.
    e. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
    f. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material and leave in place.

3.03 PROTECTION

A. 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.

    1. Comply with requirements for access and protection specified in Section 015000 – Temporary Facilities and Controls.

B. 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. Maintain existing minimum required widths of egress pathways throughout.
    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. Erect and maintain dust-proof closures to prevent the spread of dust to adjacent areas.
    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

C. 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. Provide engineered signed and sealed drawings prepared by a Professional Engineer.
    1. Strengthen or add new supports when required during progress of selective demolition.

3.04 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, to minimize disturbance of adjacent surfaces. 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 2 hours 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. 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 designated by Owner or as indicated on Drawings.
5. Protect items from damage during transport and storage.

C. Removed and Reinstalled Items:
1. Clean and repair items to functional condition adequate for intended reuse.
2. Pack or create items after cleaning and repairing. Identify content 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.

D. 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

3.05 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

A. Concrete: Demolish in small sections. Using power-driven saw, cut concrete to a depth of at least 1 inch (25 mm) 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. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, then remove masonry between saw cuts.

C. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, then break up and remove.

D. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI's "Recommended Work Practices for the Removal of Resilient Floor Coverings." Do not use

methods requiring solvent-based adhesive strippers.

E. Roofing: Remove no more existing roofing than what can be covered in once day by new roofing and so that building interior remains watertight and weathertight. Refer to Roofing Specifications.

3.06 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Except for items or materials indicated to be recycled, reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.

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. Each day, remove debris, rubbish, and other materials resulting from demolition operations from building in accordance with Specifications Sections 013563 and 017419. Material to be disposed in containers provided by the Contractor. *(For LEED Certified Projects)*

B. Burning: Do not burn demolished materials.

3.07 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. Upon completion of demolition work, remove tools, equipment and all remaining demolished materials from site. Leave areas broom clean.

END OF SECTION

DIVISION 02 – EXISTING CONDITIONS

SECTION 028000 – ASBESTOS WORK UNDER THIS CONTRACT

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. Drawings and General Provision of Contract, including General Conditions, Supplementary Conditions (if applicable), and Division 01 - Specification Sections, apply to work of this Section.

B. The abatement (removal, encapsulation, enclosure, repair or handling) of asbestos material in any quantity shall be performed by a New York State Department of Labor (NYSDOL) licensed abatement contractor in strict accordance with all federal, state, and local regulations including, but not limited to:

1. EPA 40 CFR 61 Subpart M National Emissions Standards for Hazardous Air Pollutants (NESHAP)
2. EPA 40 CFR Part 763 Asbestos Hazard Emergency Response Act (AHERA)
3. OSHA 29 CFR 1910 Occupational Safety and Health Standards
4. OSHA 29 CFR 1926 Safety and Health Regulations for Construction
5. NYSDOL 12 NYCRR Part 56 Industrial Code Rule 56 (ICR56)
6. NYSDEC 6 NYCRR Part 360 Solid Waste Management Facilities
7. NYSEC 6 NYCRR Part 364 Waste Transporters
8. NYSDOH NYCRR Part 73 Asbestos Safety Program Requirements

Any modifications must be approved by the NYSDOL in the form of a site-specific variance. Use of any variances must also be reviewed and approved for use by the Owner and/or their designated representatives.

In the event of any conflict or inconsistency between any of these regulations, including any site-specific variances, the most stringent rule/procedures shall apply.

C. The contractor is responsible to provide all labor, materials, and equipment, including electrical and water utilities to the work areas. All fees and or fines associated with required permits, agency notifications, etc. are also the responsibility of the contractor.

D. The contractor shall provide copies of all permits, agency notifications, licenses, building postings, and proposed abatement schedule to the owner/owner's representative at least ten (10) business days prior to mobilization.

E. In accordance with NYSICR 56, the contractor shall maintain an Asbestos Abatement Contractor Daily Project Log. This log must be available onsite for the duration of the project for on-demand review by the owner/owner's representative. A copy of this log shall be submitted to the owner along with other required closeout submittals.

F. The owner shall retain the services of an independent 3rd party air monitoring firm to collect required sampling in accordance with NYSICR 56 and AHERA, as applicable. The contractor is required to ensure cooperation of its personnel and shall abide by the findings of the Visual Inspection by the Project Monitor Prior to Clearance Air Sampling as well as unsatisfactory air sample results. Any costs associated with the repeated inspections, labor, and sampling due to failure to properly clean the work areas will be back charged to the contractor.

G. Upon mobilization to the project site, the contractor shall be responsible for the entire work area including site safety and security.

H. Should visible emissions or water leaks be observed outside the Work Area, immediately stop Work and institute emergency procedures per Code Rule 56. Should there be elevated fiber levels outside the Work Area, immediately stop Work, institute procedures as per Code Rule 56. All costs incurred in decontaminating such non-Work Areas and the contents thereof shall be borne by the Contractor, at no additional cost to the Owner.

I. Locations of decontamination units, equipment storage, waste containers, NFU exhaust sites, and other staging areas shall be discussed with and approved by the owner/owner's representative. Relocation of any of these items for any reason shall be completed by the contractor upon notification.

J. The contractor shall provide copies of Safety Data Sheets (SDS) for all products to be applied during the project including but not limited to (surfactants, spray adhesives, encapsulants, mastic removers).

K. Project Close-out Submittals: Within 30 days of the completion of each abatement phase, the Contractor shall submit 4 copies of the documents listed below, for review and approval by the owner/owner's representative prior to final payment:

1. All waste disposal manifests and disposal logs.
2. OSHA compliance air monitoring records conducted during the Work.
3. Daily progress log, including the entry/exit log.
4. Provide statement that lists all Workers used in the performance of the Project, including name and NYS DOL certification number. The Statement shall be notarized.
5. Disposal Site/Landfill Permit from applicable regulatory agency.
6. Project notifications, amended notifications, Variances.

1.02 SCOPE OF WORK

A. The contractor shall reference the approved project drawings for all required asbestos abatement.

B. All costs associated with the improper/accidental disturbance/handling of asbestos containing materials shall be back charged to the contractor.

C. Working hours shall be as required and approved by the Owner. Asbestos abatement activities including, but not limited to, work area preparation, gross removal activities, cleaning activities, waste removal, etc. may need to be performed during 'off-hours' (including nights and weekends). In addition, multiple mobilizations may be required to perform the work identified in this project. The Contractor shall coordinate and schedule all Work with the facility and Owner's representative.

D. The timing/phasing of individual work areas shall be communicated with the owner/owner's representative. The contractor shall provide cooperation to ensure efficient turnover of cleared work areas to the other trades and or the owner.

E. All ACM locations are descriptive and/or diagrammatic. All measurements and quantities are approximate. Exact locations and quantities should be field verified by the Contractor.

F. The contractor shall be responsible for the abatement of all specified materials. Any costs associated with re-mobilization due to failure to complete the scope of work shall be back charged to the contractor.

G. The contractor shall reference the following asbestos pre-construction report contained for details pertaining to asbestos testing results. If there is any confusion, or the contractor encounters materials not specifically identified in the pre-construction report, the contractor shall stop work until the materials can be evaluated by the owner/owner's representative.

H. Special Variances:

1. If the Contractor wishes to use any variances from NYS ICR 56 (applicable or otherwise) it must first be approved by the Owner or Owner's Agent. If the use of such variance is approved and requires additional air monitoring other than what is noted in section 17 of NYS ICR 56, then the Contractor shall be responsible for reimbursement of extra air monitoring costs to the Owner. The Contractor shall also be responsible for supplying the air monitoring firm with additional materials and equipment required to satisfy the variance requirements.

2. If the Contractor applies for the variance from the NYS DOL and it is not approved in a timely fashion adequate to complete the work within the designated time period, the Contractor must complete the scope of work without the variance at no additional cost to the District.

I. Restoration:

1. The Contractor is responsible for the cleaning and removal of all debris located in the work area and surrounding areas after the abatement has been completed. Any damages caused during the performance of abatement activities shall be repaired by the Contractor (ex. paint peeled off by barrier tape, nail holes, water damage, broken glass) at no additional expense to the building Owner.

2. The Contractor is responsible for restoring abatement surfaces to conditions acceptable to the building Owner, and Owner's representative. This shall include, but is not limited to lingering odors, or out gassing, from chemical methods of abatement, damage to substrates (ex. flooring, roof decking, etc.) caused by abatement techniques, and any other surface or subsurface damage caused by the abatement technique. The Contractor is responsible for the cleaning and removal of all debris located in the work area, and surrounding areas, after the abatement has been completed.

3. If any method of abatement results in any lingering odors, or other unexpected conditions the Contractor will be required to remediate such to pre-abatement conditions. The determination of the pre-abatement conditions will be made by the Owner, or Owner's Agent, unless otherwise documented by all parties prior to abatement activities being performed.

END OF SECTION

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NEW YORK STATE OF OPPORTUNITY. Department of Labor

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Hauppauge New York 11788

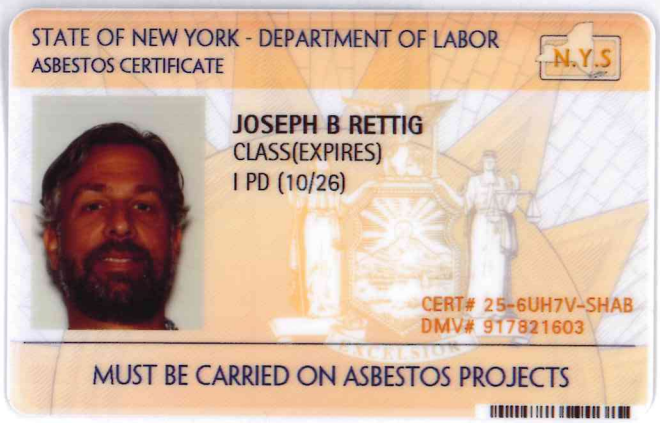
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YOUR NEW CARD



DIVISION 02 – EXISTING CONDITIONS

SECTION 028218 – ABATEMENT OF ASBESTOS FLOORING/MASTIC SCRAPE METHOD

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Abatement of non-friable asbestos-containing flooring, base and mastic materials using manual scrape method.

B. Contractor shall coordinate all work with the Owner, Construction Manager, Asbestos Project Monitor, General Contractor, Flooring Contractor, Electrical Contractor, Mechanical Contractor, Plumbing Contractor, Window/Door Contractor, Roofing Contractor, and any other entity as necessary.

C. The work is to be phased by zones. Zones are to be isolated from other building areas by hard wall barriers. Place zone partitions to allow at least two exits from each zone.

D. The Contractor shall file applications for all necessary permits as required by all administrative authorities and enforcing agencies. The Contractor is required to fulfill any format necessary as well as to pay all required fee.

E. The Contractor is responsible to secure required variances.

F. The Contractor shall be responsible for verifying the bid document drawing(s) provided and identifying any additional ACM that may exist. The proposals based upon these specifications shall be held as made with full knowledge of existing conditions and requirements.

G. The Contractor shall field verify, prior to bid submission, all quantities of asbestos containing material to be removed, and all field conditions affecting the work. Any discrepancies between the Contract Documents and the field conditions shall be reported to the Architect in writing prior to the submission of bids.

1.02 RELATED DOCUMENTS

A. Drawings and General Provision of Contract, including General Conditions, Supplementary Conditions (if applicable), and Division 01 - Specification Sections, apply to work of this Section.

B. The following sections, when included in the Project Manual, are related to this work of this section, although the work of this section with its specific techniques and Applicable Variance, may supersede provisions contained in related sections.

1. 028000 – Asbestos Work Under This Contract
2. 096519 – Resilient Flooring

1.03 APPLICABLE STANDARDS

A. The following standards cover the work of this section, depending on project location.

B. State of New York

1. NYS Industrial Code Rule 56

2. NYS Commissioner of Education Regulations 155.5 (For NYS School District projects)

C. State of Connecticut (when project located in CT)

1. RCSA Title 19a and Title 20

PART 2 - PRODUCTS

(Not Applicable)

PART 3 - EXECUTION

3.01 GENERAL

A. Set up containment and prep the work site pursuant to ICR 56-11.7.

1. Typically, a site-specific variance is not required for non-abrasive methods.

B. Coordinate all activities with the Owner's Project Monitor.

3.02 REMOVALS

A. Abate flooring, base, and mastic in accordance with ICR and applicable standards.

B. Manual scraping with amended water method shall be utilized.

C. It is recognized that full removal of mastic is not probable via this method. Extent and acceptable effort will be verifed by the Owner's Project Monitor prior to break down and demobilization.

3.03 COORDINATION

A. Communicate with subsequent trades regarding condition of substrate after abatement.

1. GC or flooring trades should expect that additional preparation, priming and flash-patching will be required of them in order to create a surface acceptable for new flooring and ahdesives.

2. GC or flooring trades are prohibited from any activities which physically disturbs or dislodges any residual floor mastic materials.

3.04 RESTORATION

A. Restore any damaged items or site to condition prior to work.

END OF SECTION

DIVISION 03 – CONCRETE

SECTION 033000 – CAST-IN-PLACE CONCRETE WORK

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. Drawings and General Provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification sections, apply to work of this section.

1.02 SCOPE/SUMMARY

A. In general, the extent of concrete work is shown on the drawings. Provide all labor, materials, equipment, services, and perform all operations required to complete the installation of all work of this section and related work as indicated on the drawings and specified herein, including, but not necessarily limited to, the following:

1. Concrete footings, pile caps, grade beams, foundations, and walls.
2. Concrete steps, platforms, ramps, equipment pads.
3. Interior concrete slabs on grade or fill and elevated slabs.
4. Exterior concrete on grade: Curbs, walks, plazas, stairs, ramps and driveway aprons.
5. Expansion, control and isolation joints in concrete work.
6. Porous fill and vapor barrier for slabs on grade or fill.
7. Floor hardening treatment for interior exposed cement floors and base.
8. Grouting of bearing plates, leveling plates, miscellaneous lintels, and equipment supported on concrete.
9. All forms and reinforcing required for work of this section.
10. Cut, patch, finish, and point concrete and cement work.
11. Pre-molded filler at intersection of floor slabs and exterior wall, and where otherwise indicated (typical at all points abutting vertical surfaces).
12. Installation of water stop material where indicated when necessary.

B. Work not included: The following items of related work are specified in other sections or contracts.

1. Furnishing of hanger inserts, anchors, leveling plates, sleeves, conduits, etc.
2. Waterproofing and damp proofing.

1.03 RELATED SECTIONS

A. The following sections, when included in the Project Manual, are related to the work of this section:

1. Section 013563 – LEED Requirements
2. Section 014523 – Tests, Inspections and Special Inspections
3. Section 014529 – Testing Laboratory Service
4. Section 017419 – Construction Waste Management
5. Section 035416 – Self Leveling Cementitious Underlayment
6. Section 042000 – Unit Masonry
7. Section 051200 – Structural Steel
8. Section 061000 – Rough Carpentry
9. Section 071000 – Damproofing
10. Section 071616 – Crystalline Waterproofing
11. Section 072000 – Building Insulation
12. Section 072600 – Vapor Retarders
13. Section 310000 – Earthwork

14. Section 310002 – Stakeout

1.04 SUBMISSIONS

A. All submissions to be made in accordance with Section 013300 - Submittal Procedures.

B. A concrete mix design: Submit laboratory test reports of concrete materials and mix design for each strength of concrete required on the project. Design data shall clearly identify the testing laboratory and provide 28 day strength testing reports representing mix proposed inclusive of all admixtures.

1. Mix design shall also include the following information;

a. Minimum design strength intended.
b. Cement content
c. Water content
d. Slag content
e. Water cement ratio
f. Maximum aggregate size
g. Coarse aggregate content
h. Fine aggregate content
i. Air entrainment by volume
j. Adjustment for aggregate moisture slump
k. Tested flexural strength
l. Tested compressive strength

2. Additional inclusions if required on job:

a. Admixtures
b. Water reducers
c. Accelerators
d. Retarders
e. Fibers
f. Colorants
g. Special purpose admixtures
h. Corrosion inhibitor
i. Viscosity modifiers

C. Product Data: Submit manufacturer's product data for all materials and items required for the proposed Scope of Work. Including, but not limited to: concrete mix components, reinforcement and forming accessories, wall sleeves, admixtures, patching compounds, waterstops, joint systems, curing compounds, dry-shake finish materials, hardener/sealers, vapor barriers, non-shrink grit, etc. Product data for materials and items not listed above will be submitted upon the request of the Architect.

D. Shop Drawings-Reinforcement: Submit complete and accurate shop drawings for approval before any work is executed. The shop drawings submitted by the Contractor shall be independently prepared for him by a Professional Engineer licensed to practice in the State of New York or otherwise within the state where the project is to be constructed and shall completely show the following:

1. Foundation plans and details, including but not limited to: pier plan details, stair sections, exterior wall elevation drawings which show all reinforcing, top of wall elevations, brick shelves & shelf elevations, tops of piers, bottom of footings, stepped footings and elevation changes, bar schedules, stirrup spacing, diagrams of bent bars, arrangement of concrete reinforcement. Include special reinforcement required for openings through concrete structures.

2. Floor slab plan indicating elevation variations, recesses, control joints, isolation joints, expansion joints and any proposed cold joints and details of each.

3. Bending and tying diagrams, including typical corners,

4. Sizes and spacing of members, relationship to contiguous work, fabrication, bending, and placement of concrete reinforcement.

5. General notes and legends as required.

6. Drawings shall comply with the latest version of ACI 315 Details and Detailing of Concrete Reinforcement.

7. Any and all other pertinent information.

8. Shop drawings must be signed and sealed by licensed professional engineer.

E. Samples: Submit samples of materials only if requested by the Architect, including names, sources, and descriptions.

F. Material Certificates: Provide material certificates in lieu of laboratory test reports when permitted by Architect. Material certificates shall be signed by the NYS-licensed Professional Engineer who prepared the shop drawing submittal, certifying that each material item complies with, or exceeds, specified requirements.

G. LEED Submittals, for LEED projects submit the following:

1. Submit recycled content and regional materials documentation for each type of product provided under work of this Section in accordance with Section 013563 - LEED Requirements.

2. Credit MR 7: If plywood forms are used, Contractor must submit documentation that the plywood used contains no urea-formaldehyde and that the plywood meets the requirements of LEED MR Credit 7, Certified Wood, by providing wood certification documentation, including chain-of-custody documentation from the manufacturer declaring conformance with the Forest Stewardship Council (FSC) guidelines for certified wood building components.

3. Manufacturer’s verification that steel reinforcement contains at least 90% combined post-consumer and post-industrial recycled content.

4. Manufacturer’s verification that VOC content of interior concrete sealer is less than 250 g/L.

1.05 GENERAL REQUIREMENTS AND QUALITY ASSURANCE

A. Codes and Standards: Comply with the provisions of the latest version of the following codes, specifications, and standards, except where more stringent requirements are shown or specified:

1. Concrete Reinforcing Steel Institute (CRSI), "Manual of Standard Practice."

2. American Society for Testing and Materials (ASTM) Latest Versions:

a. ASTM C 33 - Specification for Concrete Aggregates
b. ASTM C 39 - Test Method for Compressive Strength of Cylindrical Concrete Specimens
c. ASTM C 42 - Methods of Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
d. ASTM C 94/C94 M-00 - Standard Specification for Ready-Mix Concrete
e. ASTM C 150 - Specification for Portland Cement

f. ASTM A 1064 - Standard Specification for Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
g. ASTM C 260 - Specification for Air-Entraining Admixtures for Concrete
h. ASTM C 309 - Specification for Liquid Membrane-Forming Compounds for Curing Concrete
i. ASTM C 494/C 494M - Standard Specification for Chemical Admixtures for Concrete
j. ASTM A 615 - Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
k. ASTM A 775 - Epoxy Coated Reinforcing Steel Bars
l. ASTM F 710-11 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring

3. American Concrete Institute (ACI): Latest Versions

a. ACI 117 - Standard Tolerances for Concrete Construction and Materials
b. ACI 211 - Recommended Practice for Selecting Proportions Concrete
c. ACI 301 - Specifications for Structural Concrete for Buildings
d. ACI 302 - Guide for Concrete Floor and Slab Construction
e. ACI 302.1 - Guide for Concrete Floor and Slab Construction
f. ACI 302.2 - Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials
g. ACI 304 - Recommended Practice for Measuring, Mixing and Placing Concrete
h. ACI 305 - Guide to Hot Weather Concreting
i. ACI 306 - Guide to Cold Weather Concreting
j. ACI 308 - Standard Specification for Curing Concrete
k. ACI 315 - Details and Detailing of Concrete Reinforcement
l. ACI 318 - Building Code Requirements for Reinforced Concrete
m. ACI 347 - Recommended Practice for Concrete Formwork
n. ACI 360R-10 - Guide to Design of Slabs on Grade

B. Quality Control Testing During Construction:

1. The Owner will employ an independent testing laboratory to perform tests and to submit test reports. The contractor will be responsible for contacting the testing laboratory to arrange for all sampling, observation and testing. The Owner will pay for all passing tests; all failed tests and any additional testing required due to failed tests will be the responsibility of the contractor.

2. Sampling and testing for quality control during placement of concrete shall include the following as appropriate to scope, as directed by the Architect and in coordination with Section 014523.

3. Sampling Fresh Concrete: ASTM C 172, except modified for slump to comply with ASTM C 94.

a. Slump: ASTM C 143; one test at point of discharge per truckload or batch of each type of concrete; additional tests when concrete consistency seems to have changed. See 2.05G for slump limits.

b. Air Content: ASTM C 173, volumetric method for lightweight or normal weight concrete; ASTM C 231 pressure method for normal weight concrete; one for each days' placement of each type of air-entrained concrete.

c. Concrete Temperature: Test hourly when air temperature is 40°F (4°C) and below, and when 80°F (27°C) and above; and each time a set of compression test specimens are made.

d. Compression Test Specimen: ASTM C 31; one set of 4 standard cylinders for each compressive strength test, unless otherwise directed. Mold and store cylinders for laboratory cured test specimens except when field-cure test specimens are required.

e. Compressive Strength Tests: ASTM C 39; one set for each day's placement exceeding 5 cu. yds. plus additional sets for each 50 cu. yds. over and above the first 25 cu. yds. of each concrete class placed in any one day; one specimen tested at 7 days, two specimens tested at 28 days, and one specimen retained in reserve for later testing if required.

1) When frequency of testing will provide less than 5 strength tests for a given class of concrete, conduct testing from at least 5 randomly selected batches or from each batch if fewer than five are used.

f. When total quantity of a given class of concrete is less than 50 cubic yards, strength test may be waived by Architect if, in his judgement, adequate evidence of satisfactory strength is provided.

g. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing the in-place concrete.

h. At the discretion of the Architect the strength level of concrete will be considered satisfactory if averages of sets of three consecutive strength test results equal or exceed specified compressive strength, and no individual strength test result falls below specified compressive strength by more than 500 psi.

4. Test results will be reported in writing to the Architect, Structural Engineer, and Contractor within 24 hours after tests. Reports of compressive strength tests shall contain the project identification name and number, date of concrete placement, name of concrete testing service, concrete type and class, location of concrete batch in structure, design compressive strength at 28 days, concrete mix proportions, and materials, compressive breaking strength and type of break for both 7-day tests and 28-day tests.

5. Non-destructive Testing: Impact hammer, sonoscope, or other non-destructive device may be permitted but shall not be used as the sole basis for acceptance or rejection.

6. Additional Tests: The testing service will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by the Architect. Testing service may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed. Contractor shall pay for such tests when unacceptable concrete is verified.

C. The Contractor shall provide a storage box to be used exclusively for the storage and curing of concrete test specimens. This box shall be substantially constructed, made of 1" thick T & G lumber, well braced to prevent warping, or 1/2" thick plywood (exterior grade) may be used. Box shall be provided with a hinged cover and padlock. Storage box shall be so constructed and located on the project site that its air temperature when containing concrete specimens will remain between 60° and 80°F. During the first 24 hours that any test specimens are in the box, electric heating cables or other approved means shall be provided to maintain this temperature during freezing weather. The storage box shall be placed on the site where approved, in location such that it will not be subject to any vibration or disturbance. Storage box shall not be placed in any building or shanty while it is being used for storing specimens.

D. Should the average strength of the test cylinders fall below the required strength, the Architect may require changes in the proportion to apply to the remainder of the work or may require load tests and/or cores at the Contractor's expense on the portion of the structure which fails to develop the required strength or may require additional curing, the load test shall conform to the requirements of the Building Code Requirements for Reinforced Concrete (ACI 318, latest edition). If the concrete does not meet the specified requirements, the Architect may condemn such concrete already in place and the Contractor, at his own expense, shall remove such condemned concrete

and replace same with new concrete to the satisfaction of the Architect. Use of high early strength cement will not be permitted without written approval of the Architect.

1.06 PROJECT CONDITIONS

A. General: The contractor shall ensure that all proper project conditions are in place, ready for the setting of forms, reinforcement and subsequent concrete pouring, prior to the commencement of the work. Commencement of work constitutes contractor acceptance of all existing conditions.

1.07 CONTROLLED CONCRETE

A. Concrete shall be composed of Portland Cement, fine aggregate, coarse aggregate, and water or as otherwise composed via approved mix design.

   1. Additional materials may include: slag, admixtures, fibers, colorants, or special purpose admixtures.

B. All concrete, unless otherwise specified or called for on the drawings, shall be controlled concrete as defined and regulated in the local building code and by the American Concrete Institute and its **ultimate compressive strength at the end of 28 days shall be not less than 4,000 pounds per square inch for foundations, walls and footings, 4,500 pounds per square inch for slabs-on-ground elevated slabs, and other building concrete, and 4,500 pounds per square inch for exterior concrete including, but not limited to, sidewalks, stairs, ramps, driveway aprons and curbing, unless otherwise indicated on structural drawings.**

C. Before the work is begun, the Contractor shall have preliminary trial tests made by a laboratory approved by the Architect to determine the mixture required to give the strength specified. Concrete shall be designed in accordance with the A.C.I. *Standard Recommended Practice for Selecting Proportions for Concrete* (ACI-513) to produce the strength required. Concrete shall be so designed that the concrete materials will not segregate nor shall excessive bleeding occur. Tests shall be made in accordance with ASTM C-39. The laboratory trial mixture for each mix design shall develop a concrete of compressive strength at 28 days of 1,200 psi higher than the required minimum for each of the strengths indicated to be acceptable for use in the field, but in no case shall cement content be less than 6 bags per cubic yard for 4,000 psi and 6 1/2 bags for 4,500 psi concrete. The proposed mixture must be approved by the Architect before the Contractor proceeds with the work.

D. Upon approval by the Architect, the Contractor will be allowed to proceed with the work if the laboratory trial mixture develops a compressive strength of 70% of the required ultimate strength at the end of seven (7) days.

E. If, during the progress of the work, it is found that the required workability and strength cannot be attained with the materials furnished by the Contractor, the Architect may order such changes in proportions or materials or both as may be necessary to secure the desired properties.

F. The proportions of aggregate to cement shall be such as to produce a mixture which will work readily into the corners and around reinforcement but without permitting the materials to segregate or excess free water to collect on the surfaces. The combined aggregates shall be of such composition of sizes that when separated on the No. 4 standard sieve, the weight passing the sieve (fine aggregate) shall be not less than 40% or greater than 50% of the total, unless otherwise directed. Maximum size of coarse aggregate in slab, beams, and columns shall be 3/4" and in walls and footings 1 1/2".

G. The source of supply of the aggregate shall not change during the course of the job without previous notice to the Architect, and the materials from any new source shall be subject to acceptance or rejection based upon tests to be made by the Testing Laboratory at the Contractor's expense.

1.08 DELIVERY, STORAGE AND HANDLING

A. ASTM C 94/C 94M, Article 14 - Batch Ticket Information: In addition to the information required by Paragraph 14.1, also include the following:

1. Type and brand, and amount of cement.
2. 2. Weights of fine and coarse aggregates.
3. 3. Class and brand, and amount of fly ash (if any).

B. Epoxy-Coated Bar Reinforcement: Deliver, store and handle reinforcement in accordance with fabricator's recommendations and as specified.

1. Use padded or nylon bundling bands.
2. Lift and hoist bundles of bars with nylon or padded wire rope slings at the third points or use spreader bars.
3. Store bars on wood or padded cribbing.
4. Do not drop bars, and do not drag bars over the ground or over other bars.

C. Protect materials delivered from the elements and from otherwise being damaged on site.

D. Any materials damaged on site due to improper delivery, storage or handling shall not be incorporated in the project and shall be replaced at no cost to the Owner.

E. Deliver, store and handle steel reinforcement to prevent bending and damage.

PART 2 - PRODUCTS

2.01 FORM MATERIALS

A. Forms for Exposed Finish Concrete: Plywood, metal, metal-framed plywood faced, or other acceptable panel-type materials, to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practicable sizes to minimize number of joints and to conform to joint system shown on drawings.

B. Forms for Unexposed Finish Concrete: Plywood, lumber, metal, or other acceptable material. Provide lumber dressed on at least two edges and one side for tight fit.

C. Form Coatings: Provide commercial formulation form-coating compounds that will not bond with, stain, nor adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

D. Form Ties: Factory-fabricated, adjustable-length, removable or snap-off metal form ties, designed to prevent form deflection and to prevent spalling concrete upon removal. Provide units which will leave no metal closer than 1-1/2" to surface.

1. Provide ties which, when removed, will leave holes not larger than 1" diameter in concrete surface.

2.02 REINFORCING MATERIALS

A. Reinforcing Bars: All reinforcing steel shall conform to ASTM A615, Grade 60, deformed (60 KSI yield stress) and be rolled from intermediate grade new steel billets.

B. Epoxy Coating: Conform fusion bonded epoxy coated reinforcing steel bars to ASTM A775 when used. Furnish acceptance test reports for each lot of epoxy-coated bars delivered to the site. Leave

portions of the reinforcing steel bars uncoated where mechanical connections are shown. Bars shall be cut and bent cold before applying coating material.

C. Welded Wire Fabric: All reinforcement mesh shall be electric-welded wire fabric with an ultimate tensile strength of not less than 55,000 pounds per square inch. All reinforcement mesh shall conform to ASTM A-1064. Epoxy-Coated Fabric Reinforcement shall conform to ASTM A 884, Class A.

D. Supports for Reinforcement: Provide bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place. Use wire bar type supports complying with CRSI specifications (brick is not acceptable other than for slabs on ground).

1. For slabs-on-grade, use supports with sand plates or horizontal runners where base material will not support chair legs. Precast concrete bricks are acceptable for slab on ground construction.

2. For exposed-to-view concrete surfaces, where legs of supports are in contact with forms, provide supports with legs which are plastic protected (CRSI, Class 1) or stainless steel protected (CRSI, Class 2).

3. Certified copies of mill reports shall accompany all deliveries of reinforcing steel, identified to indicate the minimum yield strength of the furnished bars.

4. Copies of the manufacturer's affidavit shall accompany all deliveries of welded wire fabric certifying its minimum tensile strength.

E. Tie Wire: Black annealed wire, 16-1/2 gage or heavier.

F. Bar Supports for Epoxy-Coated Bar Reinforcement: Bar supports made of dielectric material compatible with concrete, or wire bar supports coated with dielectric material compatible with concrete for a minimum distance of 2 inches from the point of contact with the reinforcing bar. Reinforcing bars used as support bars and spreader bars shall be epoxy-coated.

G. Tie Wire for Epoxy-Coated Reinforcement: Wire coated with nylon, plastic or epoxy.

H. For LEED projects all steel reinforcement to contain minimum 90% combined post-consumer and post-industrial recycled content.

2.03 CONCRETE MATERIALS

A. Portland Cement: ASTM C 150, Type I.

1. Use one brand of cement throughout the project, unless otherwise acceptable to the Architect.

B. For LEED projects Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.

1. Provide no more than 25% within the mix for use on exposed slabs on grade, elevated slabs, sidewalks, ramps and stairs.

2. Provide no more than 40% within the mix for use on foundation walls, grade beams, piers, footings, etc.

C. Normal Weight Aggregates: ASTM C33, and as herein specified. Provide aggregates from a single source for exposed concrete.

1. For exterior exposed surfaces, do not use fine or coarse aggregates containing spalling-causing deleterious substances.

2. Local aggregates not complying with ASTM C 33 but which have shown by special test or actual service to produce concrete of adequate strength and durability may be used when acceptable to the Architect.

3. Coarse aggregates for all stone concrete and fine aggregate shall conform to ASTM Designation C33 - well graded from fine to coarse with the specified limits. The maximum size of the aggregate 3/4" in slabs, beams and columns and 1-1/2" in walls and footings and not larger than one-fifth (1/5) of the narrowest dimension between the sides of the forms of the member for which the concrete is to be used, not larger than three-fourths (3/4) of the minimum clear spacing between reinforcing bars.

4. Coarse aggregate for stone concrete shall consist of crushed stone or natural or crushed gravel, having clean, hard, strong, uncoated particles free from injurious amounts of soft, thin, elongated, or laminated pieces, alkali, organic, or other deleterious matter.

5. Fine aggregate for stone concrete - sand, stone screenings, or other inert material with similar characteristics having clean, strong, durable, uncoated grains, and free from lumps, salt, or flaky particles, clay, shale, alkali, organic matter, or other deleterious substance.

6. Aggregates shall be graded as follows:

Coarse Aggregate	Percent Retained
1" sieve	0
3/4" sieve	0 - 10
3/8" sieve	45 - 80
No. 4 sieve	90 – 100

Fine Aggregates	By Weight Passing
Passing 1/4" square opening	100%
Passing No. 4 sieve	95 - 100%
Passing No. 16 sieve	50 - 85%
Passing No. 50 sieve	15 - 25%
Passing No. 100 sieve	2 - 8%

D. Anti-shrinkage grout to be used for grouting in of bearing plates, anchors, and inserts shall be Master Builders *"Embecco"* premix or approved equal.

E. Admixtures shall be used only with the prior written approval of the Architect. All mixtures specified herein or proposed for use by the Contractor shall be of a manufacturer as approved by the Architect and used strictly in accordance with the manufacturer's directions.

1. A set-controlling, water-reducing admixture: *"Pozzolith"* manufactured by Master Builders or approved equal.

2. Air-entraining Admixture: ASTM C-260, certified by manufacturer to be compatible with other required admixtures.

a. Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:

1) "Air-Mix"; Euclid Chemical Company.

2) "Sika Aer"; Sika Corporation.
3) "MB-VR or MB-AE"; Master Builders.
4) "Darex AEA" or "Daravair"; W.R. Grace.
5) "Edoco 2001 or 2002"; Edoco Technical Products.
6) "Air-Tite"; Gifford Hill/American Admixtures.

b. Air-entraining admixtures shall be used for all concrete exposed to weather.

F. Water: Water used in mixing concrete shall be clean, potable (drinkable), and free from injurious amounts of oils, acids, alkalis, organic materials, or other deleterious materials. (complying with ASTM C94).

2.04 RELATED MATERIALS

A. Reglets: Where resilient or elastomeric sheet flashing or bituminous membranes are terminated in reglets, provide reglets of not less than 26 gauge galvanized sheet steel. Fill reglet or cover face opening to prevent intrusion of concrete or debris.

1. Polyethylene sheet not less than 8 mils thick.

B. Non-shrink Grout: CRD-C 621, factory pre-mixed grout.

1. Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:

a. Non-metallic:

1) "Set Grout"; Master Builders.
2) "Sonogrout"; Sonneborn-Rexnord.
3) "Euco-NS"; Euclid Chemical Company.
4) "Supreme"; Gifford-Hill/American Admixtures.
5) "Crystex"; L & M Construction Chemical Company.
6) "Sure-Grip Grout"; Dayton Superior Corporation.
7) "Horngrout"; A.C. Horn, Inc.
8) "Five Star Grout"; U.S. Grout Corporation.

C. Absorptive Cover: Burlap cloth made from jute or kenaf, weighing approximately 9 oz. per square yard, complying with AASHTO M 182, Class 2.

1. For LEED projects Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.

a. Provide no more than 25% within the mix for use on exposed slabs on grade, elevated slabs, sidewalks, ramps and stairs.

b. Provide no more than 40% within the mix for use on foundation walls, grade beams, piers, footings, etc.

D. Moisture-Retaining Cover: One of the following, complying with ASTM C 171:

1. Waterproof paper.

2. Polyethylene film.

3. Polyethylene-coated burlap.

E. Liquid Membrane-Forming Curing Compound: Concrete slabs shall be cured by means of

pigmented curing compound of a type not affecting adhesion of resilient flooring or other surface finish, of approved manufacture, conforming to ASTM C-309, and applied in strict accordance with manufacturer's directions. Liquid type membrane-forming curing compound complying with ASTM C 309, Type 1, Class A. Moisture loss not more than 0.055 gr./sq. cm. when applied at 200 sq. ft./gal.

1. Available Products: Subject to compliance with requirements, products, which may be incorporated in the work include, but are not limited to, the following:

    1) "Masterseal"; Master Builders.
    2) "A-H 3 Way Sealer"; Anti-Hydro Waterproofing Company.
    3) "Ecocure"; Euclid Chemical Company.
    4) "Clear Seal"; A.C. Horn, Inc.
    5) "Sealco 309"; Gifford-Hill/American Admixtures.
    6) "J-20 Acrylic Cure"; Dayton Superior.
    7) "Spartan-Cote"; The Burke Company.
    8) "Sealkure"; Toch Div. - Carboline.
    9) "Kure-N-Seal"; Sonneborn-Rexnord.
    10) "Polyclear"; Upco Chemical/USM Corp.
    11) "L & M Cure"; L & M Construction Chemicals.
    12) "Klearseal"; Setcon Industries.
    13) "LR-152"; Protex Industries.
    14) "Hardtop"; Gifford-Hill.

2. Liquid membrane curing compounds may only be used on slabs where there is no other finish flooring material to be installed.

F. Bonding Compound: Polyvinyl acetate or acrylic base.

1. Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:

    a. Polyvinyl Acetate (Interior Only):

        1) "Eucoweld"; Euclid Chemical Company.
        2) "Weldcrete"; Larsen Products Corporation.

    b. Acrylic or Styrene Butadiene:

        1) "J-40 Adbond Bonding Agent"; Dayton Superior Corp.
        2) "Everbond"; L & M Construction Chemicals.
        3) "Hornweld"; A.C. Horn, Inc.
        4) "Sonocrete"; Sonneborn-Rexnord.
        5) "Acrylic Bondcrete"; The Burke Company.
        6) "SBR Latex"; Euclid Chemical Company.
        7) "Daraweld C"; W.R. Grace.

G. Epoxy Adhesive: ASTM C 881, two component material suitable for use on dry or damp surfaces. Provide material "Type," "Grade," or "Class" to suit project requirements.

2. Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:

    a. *"Thiopoxy"*; W.R. Grace.
    b. *"Epoxtite"*; A.C. Horn, Inc.
    c. *"Edoco 2118 Epoxy Adhesive"*; Edoco Technical Products.

d. *"Sikadur Hi-Mod"*; Sika Chemical Corporation.
e. *"Euco Epoxy 452 or 620"*; Euclid Chemical Company.
f. *"Patch and Bond Epoxy"*; The Burke Company.
g. *"Concresive 1001"*; Adhesive Engineering Company.

H. Joint Fillers / Filler Strips: Joints for slabs on ground shall be formed with preformed, non-exuding bituminous fiber expansion filler, which shall extend full length and depth of slabs. Vertical expansion joints shall be constructed complete with water dams or waterstops and joint filler.

I. Vapor Barriers: Under typical interior slabs where finished flooring does not involve wood, provide non-woven, polyester, reinforced, polyethylene coated sheet of 15 mil thickness.

1. Vapor barrier membrane must have the following properties:

a. Permeance as tested after mandatory conditioning (ASTM E 1745 paragraphs 7.1.2-5): less than 0.01 perms (gran/ft^2/hr/in-Hg).

b. Other performance criteria:

1) Strength: Class A (ASTM E 1745).
2) Minimum thickness of plastic retarder material: 15 mils.

c. Basis of Design: Stego Wrap 15-mil Vapor barrier by Stego Industries, LLC.

d. Or Architect approved equal.

J. Vapor barrier under interior slabs where finished flooring involves wood assemblies such as gymnasium and stages provide bituminous vaporproofing/waterproofing membrane.

1. Vapor barrier must have seven-ply, weather-coated, permanently bonded, semi-flexible bituminous core board composed of a 3-ply plasmatic matrix sealed between liners of asphalt-impregnated felt and a glass mat liner. Vapor barrier shall consist of an asphalt weather coat and covered with a polyethylene anti-stick sheet. Vapor barrier shall meet or exceed all requirements of ASTM E 1993-98 and shall have the following characteristics:

a. Thickness ASTM D5147: 100-140 mils.
b. Tensile Strength ASTM E154: 140 lbf/in.
c. Puncture Resistance ASTM E154: 125 lbf.
d. Water Vapor Permeance ASTM E154: 0.000 perms
e. Permeance after Wetting, Drying and Soaking: ASTM E154: 0.01 perms
f. Permeance after Soil Organism Exposure: ASTM E154: 0.115 perms
g. Pre-molded Membrane® Vapor Seal with Plasmatic Core by W.R. Meadows, W.R. Meadows, Inc., PO Box 338, Hampshire, Illinois 60140-0338. (800) 348-5976. (847) 683-4500. Fax (847) 683-4544. Website: www.wremeadows.com.

K. Water Stops: Provide all waterstops similar to or equal to those as produced by *Greenstreak, Inc.,* as required by the drawings, either embedded in concrete, or across and/or along the joint, to form a watertight diaphragm that prevents the passage of fluid through the joint.

L. All other materials as hereinafter specified. All set-in-place concrete elements (i.e. – pre-fabricated water stops, cast aluminum nosings, exterior stair components, etc.) shall be installed in conformance with their associated specification sections, and/or manufacturer's installation instructions if no specification is provided and in complete coordination with the work of this Section.

2.05 PROPORTIONING AND DESIGN OF MIXES

A. Design mix of all concrete shall provide the following properties, as indicated on the drawings and schedules:

1. 4,000 psi 28-day compressive strength; W/C ratio, 0.58 maximum (non-air-entrained), 0.46 maximum (air-entrained).

2. 4,500 psi 28-day compressive strength; W/C ratio, 0.67 maximum (non-air-entrained), 0.54 maximum (air-entrained).

3. Do not air entrain concrete for trowel finished interior floors and suspended slabs, including polished concrete floors. Do not allow entrapped air content to exceed 3 percent.

B. Stone concrete shall weigh approximately 144 pounds per cubic foot. Exterior concrete, exposed to weather, shall have a water cement ratio not to exceed 6 1/2 gallons per sack of cement and an air entraining agent approved by the Architect to be added to obtain concrete with an air content not less than 4% nor more than 6% conforming to ASTM C-175, latest edition.

C. Prepare design mixes for each type and strength of concrete laboratory trial batch methods as specified in ACI 301. Use an independent testing facility acceptable to Architect for preparing and reporting proposed mix designs. The testing facility shall not be the same as used for field quality control testing.

D. Submit written reports to Architect and Structural Engineer of each proposed mix for each class of concrete at least 15 days prior to start of work. Do not begin concrete production until mixes have been reviewed and accepted by the Architect.

E. Adjustment to Concrete Mixes: Mix design adjustments may be requested by Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant; at no additional cost to the Owner and as accepted by the Architect. Laboratory test data for revised mix design and strength results must be submitted to and accepted by the Architect before using in work.

F. Admixtures: ONLY TO BE USED WITH PRIOR WRITTEN APPROVAL OF THE ARCHITECT!

1. Use water-reducing admixture or high range water-reducing admixture (super plasticizer) in concrete as required for placement and workability.

2. Use non-chloride accelerating admixture in concrete slabs placed at ambient temperatures below 50°F (10°C).

3. Use high-range water-reducing admixture in pumped concrete, concrete for industrial slabs, architectural concrete, parking structure slabs, concrete required to be watertight, and concrete with water/cement ratios below 0.50.

4. Use air-entraining admixture in exterior exposed concrete, unless otherwise indicated. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having total air content with a tolerance of plus or minus 1-1/2 percent within the following limits:

a. Concrete structures and slabs exposed to freezing and thawing, de-icer chemicals, or subjected to hydraulic pressure.

b. 4.5 percent (moderate exposure).
5.5 percent (severe exposure) 1-1/2" maximum aggregate.

c. 4.5 percent (moderate exposure)
6.0 percent (severe exposure) 1" maximum aggregate.

5. Use admixtures for water-reducing and set-control in strict compliance with manufacturer's directions.

G. Slump Limits: Proportion and design mixes to result in concrete slump at point of placement as follows:

1. Ramps, slabs, and sloping surfaces: Not more than 3".

2. Reinforced foundation systems: Not less than 1" and not more than 3".

3. Concrete containing HRWR admixture (super-plasticizer): Not more than 8" after addition of HRWR to site-verified 2"-3" slump concrete.

4. Other concrete: Not less than 1" and not more than 4".

2.06 MIXING

A. All concrete shall be machine mixed or transit mixed.

B. Hand mixing will not be permitted unless approved by the Architect. Mixing shall conform to ASTM C-94 and ACI-304. On-site mixing will not be permitted unless approved by the Architect/Engineer.

C. Machine mixing shall be done in an approved batch mixer. Sand and gravel shall be measured by weighing. Mixing shall be continued for at least one minute after all materials are in the mixing drum at a speed of not less than twelve nor more than eighteen revolutions per minute. The volume of the mixing materials per batch shall not exceed manufacturer's rated capacity of mixer. A water gauge shall be provided to deliver the exact predetermined amount of water for each batch. Mixing shall be continued for at least 1 minute for 1 cubic yard of concrete plus 1/4 minute for each additional cubic yard of concrete after all materials.

D. Transit mix concrete shall conform to the specification and tests herein described and to ASTM C-94 and ACI-304, most current edition(s); and further provided that the central plant producing the concrete and equipment transporting it are, in the opinion of the Architect, suitable for production and transportation of controlled concrete. The maximum elapsed time between the time of the introduction of water and placing shall be one hour.

E. Exterior concrete exposed to weather: Water cement ratio shall not exceed 6 1/2 gallons per sack of cement and an air-entraining agent approved by the Architect shall be added to obtain concrete with an air content not less than 4% nor more than 6% conforming to ASTM C-175, latest edition.

F. Ready-mix Concrete: Comply with the requirements of ASTM C 94, and as specified herein.

1. During hot weather, or under conditions contributing to rapid setting of concrete, a shorter mixing time than specified in ASTM C 94 may be required.

PART 3 - EXECUTION

3.01 GENERAL

A. The Contractor shall notify the Architect, Construction Manager (when applicable) and the approved testing laboratory at least 24 hours in advance of the time he intends to use ready mixed concrete so that an inspector may be assigned to the plant to supervise the mix, and be available at the site to witness pour and sampling.

B. With each delivery of concrete, furnish to the superintendent at the building site a delivery slip (certified by laboratory representative) showing mix, quantity of cement, fine and coarse aggregates, and water, and time of departure from the plant.

C. Under no circumstances shall transit-mixed concrete be delivered from the plant, unless mix design has been approved by the Architect and inspector of testing laboratory. The approved plant and its operating equipment shall be under the supervision of the testing laboratory appointed by and directly responsible to the Architect.

D. Coordinate the installation of joint materials and vapor retarders with placement of forms and reinforcing steel.

3.02 FORMS

A. Design, erect, support, brace, and maintain form work to support vertical and lateral, static, and dynamic loads that might be applied until such loads can be supported by concrete structure. Construct formwork so that concrete members and structures are of correct size, shape, alignment, elevation, and position. Maintain formwork construction tolerances complying with ACI 347.

B. Design form work to be readily removable without impact, shock, or damage to cast-in-place concrete surfaces and adjacent materials.

C. Construct forms to sizes, shapes, lines, and dimensions shown, and to obtain accurate alignment, location, grades, level and plumb work in finished structures. Provide for openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages, inserts, and other features required in the work. Use selected materials to obtain required finishes. Solidly butt joints and provide back up at joints to prevent leakage of cement paste.

D. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces.

   1. Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only. Kerf wood inserts for forming keyways, reglets, recesses, and the like, to prevent swelling and for easy removal.

E. Provide temporary openings where interior area of formwork is inaccessible for cleanout, for inspection before concrete placement, and for placement of concrete. Securely brace temporary openings and set tightly to forms to prevent loss of concrete mortar. Locate temporary openings on forms at inconspicuous locations.

F. Chamfer exposed corners and edges as indicated, using wood, metal, PVC, or rubber chamfer strips fabricated to produce uniform smooth lines and tight edge joints.

G. Provisions for Other Trades: Provide openings in concrete formwork to accommodate work of other trades. Determine size and location of openings, recesses, and chases from trades providing such items. Accurately place and securely support items built into forms.

H. Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, etc., or other debris just before concrete is placed. Retightening forms and bracing after concrete placement as required to eliminate mortar leaks and maintain proper alignment.

3.03 PREPARATION OF FORM SURFACES

A. Clean re-used forms of concrete matrix residue, repair and patch as required to return forms to

acceptable surface condition.

B. Coat contact surfaces of forms with a form-coating compound before reinforcement is placed.

C. Thin form-coating compounds only with thinning agent of type, amount, and under conditions of form-coating compound manufacturer's directions. Do not allow excess form-coating material to accumulate in forms or to come into contact with in-place concrete surfaces against which fresh concrete will be placed. Apply in compliance with manufacturer's instructions.

D. Coat steel forms with a non-staining, rust preventative form oil or otherwise protect against rusting. Rust-stained steel formwork is not acceptable.

3.04 VAPOR RETARDER INSTALLATION

A. Following leveling and tamping of granular base for slabs on grade, place vapor retarder sheeting with longest dimension parallel with direction of pour. Lap joints and seal with appropriate tape.

B. All concrete slabs on grade or fill shall receive membrane placed on porous fill prior to placing reinforcing. Membrane shall be placed with 6" laps at ends and sides, and without tears or ruptures at the time concrete is placed thereon.

C. Both standard vapor barrier and pre-molded membrane when applicable shall be installed in accordance with the manufacturers requirements.

3.05 PLACING OF REINFORCEMENT

A. Comply with *Concrete Reinforcing Steel Institute*'s recommended practice for *"Placing Reinforcing Bars",* for details and methods of reinforcement placement and supports, and as specified herein.

B. All reinforcement shall be rigidly wired in place with adequate spacers and zinc coated tie chairs. Bar supports shall be not more than 4'-0" o.c. Clean reinforcement of loose rust and mill scale, earth, ice, and other materials which reduce or destroy bond with concrete. Reinforcement for concrete slabs on ground or fill shall be supported on precast concrete bricks. On formwork, galvanized coated chairs or spacers shall be used.

C. Reinforcement shall be placed so that where temperature shrinkage of bars occur, they shall be no closer to top of slab than 3/4". Coordinate with work under Electrical Contract so that conduits may be replaced to obtain this result.

D. Accurately position, support, and secure reinforcement against displacement by formwork, construction, or concrete placement operations. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers as required.

E. All reinforcement shall be bent cold. The minimum radius of bend shall be 4 diameters for bars 5/8" round or less and 6 diameters for larger bars.

F. Place reinforcement to obtain at least minimum coverage for concrete protection. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.

G. Install welded wire fabric in as long lengths as practicable. Lap adjoining pieces at least one full mesh and lace overlaps with wire. Offset end laps in adjacent widths to prevent continuous laps in either direction.

H. Do not cut or puncture vapor barrier. Repair damage and reseal vapor barrier in accordance with manufacturer’s requirements before placing concrete.

I. Epoxy-Coated Reinforcement: (To be used in all concrete exposed to weather or wet conditions)

1. Field Bending: Field bending shall be done by cold methods only, and only when ambient and bar temperatures are 40 degrees F or higher. Epoxy coating damaged by field bending shall be repaired, or the damaged reinforcement shall be replaced, in accordance with specified tolerances.

2. Field Repair: Repair cut and damaged epoxy coating with epoxy repair coating according to ASTM D 3963/D 3963M or in accordance with the material manufacturer's recommendations. Also coat cut ends, welds, and steel splice members if such procedures are permitted.

3. Tolerances for Coating Damage: Coating damage need not be repaired where the damaged area is less than 0.1 square inch. The maximum amount of coating damage, including repaired and unrepaired areas, shall not exceed 2 percent of the surface area of the bar.

4. Use epoxy-coated steel wire ties to fasten epoxy-coated steel reinforcement.

J. Zinc-Coated Reinforcement: Repair, cut and damaged zinc coatings with zinc repair material according to ASTM A 780. Use galvanized steel wire ties to fasten zinc-coated steel reinforcement.

3.06 EXPANSION JOINTS

A. Joints for slabs on ground shall be formed with preformed, non-exuding bituminous fiber expansion filler, which shall extend full length and depth of slabs.

B. Vertical expansion joints shall be constructed complete with water dams or waterstops and joint filler.

C. Joint material in exterior concrete, sidewalks, plazas, stairs, ramps, curbs, etc. shall be held 1/4" from finished surface and finished with approved traffic grade sealant.

3.07 OTHER JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install 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. Do not continue reinforcement through sides of strip placements of floors and slabs.

2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches (38 mm) into concrete.

3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints to 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 per typical detail. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.

6. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construction contraction joints for a depth as follows:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch (3.2 mm). Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.

2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- (3.2 mm-) wide joints 1" deep into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated.

2. Terminate full-width joint-filler strips not less than 1/2 inch (13 mm) or more than 1 inch (25 mm) below finished concrete surface where joint sealants, specified in Division 07 Section "Joint Sealant," are indicated.

3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip section together.

E. Doweled Joints: Install dowel bards and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.08 INSTALLATION OF EMBEDDED ITEMS

A. General: Set and build into work anchorage devices and other embedded items required for other work that is attached to or supported by cast-in-place concrete. Use setting drawings, diagrams, instructions, and directions provided by suppliers of items to be attached thereto.

1. Install reglets to receive top edge of foundation sheet waterproofing, and to receive thru-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, relieving angles, and other conditions.

2. Install anchor bolts, accurately located, to elevations required.

B. Edge Forms and Screed Strips for Slabs: Set edge forms or bulkheads and intermediate screed straps for slabs to obtain required elevations and contours in finished slab surface. Provide and secure units sufficiently strong to support types of screed strips by use of strike-off templates or accepted compacting type screeds.

3.09 CONCRETE PLACEMENT

A. The Contractor shall notify the Owner, the Architect, the Construction Manager (when applicable) and the testing laboratory at least 48 hours in advance of the time he intends to place concrete in order to afford them the opportunity to observe placing operations. The Contractor shall obtain the Architect's and testing laboratory's permission prior to placing concrete.

B. All forms must be absolutely clean and free from shavings and dirt prior to starting concrete operations.

C. Under no circumstances shall concrete be deposited in or under water, nor on muddy or frozen ground.

D. Pre-placement Inspection: Before placing concrete, the Contractor shall inspect and complete all formwork installation, reinforcing steel, and items to be embedded or cast-in. Notify other crafts to permit installation of their work; cooperate with other trades in setting such work. Moisten wood forms immediately before placing concrete where form coatings are not used. Protect adjacent finish materials against spatter during concrete placement.

1. Apply temporary protective covering to lower 2' of finished walls adjacent to poured floor slabs and similar conditions, and guard against spattering during placement under any and all conditions of placement.

E. General: Comply with ACI 304 *"Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete"* and as herein specified.

1. Deposit concrete continuously or in layers of such thickness that no concrete will be placed on concrete which has hardened sufficiently to cause the formation of seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as herein specified. Deposit concrete as nearly as practicable to its final location to avoid segregation.

2. Before depositing new concrete against concrete which has set, the forms shall be re-tightened and the surface of the concrete placed earlier shall be thoroughly roughened, cleaned of all foreign matter and laitance, shall be slushed with water, slushed with a coat of neat cement grout, and the new concrete shall be placed before the grout has attained its initial set, or the work shall be performed in such other approved manner as will insure a thorough bonding to the work.

F. All concrete must be placed as rapidly as possible after mixing and thoroughly spaded and rammed in place. Consolidate placed concrete by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping. All possible care is to be exercised to prevent honeycombing. Concrete shall be placed in layers not over 12” thick and shall not be dumped from height over three feet. Concrete that must be placed more than 3 feet below placement level shall be chuted at a slope of not more than 1 in 2 or deposited through elephant trunks.

G. Concrete shall be placed in one operation up to temporary bulkheads, which shall be located, in general, at points of minimum shear.

H. Placing Concrete in Forms: Deposit concrete in forms in horizontal layers not deeper than 12" and in a manner to avoid inclined construction joints. Where placement consists of several layers, place each layer while preceding layer is still plastic to avoid cold joints.

1. Use equipment and procedures for consolidation of concrete in accordance with ACI 309.

2. All structural concrete shall be placed with the aid of mechanical vibrators. The vibrators shall be of a type and design approved by the Architect and shall be capable of transmitting to the concrete not less than 3,000 impulses per minute. The vibration shall be sufficiently intense to visibly affect the concrete over a radius of at least 2'-0" around the point of application but shall not be applied long enough to segregate the ingredients. Insert and withdraw vibrators vertically at uniformly spaced locations not farther than visible effectiveness of machine. Place vibrators to rapidly penetrate placed layer and at least 6" into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to set. Enough vibration shall be used to cause all the concrete to flow or settle readily into place. The vibration shall be of internal type, applied directly to the concrete and not through the forms, except in sections too thin to permit the insertion of the internal type, in which case form vibration may be employed at the discretion of the Architect. Do not use vibrators to transport concrete inside forms.

I. Placing Concrete Slabs: Deposit and consolidate concrete slabs in a continuous operation, within limits of construction joints, until the placing of a panel or section is completed.

1. Consolidate concrete during placing operations so that concrete is thoroughly worked around reinforcement and other embedded items and into corners.

2. Bring slab surfaces to correct level with straightedge and strikeoff. Use bull floats or darbies to smooth surface, free of humps or hollows. Do not disturb slab surfaces prior to beginning finishing operations.

3. Maintain reinforcing in proper position during concrete placement operations.

4. Slope surfaces uniformly to drains where required.

5. For exterior placement such as sidewalks, plazas, driveway aprons, curbing and equipment pads where no vapor barrier is required, the subgrade shall be moist before placing concrete. Dry or dusty subgrades shall be moistened to a minimum depth of one inch (1") prior to placing concrete.

J. Cold Weather Placing: Protect concrete work from physical damage or reduced strength which could be caused by frost, freezing actions, or low temperatures, in compliance with ACI 306 and as herein specified.

1. When air temperature has fallen to or is expected to fall below 40°F (4°C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50°F (10°C), and not more than 80°F (27°C) at point of placement.

   a. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.

   b. Do not use calcium chloride, salt, and other materials containing antifreeze agents or chemical accelerators, unless otherwise accepted in mix designs.

   c. Protection of Footings Against Freezing: Cover completed work at footing level with sufficient temporary or permanent cover as required to protect footings and adjacent subgrade against possibility of freezing; maintain cover for time period as necessary.

K. Hot Weather Placing: When hot weather conditions exist that would seriously impair quality and strength of concrete, place concrete in compliance with ACI 305 and as herein specified. Concrete placed in warm weather shall be kept well sprinkled with water for at least one week after placing, unless other approved curing methods are used. No concrete shall be placed when the atmospheric temperature is above 90°F.

1. Cool ingredients before mixing to maintain concrete temperature at time of placement below 90°F (32°C). Mixing water may be chilled or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Use of liquid nitrogen to cool concrete is Contractor's option.

2. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embedment in concrete.

   a. Fog spray forms, reinforcing steel, and subgrade just before concrete is placed.

3. Use water-reducing retarding admixture (Type D) when required by high temperatures, low humidity, or other adverse placing conditions, only upon approval of the Architect.

3.10 FINISH OF FORMED SURFACES

A. Rough Form Finish: For formed concrete surfaces not exposed to view in the finish work or by other construction, unless otherwise shown or indicated. This is the concrete surface having texture imparted by form facing material used, with tie holes and defective areas repaired and patched and fins and other projections exceeding 1/4" in height rubbed down or chipped off.

B. Smooth Form Finish: For formed concrete surfaces exposed to view, or that are to be covered with a coating material applied directly to concrete, or a covering material applied directly to concrete, such as waterproofing, dampproofing, veneer plaster, painting, or other similar system. This is as-cast concrete surface obtained with selected form facing material, arranged orderly and symmetrically with a minimum of seams. Repair and patch defective areas with fins or other projections completely removed and smoothed.

C. Smooth Rubbed Finish: Provide smooth rubbed finish to scheduled concrete surfaces, which have received smooth form finish treatment, immediately following form removal and not later than one day after form removal.

1. Moisten concrete surfaces and rub with carborundum brick or other abrasive until a uniform color and texture is produced. Do not apply cement grout other than that created by the rubbing process.

D. Grout Cleaned Finish: Provide grout cleaned finish to scheduled concrete surfaces which have received smooth form finish treatment.

1. Combine one part Portland cement to 1-1/2 parts fine sand by volume, and mix with water to consistency of thick paint. Proprietary additives may be used at Contractor's option. Blend standard Portland cement and white Portland cement, amounts determined by trial patches, so that final color of dry grout will match adjacent surfaces.

2. Thoroughly wet concrete surfaces and apply grout to coat surfaces and fill small holes. Remove excess grout by scraping and rubbing with clean burlap. Keep damp by fog spray for at least 36 hours after rubbing.

E. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces occurring adjacent to formed surfaces, strike-off, smooth, and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.11 MONOLITHIC SLAB FINISHES

A. Scratch Finish: Apply scratch finish to monolithic slab surfaces that are to receive concrete floor topping or mortar setting beds for tile, Portland cement terrazzo, and other bonded applied cementitious finish flooring material, and as otherwise indicated.

1. After placing slabs, plane surface to tolerances for floor flatness (F_F) of 15 and floor levelness (F_L) of 13. Slope surfaces uniformly to drains where required. After leveling, while sill plastic, roughen surface before final set, with stiff brushes, brooms, or rakes to provide a profile amplitude of ¼ inch (6 mm) in one direction.

B. Float Finish: Apply float finish to monolithic slab surfaces to receive trowel finish and other finishes as hereinafter specified, and slab surfaces which are to be covered with membrane or elastic waterproofing, membrane or elastic roofing, or sand-bed terrazzo, and as otherwise indicated.

1. After screeding, consolidating, and leveling concrete slabs, do not work surface until ready for floating. Begin floating when surface water has disappeared or when concrete has stiffened

sufficiently to permit operation of power-driven floats, or both. Consolidate surface with power-driven floats, or by hand floating if area is small or inaccessible to power units. Check and level surface plant to tolerances of F_F 18 - F_L 15. Cut down high spots and fill low spots. Uniformly slope surfaces to drains. Immediately after leveling, refloat surface to a uniform, smooth, granular texture.

C. Trowel Finish: Apply trowel finish to monolithic slab surfaces to be exposed to view and slab surfaces to be covered with resilient flooring, carpet, ceramic or quarry tile, paint, or other thin film finish coating system and below wood flooring systems.

1. After floating, begin first trowel finish operation using a hand or power-driven trowel. Begin final troweling when surface produces a ringing sound as trowel is moved over surface. Consolidate concrete surface by final hand-troweling operation, free of trowel marks, uniform in texture and appearance, and with surface leveled to tolerances according to ASTM E 1155 (ASTM E1155M)for a randomly trafficked floor surface. Grind smooth surface defects which would telegraph through applied floor covering system.

    a. Specified overall values of flatness: (F(F)35, and levelness, F(L)25, with minimum local values of flatness F(F)24 and levelness F(L)17 for slabs on grade.

2. Finish and measure surface so gap at any point between concrete surface and an unleveled, freestanding, 10-ft.- (3.05-m-) long straightedge resting on two high spots and placed anywhere on the surface does not exceed 1/8 inch (3.2 mm).

D. Trowel and Fine Broom Finish: Where ceramic or quarry tile is to be installed with either thin-set or thick-set mortar, apply trowel finish as specified, then immediately follow with slightly scarifying surface by fine brooming. Comply with flatness and levelness tolerances for trowel finished floor surfaces.

E. Non-Slip Broom Finish: Apply non-slip broom finish to exterior concrete platforms, steps, sidewalks, plazas, aprons, curbs and ramps, and elsewhere indicated.

1. Immediately after float finishing, slightly roughen concrete surface by brooming with fiber bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

F. Slip-Resistive Finish: Before final floating, apply slip-resistive aggregate finish where indicated and to concrete stair treads, platforms and ramps. Apply according to manufacturer’s written instructions and as follows:

1. Uniformly spread 25/100 sq. ft. (12 kg/10 sq. m) of dampened slip-resistive aggregate over surface in one or two applications. Tamp aggregate flush with surface, but do not force below surface.

2. After broadcasting and tamping, apply float finish.

3. After curing, lightly work surface with a steel wire brush or an abrasive stone and water to expose slip-resistive aggregate.

G. Dry-Shake Floor Hardener Finish: After initial floating, apply dry-shake floor hardener to surfaces according to manufacturer’s written instructions as follows:

1. Uniformly apply dry-shake floor hardener at a rate of 100 lb/100 sq. ft. (49 kg/10 sq. m) unless greater amount is recommended by manufacturer.

2. Uniformly distribute approximately two-thirds of dry-shake floor hardener over surface by hand

or with mechanical spreader, and embed by power floating. Follow power floating with a second dry-shake floor hardener application, uniformly distributing remainder of material, and embed by power floating.

3. After final floating, apply a trowel finish. Cure concrete with curing compound recommended by dry-shake floor hardener manufacturer and apply immediately after final finishing.

3.12 CONCRETE CURING AND PROTECTION

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

1. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Weather permitting; keep continuously moist for not less than 7 days.

2. Begin final curing procedures immediately following initial curing and before concrete has dried. Continue final curing for at least 7 days in accordance with ACI 301 procedures. Avoid rapid drying at end of final curing period.

3. The Contractor shall continuously protect cement finish floors from damage for the duration of the work by such means as approved by the Architect and shall leave same in perfect condition to receive other floor finishes or where exposed in the finished work, they shall be in perfect condition at completion and acceptance of the building.

B. Curing Methods: Perform curing of concrete by curing and sealing compound, by moist curing, by moisture-retaining cover curing, and by combinations thereof, as herein specified as appropriate to finished condition of concrete surface.

1. Provide moisture curing by following methods:

a. Keep concrete surface continuously wet by covering with water.
b. Continuous water-fog spray.
c. Covering concrete surface with specified absorptive cover, thoroughly saturating cover with water and continuously keeping wet. Place absorptive cover to provide coverage of concrete surfaces and edges, with 4" lap over adjacent absorptive covers.

2. Provide moisture-cover curing as follows:

a. Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width with sides and ends lapped at least 3" and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

3. Provide curing and sealing compound to exposed interior slabs (no other finish materials) and to exterior slabs, walks, and curbs as follows:

a. Apply specified curing and sealing compound to concrete slabs as soon as final finishing operations are complete (within 2 hours). Apply uniformly in continuous operation by power-spray or roller in accordance with manufacturer's directions. Recoat areas subjected to heavy rainfall within 3 hours after initial application. Maintain continuity of coating and repair damage during curing period.

b. Do not use membrane curing and sealing compounds compounds on surfaces which are to be covered with coating material applied directly to concrete, liquid floor hardener, waterproofing, dampproofing, membrane roofing, flooring (such as ceramic or quarry tile, vinyl tile, linoleum, glue-down carpet, etc.), painting, and other coatings and finish materials

unless otherwise acceptable to the Architect.

C. Curing Formed Surfaces: Cure formed concrete surfaces, including undersides of beams, supported slabs, and other similar surfaces by moist curing with forms in place for full curing period or until forms are removed. If forms are removed, continue curing by methods specified above, as applicable.

D. Curing Unformed Surfaces: Cure unformed surfaces, such as slabs, floor topping, and other flat surfaces by application of appropriate curing method.

1. Final cure concrete surfaces to receive liquid floor hardener or finish flooring by use of moisture retaining cover, unless otherwise directed.

3.13 REMOVAL OF FORMS

A. Form work not supporting weight of concrete, such as sides of beams, walls, columns, and similar parts of the work, may be removed after cumulatively curing at not less than 50°F (10°C) for 24 hours after placing concrete, provided concrete is sufficiently hard not to be damaged by form removal operations and provided curing and protection operations are maintained.

1. Leave formwork for beam soffits, joists, slabs, and other structural elements that supports weight of concrete-in-place unit concrete has achieved at least 70 percent of its 28-day design compressive strength.

2. Remove forms only if shores have been arranged to permit remove of forms without loosening or distributing shores.

B. Form facing material may be removed 4 days after placement, only if shores and other vertical supports have been arranged to permit removal of form facing material without loosening or disturbing shores and supports.

3.14 RE-USE OF FORMS

A. Clean and repair surfaces of forms to be re-used in work. Split, frayed, delaminated, or otherwise damaged form facing material will not be acceptable for exposed surfaces. Apply new form coating compound as specified for new form work.

B. When forms are extended for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms close to joints. Align and secure joint to avoid offsets. Do not use "patched" forms for exposed concrete surfaces, except as acceptable to the Architect.

3.15 SHORES AND RESHORES

A. Comply with ACI 318 (ACI 318M) and ACI 301 for design, installation, and removal of shoring and re-shoring.

1. Do not remove shoring or re-shoring until measurement of slab tolerances is complete.

B. In multi-story construction, extend shoring or re-shoring over a sufficient number of stories to distribute loads in such a manner that no floor or member will be excessively loaded or will induce tensile stress in concrete members without sufficient steel reinforcement.

C. Plan sequence of removal of shores and re-shores to avoid damage to concrete. Locate and provide adequate re-shoring support construction without excessive stress or deflection.

3.16 MISCELLANEOUS CONCRETE ITEMS

A. Filling In: Fill in holes and openings left in concrete structures for passage of work by other trades, unless otherwise shown or directed, after work of other trades is in place. Mix, place, and cure concrete as herein specified, to blend with in-place construction. Provide other miscellaneous concrete filling shown or required to complete work.

B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on drawings. Set anchor bolts for machines and equipment to template at correct elevations, complying with certified diagrams or templates of manufacturer finishing machines and equipment.

   1. Grout base plates and foundations as indicated, using specified non-shrink grout. Use non-metallic grout for exposed conditions, unless otherwise indicated.

D. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in safety inserts and accessories as shown on drawings. Screed, tamp, and finish concrete surfaces as scheduled.

E. Pits, Trenches, etc.: Build all pits, pit cleanouts, trap pits, trenches, curbs, and pads as required by the drawings and by job conditions.

F. Flexible Waterstops: Install in construction joints and at other joints indicated to form a continuous watertight diaphragm. Install in longest lengths practicable. Support and protect exposed waterstops during progress of the Work. Field fabricate joints in waterstops according to manufacturer’s written instructions.

G. Self-Expanding Strip Waterstops: Install in construction joints and at other locations indicated, according to manufacturer’s written instructions, adhesive bonding, mechanically fastening, and firmly pressing into place. Install in longest lengths practicable.

3.17 CONCRETE SURFACE REPAIRS

A. Patching Defective Areas: Repair and patch defective areas with cement mortar immediately after removal of forms, when acceptable to Architect.

   1. Cut out honeycomb, rock pockets, voids over 1/4" in any dimension, and holes left by tie rods and bolts down to solid concrete but in no case to a depth of less than 1". Make edges of cuts perpendicular to the concrete surface. Before placing cement mortar, thoroughly clean, dampen with water, and brush-coat the area to be patched with specified bonding agent. Place patching mortar after bonding compound has dried.

      a. For exposed-to-view surfaces, blend white Portland cement and standard Portland cement so that, when dry, patching mortar will match color surrounding. Provide test areas at inconspicuous location to verify mixture and color match before proceeding with patching. Compact mortar in place and strike-off slightly higher than surrounding surface.

B. Repair of Formed Surfaces: Remove and replace concrete having defective surfaces if defects cannot be repaired to satisfaction of Architect. Surface defects, as such, include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets, fins and other projections on surface, and stains or other discolorations that cannot be removed by cleaning. Flush out form tie holes, fill with dry pack mortar or precast cement cone plugs secured in place with bonding agent.

1. Repair concealed formed surfaces, where possible, that contain defects that affect the durability of concrete. If defects cannot be repaired, remove and replace concrete.

C. Repair of Unformed Surfaces: Test unformed surfaces, such as monolithic slabs, for smoothness and verify surface plane to tolerances specified for each surface and finish. Correct low and high areas as herein specified. Test unformed surfaces sloped to drain for trueness of slope, in addition to smoothness, using a template having required slope.

1. Repair finished unformed surfaces that contain defects which affect durability of concrete. Surface defects, as such, include crazing, cracks in excess of 0.01" wide or which penetrate to reinforcement or completely through non-reinforced sections regardless of width, spalling, pop-outs, honeycomb, rock pockets, and other objectionable conditions.

2. Correct high areas in unformed surfaces by grinding, after concrete has cured at least 14 days.

3. Correct low areas in unformed surfaces during or immediately after completion of surface finishing operations by cutting out low areas and replacing with fresh concrete. Finish repaired areas to blend into adjacent concrete. Patching compounds may be used when acceptable to Architect.

4. Repair defective areas, except random cracks and single holes not exceeding 1" diameter, by cutting out and replacing with fresh concrete. Remove defective areas to sound concrete with clean, square cuts and expose reinforcing steel with at least 3/4" clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding compound. Mix patching concrete of same materials to provide concrete of same type or class as original concrete. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

5. Repair isolated random cracks and single holes not over 1" diameter by dry-pack method. Groove top of cracks and cutout holes to sound concrete and clean of dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding compound. Mix dry-pack, consisting of one part Portland cement to 2-1/2 parts fine aggregate passing a No. 16 mesh sieve, using only enough water as required for handling and placing. Place dry pack after bonding compound has dried. Compact dry-pack mixture in place and finish to match adjacent concrete. Keep patched area continuously moist for not less than 72 hours.

6. Perform structural repairs with prior approval of Architect or Structural Engineer for method and procedure, using specified epoxy adhesive and mortar.

7. Repair methods not specified above may be used, subject to acceptance of Architect.

3.18 CUTTING, PATCHING, AND REMOVAL

A. The Contractor shall be responsible for all cutting and patching of his work as required to accommodate work of this section and of other sections and contracts.

B. Materials which have become damaged or have been condemned shall be removed from the site.

END OF SECTION

DIVISION 03 – CONCRETE

SECTION 035416 – SELF LEVELING CEMENTITIOUS UNDERLAYMENT

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provision of Contract, including General Conditions, Supplementary Conditions (if applicable), and Division 01 - Specification Sections, apply to work of this Section.

B. The following sections, when included in the Project Manual, are related to the work of this section:

1. Section 013563 – LEED Requirements
2. Section 017419 – Construction Waste Management
3. Section 028218 – Removal of Asbestos Contaminated Substrate Material
4. Section 033000 – Cast-in-Place Concrete
5. Section 090561.13 – Moisture Vapor Emission Control
6. Section 093013 – Ceramic Tile
7. Section 096519 – Resilient Flooring
8. Various other Division 09 Flooring Sections.

1.02 SCOPE

A. The work under this section of the specifications shall consist of furnishing all labor, materials, equipment, and appliances necessary or required to furnish and install all work of this section as shown on the drawings and/or specified herein, including, but not limited to, the following:

1. Provide a self-leveling cementitious underlayment in accordance with the Contract Documents.

2. This system consists of the use of a primer and a mix of special cements and binders which, when mixed with water, becomes a highly liquid cement compound that seeks its own level and produces a smooth and flat surface. Finished surface shall be true to plane in accordance with ACI 117, Standard Specifications for Tolerances for Concrete Construction & Materials, or as directed by the floor finish manufacturer.

3. This Section includes ARDEX K 15® a self-leveling underlayment that consists of a blend of Portland cement and other hydraulic cements and polymers that is used to level and smooth interior concrete, terrazzo, well-bonded ceramic & quarry tile, epoxy coating systems, wood, metal and properly prepared, non-water-soluble adhesive residue on concrete prior to the installation of finish flooring on all grade levels.

    a. ARDEX K 15® Premium Self-Leveling Underlayment

    b. ARDEX P 51™ Primer

    c. ARDEX P 82™ Ultra Prime

    d. ARDEX EP 2000™ Substrate Preparation Epoxy Primer

    e. ARDEX E 25™ Resilient Emulsion

    f. ARDEX Feather Finish® Self-Drying, Cement-Based Finishing Underlayment

B. For this project, it is the expressed intent that all self-leveling products are to be provided in

accordance with the Specifications by the General Contractor at all necessary and appropriate thicknesses at all locations requiring self-leveling product application due to new or existing slabs/subfloors not meeting required finish flooring product tolerances or infill of recessed slabs/subfloors. Refer to the specifications and manufacturers requirements for additional tolerance requirements specific to each type of finish flooring.

1.03 REFERENCES

A. ASTM C109M, Compressive Strength Air-Cure Only
B. ASTM C348, Flexural Strength of Hydraulic-Cement Mortars
C. ASTM F2170, Relative Humidity in Concrete Floor Slabs Using in situ Probes
D. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring
E. ASTM D4263, Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method

1.04 QUALITY ASSURANCE

A. Self-leveling underlayment concrete shall be " ARDEX K 15®" as manufactured by Ardex, Inc., 400 Ardex Park Dr, Aliquippa PA 15001, www.ardexamericas.com; or Architect approved equal.

   1. Underlayment shall be able to be installed from 1/8” over the highest point in the space and up to 1 1/2” in one pour and up to 5” with the addition of aggregate. It may also be feathered to match existing elevations.

   2. Underlayment shall be walkable after 2-3 hours and allow floor covering to be installed after 16 hours at 70°F.

   3. Underlayment compressive strength shall be 5500 psi after 28 days per ASTM C109/mod (air cure only)

   4. After proper substrate preparation, underlayment shall be suitable for use over the following substrates.

      a. New construction: Un-level concrete, rough concrete, rained-on concrete, frozen concrete, unfinished concrete, rough-screeded concrete, wooden or metal subfloors.

      b. Rehabilitation projects: Existing concrete, wood, metal, terrazzo, quarry tile, ceramic tile, and over cutback adhesive residue.

B. Installation of the ARDEX product must be completed by a factory-trained applicator, such as an ARDEX LevelMaster® Elite, Choice Contractor or INSTALL Substrate Prep Certified Installer, using mixing equipment and tools approved by the manufacturer. Contact ARDEX Engineered Cements (724) 203-5000 for a list of recommended installers.

C. Product must have a hydraulic cement-based inorganic binder content as the primary binder which includes portland cement per ASTM C150: Standard Specification for Portland Cement and other specialty hydraulic cements. Gypsum-based products are not acceptable.

D. Manufacturer Experience: Provide products of this section by companies which have successfully specialized in production of this type of work for not less than 10 years. Contact Manufacturer Representative prior to installation.

1.05 SUBMISSIONS

A. General: Comply with provisions of Section 013300 – Submittal Procedures.

B. Product Data: Submit manufacturer's product data and installation instructions for each material and product used. Include manufacturer's Safety Data Sheets.

1. Complete materials list of all items proposed to be furnished and installed under this Section.

2. Manufacturer's specifications and other data required demonstrating compliance with specified requirements.

3. Manufacturer's certification that the product specified is suitable for the intended use when installed according to the parameters described in the manufacturer's printed literature and installation instructions.

4. Installer Qualifications: Manufacturer’s written approval that installer is trained and qualified to perform work of this type.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver products in original packaging, labeled with product identification, manufacturer, batch number and shelf life.

B. Store products in a dry area with temperature maintained between 50° and 85°F and Protect from direct sunlight.

C. Handle products in accordance with manufacturer's printed recommendations.

1.07 PROJECT CONDITIONS

A. Do not install material below 50°F surface and air temperatures. These temperatures must also be maintained during and for 48 hours after the installation of products included in this section. Install quickly if the substrate is warm and follow warm weather instructions available from the ARDEX Technical Service Department.

1.08 WARRANTY

A. ARDEX K 15® installed as part of a floor system, shall be installed in conjunction with the recommended ARDEX Tile & Stone Installation Materials or WW HENRY Flooring Adhesive, as appropriate, to provide the ARDEX SystemOne comprehensive warranty, depending on the system installed.

PART 2 – PRODUCTS

2.01 MATERIALS AND COMPONENTS

A. Hydraulic Cement-Based Self-Leveling Underlayment:

1. The Portland cement-based self-leveling, cementitious underlayment or patching material shall be: ARDEX K 15® self-leveling underlayment concrete (for all standard self-leveling); or Architect approved equal.

a. Primer:

1) Standard Absorbent Concrete: ARDEX P 51™ Primer.
2) Extremely Absorbent Concrete: May require two applications of ARDEX P 51™ to minimize the potential for pinholes forming in the ARDEX K 15.
3) Wood: ARDEX P 82™ Ultra Prime.

4) Metal: ARDEX EP 2000™ Substrate Preparation Epoxy Primer.
5) Other Non-Porous Substrates (burnished concrete, terrazzo, well-bonded ceramic, quarry and porcelain tiles, epoxy coating systems and non-water-soluble adhesive residue on concrete and concrete treated with silicate compounds): ARDEX P 82™ Ultra Prime.

b. Performance and Physical Properties: Meet or exceed the following values for material cured at 73° F+/-3°F and 50% +/-5% relative humidity:

1) Application: Barrel Mix or Pump
2) Flowing Time: Approximately 10 minutes
3) Initial Set, ASTM C191: Approximately 30 minutes
4) Final Set, ASTM C191: Approximately 90 minutes
5) Compressive Strength: 5,500 psi at 28 days, ASTM C109M
6) Flexural Strength: 1,200 psi at 28 days, ASTM C348
7) Flammability, ASTM E84-81a:

Flame Spread	-0-
Fuel Contribution	-0-
Smoke Development	-0-

8) VOC: 0
9) Coverage: Approx. 30 sq.ft. per bag at 1/4".

2. Primer for non-porous subfloors, cut-back and non-water soluble adhesive residues, and metal and wooden subfloors shall be ARDEX P 82™ Ultra Prime.

3. The additive to be mixed with ARDEX K 15® when used over cut-back adhesive, metal, or wooden subfloors shall be ARDEX E 25™ Resilient Emulsion.

4. Aggregate shall be well-graded, washed pea gravel (1/8" to 1/4" or larger) for use when underlayment is installed over 1 1/2" thick. (Max. installation is 5”)

5. Water shall be clean, potable, and sufficiently cool (not warmer than 70°F).

6. Portland cement-based trowel-grade underlayment (for patch & skim coating) shall be:

a. ARDEX SD-P® Instant Patch Self-Drying, Fast-Setting Concrete Underlayment Patch (for repairing substrates and ramping).

b. ARDEX Feather Finish® Self-Drying, Cement-Based Finishing

B. Moisture Vapor Suppression (For use where the level of moisture emissions from the concrete slab exceed the maximum permitted by the manufacturer of the finished flooring):

1. Moisture Control System shall be ARDEX MC™ Rapid one-coat moisture control system for use over new or existing concrete. Use of a moisture control system shall be field determined based upon relative humidity measurements within the concrete in accordance with ASTM F2170 or surface of the concrete in accordance with ASTM F2420. Labor and material costs for the installation of the moisture control system are excluded from the contractors Base Bid and shall be applied via agreed upon Change Order or Allowance Authorization in accordance with the General Conditions of Contract.

2.02 MIX DESIGNS

A. ARDEX K 15® Self-Leveling Underlayment Concrete (standard underlayment):

1. Standard mixing ratio: ARDEX K 15® shall be mixed in 2-bag batches at one time. Mix each

bag of ARDEX K 15® (55 lb.) with 7 quarts of water. Product shall be mixed in T-10 mixing drum using a T-1 mixing paddle and a 1/2" heavy-duty drill (min. 650 rpm). Mix thoroughly for approximately 2-3 minutes to obtain a lump-free mixture. Follow written instructions per the ARDEX K 15® bag label.

2. Resilient mix for applications over cutback and non-water soluble adhesive residues, wood, and metal: Use 6 qt. of water and 2 qt. of ARDEX E 25™ Resilient Emulsion for each bag of ARDEX K 15®.

3. Aggregate mix: For areas to be installed over 1 1/2" thick and up to 5”, aggregate may be added to reduce material costs. Mix ARDEX K 15® with water first, then add from 1/3 up to 1 part by volume of aggregate (1/8" to 1/4" or larger). Do not use sand.

4. For pump installations, ARDEX K 15® shall be mixed using the Ardex Levelcraft Automatic Mixing Pump. Start the pump at 210 gallons of water per hour, and then adjust to the minimum water reading that still allows self-leveling properties. DO NOT OVERWATER. Check the consistency of the product on the floor to ensure a uniform distribution of the sand aggregate at both the top surface and bottom of the pour. If settling is occurring, reduce the water amount and recheck. If settling is occurring, reduce the water amount and recheck. Conditions during the installation, such as variations in water, powder, substrate, and ambient temperature, require that the water setting be monitored and adjusted carefully to avoid overwatering.

B. ARDEX SD-P® - Instant Patch Self-Drying, Fast-Setting Concrete Underlayment Patch (for repairing substrates and ramping):

1. Mix 1 bag of Ardex SD-P (40 lbs.) with 4 quarts of water. Product can be mixed in a clean 5-gallon pail using a mixing paddle and a ½” heavy-duty drill (min. 650 rpm). Mix thoroughly for approximately 2-3 minutes to obtain a lump-free mixture. Follow written installation instructions per Ardex SD-P bag label.

C. ARDEX Feather Finish® - Self-Drying, Cement-Based Finishing Underlayment (for flash patching & skim coating):

1. The recommended mixing ratio is 2 parts powder to 1 part water by volume. Mix the ARDEX Feather Finish® powder with water to the desired trowelable consistency using a margin trowel or an approved paddle and drill.

PART 3 - EXECUTION

3.01 GENERAL

A. In addition to the general procedures described herein, refer to manufacturer's current published product literature for complete installation details for the underlayment system being installed.

3.02 SUBSTRATE PREPARATION

A. General: Prepare substrate in accordance with manufacturer’s instructions.

B. Concrete:

1. Prior to proceeding please refer to ASTM F710 Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring. All concrete subfloors must be sound, solid, clean, and free of all oil, grease, dirt, curing compounds and any substance that might act as a bond breaker before priming. Mechanically clean if necessary using shot blasting or other. **Acid etching and the use of sweeping compounds and solvents are not acceptable.**

2. Substrates shall be inspected in accordance with ASTM F2170 and corrected for moisture or any other conditions that could affect the performance of the underlayment or the finished floor covering. For areas where moisture vapor emissions exceed the required limits refer to Section 090561.13, Moisture Vapor Emission Control and install the appropriate ARDEX Moisture Control System.

C. Wooden subfloors:

1. The wood subfloor either must be solid hardwood flooring; a minimum of ¾" (19 mm) tongue-and-groove, APA-rated Type 1, exterior exposure plywood; or an approved OSB equivalent. The wood subfloor must be constructed according to prevailing building codes and must be solid and securely fixed to provide a rigid base free of undue flex. Any boards exhibiting movement must be refastened to create a sound, solid subfloor.

2. The wood must be clean and free of all foreign matter. If necessary, sand down to bare wood. Vacuum to remove all dust. Do not use solvent, strippers or cleaners. Open joints should be filled with ARDEX FEATHER FINISH®. It is the responsibility of the installation contractor to ensure that the wood subfloor is thoroughly clean and properly anchored prior to the installation of any ARDEX material.

D. Metal subfloors:

1. Metal subfloors must be rigid, well supported, properly anchored and free of undue flex and vibration. They must also be clean and free of all rust, corrosion and foreign matter. Where required, a corrosive resistant coating should then be applied, and be allowed to dry before priming.

2. Non-lead metal substrates must be mechanically cleaned and profiled to create a bonding surface. Please note that care must be taken when mechanically preparing thin metal foils so that the metal foil is not compromised. Use an #80 or #100 grit sanding screen to mechanically profile the metal surface. A hand or floor sander may be used. After sanding, thoroughly deep vacuum to remove all loose material, and then wipe the metal using a clean, white cloth dampened with 91% isopropyl alcohol. Repeat wiping using a new cloth on each pass until the degree of discoloration on the cloth remains consistent on subsequent passes (typically, approx. 5 – 7 passes). Lightly shot blasting also is suitable. From this point until the metal has been primed, disposable shoe covers should be worn by anyone traversing the surface of the prepared metal. Allow 15 – 20 minutes for residual alcohol to evaporate before proceeding. Contact the Technical Service Department for guidelines on preparing lead substrates.

E. Adhesive residues on concrete must first be tested to make certain they are not water-soluble. Water-soluble adhesives must be completely mechanically removed down to clean concrete. Non-water-soluble adhesives should be prepared to a thin, well-bonded residue using the wet- scraping technique as recommended by the Resilient Floor Covering Institute (www.rfci.com). The prepared residue should appear as nothing more than a transparent stain on the concrete after scraping.

F. Non-porous subfloors such as ceramic, porcelain and quarry tile, burnished concrete, epoxy coating systems as well as terrazzo should be clean and free of all waxes, sealers, dust, dirt, debris and any other contaminant that may act as a bond breaker. If necessary, clean by mechanical methods such as shot blasting.

G. All subfloors, regardless of material, must be solid, thoroughly cleaned, and properly primed. Gypsum, latex patches, asphalt, coal tar and lightweight insulating concrete are not suitable substrates to receive cementitious underlayment.

1. Cut-back and other non-water soluble adhesive residues must be wet-scraped to a thin, solid, well bonded layer.

2. Non-porous surfaces such as ceramic tile, quarry tile, terrazzo etc., should be clean and free of wax and sealers. If necessary, have the surface professionally cleaned.

3. All cracks in the subfloor shall be repaired to minimize telegraphing through the underlayment.

4. Prior to installation, substrates shall be inspected and corrected for moisture or any other conditions that could affect the performance of the underlayment or the finished floor covering. If moisture vapor emissions exceed the flooring manufacturer's recommendations, installation of an ARDEX MC™ Moisture Control System (ARDEX MC RAPID, MC PLUS or MC Ultra) will be required. For complete installation instructions, please refer to the appropriate ARDEX MC Moisture Control Technical Brochure.

H. ARDEX MC™ Moisture Control System shall be installed in accordance with manufacturers written technical instructions.

3.03 CRACK AND JOINT PREPARATION

A. Moving Joints and Moving Cracks – honor all expansion, isolation joints and moving cracks up through the underlayment. A flexible sealing compound such as ARDEX ARDISEAL™ Rapid Plus Semi-Rigid Joint Sealant may be installed.

B. Saw Cuts, Dormant Control Joints and Dormant Cracks – fill all dormant control joints and dormant cracks with ARDEX ARDIFIX™ Low Viscosity Rigid Polyurethane Crack & Joint Repair or ARDEX FEATHER FINISH® Self-Drying, Cement-Based Finish Underlayment as recommended by the manufacturer.

C. When using an Ardex MC Moisture Control System, installation shall be in accordance with manufacturers written technical instructions for the treatment of saw cuts, control joints and dormant cracks.

3.04 APPLICATION OF ARDEX K-15:

A. Examine substrates and conditions under which materials will be installed. Do not proceed with installation until unsatisfactory conditions are corrected.

B. Coordinate installation with adjacent work to ensure proper sequence of construction. Protect adjacent areas from contact due to mixing and handling of materials.

C. Priming:

1. Note: When using ARDEX P 51, It is critical to ensure that the ARDEX P 51 is dry prior to proceeding with the next installation step. To determine if the ARDEX P 51 is dry after a minimum of 30 minutes (max. 24 hours), pour water onto the surface of the primer in several areas and rub it with your finger. If the water remains clear, the primer is dry. If the water turns cloudy or milky, additional drying time is needed.

2. Primer for standard absorbent concrete subfloors: Dilute ARDEX P 51 1:1 with water and apply evenly with a soft push broom. Do not leave any bare spots. Remove all puddles and excess primer. Allow to dry to a clear, thin film (min. 30 minutes, max. 24 hours). Underlayment shall not be applied until the primer is dry.

3. Primer for extremely absorbent concrete subfloors: Make an initial application of ARDEX P 51 mixed with 3 parts water using a soft push broom. Do not leave any bare spots. Remove all puddles and excess primer. Allow to dry thoroughly (1 to 3 hours) before proceeding with the standard application of primer as described above for standard absorbent concrete.

4. Primer for non-porous subfloors such as burnished concrete, terrazzo, well-bonded ceramic, porcelain and quarry tile, epoxy coating systems, wooden subfloors and non-water soluble adhesive residues over concrete: Prime with ARDEX P 82 Ultra Prime. Follow the mixing instructions on the container and apply with a short-nap or sponge paint roller, leaving a thin coat of primer no heavier than a coat of paint. Do not leave any bare spots. Remove all puddles and excess primer. Allow to dry to a clear, slightly tacky film (minimum 3 hours, maximum 24 hours). Underlayment shall not be installed until primer is dry. Note: If a suitable acrylic curing compound has been used on the concrete, test the surface for porosity. If the concrete is porous, prime with ARDEX P 51. If it is non-porous, prime with ARDEX P 82. For wood substrates, once the primer is applied, install 3.4 galvanized, expanded diamond metal lath mesh, stapling approximately every 6 inches (15.2 cm). Do not walk on wet primer.

5. Primer for metal substrates: Prime the prepared subfloor with ARDEX EP 2000 and immediately broadcast fine sand to refusal into the fresh epoxy. After a 16-hour cure remove all excess sand. Remove all excess sand prior to proceeding:

    a. Do not sweep. Using a rubber squeegee, consolidate excess sand into piles.
    b. Shovel the piles of sand into barrels.
    c. Vacuum remaining sand using a heavy-duty, bucket-style (Shop-Vac®-style) vacuum and HEPA dust extraction vacuum system.

D. Mixing: Comply with manufacturer's printed instructions and the following.

1. Add 7 quarts (6.6 L) of clean potable water per 55 lb. (25 kg) bag. For applications over wood and metal, the addition of ARDEX E 25™ Resilient Emulsion is required to increase the resiliency of the ARDEX K 15. In these cases, mix 2 quarts (1.9 L) of ARDEX E 25 with 6 quarts (5.68 L) of water for each bag of ARDEX K 15.

2. Mix using a ½” (12 mm) heavy-duty drill (min. 650 rpm) with an ARDEX T-1 mixing paddle. Do not overwater. When mixing sanded materials, ARDEX recommends using the ARDEX DUSTFREE™ or a standard “gutter hook” vacuum attachment in combination with a wet/dry (Shop-Vac® style) vacuum and HEPA dust extraction vacuum system. Additionally, each bag should be handled with care and emptied slowly to avoid creating a plume of dust. Contact the ARDEX Technical Service Department for more details on ARDEX products and air quality management.

3. Aggregate mix: For areas to be installed over 1 ½” (4 cm) thick, aggregate may be added to reduce material costs. Mix ARDEX K 15® with water first, then add 1 part aggregate by volume of washed, well-graded 1/8" to 3/8” (3 to 9.5 mm) pea gravel. The aggregate size must not exceed 1/3 the depth of the pour. Do not use sand. Note: The addition of aggregate will diminish the workability of the product and may make it necessary to install a finish coat to obtain a smooth surface. Allow the initial application to dry for 12 to 16 hours, and then prime this layer with ARDEX P 51 mixed 1: 1 with water. Allow the primer to dry (min. 30 minutes, max. 24 hours) before installing the neat coat of ARDEX K 15.

4. For pump installations, ARDEX K 15® shall be mixed using the ARDEX ARDIFLO™ Automatic Mixing Pumps. Contact the ARDEX Technical Service Department (888) 512-7339 for complete pump operation instructions.

E. Application: Comply with manufacturer's printed instructions and the following.

1. Installations over metal and other non-porous substrates should be limited to a thickness of ½” (12.7 mm) unless otherwise approved by the ARDEX Technical Services Department. For all other substrates, ARDEX K 15® must be installed at a minimum thickness of 1/8” (3 mm) over the highest point in the floor, which typically results in an average thickness of ¼” (6 mm) or more over the entire floor. ARDEX K 15® can be installed up to 1 ½” (4 cm) over large areas

neat, and up to 5” (12.7 cm) with the addition of proper aggregate. ARDEX K 15® can also be featheredged to match existing elevations. If a true featheredge is needed, ARDEX recommends using ARDEX FEATHER FINISH® for transitions.

2. Pour or pump the liquid ARDEX K 15® and spread into place with the ARDEX T-4 Spreader. Immediately use the ARDEX T-5 Smoother to smooth the surface. Wear non- metallic cleats to avoid leaving marks in the liquid ARDEX K 15®.

3. Wood subfloors require the use of the mesh-reinforced ARDEX K 15® + E 25™ Resilient Emulsion Underlayment System. After priming, install 3.4 galvanized diamond metal lath by stapling to the wooden subfloor approximately every 6 inches to center.

4. Metal subfloors require the use ARDEX K 15® + E 25™ Resilient Emulsion Underlayment System.

F. Curing:

1. ARDEX K 15® can be walked on in 2-3 hours. Moisture-insensitive tiles such as ceramic, quarry and porcelain can be installed after 6 hours. All other finish floor coverings can be installed after 16 hours at 70°F (21°C). For resinous systems such as epoxy and polyurethane floors please contact the ARDEX Technical Services Department.

3.05 APPLICATION OF ARDEX SD-P

A. Examine substrates and conditions under which materials will be installed. Do not proceed with installation until unsatisfactory conditions are corrected.

B. Coordinate installation with adjacent work to ensure proper sequence of construction. Protect adjacent areas from contact due to mixing and handling of materials.

C. Priming:

1. Porous concrete:

a. While no primer is required to obtain a solid bond when installing ARDEX SD-P over concrete, ARDEX P 51 can be used to prime a properly prepared concrete substrate prior to installing ARDEX SD-P. The use of ARDEX P 51 will improve the workability of the product, prevent it from drying out too fast, and help ensure that any residual dust on the surface of the concrete will be bound up so that it will not interfere with the bond.

b. For this application, mix ARDEX P 51 with an equal part of water, and prime the properly prepared concrete surface using a soft bristle push broom. Once the primer has dried (min. 30 minutes, max. 24 hours). It is critical to ensure that the ARDEX P 51 is dry prior to proceeding with the next installation step. To determine if the ARDEX P 51 is dry after a minimum of 30 minutes (max. 24 hours), pour water onto the surface of the primer in several areas and rub it with your finger. If the water remains clear, the primer is dry. If the water turns cloudy or milky, additional drying time is needed.

2. Burnished concrete, epoxy coating systems, terrazzo, ceramic, quarry and porcelain tiles, concrete treated with silicate compounds shall be primed with ARDEX P 82. Do not leave any bare spots. Brush off puddles and excess primer. Allow primer to dry to a thin, slightly tacky film (min. 3 hours, max. 24 hours).

D. Mixing: Comply with manufacturer's printed instructions and the following.

1. Add 4 quarts (3.8 L) of clean potable water per 40-pound (18 kg) bag.

2. Mix using a ½" (12 mm, 650 rpm) low speed heavy-duty mixing drill with an ARDEX T-2 ring mixing paddle. Do not overwater.

3. When mixing sanded materials, ARDEX recommends using the ARDEX DUSTFREE™ or a standard "gutter hook" vacuum attachment in combination with a wet/dry (Shop-Vac® style) vacuum and HEPA dust extraction vacuum system. Additionally, each bag should be handled with care and emptied slowly to avoid creating a plume of dust. Contact the ARDEX Technical Service Department for more details on ARDEX products and air quality management.

E. Application: Comply with manufacturer's printed instructions and the following.

1. ARDEX SD-P can be installed from a true featheredge up to 1" (25.4 mm) over large areas neat and up to 3" (7.6 cm) with the addition of proper aggregate. ARDEX SD-P can also be featheredged to match existing elevations. There is no minimum thickness requirement for this product. Use the least amount possible to attain the desired smoothness. The thickness of the application should be calculated based on the surface profile of the substrate and the specified tolerances of the floor covering.

2. For areas with a thickness greater than 1" (25.4 mm), mix ARDEX SD-P with washed and well-graded 1/8" – ¼" (3 – 6 mm) pea gravel. Mix the ARDEX SD-P with water first, and then add part aggregate by volume, mixing until the aggregate is completely coated. Do not use sand. If the aggregate is wet, reduce the amount of water to avoid overwatering.

3. For applications of ARDEX SD-P over non-porous substrates, the maximum thickness is ¼" (6 mm).

4. Apply the ARDEX SD-P to the substrate with a wood or magnesium float to obtain a solid mechanical bond. Allow the material to take set (approx. 30 minutes) then finish the surface using a steel trowel.

F. Curing:

1. As soon as the ARDEX SD-P can be worked on without damaging the surface (approx. 90 minutes), standard floor coverings such as ceramic tile, VCT, sheet vinyl and carpeting can be installed. If installing wood flooring, or, if high-performance adhesives will be used, such as epoxies or urethanes, ARDEX SD-P must first cure for 16 hours.

3.06 APPLICATION OF ARDEX FEATHER FINISH

A. Examine substrates and conditions under which materials will be installed. Do not proceed with installation until unsatisfactory conditions are corrected.

B. Coordinate installation with adjacent work to ensure proper sequence of construction. Protect adjacent areas from contact due to mixing and handling of materials.

C. Priming:

1. Gypsum: Make an initial application of ARDEX P 51 diluted with 3 parts water using a soft push broom. Do not leave any bare spots. Remove all puddles and excess primer. Allow to dry thoroughly (1 to 3 hours) before proceeding with the second application of ARDEX P 51 diluted 1:1 with water. Allow thorough drying to a clear, thin film (min. 3 hours, max. 24 hours).

D. Mixing: Comply with manufacturer's printed instructions and the following.

1. Add 2 1/2 quarts (2.4 L) of clean potable water per 10-pound (4.5 kg) bag.

2. Mix using a ½" (12 mm, 650 rpm) low speed heavy-duty mixing drill with an ARDEX T-2 ring mixing paddle. Do not overwater.

E. Application: Comply with manufacturer's printed instructions and the following.

1. ARDEX FEATHER FINISH can be installed from a true featheredge up to ½" (12.7 mm) over large areas. It can also be installed up to any thickness in small, well-defined areas.

2. Apply the ARDEX FEATHER FINISH to the substrate with the flat side of a trowel to obtain a solid mechanical bond before applying the desired thickness.

F. Curing:

1. As soon as the ARDEX FEATHER FINISH can be worked on without damaging the surface (15-20 minutes), standard floor coverings such as VCT, sheet vinyl and carpeting can be installed. If installing wood flooring, or, if high-performance adhesives will be used, such as epoxies or urethanes, ARDEX FEATHER FINISH must first cure for 16 hours (70°F).

3.07 PREPARATION FOR FLOORING INSTALLATION

A. Underlayment can accept finish floor covering materials, to include Carpet, after 16 hours at 70°F and 50% relative humidity.

B. The surface of the underlayment shall be checked to ensure that it meets the flooring manufacturer's specifications for flatness before beginning the flooring installation. Areas out of tolerance shall be repaired using the appropriate Ardex underlayment (described herein based upon tolerance discrepancy) as required at the contractors expense.

C. Due to the wide range of adhesives that are used to install floor coverings, some adhesives may dry more quickly over underlayments than over other substrates. If this condition occurs, priming the surface of the underlayment with ARDEX P-51 Primer diluted 1:3 with water will even out the drying of the adhesive. Allow the primer to dry 1-3 hours before proceeding with the adhesive installation.

3.08 FIELD QUALITY CONTROL

A. Where specified, field sampling of the ARDEX underlayment is to be done by taking an entire unopened bag of the product being installed to an independent testing facility to perform compressive strength testing in accordance with ASTM C 109/modified: air-cure only. There are no in situ test procedures for the evaluation of compressive strength.

3.09 PROTECTION

A. Prior to the installation of the finish flooring, the surface of the underlayment should be protected from abuse by other trades by the use of plywood, Masonite or other suitable protection course.

END OF SECTION

DIVISION 04 – MASONRY

SECTION 042000 – UNIT MASONRY

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provision of Contract, including General Conditions, Supplementary Conditions (if applicable), and Division 01 - Specification Sections, apply to work of this Section.

1.02 DESCRIPTION OF WORK / SUMMARY

A. Extent of each type of masonry work is indicated on drawings and schedule.

B. This Section includes unit masonry assemblies consisting of the following:

1. Concrete unit masonry.
2. Brick masonry.
3. Decorative concrete masonry units.
4. Pre-faced concrete masonry units.
5. Natural stone.
6. Concrete brick.
7. Mortar and grout.
8. Reinforcing steel.
9. Masonry joint reinforcement.
10. Ties and anchors.
11. Miscellaneous masonry accessories.

1.03 RELATED SECTIONS

A. The following sections, when included in the Project Manual, are related to the work of this section:

1. Section 033000 – Cast-In-Place Concrete
2. Section 051200 – Structural Steel
3. Section 061000 – Rough Carpentry
4. Section 072100 – Building Insulation
5. Section 072113 – Ultra Wall Insulation and Air Barrier System Air / Vapor Barrier System
6. Section 076000 – Flashing and Sheet Metal
7. Section 079200 – Joint Sealants
8. Section 081113 – Hollow Metal Doors and Frames
9. Section 081416 – Flush Wood Doors
10. Section 084113 – Aluminum Entrances and Storefronts
11. Section 083600 – Sectional Overhead Doors
12. Section 085113 – Aluminum Windows

1.04 REFERENCES

A. ACI 530/ASCE 5/TMS 402 - Building Code Requirements for Masonry Structures; American Concrete Institute International; 2002.

B. ACI 530.1/ASCE 6/TMS 602 - Specification for Masonry Structures; American Concrete Institute International; 2002.

C. IMIAWC (CW) - Recommended Practices & Guide Specifications for Cold Weather Masonry

Construction; International Masonry Industry All-Weather Council; 1993.

D. IMIAWC (HW) - Recommended Practices & Guide Specifications for Hot Weather Masonry Construction; International Masonry Industry All-Weather Council; current edition.

1.05 DEFINITIONS

A. Reinforced Masonry: Masonry containing horizontal joint reinforcing and reinforcing steel in grouted cells.

B. Multi-Wythe Masonry: Masonry wall construction containing adjacent wythes of masonry with the same unit type without a cavity.

C. Composite Masonry: Masonry wall construction containing adjacent wythes of masonry with different unit type without a cavity.

D. Cavity Wall Masonry: Masonry wall construction containing adjacent wythes of masonry with different unit types separated with a continuous air space cavity in-between connected by metal ties.

E. Structural Masonry: Masonry wall construction constructed to be the main supporting structure of other building components such as a floor or roof.

1.06 PERFORMANCE REQUIREMENTS

A. Provide structural unit masonry that develops indicated net-area compressive strengths (f'_m) at 28 days.

B. Determine net-area compressive strength (f'_m) of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.

1.07 SUBMITTALS

A. Comply with the requirements of Section 013300 – Submittal Procedures and as modified below.

B. Product Data: Submit manufacturer's product data for each type of masonry unit, accessory, and other manufactured products, including certifications that each type complies with specified requirements.

C. Shop Drawings: Submit shop drawings for the following:

1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
2. Stone Trim Units: Show sizes, profiles, and locations of each stone trim unit required.
3. Reinforcing Steel: Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement”. Show elevations of reinforced walls.
4. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.
5. Self-Adhering Sheet Flashing & Waterproofing Membranes: Detail all proposed application conditions, Submit manufacturer’s data for membrane, primers, sealants, adhesives and associated auxiliary materials. Prior to commencing the Work, submit manufacturer’s complete set of standard details for waterproofing systems.

D. Samples: Submit samples of the following materials:

1. Unit masonry samples in small scale form showing full extent of colors and textures available

for each type of exposed masonry unit required.

2. Face brick, in the form of straps of five or more bricks. Include size variation data verifying that actual range of sizes for brick falls within ASTM C 216 dimension tolerances for brick where modular dimensioning is indicated.

3. Colored masonry mortar samples showing full extent of colors available.

4. Decorative concrete masonry unit samples for each type of exposed masonry unit required; include in each set the full range of exposed color and texture to be expected in completed work.

5. Include size variation data verifying that actual range of sizes for brick falls within ASTM C 216 dimension tolerances for brick where modular dimensioning is indicated.

6. Pigmented mortar. Make Samples using same sand and mortar ingredients to be used on Project. Label Samples to indicate types and amounts of pigments used. Show full extent of colors available.

7. Weep vents in color to match mortar color.

8. Accessories embedded in masonry.

E. List of Materials Used in Constructing Mockups: List generic product names together with manufacturers, manufacturers' product names, model numbers, lot numbers, batch numbers, source of supply, and other information as required to identify materials used. Include mix proportions for mortar and grout and source of aggregates.

1. Submittal is for information only. Neither receipt of list nor approval of mockup constitutes approval of deviations from the Contract Documents unless such deviations are specifically brought to the attention of Architect and submission of materials in accordance with this section have been provided for review by the Architect and approved in writing.

F. Material Certificates: Include statements of material properties indicating compliance with requirements including compliance with standards and type designations within standards. Provide for each type and size of the following:

1. Masonry units. Include material test reports substantiating compliance with requirements.
2. Cementitious materials. Include brand, type, and name of manufacturer.
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.

G. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.

1. Include test reports, per ASTM C 780, for mortar mixes required to comply with properties specification.

2. Include test reports, per ASTM C 1019, for grout mixes required to comply with compressive strength requirement.

H. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar

type, and resulting net-area compressive strength of masonry determined according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.

I. Cold-Weather Procedures: Submit a detailed description of methods, materials, and equipment to be used to comply with cold-weather requirements.

1.08 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency qualified according to ASTM C 1093 for testing indicated, as documented according to ASTM E 548.

B. 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, through one source from a single manufacturer for each product required.

C. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from a single manufacturer for each cementitious component and from one source or producer for each aggregate.

D. Fire Performance Characteristics: Where indicated, provide materials and construction which are identical to those of assemblies whose fire resistance ratings have been determined per ASTM E 119 by a testing and inspecting agency, by equivalent concrete masonry thickness, or by other means, as acceptable to authorities having jurisdiction.

E. Field Constructed Mock-ups: Prior to installation of masonry work, erect sample wall panels to further verify selections made under sample submittals to demonstrate aesthetic effects and set quality standards for materials and execution, as well as for color and textural characteristics of masonry units and mortar, and to represent completed masonry work for qualities of appearance, materials, and construction; build mock-ups to comply with the following requirements:

1. Locate mock-ups on site in locations indicated or, if not indicated, as directed by the Architect.

2. Build mock-ups for each type of exposed masonry in sizes of approximately 6' long by 4' high by full thickness, including face and back-up wythes as well as all accessories including but not limited to insulation and horizontal and vertical reinforcement.

3. Include a sealant-filled joint at least 16 inches long in exterior wall mockups.

4. Include through-wall flashing; with a 12-inch length of flashing left exposed to view (omit masonry above half of flashing).

5. Include metal/wood studs, sheathing, veneer anchors, flashing, and weep holes in exterior masonry-veneer wall mockup, when applicable.

6. Where masonry is to match existing, erect panels adjacent and parallel to existing surface.

7. Clean one-half of exposed faces of mockups with masonry cleaner as indicated.

8. Approval of mockups is for construction of full assembly, color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; and aesthetic qualities of workmanship.

9. Protect mock-ups from the elements with weather resistant membrane.

10. Retain mock-ups during construction as standard for judging completed masonry work. When directed, demolish mock-ups and remove from site.

11. Pre-installation Conference to be after construction of mock-up but before proceeding with masonry work. Conduct pre-installation conference at Project Site.

F. Qualifications:

1. Masonry Cleaning:

a. Manufacturer: Regularly engaged in manufacturer of masonry cleaning products with at least 5 completed applications of materials to be provided in this project.

b. Applicator: Experienced with use of masonry cleaning products. Provide documentation of such experience when requested by the Architect.

c. For buildings designated Historic by the NYOPRHP, or those eligible for listing on the National Register of Historic Places, the Contractor is obligated to follow the National Park Service Preservation Brief No. 1, Assessing Cleaning and Water-Repellant Treatments for Historic Masonry Buildings.
https://www.nps.gov/orgs/1739/upload/preservation-brief-01-cleaning-masonry.pdf

d. Low-pressure water washing (below 250 psi) and gentle non-ionic detergents are to be used.

2. Tuckpointing:

a. Tuckpointing work is only to be performed by a qualified and experienced tuckpointing craftsman. Field mock-ups required below are to be prepared by those who will perform the masonry work.

b. Contractor is obligated to follow the National Park Service Preservation Brief No. 2, Repointing Mortar Joints in Historic Masonry Buildings.
https://www.nps.gov/orgs/1739/upload/preservation-brief-02-repointing.pdf

1.09 FIELD QUALITY CONTROL

A. Inspectors: Owner will engage qualified independent inspectors to perform inspections and prepare reports. Allow inspectors access to scaffolding and work areas, as needed to perform inspections.

1. Place grout only after inspectors have verified compliance of grout spaces and grades, sizes, and locations of reinforcement.

B. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections indicated below and prepare test reports:

1. Payment for these services will be made by Owner.

2. Retesting of materials failing to comply with specified requirements shall be done at Contractor's expense.

3. Refer to Specification Sections 014523 & 014529 for additional Special Inspection requirements.

C. Testing Frequency: One set of tests for each 5000 sq. ft. of wall area or portion thereof.

D. Clay Masonry Unit Test: For each type of unit provided, per ASTM C 67.

E. Concrete Masonry Unit Test: For each type of unit provided, per ASTM C 140.

F. Mortar Test (Property Specification): For each mix provided, per ASTM C 780. Test mortar for mortar air content and compressive strength.

G. Grout Test (Compressive Strength): For each mix provided, per ASTM C 1019.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Deliver masonry materials and accessories to project in undamaged condition.

B. Store and handle masonry units to prevent their deterioration or damage due to moisture, temperature changes, contaminants, corrosion, or other causes.

C. Store masonry units and cementitious material off the ground, 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 masonry units become wet, do not install until they are dry. Do not use cementitious materials that have become damp.

D. Store aggregates where grading and other required characteristics can be maintained, and contamination avoided.

E. Store masonry accessories including metal items to prevent deterioration by corrosion and accumulation of dirt.

F. Cold-applied elastomeric membranes should be stored in closed containers outdoors. Store membrane at temperature of 40°F and above to facilitate handling. Membrane contains petroleum solvents and are flammable; do not use near open flame. Store roll materials horizontally; store adhesives and primers at temperatures of 40°F and above to facilitate handling. Keep all solvents away from open flame or excessive heat.

1.11 PROJECT CONDITIONS

A. Protection of Work: During construction, cover top of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed structures when work is not in progress.

1. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.

2. Where 1 wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to unconstructed wythe and hold cover in place.

3. Do not apply uniform floor or roof loading for at least 12 hours after building masonry walls or columns.

4. Do not apply concentrated loads for at least 3 days after building masonry walls or columns.

B. Stain Prevention: Prevent grout, mortar, or 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 mortar splatter by means of coverings spread 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 and wash down detergent.

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.

C. Cold Weather Requirements:

1. Do not lay masonry units which are wet or frozen. Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions.

2. Remove any ice or snow formed on masonry bed by carefully applying heat until top surface is dry to the touch.

3. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602 and Chapter 21 of the Building Code of New York State, latest edition.

D. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40°F and above and will remain so until masonry has dried, but not less than 7 days after completing cleaning.

E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602 and Chapter 21 of the Building Code of New York State, latest edition.

F. Perform the following construction procedures while masonry work is progressing. Temperature ranges indicated below apply to air temperatures existing at the time of installation except for grout. For grout, temperature ranges apply to anticipated minimum night temperatures. In heating mortar and grout materials, maintain mixing temperature selected within 10°F (6°C).

1. 40°F (4°C) to 32°F (0°C):

a. Mortar: Heat mixing water to produce mortar temperature between 40°F (4°C) and 120°F (49°C).
b. Grout: Follow normal masonry procedures.

2. Do not heat water for mortar and grout to above 160°F (71°C).

G. Protect completed masonry and masonry not being worked on in the following manner. Temperature ranges indicated apply to mean daily air temperatures except for grouted masonry. For grouted masonry, temperature ranges apply to anticipated minimum night temperatures.

1. 40°F (4°C) to 32°F (0°C):

a. Protect masonry from rain or snow for at least 24 hours by covering with weather-resistive membrane.

2. 32°F (0°C) to 25°F (-4°C):

a. Completely cover masonry with weather-resistive membrane for at least 24 hours.

3. 25°F (-4°C) to 20°F (-7°C):

a. Completely cover masonry with weather-resistive insulating blankets or similar protection for at least 24 hours, 48 hours for grouted masonry.

4. 20°F (-7°C) and below:

a. Except as otherwise indicated, maintain masonry temperature above 32°F (0°C) for 24

hours using enclosures and supplementary heat, electric heating blankets, infrared lamps, or other methods proven to be satisfactory. For grouted masonry maintain heated enclosure to 40°F (4°C) for 48 hours.

H. Coordination: Ensure installation continuity of the waterproofing membranes scheduled for installation throughout the scope of this section. Work shall be so scheduled as to provide a watertight seal at the end of each working day on the areas worked upon during the day.

PART 2 - PRODUCTS

2.01 GENERAL

A. All specific products indicated within this section are to establish a level of quality. Equivalency is permitted in accordance with General Municipal Law per the Architect's determination to be considered an Approved Equal.

2.02 MASONRY UNITS, GENERAL

A. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to exceed tolerances and to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not use units where such defects, including dimensions that vary from specified dimensions by more than stated tolerances, will be exposed in the completed Work or will impair the quality of completed masonry.

2.03 CONCRETE MASONRY UNITS (CMU)

A. General: Comply with referenced standards and other requirements indicated below applicable to each form of concrete masonry unit required.

B. Concrete Block: Provide units complying with characteristics indicated below for grade, type, face size, exposed face, and, under each form of block included, for weight classification.

1. Size: Manufacturer's standard units with nominal face dimensions and thicknesses indicated on drawings.

2. Type II, non-moisture controlled units.

C. Hollow Load-Bearing Block: ASTM C 90 and as follows:

1. Weight Classification: Lightweight

2. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 1900 psi.

3. Size (Width): Manufactured to dimensions 3/8 inch less than nominal dimensions.

4. All components (aggregate, cement, etc.) of CMU must be harvested within 500 miles of project site. (Required for LEED Projects only)

5. CMU to contain 20% post-industrial recycled content, by weight. (Required for LEED Projects only)

D. Concrete Building Brick: ASTM C 55.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive

strength of 2500 psi.

2. Weight Classification: Medium weight.

3. Size (Actual Dimensions): 3-5/8 inches wide by 3-5/8 inches high by 7-5/8 inches long.

E. Shapes: Provide shapes indicated and as follows:

1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.

2. **All interior outside corners of CMUs shall have a 5/8" to 1" manufactured bullnosed edge. This requirement supercedes any details which may or may not be provided in the Contract Documents. All masonry bids shall include the cost of all necessary bullnose materials, at no additional costs to the Owner.**

2.04 VENEER BLOCK

A. General: Comply with referenced standards and other requirements indicated below applicable to each form of concrete masonry unit required.

1. Provide special shapes where required for lintels, corners, jambs, sash, control joints, headers, bonding, and other special conditions.

2. Provide square-edged units for outside corners, except where indicated as bullnose.

3. Provide corner units where applicable and available.

B. Concrete Block: Provide units complying with characteristics indicated below for grade, type, face size, exposed face, and, under each form of block included, for weight classification.

1. Types included but not limited to the following:

a. Split-face
b. Split-face center score
c. Smooth-cast
d. Split Rib
e. Or as indicated on the drawings.

C. Size: Manufacturer's standard units with nominal face dimensions of 16" or 18” long x 8" high x 4" thick (15-5/8" or 17-5/8” x 7-5/8" x 3-5/8” actual).

D. Type I, moisture-controlled units.

E. Exposed Faces: Manufacturer's standard color and texture as selected by Architect unless otherwise indicated.

1. Where special finishes are indicated, provide units with exposed faces of the following general description matching color and texture of Architect's samples.

2. Where special patterns are indicated, provide units with exposed faces matching color, texture, and pattern of Architect's samples.

2.05 BRICK MADE FROM CLAY OR SHALE

A. General: Comply with referenced standards and other requirements indicated below applicable to

each form of brick required.

1. Size: Provide bricks manufactured to the following actual dimensions:

    a. Standard Modular: 2-1/4" x 3-5/8" x 7-5/8".
    b. Or as indicated on the drawings.

2. Provide special molded shapes where indicated and for application requiring brick of form, size, and finish on exposed surfaces which cannot be produced from standard brick sizes by sawing.

3. For sills, caps, and similar applications resulting in exposure of brick surfaces which otherwise would be concealed from view, provide uncored or unfrogged units with all exposed surfaces finished.

B. Facing Brick: ASTM C 216, and as follows:

1. Grade SW.

2. Type FBS (normal size and color variations).

3. Compressive Strength: 4,500 psi, minimum, per ASTM C 67.

4. Application: Use where brick is exposed, unless otherwise indicated.

5. Texture and Color: As indicated on drawings or as selected by Architect.

C. Building (Common Brick): ASTM C 62, and as follows:

1. Grade MW except Grade SW where indicated by ASTM C 62 grade requirements for applicable weathering index and exposure.

2. Application: Use where brick is indicated for concealed locations.

2.06 FIRE BRICK MASONRY

A. General: Comply with referenced standards and other requirements indicated below applicable to each form.

B. Fire Brick: Provide units complying with characteristics indicated below for classification, P.C.E. rating, chemical percentage analysis, modulus of rupture, cold crushing P.S.I., porosity % and bulk density.

1. Classification: ASTM C-27-98 (2013), medium duty.
2. P.C.E.: Cone 29 3018 F.
3. Chemical Analysis:

    a. Silca: 59.90
    b. Alumina: 32.83
    c. Iron Oxide: 1.97
    d. Titanium Oxide: 1.48
    e. Calcium Oxide: .57
    f. Magnesium Oxide: .89
    g. Sodium Oxide: .49
    h. Potassium Oxide: 1.80

4. Modulus of Rupture: 1000–1200 PSI

5. Cold Crushing: 3500-4500 PSI
6. Apparent Porosity: 16-19%
7. Bulk Density: 130-134 lbs/ft
8. Method of Manufacturer: Dry Press

2.07 MORTAR AND GROUT MATERIALS

A. General: Do not use admixtures, including coloring pigments, air entraining agents, accelerators, retarders, water repellant agents, anti-freeze compounds, or other admixtures unless otherwise indicated and approved by Architect.

1. Do not use calcium chloride in mortar or grout.
2. Limit cementitious materials in mortar to portland cement and lime.
3. Limit cementitious materials in mortar for exterior and reinforced masonry to portland cement and lime.
4. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.
5. All new face brick mortars shall match existing face brick mortars where restoration work is required, samples of which shall be prepared and thoroughly tested for color, density, and uniformity before submitting samples for the approval of the Architect.

B. Option 1 – Pre-blended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a pre-blended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to project site.

C. Option 2 – Manual Blend: Combine and thoroughly mix cementitious materials, water, and aggregates in a mechanical batch mixer; comply with referenced ASTM standards for mixing time and water content.

D. Mortar for Unit Masonry: Comply with ASTM C 270, “Standard Specification for Mortar for Unit”, Masonry Proportion Specification, for types of mortar required unless otherwise indicated.

1. For masonry below grade or in contact with earth, use Type M.
2. For reinforced CMU masonry, use Type S.
3. For brick masonry walls above grade, use Type N.
4. For exterior, above-grade, load-bearing and non-load-bearing CMU walls and parapet walls; for interior load-bearing CMU walls; for interior non-load-bearing partitions; and for other applications where another type is not indicated, use Type S.
5. Analysis of the existing mortar to remain is required within the contract if the type required is not clear.

E. Portland Cement: ASTM C 150, “Standard Specification for Portland Cement”, Type I, except Type III, may be used for cold weather construction. Provide natural color or white cement as required to produce required mortar color.

1. For colored pigmented mortars, use premixed colored masonry cements of formulation required to produce color indicated, or, if not indicated, as selected from manufacturer's standard formulations by Architect.
2. Available Products: Subject to compliance with requirements, masonry cements which may be incorporated in the work include, but are not limited to, the following:

   a. "Lehigh & Flamingo Custom Color Masonry Cement"; Lehigh Portland Cement Company.
   b. "Custom Color Masonry Cement"; Spec Mix, LLC.
   c. “Glen-Gery Color Mortar Blend”; Glen–Gery Corporation.

F. For Manually Blended Colored Mortar Use Colored Mortar Pigments (for use with veneer brick and

veneer block): Use pigments complying with ASTM C979, “Standard Specification for Pigments for Integrally Colored Concrete”. Select and proportion pigments with other ingredients to produce color required. Do not exceed pigment to cement ratio of 1 to 10 by weight. Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes. Use only pigments with record of satisfactory performance in masonry mortars.

1. Available Products: Subject to compliance with requirements, colored mortar pigments which may be incorporated in the work include, but are not limited to, the following:

   a. "SGS Mortar Colors”, Solomon Colors, Inc.
   b. "Canister Colors"; Spec Mix, LLC.
   c. "True Tone Mortar Colors”; Davis Colors.
   d. “Bayferrox Iron Oxide Pigments”; Bayer Corporation, Industrial Chemical Division.

G. Water: Clean and potable.

H. Hydrated Lime: ASTM C 207, “Standard Specification for Hydrated Lime for Masonry Purposes”, Type S.

I. Portland Cement-Lime Mix: Packaged blend of portland cement complying with ASTM C 150, Type I or Type III, and hydrated lime complying with ASTM C 207, Type S.

J. Aggregate for Mortar: ASTM C 144, “Standard Specification for Aggregates for Masonry Mortar”.

1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.

2. For joints less than ¼ inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.

3. White-Mortar Aggregates: Natural white sand or crushed white stone.

K. Aggregate for Grout: ASTM C 404, “Standard Specification for Aggregates for Masonry Grout”.

L. Grout for Unit Masonry: Comply with ASTM C 476, “Standard Specification for Grout for Masonry”, for grout for use in construction of reinforced and non-reinforced unit masonry. (Refer to Table 1 Conventional Grout Proportions by Volume. Use grout of consistency indicated or, if not otherwise indicated, of consistency (fine or coarse) at time of placement which will completely fill all spaces intended to receive grout. Comply with Table 1.15.1 in ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.

TABLE 1 Conventional Grout Proportions by Volume

Type	Parts by Volume of Portland Cement or Blended Cement	Parts by Volume of Hydrated Lime or Lime Putty	Aggregate, Measured in a Damp, Loose Condition	
			Fine	Coarse
Fine grout	1	0–1⁄10	2-1⁄4 –3 times the sum of the volumes of the cementitious materials	. . .
Coarse grout	1	0–1⁄10	2-1⁄4 –3 times the sum of the volumes of the cementitious materials	1–2 times the sum of the volumes of the cementitious materials

1. Use fine grout in grout spaces less than 2" in horizontal direction unless otherwise indicated.

2. Use coarse grout in grout spaces 2" or more in least horizontal dimension unless otherwise indicated.
3. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143/C 143M.
4. The compressive strength of the grout shall match the compressive strength of the masonry f'm, but not less than 2,000 psi. The compressive strength of grout so specified should be determined according to ASTM C1019 (UBC 21-18).

M. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494/C 494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.

1. Available Products:

a. Euclid Chemical Compnay; Accelguard 80.
b. Grace Construction Products, a unit of W.R. Grace & Co., Morset.
c. Sonneborn, division of ChemRex; Trimix-NCA.

2.08 FIRE WALLS

A. General: Comply with the referenced standards and other requirements indicated below as applicable to each type of fire wall construction required.

B. Provide masonry units and construction as required by Underwriter's Laboratories, Inc.; Design as indicated on the Contract Drawings.

1. If no specific designs are represented on the drawings, the following designs shall be utilized:
a. 3-Hour Firewall – UL Design No. U904.
b. 2-Hour Firewall – UL Design No. U905 or UL Design No. U906.

C. Provide complete fire wall assembly submittals independent of typical masonry submittals.

1. Only eligible manufacturers with products bearing the UL mark will be accepted for use in the construction of fire walls.

2.09 JOINT REINFORCEMENT, TIES, AND ANCHORING DEVICES

A. Materials: Comply with requirements indicated below for basic materials and with requirements indicated under each form of joint reinforcement, tie, and anchor for size and other characteristics.

1. Zinc-Coated (mill galvanized) Steel Wire: ASTM A 82 for uncoated wire and with ASTM A 641 for zinc coating of class indicated below:

a. Class 1: 0.40 oz. per square foot of wire surface.
b. Application: Use for masonry not exposed to exterior or earth.

2. Hot-Dip Galvanized Steel Wire: ASTM A 82 for uncoated wire and with ASTM A 153 for zinc coating applied after prefabrication into units.

a. Class B-2: 1.5 oz. per square foot of wire surface.
b. Application: Use for all masonry back-up exposed to exterior.

3. Uncoated Steel Reinforcing Bars: Of size and locations as indicated on drawings, ASTM A615, Grade 60, deformed.

4. Stainless Steel Reinforcing Bars: AISI Type 304, ASTM A580, for historical masonry reconstruction projects.

B. Joint Reinforcement: Reinforcement to conform to Standard Specification ASTM A951 & ACI/ASCE 530 (Building Code Requirements for Masonry Structures). Provide welded-wire units prefabricated with deformed continuous side rods and plain cross rods into straight lengths of not less than 10 feet with prefabricated corner and tee units, and complying with requirements indicated below:

1. Width: Fabricate joint reinforcement in units with widths of approximately 2" less than nominal width of walls and partitions as required to provide mortar coverage of not less than 5/8" on joint faces exposed to exterior and 1/2" elsewhere.

2. Wire (Carbon Steel): Pre-fabricated construction from cold-drawn steel wire conforming to ASTM A 82:

   a. Tensile Strength: 80,000 psi.
   b. Yield Point: 70,000 psi, minimum.

3. Wire Diameter for Cross & Side Rods: Provide standard weight 9 gauge (.148”), typical.

C. Single-Wythe Masonry: Provide type as follows with single pair of side rods:

1. Provide Hohmann & Barnard, Inc. **#220 Ladder Mesh Reinforcement** - Ladder design with perpendicular cross rods spaced not more than 16" o.c.

2. Finish: Provide mill galvanized, per ASTM A 641.

D. Multi-Wythe Masonry: Provide type as follows:

1. Provide Hohmann & Barnard, Inc. **#120 Ladder Mesh Reinforcement** - Ladder design with perpendicular cross rods spaced not more than 16" o.c.

2. Finish: Provide mill galvanized, per ASTM A 641.

E. Masonry Joint Reinforcement for Cavity-Wall Masonry:

1. Provide Hohmann & Barnard, Inc. **# 270-ML Ladder Adjustable Eye-Wire Reinforcement** - Ladder design with perpendicular cross rods spaced not more than 16" o.c., Cross rods to be welded at 16” o.c; first cross rods to be welded 12” in from each end to allow for lap splices.

2. Finish: Provide hot-dip galvanized, after fabrication, per ASTM A 153.

F. Steel Stud Masonry Anchor System: (Where required) Provide **X-Seal Anchor System with Byna-Lock Wire Ties**, as manufactured by *Hohmann & Barnard, Inc.*, 30 Rasons Court, Hauppauge, New York, 11788; tel (800) 645-0616; fax (631) 234-0683. website: www.h-b.com.

G. Reinforce each course of block cut back for fire extinguisher cabinets, electrical boxes and toilet accessory type recessed items. Mortar 9 gauge reinforcing wire in joints, that is 24-inches longer than recessed opening width on both sides.

H. All steel reinforcement to contain minimum 90 percent combined post-consumer and post-industrial recycled content. (Required for LEED Projects only)

2.10 TIES AND ANCHORS

A. Materials: Provide ties, reinforcing and anchors, specified in subsequent articles, made from materials that comply with this article, unless otherwise indicated.

1. Carbon Steel Wire: ASTM A 82.

2. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82; with ASTM A 153, Class B-2 coating.
3. Products meeting specified products quantities by Hohmann & Barnard, Inc. or Heckmann Building Products Inc.
4. Anchors and ties shall be 16 inches on center each way.
5. Horizontal reinforcing shall be 16 inches on center.

B. Joint Stabilizing Anchors: Provide Hohmann & Barnard, Inc., **Slip-Set™ Stabilizer** joint stabilizing anchors at veneer control joints and block interior wall, running wall, corner, "Tee", and "Ell" joints.

1. Provide joint stabilizing anchors at connection of new masonry to existing masonry or concrete walls.

2. Refer to Structural Drawings for additional requirements.

C. Rigid Anchors: Provide Hohmann & Barnard, Inc., #**344 - Rigid Partition Anchor,** Z-Type bent steel shape 1-1/2 inches wide by 1/4 inch thick by 24 inches long or length required, with ends turned up 2 inches or with cross pins. (Rigid anchors can be used to connect T-intersections of CMU shear walls in lieu of masonry bonding or bond beams. (Used at T-intersections of other CMU walls and piers where indicated on drawings, although masonry bonding and T-shaped masonry joint reinforcement may be used.)

1. Corrosion Protection: Hot-dip galvanized to comply with ASTM A 153/A 153M. (Rigid anchors may not be fully embedded in mortar or grout and, therefore, require a coating for corrosion protection.)

D. Mesh Wall Ties: Provide Hohmann & Barnard, Inc., **MWT - Mesh Wall Tie,** ½" square x 16-gauge, by width & length required; hot dip galvanized to ASTM A153 B2 finish.

E. Corrugated Wall Ties: Provide Hohmann & Barnard, Inc., **CWT – Corrugated Wall Tie,** 7" long x 16-gauge, or length as required; hot dip galvanized to ASTM A153 B2 finish.

F. Channel Anchors: Provide Hohmann & Barnard, Inc., **#360 Gripstay Channel Slot** 7-1/2" long x 14 gauge; hot dip galvanized to ASTM A153 B2 finish.

G. Beam Strap Anchors: Provide Hohmann & Barnard, Inc., **#365 Bent Gripstay Channel Slot Anchor** 1-1/4 inch x 14 gauge, by length required; hot dip galvanized to ASTM A153 B2 finish.

H. Breakaway Fire Wall Anchors: Provide Heckmann Building Products, **#134 Channel Slot Corrugated Anchor** for masonry to structural steel beams and **#196 Corrugated Notch Column Anchor** for masonry to structural steel columns, 1-1/4 inch x 16 gauge, by length required; Zinc Alloy 710.

I. Masonry Column Anchors: Provide Hohmann & Barnard, Inc., #**356L - Column Anchor,** 1-1/4 inch x 12 gauge, by length required; hot dip galvanized to ASTM A153 B2 finish or Hohmann & Barnard, Inc., #**355L - Column Anchor,** 1-1/4 inch x 12 gauge, by length required; hot dip galvanized to ASTM A153 B2 finish.

J. Partition Top Anchors: Provide Hohmann & Barnard, Inc., **PTA Series Anchors - PTA 422,** 12-gauge steel plate; hot dip galvanized to ASTM A153 B2 finish.

K. Adjustable Masonry-Veneer Anchors:

1. General: Provide anchors that allow vertical adjustment but resist tension and compression forces perpendicular to plane of wall, for attachment over sheathing to wood or metal studs, and as follows:

2. Screw-Attached, Masonry-Veneer Anchors: Units consisting of a wire tie and a metal anchor section.

    a. Provide Hohmann & Barnard, Inc., **HB-200/DA-213 Adjustable Veneer Anchor,** with two stainless steel fasteners #12 diameter each.

2.11 MISCELLANEOUS ANCHORS

A. Anchor Bolts: L-shaped steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers; hot-dip galvanized to comply with ASTM A 153, Class C; of dimensions indicated.

B. Wedge Anchors: Anchors shall meet the physical requirements of Federal Specification A-A-1923A, Type 4. Anchors shall be non-bottom bearing type with a single piece steel expansion clip providing 360-degree contact with the base material and shall not require oversized holes for installation. Carbon steel anchors shall have an electroplated zinc finish or shall be mechanically galvanized in accordance with ASTM B695, Class 55, Type 1, as appropriate. Stainless steel anchors shall be type 303, 304 or 316. Anchors shall have an evaluation report issued by ICC-ES and have been tested in accordance with ICC-ES AC01 for all mandatory tests and including the following:

    1. Seismic tension & shear
    2. Combination of tension and shear loads
    3. Critical and minimum edge distance

    Unless otherwise noted, wedge anchors shall be **"Wedge-All" Wedge Anchors** by Simpson Strong-Tie (ICC-ES ESR-1396).

C. Sleeve Anchors: Anchors shall meet the physical requirements of Federal Specification A-A-1922A. Anchors shall be non-bottom bearing type with a single piece steel expansion sleeve providing 360-degree contact with the base material and shall not require oversized holes for installation. Carbon steel anchors shall have an electroplated zinc finish. Stainless steel anchors shall be type 304. Anchors shall have been tested in accordance with ICC-ES AC01 for the following:

    1. Static Loads
    2. Critical and minimum edge distance and spacing

    Unless otherwise noted, sleeve anchors shall be **"Sleeve-All" Sleeve Anchors** by Simpson Strong-Tie.

D. Postinstalled Veneer Anchors For Reconstruction Work: Provide chemical anchors, with capability to sustain, without failure, a load equal to six times the load imposed when installed in solid or grouted unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

    1. Corrosion Protection: Stainless-steel components complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2 for bolts and nuts; ASTM A 666 or ASTM A 276, Type 304 or 316, for anchors.

2.12 CONCEALED FLASHING MATERIALS

A. Thru Wall Flashing Membrane (where so noted on the drawings):

    1. Through-wall Flashing Membrane (Self-Adhering) shall be **Blueskin® TWF**, an SBS modified bitumen, self-adhering sheet membrane complete with a yellow engineered thermoplastic film;

as manufactured by Henry Company, 909 North Sepulveda Blvd. Suite 650, El Segundo, CA, 90245; tel. (800) 598-7663; email: techservices@henry.com. Provide pre-fabricated inside & outside corners and end dams mitered and fully adhered, including **Stainless Steel 3" Drip Plate** and all required bonding accessories as standard to Base Bid. Provide pre-formed drip plate inside and outside corners with smooth uninterrupted hemmed drip edge.

Membrane shall have the following physical properties:

a. Membrane Thickness: 0.0394 inches (40 mils),
b. Film Thickness: 4.0 mils,
c. Flow (ASTM D5147): Pass @ 212 degrees F,
d. Puncture Resistance: 134 lbf to ASTM E 154,
e. Tensile Strength (film): 5000 psi minimum ASTM D 882,
f. Tear Resistance: 45lbs.-MD, 17lbs.-CD to ASTM D1004,
g. Low temperature flexibility: -22 degrees F to CGSB 37-GP-56M

B. Sheet Metal Counter Flashing (where so noted on the drawings): Fabricated from the following metal complying with requirements specified in Division 7 Section "Flashing and Sheet Metal" and below:

1. Copper: 7 oz. weight copper fabric flashing; asphalt-free (red) York Multi-Flash 500 series as manufactured by York Manufacturing Inc., for fully concealed flashing, and 16 oz. weight copper for cap flashing. Provide copper flashing where sloped glazing occurs.

2. At parapet cap stones use 16 oz. copper dove-tail flashing manufactured by Cheney Flashing Company.

3. Fabricate through-wall metal flashings with deformation in both directions for integral mechanical mortar bond.

4. Solder and Sealants for Sheet Metal Flashings: As specified in Division 07 Section - 076000 "Flashing and Sheet Metal".

2.13 TRANSITION MEMBRANES

A. Primary sheet air/vapor barrier membrane shall be **Blueskin® SA**, an SBS modified bitumen, self-adhering sheet membrane complete with a blue engineered thermoplastic film; as manufactured by Henry Company, 909 North Sepulveda Blvd. Suite 650, El Segundo, CA, 90245; tel. (800) 598-7663; email: techservices@henry.com.

B. Primer: Primer for self-adhering membranes at temperatures above 25°F shall be Aquatac™ Primer manufactured by Henry, a polymer emulsion based adhesive, quick setting, having the following physical properties:

1. Color: Aqua.
2. Weight: 8.7 lbs/gal.
3. Solids by weight: 53%.
4. Water based, no solvent odors.
5. Drying time (initial set): 30 minutes at 50% RH and 70°F.

2.14 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene, urethane or PVC.

B. Preformed Control Joint Strips: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 or PVC, complying with ASTM D 2287, Type PVC-65406 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.

C. Bond Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).

D. Control Joint Block Shear Connector: Provide sash block either side of control joint and insert Hohmann & Barnard, Inc. **RS Series - Rubber Control Joint** in joint full height.

E. Control Joint Foam (Mortar Excluding) Filler: Provide Hohmann & Barnard, Inc., **NS - Closed Cell Neoprene Sponge** expansion joint in veneer control joints held back for bond breaker and sealant. Apply sealant at cavity face of block prior to applying vapor barrier to make building airtight.

1. Compressible Control Joint Foam Filler: Provide Hohmann & Barnard, Inc., **NS - Closed Cell Neoprene Sponge** with adhesive backing under shelf angles to allow for vertical veneer movement. Hold back for sealant and bond breaker.

F. Weepholes: Provide the following for weepholes:

1. Full Head Joint Weep Holes: Provide a full height **open** cell weep hole at base of wall above flashing and above steel lintels provided with thru-wall flashing.

2. Weep Vents (Top of Wall): Available Products; subject to compliance with requirements, weephole/ventilators which shall be incorporated in the work include, but are not limited to, the following:

   a. “Hohmann and Barnard” No. 343, No. 343W Louvered Weep Hole. For use with Standard white and grey mortar.
   b. “Hohmann and Barnard” No. QV-Quadrovent. For use with colored mortars. Color as selected by Architect.

G. Cavity Drainage Material: Free-draining mesh, made from high density polyethylene strands (1” x 10” x 60”) that will not degrade within the wall cavity; 90% open mesh weave.

1. Provide the following configuration:

   a. Strips, full-depth of cavity and 10 inches high, with dovetail-shaped notches 7 inches deep that prevent mesh from being clogged with mortar droppings.

2. Products:

   a. Mortar Net USA, Ltd.; “Mortar Net”
   b. Hohmann and Barnard; “Mortar Trap”

H. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells with loops for holding reinforcing bars in center of cells. Units are formed from 0.142-inch steel wire, hot-dip galvanized after fabrication. Provide units with either two loops or four loops as needed for number of bars indicated.

1. Available Products:

   a. Hohmann & Barnard, Inc.; #RB or #RB-Twin Rebar Positioner.
   b. Heckmann Building Products Inc.; No. 376 Rebar Positioner.
   c. Wire-Bond; O-Ring or Double O-Ring Rebar Positioner.

2.15 INSULATION

A. Cavity wall closed cell expanded polystyrene insulation as indicated on drawings and specified in related sections. Refer to Specification Section 072113. Thickness as indicated on drawings.

1. Cavity wall assembly will utilize continuous rigid board cavity insulation adhered to CMU with all joints and penetrations sealed with spray foam sealant.

2.16 MASONRY CLEANERS

A. Acidic Cleaner: Manufacturer's standard strength general purpose cleaner designed for new masonry surfaces of type indicated; composed of blended organic and inorganic acids combined with special wetting systems and inhibitors; expressly approved for intended use by manufacturer of masonry units being cleaned.

1. Available Products: Subject to compliance with requirements, a product which may be used to clean unit masonry surfaces includes, but is not limited to, the following:

a. "Sure Klean" No. 600 Detergent; ProSoCo, Inc.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Contractor shall examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

1. Prepare written report, endorsed by Installer, listing any conditions requiring correction prior to performance of work.
2. Verify that foundations are within tolerances specified.
3. Verify that reinforcing dowels are properly placed.

B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

D. Commencement of installation indicates acceptance of conditions provided.

3.02 INSTALLATION, GENERAL

A. Do not wet concrete masonry units.

B. Cleaning Reinforcing: Before placing, remove loose rust, ice, and other coatings from reinforcing.

C. Thickness: Build cavity and composite walls, and other masonry construction to the full thickness shown. Build single-wythe walls (if any) to the actual thickness of the masonry units, using units of nominal thickness indicated.

1. Build chases and recesses as shown or required for the work of other trades. Provide not less than 8" of masonry between chase or recess and jamb of openings and between adjacent chases and recesses.
2. Leave openings for equipment to be installed before completion of masonry work. After installation of equipment, complete masonry work to match work immediately adjacent to the opening.

3. Cut masonry units using motor-driven saws to provide clean, sharp, unchipped edges. Cut units as required to provide continuous pattern and to fit adjoining work. Use full-size units without cutting where possible.

D. Matching Existing Masonry Work: Match coursing, bonding, color, and texture of new masonry work with existing work unless otherwise indicated or if there is a unit size different or joint thickness variation. Tooth-in new masonry when tying into existing unless otherwise indicated on the drawings.

E. Tuck Pointing: Mortar shall be pre-hydrated. The specified ingredients shall be mixed with only enough water to produce a damp mass of such consistency that it will retain its form when pressed into a ball by the hands but will not flow under the trowel; then allowed to stand for not less than 1 hour nor more than 2 hours and remixed at once with the addition of enough water to produce satisfactory workability for immediate use. Tuck pointing is intended for use in repair work.

F. Select and arrange units for exposed brick unit masonry to produce a uniform blend of colors and textures. Mix units from several pallets or cubes as they are placed unless otherwise specifically indicated on documents.

3.03 CONSTRUCTION TOLERANCES

A. Comply with construction tolerances in ACI 530.1/ASCE 6/TMS 602 and with the following:

B. Variation from Plumb: For vertical lines and surfaces of columns, walls, and arises, do not exceed 1/4" in 10", or 3/8" in a story height not to exceed 20', nor 1/2" in 40' or more. For external corners, expansion joints, control joints, and other conspicuous lines, do not exceed 1/4" in any story or 20' maximum, or 1/2" in 40' or more. For vertical alignment of head joints, do not exceed plus or minus 1/4" in 10', 1/2" maximum.

C. Variation from Level: For bed joints and lines of exposed lintels, sills, parapets, horizontal grooves, and other conspicuous lines, do not exceed 1/4" in any bay or 20' maximum, nor 1/2" in 40' or more. For top surface of bearing walls, do not exceed 1/8" between adjacent floor elements in 10' or 1/16" within width of a single unit.

D. Variation in Cross-Sectional Dimensions: For columns and thickness of walls, from dimensions shown, do not exceed minus 1/4" nor plus 1/2".

E. Variation In Mortar Joint Thickness:

1. For exposed 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. Do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.

2. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch. Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch.

F. Variation In Face Dimensions: For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch except due to warpage of masonry units within tolerances specified for warpage of units.

G. Variation In Alignment: For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than 1/16 inch from one masonry unit to the next.

3.04 LAYING MASONRY WALLS

A. Layout walls in advance for accurate spacing of surface bond patterns with uniform joint widths and

to accurately locate openings, movement-type joints, returns, and offsets. Avoid the use of less-than-half size units at corners, jambs, and, wherever possible, at other locations.

B. Lay-up walls to comply with specified construction tolerances, with courses accurately spaced and coordinated with other work.

C. Pattern Bond: Lay exposed masonry in the bond pattern shown, or, if not shown, lay in running bond with vertical joint in each course centered on units in courses above and below. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 2". Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4" horizontal face dimensions at corners or jambs.

D. Stopping and Resuming Work: Stop work by racking back ½-unit length in each course; 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 the work progresses, build-in items specified under this and other sections of these specifications. Fill in solidly with masonry around built-in items.

1. Fill space between hollow metal frames and masonry solidly with mortar unless otherwise indicated.

2. 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. Fill cores in hollow concrete masonry units with grout 3 courses (24") under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.

F. Build non-load-bearing interior partitions full height of story to within 1” of underside of solid floor or roof structure above, unless otherwise indicated. Coordinate this work with all required firestopping requirements.

1. Install compressible filler in joint between top of partition and underside of structure above.

2. Fasten partition top anchors to structure above and build into top of partition. Grout cells of CMUs solidly around plastic tubes of anchors and push tubes down into grout to provide 1/2-inch clearance between end of anchor rod and end of tube. Space anchors 48 inches o.c., unless otherwise indicated.

3. At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Division 07 Section "Fire-Resistive Joint Systems."

G. Intersecting and Abutting Walls: Unless vertical expansion or control joints are shown at juncture, provide same type of bonding specified for structural bonding between wythes.

1. Provide continuity with horizontal joint reinforcement using prefabricated "T" units.

2. If construction sequence does not allow simultaneous construction of intersecting or abutting walls, provide mesh wall ties @ 16” o.c. vertical install in initial wall and leave hanging out for incorporation into secondary wall.

3.05 MORTAR BEDDING AND JOINTING

A. Lay solid masonry units with completely filled bed and head joint; butter ends with sufficient mortar to fill head joints and place units. Do not slush head joints.

B. Lay hollow concrete masonry units with full mortar coverage on horizontal and vertical face shells. Bed webs in mortar in starting course on footings and in all courses of piers, columns and pilasters, and where adjacent to cells or cavities to be reinforced or filled with concrete or grout. For starting course on footings where cells are not grouted, spread out full mortar bed including areas under cells.

C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness, unless otherwise indicated.

D. Maintain joint widths shown, except for minor variations required to maintain bond alignment. If not shown, lay walls with 3/8" joints.

E. Cut joints flush for masonry walls which are to be concealed or to be covered by other materials, unless otherwise indicated.

F. Interior Exposure Joints: Provide concave joints horizontal and vertical.

G. Remove masonry units disturbed after laying; clean and reset in fresh mortar. Do not pound corners or jambs to shift adjacent stretcher units which have been set in position. If adjustments are required, remove units, clean off mortar and reset in fresh mortar.

3.06 STRUCTURAL BONDING OF MULTI-WYTHE MASONRY

A. Use continuous horizontal joint reinforcement installed in horizontal mortar joints for bond tie between wythes. Install at not more than 16" o.c. vertically.

B. Corners: Provide interlocking masonry unit bond in each course at corners, unless otherwise shown.

1. For horizontally reinforced masonry, provide continuity at corners with prefabricated "L" units, in addition to masonry bonding.

C. Intersecting and Abutting Walls: Unless vertical expansion or control joints are shown at juncture, provide same type of bonding specified for structural bonding between wythes.

1. Provide continuity with horizontal joint reinforcement using prefabricated "T" units.

2. If construction sequence does not allow simultaneous construction of intersecting or abutting walls, provide mesh wall ties @ 16” o.c. vertical install in initial wall and leave hanging out for incorporation into secondary wall.

3.07 COMPOSITE MASONRY

A. Bond wythes of composite masonry together using one of the following methods:

1. Individual Metal Ties: Provide ties as shown installed in horizontal joints, but not less than one metal tie for 2.67 sq. ft. of wall area spaced not to exceed 24 inches o.c. horizontally and 16 inches o.c. vertically. Stagger ties in alternate courses. Provide additional ties within 12 inches of openings and space not more than 36 inches apart around perimeter of openings. At intersecting and abutting walls, provide ties at no more than 24 inches o.c. vertically.

a. Where bed joints of wythes do not align, use adjustable (two-piece) type ties.

2. Masonry Joint Reinforcement: Installed in horizontal joints.

a. Where bed joints of both wythes align, use ladder-type reinforcement extending across

both wythes.

b. Where bed joints of wythes do not align, use adjustable (two-piece) type reinforcement with continuous horizontal wire in facing wythe attached to ties.

B. Bond adjacent wythes of composite masonry together using full collar joints.

C. Collar Joints: Solidly fill collar joints by parging face of first wythe that is laid and shoving units of other wythe into place.

D. Corners: Provide interlocking masonry unit bond in each wythe and course at corners, unless otherwise indicated.

1. Provide continuity with masonry joint reinforcement at corners by using prefabricated L-shaped units as well as masonry bonding.

E. Intersecting and Abutting Walls: Unless vertical expansion or control joints are shown at juncture, bond walls together as follows:

1. Provide individual metal ties not more than 16 inches o.c.

2. Provide continuity with masonry joint reinforcement by using prefabricated T-shaped units.

3. Provide rigid metal anchors not more than 24 inches o.c. If used with hollow masonry units, embed ends in mortar-filled cores.

4. If construction sequence does not allow simultaneous construction of intersecting or abutting walls, provide mesh wall ties @ 16” o.c. vertical install in initial wall and leave hanging out for incorporation into secondary wall.

3.08 CAVITY WALLS

A. Tie wythes of cavity walls together using one of the following methods:

1. Ladder Type Pintel & Eye Joint Reinforcement: Installed in horizontal mortar joints where bed joints of both wythes align, use adjustable (two piece) ladder-type reinforcement on back-up masonry with pintel & eye extending across cavity securing veneer.

2. Individual Metal Ties: Provide ties as shown installed in horizontal joints, but not less than one metal tie for 2.67 sq. ft. of wall area spaced not to exceed 24 inches o.c. horizontally and 16 inches o.c. vertically. Stagger ties in alternate courses. Provide additional ties within 12 inches of openings and space not more than 36 inches apart around perimeter of openings. At intersecting and abutting walls, provide ties at no more than 24 inches o.c. vertically.

a. Where bed joints of wythes do not align, use adjustable (two-piece) type ties.

3. Masonry Veneer Anchors: Comply with requirements for anchoring masonry veneers.

B. Attempting to remove mortar fins from cavity or to trowel them flat against brick usually results in increased mortar droppings at base of cavity; keep cavities clean of mortar droppings and other materials during construction. Strike joints facing cavity flush. Bevel beds away from cavity, to minimize mortar protrusions into cavity.

C. Provide weepholes (full head open cell joints) in exterior wythe of cavity wall located immediately above ledges and flashing, spaced 24" o.c., unless otherwise indicated.

D. Provide weep vents in exterior wythe of cavity wall located at top of cavity walls at 24” o.c., unless otherwise indicated.

3.09 CAVITY WALL INSULATION

A. Cavity insulation shall be installed continuously between lines of horizontal joint reinforcement butting edges flush. Adhere to back-up block and seal all joints with adhesive/sealer compatible with insulation, product as recommended by the insulation manufacturer.

B. Refer to Division 07 Section 072100 – Building Insulation & Section 072113 – Ultra Wall Insulation and Air Barrier System for installation requirements applicable to continuous rigid insulation.

C. Provide insulation thickness as indicated on drawings.

3.10 HORIZONTAL JOINT REINFORCEMENT

A. General: Provide continuous horizontal joint reinforcements as indicated. Install longitudinal side rods in mortar for their entire length with a minimum cover of 5/8" on exterior side of walls, 1/2" elsewhere. Lap reinforcing a minimum of 6".

B. Cut or interrupt joint reinforcement at control and expansion joints unless otherwise indicated.

C. Reinforce walls with continuous horizontal joint reinforcing unless specifically noted to be omitted.

D. Provide continuity at corners and wall intersections by use of prefabricated "L" and "T" sections.

E. Cut and bend reinforcement units as directed by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

1. Space continuous horizontal reinforcement as follows:

    a. For multi-wythe walls (solid or cavity) where continuous horizontal reinforcement acts as structural bond or tie between wythes, space reinforcement as required by code but not more than 16" o.c. vertically.
    b. For foundation and parapet walls, space reinforcement at 8" o.c. vertically unless otherwise indicated.

2. Reinforce masonry openings greater than 1'-0" wide, with horizontal joint reinforcement placed in 2 horizontal joints approximately 8" apart, immediately above the lintel and immediately below the sill. Extend reinforcement a minimum of 2'-0" beyond jambs of the opening except at control joints.

    a. In addition to wall reinforcement, provide additional reinforcement at openings as required to comply with the above.

3.11 CONTROL AND EXPANSION JOINTS

A. General: Provide vertical and horizontal expansion, control, and isolation joints in masonry where shown. Build-in related items as the masonry work progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.

1. Build-in horizontal pressure relieving joints where indicated; construct joints by either leaving an air space or inserting non-metallic compressible joint filler of width required to permit installation of sealant and backer rod.

    a. Locate horizontal pressure relieving joints beneath shelf angles supporting masonry

veneer and attached to structure behind masonry veneer.

2. Build in vertical pressure relieving joints. Expansion joints shall be located in sizes and locations as shown on drawings.

3. Vertical control joints: unless otherwise noted, control joints shall be located as shown on drawings and/or in accordance with the ACI guidelines and specified herein. Location of all control joints shall be reviewed by Architect prior to proceeding with work.

   a. Vertical interior and exterior masonry control joints shall be ½" wide and filled with appropriate caulk.

   b. Control joint spacing for exterior and interior walls:

Wall Height (FT)	Horizontal Joint reinforcing 16" O.C.
Up to 8 feet	25 ft O.C.
8ft to 12 ft	30 ft. O.C.
Over 12 ft.	35 ft. O.C.

   c. Control joints for interior and exterior masonry shall be located at the following points of weakness or high stress concentrations:

      1) At all abrupt changes in wall height.

      2) At all changes in wall thickness, such as those at pipe or duct chases and those adjacent to columns or pilasters.

      3) Above joints in foundations and floors.

      4) Below joints in roof and floors that bear on the wall.

      5) At a distance of not over one-half the allowable joint spacing from bonded intersections or corners.

      6) At one or both sides of all door and window opening unless other crack control measures as used, such as joint reinforcement or bond beams.

B. Control joints in 2 hour fire rated CMU walls shall be as follows: Joint size maximum ½" with nominal ¾" diameter polyethylene backer rod compressed and installed into joint with minimum of ¼" thick fill materials applied within the joint flush with both surfaces of the wall as manufactured by "3M Company" - model # FD-150+. Note: All installations shall be in accordance with UL guidelines for joint systems.

3.12 ANCHORING MASONRY TO STRUCTURAL MEMBERS

A. Anchor masonry to structural members as detailed and indicated within the Construction Documents or where masonry abuts or faces structural members to comply with the following:

1. Provide an open space not less than 1/2 inch in width between masonry and structural member, unless otherwise indicated. Keep open space free of mortar and other rigid materials.

2. Anchor masonry to structural members with anchors embedded in masonry joints and attached to structure.

3. Space anchors as indicated, but not more than 24 inches o.c. vertically and 36 inches o.c.

horizontally.

4. Coordinate anchors with flashing and air/vapor barrier requirements. Seal any penetrations necessary in flashing and air/vapor barriers.

B. Firewalls: Provide melt-away anchors at all firewalls to anchor masonry to structural members as detailed and indicated within the Construction Documents when required for structural bracing.

3.13 LINTELS

A. Install steel lintels of size and configuration shown where indicated in Construction Documents. Contractor is responsible to provide galvanized steel lintels at all exterior conditions where exposure to moisture is possible; regardless if indicated on drawings or not.

B. Provide minimum bearing of 6" at each jamb unless otherwise indicated.

3.14 FLASHING OF MASONRY WORK

A. Refer to Division 07 Section 072113 – Ultra Wall Insulation and Air Barrier System for installation requirements applicable to through wall flashing.

B. General: Provide concealed self-adhering through wall flashing in masonry work continuous at base of wall at or above shelf angles, lintels, ledges, and other obstructions to the downward flow of water in the wall so as to divert such water to the exterior.

1. Prepare masonry surfaces smooth and free from projections which could puncture flashing. Seal penetrations in flashing with mastic before covering with mortar.

2. Place horizontal leg of through wall flashing on sloping bed of mortar and cover with mortar. Set stainless steel drip plate into minimum of ¼” bead of water block sealant, apply spray primer and allow to dry 4 to 5 minutes; within 30 minutes of setting primer set self-adhering through wall flashing onto drip plate set back from face of exterior face of masonry.

3. Extend flashing the full length of lintels and shelf angles and minimum of 4" into masonry each end then provide end dams at lintels and sills. Extend flashing from exterior face of outer wythe of masonry, through the outer wythe, turned up typically two full cmu back-up courses (16”) but a minimum of 4" where restricted, and through the inner wythe to within 1/2" of the interior face of the wall in exposed work. Where interior surface of inner wythe is concealed by furring, carry flashing completely through the inner wythe and turn up approximately 2". At heads and sills turn up ends not less than 2" to form a pan.

4. Install flashing to comply with manufacturer's instructions.

5. Provide fully open cell weep hole head joints of the first course of masonry immediately above concealed flashings. Space 24" o.c. unless otherwise indicated.

6. Install reglets and nailers for flashing and other related work where shown to be built into masonry work.

7. Place cavity drainage material in cavities to comply with configuration requirements for cavity drainage material in Part 2 “Cavity Drainage Material” Article.

8. Install vents in head joints at top course of just below or where indicated in exterior wythes at spacing indicated or 24” o.c. Use specified weep/vent products to form vents.

   a. Close cavities off vertically and horizontally with treated wood blocking in manner indicated.

Install through-wall flashing and weep holes above horizontal blocking.

3.15 INSTALLATION OF REINFORCED UNIT MASONRY

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 temporary loads that may be placed on them during construction.

B. Placing Reinforcement: Comply with requirements in ACI 530.1/ASCE 6/TMS 602. Place reinforcement of size and type and spacing as indicated in structural drawings.

C. Grouting: Grout reinforced cores full height in coordination with and as indicated on structural drawings. 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 ACI 530.1/ASCE 6/TMS 602 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. The use of mortar to fill the cells is not permissible.

3.16 INSTALLATION OF SELF-ADHERING TRANSITION MEMBRANES

A. Refer to Division 7 Section 072113 – Ultra Wall Insulation and Air Barrier System for installation requirements applicable to self-adhering transition membranes.

B. General: Provide self-adhering transition membranes locations including window & door openings, top of wall covering wood blocking tied into roofing, changes in materials, across expansion joints, around penetrations, structural steel exposed within the cavity and wherever indicated on the construction documents.

1. Coordinate installation of transition membranes with other materials utilized as part of the air/vapor barrier system utilizing compatible products.

2. Install transition membranes to comply with manufacturer's instructions.

3.17 REPAIR, POINTING, AND CLEANING

A. Remove and replace masonry units which are loose, chipped, broken, stained, or otherwise damaged, or if units do not match adjoining units as intended. Provide new units to match adjoining units and install in fresh mortar or grout, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge any voids or holes, except weepholes, and completely fill with mortar. Point up all joints including corners, openings, and adjacent work to provide a neat, uniform appearance, prepared for application of sealants.

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 sets and cured, clean masonry as follows:

1. Remove large mortar particles by hand with wooden paddles and non-metallic scrape hoes or chisels.

2. Test cleaning methods on sample wall panel; leave 1/2 panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of installed masonry.

3. Fully clean installation of exterior masonry with specified cleaner; apply and rinse, remove in accordance with manufacturer instructions.
4. Protect adjacent stone and non-masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film, or waterproof masking tape.

5. Saturate wall surfaces with water prior to application of cleaners; remove cleaners promptly by rinsing thoroughly with clear water.

6. Use bucket and brush hand cleaning method described in BIA "Technical Note No. 20 Revised" to clean brick masonry made from clay or shale, except use masonry cleaner as indicated in Part 2 “Masonry Cleaners” Article.

7. Clean exterior finished concrete unit masonry to comply with masonry manufacturer's directions and applicable NCMA "Tek" bulletins.

E. Protection: Provide final protection and maintain conditions in a manner acceptable to Installer, which ensures unit masonry work being without damage and deterioration at time of substantial completion. Protect waterproofing membrane and drain board work from other trades during construction. Backfill with specified materials, protect membrane from damage.

3.18 MASONRY WASTE DISPOSAL

A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, recycle or remove all surplus materials from the Project site(s).

END OF SECTION

DIVISION 05 – METALS

SECTION 051200 – STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provision of Contract, including General Conditions, Supplementary Conditions (if applicable), and Division 01 - Specification Sections, apply to work of this Section.

1.02 SUMMARY

A. Extent of structural steel work is shown on drawings, including schedules, notes, and details to show size and location of members, typical connections, and type of steel required.

B. Structural steel is that work defined in American Institute of Steel Construction (AISC) *"Code of Standard Practice",* and as otherwise shown on drawings.

C. Miscellaneous metal fabrications are specified elsewhere in Division 05. Refer to Division 03 for anchor bolt installation in concrete; Division 04 for masonry.

D. Source Quality Control: Materials and fabrication procedures are subject to inspection and tests in mill, shop, and field, conducted by a qualified inspection agency. Such inspections and test will not relieve Contractor of responsibility for providing materials and fabrication procedures in compliance with specified requirements.

1. Promptly remove and replace materials or fabricated components which do not comply.

E. Design of Members and Connections: Details shown are typical; similar details apply to similar conditions, unless otherwise indicated. Verify dimensions at site whenever possible without causing delay in the work. Contractor shall retain the services of a licensed professional engineer for the design of any connections not shown on the drawings.

1. Promptly notify Architect whenever design of members and connections for any portion of structure are not clearly indicated.

F. The following sections, when included in the Project Manual, are related to the work of this section:

1. Section 053000 – Metal Decking; for field installation of shear connectors.

2. Section 055000 – Metal Fabrications; for steel lintels or shelf angles not attached to structural-steel frame, miscellaneous steel fabrications and other metal items not defined as structural steel, including, but not limited to, loose steel bearing plates for structural steel and miscellaneous steel shapes for framing deck openings.

1.03 DEFINITIONS

A. Structural Steel: Elements of structural-steel frame, as classified by AISC's "Code of Standard Practice for Steel Buildings and Bridges," that support design loads.

1.04 PERFORMANCE REQUIREMENTS

A. Structural Performance: Engineer structural steel connections required by the Contract Documents to be selected or completed by the fabricator to withstand design loadings indicated.

B. Connections: Provide details of connections to withstand loads and other design criteria indicated and to comply with other information and restrictions indicated.

1. Steel fabricator shall detail connections using sections, details, typical details, and other requirements indicated on the structural drawings and using the schematic details indicated and AISC's "Manual of Steel Construction, Allowable Stress Design," Part 4 to resist loads and other design criteria specified on the structural drawings.

C. Construction: Type 2, simple framing.

D. Engineering Responsibility: Under Base Bid submitted, the Prime Contractor shall engage a fabricator who utilizes a qualified professional engineer to prepare calculations, Shop Drawings, and other structural data for structural steel connections.

1.05 SUBMISSIONS

A. All submissions shall be made in accordance with Section 013300 – Submittal Procedures.

B. Product Data: Submit producer's or manufacturer's specifications and installation instructions for the following products. Include laboratory test reports and other data to show compliance with specifications (including specified standards).

1. Structural steel (each type), including certified copies of mill reports covering chemical and physical properties.

2. High-strength bolts (each type), including nuts and washers.

3. Structural steel primer paint.

4. Shrink-resistant grout.

C. Shop Drawings: Submit shop drawings prepared under the supervision of a registered professional engineer, including complete details and schedules for fabrication and assembly of structural steel members, procedures, and diagrams. Show fabrication of all structural steel components.

1. Include details of cuts, connections, splices, camber, holes, and other pertinent data. Indicate welds by standard AWS A2.1 and A2.4 symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Indicate type, size and length of bolts, distinguishing between shop and field bolts.

2. Provide setting drawings, templates, and directions, for installation of anchor bolts and other anchorages to be installed as work of other sections.

3. Include embedment drawings.

4. Include welding certificates.

5. Include shop drawings signed and sealed by a qualified professional engineer responsible for their preparation.

6. Qualification Data: For installer, fabricator, Professional Engineer, and testing agency.

7. Mill Test Reports: Signed by manufacturers certifying that the following products comply with requirements:

a. Structural steel, including chemical and physical properties.

b. Bolts, nuts and washers, including mechanical properties and chemical analysis.
c. Direct-tension indicators.
d. Tension-control, high-strength bolt-nut-washer assemblies.
e. Shear stud connectors.
f. Shop primers.
g. Non-shrink grout.

1. Include source quality-control test reports.

D. Test Reports: Submit copies of reports of tests conducted on shop and field bolted and welded connections. Include data on type(s) of tests conducted and test results.

E. Surveys: Submit certified copies of each survey conducted by a registered Professional Engineer or land surveyor, showing elevations and locations of base plates and anchor bolts to receive structural steel, and final elevations and locations for major members. Indicate discrepancies between actual installation and contract documents.

1.06 QUALITY ASSURANCE

A. Codes and Standards: Comply with provisions of following, except as otherwise indicated:

1. AISC "*Code of Standard Practice for Steel Buildings and Bridges*."

a. Paragraph 4.2.1 of the above code is hereby modified by deletion of the following sentence: "This approval constitutes the owner's acceptance of all responsibility for the design adequacy of any connections designed by the fabricator as a part of his preparation of these shop drawings."

2. AISC *"Seismic Provisions for Structural Steel Buildings"*

3. AISC *"Specifications for the Design, Fabrications, and Erection of Structural Steel for Buildings,"* including "Commentary" and Supplements thereto as issued.

4. AISC *"Specifications for Architecturally Exposed Structural Steel."*

5. AISC *"Specifications for Structural Joints using ASTM A325 or A490 Bolts"* approved by the Research Council on Riveted and Bolted Structural Joints of the Engineering Foundation.

6. AISC *"Specification for Structural Steel Buildings – Allowable Stress Design and Plastic Design".*

7. AISC *"Specification for the Design of Steel Hollow Structural Sections".*

8. AISC *"Specification for Allowable Stress Design of Single-Angle Members".*

9. American Welding Society (AWS) D1.1 *"Structural Welding Code - Steel."*

10. ASTM A6 "*General Requirements for Delivery of Rolled Steel Plates, Shapes, Sheet Piling, and Bars for Structural Use."*

11. Research Council on Structural Connections' (RCSC) *"Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."*

B. Qualifications for Welding Work: Qualify welding processes and welding operators in accordance with AWS D1.1, *"Structural Welding Code – Steel."*

1. Provide certification that welders to be employed in work have satisfactorily passed AWS qualification tests.

2. If re-certification of welders is required, retesting will be Contractor's responsibility.

C. Installer's Qualifications: A qualified installer who is familiar with and performs work in accordance with AISC's *"Code of Standard Practice for Steel Buildings and Bridges"* and *"Specification for Structural Steel Buildings-Allowable Stress Design and Plastic Design"* and OSHA's Steel Erection Standard and who has successfully completed projects of similar size and complexity.

D. Fabricator's Qualifications: Engage a firm experienced in fabricating structural steel similar to that indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to fabricate structural steel without delaying the Work.

1. Fabricator must participate in the AISC Quality Certification Program and be designated an AISC-Certified Plant as follows:

a. Category: Complex steel building structures.

b. Fabricator shall be registered with and approved by authorities having jurisdiction.

E. Professional Engineer Qualifications: A professional engineer who is legally authorized to practice in the State of New York and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for projects with structural steel framing that are similar to that indicated for this Project in material, design, and extent.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to site at such intervals to insure uninterrupted progress of work.

B. Deliver anchor bolts and anchorage devices, which are to be embedded in cast-in-place concrete or masonry, in ample time to not delay work.

C. Store materials to permit easy access for inspection and identification. Keep steel members off ground, using pallets, platforms, or other supports and spacers. Protect steel members and packaged materials from corrosion or deterioration.

1. Do not store materials on structure in a manner that might cause distortion, damage or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

2. Store fasteners in a protected place. Clean and re-lubricate bolts and nuts that become dry or rusty before use.

1.08 COORDINATION

A. Furnish anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions and directions for installation.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Metal Surfaces, General: For fabrications of work which will be exposed to view, use only materials which are smooth and free of surface blemishes including pitting, rust and scale, seam marks, roller

marks, rolled trade names, and roughness. Remove such blemishes by grinding, or by welding and grinding, prior to cleaning, treating, and application of surface finishes.

B. Structural Steel Shapes, Plates, and Bars: ASTM A992/A572-50. minimum F_y = 50 ksi.

C. Channels and Angles, Plates and Bars: ASTM A 36, minimum F_y = 36 ksi.

D. Cold-Formed Steel Tubing / Hollow Structural Sections (HSS): ASTM A500, Grade B; minimum F_y = 46 ksi, structural tubing.

E. Hot-Formed Steel Tubing: ASTM A501.

F. Steel Castings: ASTM A27, Grade 65-35, medium-strength carbon steel.

G. Headed Stud-Type Shear Connectors: ASTM A108, Grade 1015 or 1020, cold finished carbon steel; with dimensions headed-stud type, cold-finished carbon steel; Type B, complying with AWS D1.1 requirements.

H. Anchor Bolts: ASTM F 1554, Grade 36; non-headed type unless otherwise indicated.

1. Configuration: As shown in contract documents.
2. Nuts: ASTM A 563 heavy hex carbon steel.
3. Plate Washers: ASTM A 36 carbon steel.
4. Washers: ASTM F 436 hardened carbon steel.
5. Finish: Plain typical, except hot-dip zinc coating, ASTM A 153, Class C for galvanized members.

I. High-Strength Threaded Fasteners: Heavy hexagon structural bolts, heavy hexagon nuts, and hardened washers, as follows:

1. Quenched and tempered medium-carbon steel bolts, nuts, and washers, complying with ASTM A325, Type 1, heavy hex steel structural bolts; ASTM A 563 heavy hex carbon-steel nuts; and ASTM F 436 hardened carbon-steel washers.

    a. Finish: Plain typical, except hot-dip zinc coating, ASTM A 153, Class C for galvanized members.

2. Quenched and tempered alloy steel bolts, nuts, and washers, complying with ASTM A490.

    a. Direct tension indicator washers may be used at Contractor's option.

J. Electrodes for Welding: Comply with AWS Code requirements, E70XX minimum.

K. Primer:

1. Primer for steel not exposed to weather or exterior conditions: Fast-curing, lead- and chromate-free, universal modified-alkyd primer with good resistance to normal atmospheric corrosion, complying with performance requirements of FS TT-P-664.

2. Primer for exterior exposed steel:

    a. Prime coat: Tnemec series 90-97 zinc-rich aromatic urethane primer.
    b. Intermediate coat: Tnemec series 66 polyamide epoxy coating.

L. Loose and Hung Lintel Steel Primer Paint: Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer, similar or equal to: Series V10 Primer by Tnemec Co., Inc.

2. Lintel angles for exterior veneer, either loose or hung, shall be hot dip galvanized. Final painting shall be after installation, but prior to installation of items in masonry openings.

M. Galvanizing Repair Paint: Comply with Fed. Spec. SSPC-Paint 20.

N. Non-metallic Shrinkage-resistant Grout: Factory-packaged, pre-mixed, non-metallic, non-corrosive, non-staining aggregate grout containing selected silica sands, Portland cement, shrinkage compensating agents, plasticizing and water reducing agents, complying with CE-CRD-C621 and ASTM C1107. Mixed with water to consistency suitable for application and a 30-minute working time.

1. Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:

a. Euco N.S.; Euclid Chemical Company.
b. Crystex; L & M Construction Chemicals.
c. Masterflow 713; Master Builders.
d. Five Star Grout; U.S. Grout Corporation.
e. Upcon; Upco Chemical Division, USM Corporation.
f. Propak; Protex Industries, Inc.
g. Set Non-Shrink; Set Products, Inc.

O. Combined post-consumer and post-industrial recycled content of all structural steel components must be at least 90%, electric arc furnace steel.

2.02 FABRICATION

A. Shop Fabrication and Assembly: Fabricate and assemble structural assemblies in shop to greatest extent possible. Fabricate items of structural steel in accordance with AISC's *"Code of Standard Practice for Steel Buildings and Bridges"* and AISC's *"Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design."* and as indicated on final shop drawings. Provide camber in structural members where indicated.

1. Properly mark and match-mark materials for field assembly. Fabricate for delivery sequence which will expedite erection and minimize field handling of materials. Identify high-strength structural steel according to ASTM A6 and maintain markings until structural steel has been erected. Mark and match-mark materials for field assembly.

2. Where finishing is required, complete assembly, including welding of units, before start of finishing operations. Provide finish surfaces of members exposed in final structure free of markings, burrs, and other defects.

B. Connections: Weld or bolt shop connections, as indicated. Bolt field connections, except where welded connections or other connections are indicated.

1. Provide high-strength threaded fasteners for principal bolted connections, except where unfinished bolts are indicated.

2. Provide unfinished threaded fasteners for only bolted connections of secondary framing members to primary members (including purlins, girts, and other framing members taking only nominal stresses) and for temporary bracing to facilitate erection.

C. High-Strength Bolted Construction: Install high-strength threaded fasteners in accordance with RCSC's *"Specifications for Structural Joints using ASTM A325 or A490 Bolts"* for type of bolt and type of joint specified or required.

D. Welded Construction: Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance and quality of welds, and for methods used in correcting welding work.

1. Assemble and weld built-up sections by methods which will produce and maintain true alignment of axes without warp and without exceeding tolerances of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for mill material.

E. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Shop weld shear connectors, spaced as shown, to beams and girders in composite construction. Use automatic end welding of headed stud shear connectors in accordance with AWS D1.1 and manufacturer's written instructions.

F. Bolt Holes: Cut, drill, or punch standard bolt holes perpendicular to metal surfaces.

G. Holes for Other Work: Provide holes as required for securing other work to structural steel framing, and for passage of other work through steel framing members, as shown on final shop drawings. Holes not indicated on structural drawing are not permitted without written approval from the Structural Engineer.

1. Provide threaded nuts welded to framing, and other specialty items as indicated to receive other work.

2. Cut, drill, or punch holes perpendicular to metal surfaces. Do not thermally cut holes or enlarge holes by burning. Drill holes in bearing plates.

3. Base-Plate Holes: Cut, drill or punch holes perpendicular to steel surfaces.

4. Weld threaded nuts to framing and other specialty items indicated to receive other work.

H. Expansion Joints: Provide expansion joints in steel shelf angles when part of structural steel frame; locate at vertical brick expansion joints as indicated on drawings.

I. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1.

J. Steel Wall-Opening Framing: Select true and straight members for fabricating steel wall-opening framing to be attached to structural steel. Straighten as required to provide uniform, square, and true members in completed wall framing.

2.03 SHOP PAINTING

A. General: Shop paint structural steel, except those members or portions of members to be embedded in concrete or mortar. Paint embedded steel which is partially exposed on exposed portions and initial 2" of embedded areas only. Accurately finish ends of columns and other members transmitting bearing loads.

1. Do not paint surfaces which are to be welded or high-strength bolted with friction-type connections.

2. Do not paint surfaces which are scheduled to receive sprayed-on fireproofing.

3. Apply 2 coats of paint to surfaces which are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

B. Surface Preparation: After inspection and before shipping, clean steel surfaces to be painted. Remove loose rust, loose mill scale, and spatter, slag, or flux deposits. Clean steel in accordance

with one of the approved Steel Structures Painting Council (SSPC) methods as follows:

1. SP-1 "Solvent Cleaning."
2. SP-2 "Hand Tool Cleaning."
3. SP-3 "Power Tool Cleaning."
4. SP-5 "White Metal Blast Cleaning."
5. SP-6 "Commercial Blast Cleaning."
6. SP-7 "Brush-Off Blast Cleaning."
7. SP-10 "Near-White Blast Cleaning."

C. Painting: Immediately after surface preparation, apply structural steel primer paint in accordance with manufacturer's written instructions and at a rate recommended by SSPC to provide dry film thickness of not less than 1.5 mils. Use painting Paint System Guide No. 7.00, and priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

1. Apply two coats of shop paint to inaccessible surfaces after assembly or erection. Change color of second coat to distinguish it from first.

D. Painting: Provide a one-coat shop applied paint system complying with Steel Structures Painting Council (SSPC), methods which result in full coverage of joints, corners, edges, and exposed surfaces.

2.04 GALVANIZING

A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A 123.

1. Fill vent holes and grind smooth after galvanizing.

2. Galvanize lintels, shelf angles, beams and all other steel members located in exterior walls supporting and/or in contact with masonry veneer and/or masonry back-up.

2.05 SOURCE QUALITY CONTROL

A. Contractor will engage an independent testing and inspecting agency to perform shop tests and inspections and prepare test reports.

1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.

B. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

C. Bolted Connections: Shop-bolted connections will be inspected according to RCSC's *"Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."*

D. Welded Connections: In addition to visual inspection required for every weld, shop-welded connections will be tested and inspected according to AWS D1.1 and the following inspection procedures, at testing agency's option:

1. Ultrasonic Inspection: ASTM E 164.
2. Radiographic Inspection: ASTM E 94.

E. In addition to visual inspection, shop-welded shear connectors will be tested and inspected according to requirements in AWS D1.1 for stud welding and as follows:

1. Bend tests will be performed if visual inspections reveal either a less-than- continuous 360-degree flash or welding repairs to any shear connector.

2. Tests will be conducted on additional shear connectors if weld fracture occurs on shear connectors already tested, according to requirements in AWS D1.1.

F. Extent of Inspection and Testing:

1. Bolted Connections:

a. 100 percent of shop-bolted connections shall be visually inspected.

2. Welded Connections:

a. 40 percent of shop-welded connections shall be visually inspected.

b. 100 percent of partial penetration and full penetration type shop welded connections shall be tested by ultrasonic or radiographic inspection.

c. All welds suspected of being defective based on visual inspection shall be tested by ultrasonic or radiographic inspection.

3. Shear Connectors:

a. 100 percent welded shear connectors shall be visually inspected.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify elevations of concrete and masonry bearing surfaces and locations of anchor rods/bolts, bearing plates, and other embedments, with steel erector present, for compliance with requirements.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place, unless otherwise indicated.

3.03 ERECTION

A. Surveys: Employ a registered professional engineer or land surveyor for accurate erection of structural steel. Set structural steel accurately in locations and to elevations indicated and according to AISC's *"Code of Standard Practice for Steel Buildings and Bridges" and "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design."* Check elevations of concrete and masonry bearing surfaces, and locations of anchor bolts and similar devices, before erection work proceeds, and report discrepancies to Architect. Do not proceed with erection until corrections have been made, or until compensating adjustments to structural steel work have been agreed upon with Architect.

B. Temporary Shoring and Bracing: Provide temporary shoring and bracing members with

connections of sufficient strength to bear imposed loads, as required. Remove temporary members and connections when permanent members are in place and final connections are made. Provide temporary guy lines to achieve proper alignment of structures as erection proceeds.

C. Temporary Planking: Provide temporary planking and working platforms as necessary to effectively complete work.

D. Setting Bases and Bearing Plates: Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen to improve bond to surfaces, prior to setting base, bearing and leveling plates. Clean bottom surface of base, bearing and leveling plates.

1. Set loose and attached base plates and bearing plates for structural members on wedges, shims, setting/leveling nuts or other adjusting devices as required and adjust column base leveling nuts as required.

a. Snug-tighten anchor bolts after supported members have been positioned and plumbed. Do not remove wedges or shims, but if protruding, cut off flush with edge of base or bearing plate prior to packing with grout.

b. Pack grout solidly between bearing surfaces and base or bearing plates to ensure that no voids remain. Neatly finish exposed surfaces, protect installed materials and grout, and allow to cure.

c. For proprietary grout materials, comply with manufacturer's written instructions for shrinkage-resistant grouts.

E. Field Assembly: Set structural frames accurately to lines and elevations indicated. Align and adjust various members forming part of complete frame or structure before permanently fastening. Clean bearing surfaces and other surfaces which will be in permanent contact before assembly. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

1. Level and plumb individual members of structure within specified AISC tolerances.

2. Establish required leveling and plumbing measurements on mean operating temperature of structure. Make allowances for difference between temperature at time of erection and mean temperature at time of erection and mean temperature at which structure will be when completed and in service.

3. Splice members only where indicated and accepted on shop drawings and as required to meet OSHA's Steel Erection Standards.

4. Do not use thermal cutting during erection.

5. Maintain erection tolerances of structural steel within AISC's *"Code of Standard Practice for Steel Buildings and Bridges."*

F. Erection Bolts: On exposed welded construction, remove erection bolts, fill holes with plug welds, and grind smooth at exposed surfaces.

1. Comply with AISC Specifications for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.

a. Do not enlarge unfair holes in members by burning or by use of drift pins, except in secondary bracing members. Ream holes that must be enlarged to admit bolts.

G. Gas Cutting: Do not use gas cutting torches in field for correcting fabrication errors in primary

structural framing. Cutting will be permitted only on secondary members which are not under stress, as acceptable to Architect. Finish gas-cut sections equal to a sheared appearance when permitted.

H. Touch-up Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint. Apply paint to exposed areas using same material as used for shop painting.

1. Apply by brush or spray to provide minimum dry film thickness of 1.5 mils.

I. Touch-up Painting: Cleaning and touch-up painting of field welds, bolted connections, and abraded areas of shop paint on structural steel is included in Division 9 under painting work.

3.04 FIELD CONNECTIONS

A. High Strength Bolts: Install high-strength bolts according to RCSC's *"Specification for Structural Joints Using ASTM A 325 or A 490 Bolts"* for type of bolt and type of joint specified.
1. Joint Type: Snug tightened.

B. Weld Connections: Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting welding work.

1. Comply with AISC's *"Code of Standard Practice for Steel Buildings and Bridges"* and *"Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design"* for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.

2. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances of AISC's *"Code of Standard Practice for Steel Buildings and Bridges"* for mill material.

3.05 FIELD QUALITY CONTROL:

A. The Contractor shall make arrangement for and the Owner shall pay for an independent testing and inspection agency to inspect and test high-strength bolted connections and welded connections, to perform tests and prepare test reports, in conformance with all Special Inspection requirements. The Contractor will be responsible for all costs associated with failed tests.

1. Testing agency shall conduct and interpret tests, and state in each report whether test specimens comply with requirements, and specifically state any deviations therefrom.

2. Provide access for testing agency to places where structural steel work is being fabricated or produced so that required inspection and testing can be accomplished.

3. Testing agency may inspect structural steel at plant before shipment; however, Architect reserves right, at any time before final acceptance, to reject material not complying with specified requirements.

4. Correct deficiencies in structural steel work which inspections and laboratory test reports have indicated to be not in compliance with requirements. Perform additional tests, at Contractor's expense, as may be necessary to reconfirm any non-compliance of original work, and as may be necessary to show compliance of corrected work.

B. Shop Bolted Connections: Inspect or test in accordance with AISC specifications.

C. Shop Welding: Inspect and test during fabrication of structural steel assemblies, as follows:

1. Certify welders and conduct inspections and tests as required. Record types and locations of defects found in work. Record work required and performed to correct deficiencies.

2. Perform visual inspection of all welds.

3. Perform tests of welds as follows. Inspection procedures listed are to be used at Contractor's option:

    a. Liquid Penetrant Inspection: ASTM E165.

    b. Magnetic Particle Inspection: ASTM E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration not acceptable.

    c. Radiographic Inspection: ASTM E94 and ASTM E142; minimum quality level "2-2T."

    d. Ultrasonic Inspection: ASTM E164.

D. Field Bolted Connections: Inspect in accordance with RCSC's *"Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."*

E. Field Welding: Field welds will be visually inspected according to AWS D1.1, ***and in accordance with Chapter 17 requirements of the NYS Building Code***. Inspect and test during erection of structural steel as follows:

1. Verify certification of welders and conduct inspections and tests as required. Record types and locations of defects found in work. Record work required and performed to correct deficiencies.

2. Perform visual inspection of all welds.

3. The testing agency shall perform tests of welds as follows:

    a. Liquid Penetrant Inspection: ASTM E165.

    b. Magnetic Particle Inspection: ASTM E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration not acceptable.

    c. Radiographic Inspection: ASTM E94 and ASTM E142; minimum quality level "2-2T."

    d. Ultrasonic Inspection: ASTM E164.

4. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

5. Extent of Inspection and Testing:

        1. Bolted Connections:

            a. 100% of field-bolted connections shall be visually inspected.

        2. Welded Connections:

            a. 100% of field-welded connections shall be visually inspected.

    b. 100% of partial penetration and full penetration type field-welded connections shall be tested by ultrasonic or radiographic inspection.

c. 100% of any weld suspected of being defective based on visual inspection shall be tested by ultrasonic or radiographic inspection.

6. Shear Connectors:

a. 100% of field-welded shear connectors shall be visually inspected.

b. Any shear connector suspected of being defective based on visual inspection shall be tested by bend test.

c. Additional 10% minimum of total number of shear connectors shall be tested by bend test if weld fracture occurs on shear connectors already tested.

F. Installation of hangers and supports on structural components by Mechanical Contractor and/or Plumbing Contractor.

1. Structural steel (wide flange and standard beams, channels):

a. Mechanical Contractor and/or Plumbing Contractor to install individual supports/hangers and trapezes off center of structural steel component.

2. Light gauge metal trusses:

a. Mechanical Contractor and/or Plumbing Contractor to install individual support/hangers and trapezes only at panel points. The Mechanical Contractor and/or Plumbing Contractor shall reimburse the General Contractor (who is supplying the trusses) to provide reinforcing per manufacturers recommendations. ***If work is in an existing structure, no panel point deviation will be permitted and the Mechanical Contractor provides hanging/support details showing reinforcement of existing structural components designed, signed and sealed by an Engineer licensed in the State of New York.***

3.06 REPAIRS AND PROTECTION:

A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Touchup Painting: After installation, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted structural steel and accessories, bearing plates, and abutting structural steel.

1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.

2. Apply a compatible primer of same type as shop primer used on adjacent surfaces.

END OF SECTION

DIVISION 05 – METALS

SECTION 053000 – METAL DECKING

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. Furnish material, labor, equipment, services necessary to erect all metal deck, including connections, welding and accessories required for installation of Work. Field cut and fit deck as required and cut all openings.

B. Place edge of deck at proper location to ensure proper placement of masonry. Set deck edge from a survey line based on the theoretical building line.

1.02 RELATED SECTIONS

A. Drawings and General Provision of Contract, including General Conditions, Supplementary Conditions (if applicable), and Division 01 - Specification Sections, apply to work of this Section.

B. The following sections, when included in the Project Manual, are related to the work of this section:

1. Section 051200 – Structural Steel Framing
2. Section 052100 – Steel Joist Framing
3. Section 055000 – Metal Fabrications
4. Section 078100 – Spray-Applied Fire Resistive Materials

1.03 REFERENCES

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**.**

A. American Society Testing and Materials (ASTM) standards, latest editions.

1. A29 - Standard Specification for Steel Bars, Carbon and Alloy, Hot-Wrought, General Requirements for

2. A36 - Standard Specification for Carbon Structural Steel.

3. A108 - Standard Specification for Steel Bars, Carbon, Cold-finished, Standard Quality.

4. A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

5. A780 - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coating.

6. A992 - Standard Specification for Steel for Structural Shapes for Use in Building Framing

7. B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel

B. "Specification for Structural Steel Buildings” - American Institute of Steel Constructor's (AISC 360-05).

C. “Seismic Provisions for Structural Steel Buildings” (AISC 341-05).

D. “Structural Design of Composite Slabs” – American Society of Civil Engineers (ASCE 3-91).

E. “Standard for Noncomposite Steel Floor Deck” - Steel Deck Institute (ANSI/NC 1.0-06)

F. “Standard for Steel Floor Deck” – Steel Deck Institute (ANSI/RD 1.0-06).

G. Safety Requirements for Powder-Actuated Fastening Systems (ANSI A10.3), American National Standard (ANSI).

H. International Code Council Evaluation Service (ICC-ES):

1. International Building Code

2. Acceptance Criteria for Steel Deck Roof and Floor Systems (AC43)

3. Steel Deck Diaphragms (ESR-2199)

I. "Structural Welding Code - AWS D1.1" - American Welding Society (AWS).

J. "Specifications for Mild Steel Covered Arc - Welding Electrodes - AWS A5.1" - AWS.

K. "Diaphragm Design Manual for Floor Decks and Roof Decks" 3rd Edition - Steel Deck Institute (SDI).

L. "Fire Resistance Directory" - Underwriters Laboratory (UL).

1.04 DESIGN REQUIREMENTS

A. Design of metal deck is governed by Chapter 22 of the 2020 NYS Building Code. Structural integrity requirements of the BC shall be met.

B. Metal deck unit sizes and gages are indicated on the Drawings.

C. Units shall be of three-span length except where framing layout does not permit. Deck sheets shall be butted over supports.

D. Provide shoring where required by the deck manufacturer as indicated on the approved shop drawings and where indicated on the Contract Documents.

E. Use of integral and non-piercing hanger tabs to support ceiling systems is not permitted. Piercing hanger tabs with a safe working loading of 250 lbs or greater are permitted for ceilings weights below the hanger tab capacity. Integral hanger tabs are to be used for venting purposes only.

F. Units included in a fire rated assembly must be classified in appropriate UL designs or have MEA, BSA, or OTCR approval.

G. Use fasteners or welds for decking attachment that provide adequate diaphragm shear strength, uplift resistance and stiffness for imposed load combinations.

H. Performance Requirements: FM classified Class I-90 minimum for uplift resistance and UL fire classified for roof deck.

1.05 SUBMITTALS

A. All submissions shall be made in accordance with Section 013300 – Submittal Procedures.

B. Product Data:

1. Submit manufacturer's specifications for

a. Shear stud connectors
b. Deck Fasteners, if used
c. Primer Paint

C. Shop Drawings:

1. Prepare metal deck shop drawings immediately after award of Contract.

2. Shop drawings shall include, but not be limited to the following:

a. Type and gage of metal deck.
b. Metal deck layout and orientation, including clear indication where shoring is required.
c. Welding or fastener types, sizes and pattern.
d. Side and end details of metal deck.
e. Supplementary framing details.
f. Location of all openings and fittings.
g. Shop finish.
h. Size, location, and spacing of stud shear connectors, where required, for each beam.
i. Designation of welding electrode strength to be used.

D. Shop drawings reviewed by the Engineer of Record for general conformity with the Drawings shall not relieve the Contractor or the metal deck supplier of responsibility for correctness of fit, quantities of materials, and adequacy of attachment details of deck and accessories to the structural steel. Deck must have UL or OTCR approval as part of the fire rated assembly. Approval of shop drawings does not absolve the Contractor of this requirement.

E. Calculations in accordance with ICC-ES AC 43 or SDI Design Method verifying diaphragm shear strength and stiffness: Submit calculations for the load tables of the metal deck supplied. Calculations shall be signed and sealed by a Professional Engineer licensed in the State of New York.

F. Quality Control Submittals:

1. Certificates

a. Submit notarized certificates from the manufacturers of the specified materials stating compliance with the applicable requirements set forth for all materials specified in this Section.

b. Furnish steel manufacturer's certificate certifying welders employed on the Work have met AWS qualifications within the previous twelve months, and for work performed in the field are licensed welders.

c. Furnish proof that deck to be used is part of a UL, MEA, BSA, or OTCR approved fire-rated assembly if other than deck shown on Drawings.

d. Submit certificate stating deck manufacturer is a member producer of SDI.

2. Manufacturers' Instructions: Furnish manufacturers' printed material, specifications and installation instructions for each type of decking, accessories, and studs.

3. Contractor Qualifications

G. Provide proof of Manufacturer, Erector, welder, and mechanical fastener technician qualifications specified under “Quality Assurance”.
H. Surveys:

1. Submit signed and sealed copies of surveys conducted by a Licensed Land Surveyor showing locations of edge of deck with respect to theoretical edge of deck and building survey line.

1.06 QUALITY ASSURANCE

A. Qualifications

1. Manufacturer: Company specializing in the manufacture of metal deck as used in this Contract shall have a minimum of five years experience and is a member producer of SDI.

2. Erector: Company specializing in performing the Work of this Section shall have a minimum of three years experience and have done at least three projects with similar quantity of material.

3. Welders: All steel roof deck welders shall be AWS certified for welding of sheet steel.

4. Mechanical Fastener Installer: Shall be certified or licensed by the fastener and tool system manufacturer on the project site in accordance with ANSI A10.3 requirements. Certification or licensing includes all training necessary for proper tool operation, fastener selection, maintenance and troubleshooting.

B. Regulatory Requirements

1. Building Code: Work of this Section shall conform to all requirements of the NYS Building Code and all applicable regulations of other governmental authorities. Where more severe requirements than those contained in the Building Code are given in this Section, the requirements of this Section shall govern.

2. Industry Standards: Standards specified herein shall apply to Work of this Section. Where more severe requirements then those contained in the standards are given in this section or the Building Code, requirements of this Section or the Building Code shall govern.

a. AISC 360-05 as modified by the 2020 NYS Building Code.

b. Seismic Provisions for Structural Steel Buildings AISC 341-05.

c. 2020 NYS Building Code

d. Fire Resistance Directory - UL.

1) Composite metal deck shall have UL approval with respect to the following:

2. As a component part of a floor construction of specified fire resistance rating without need for sprayed fireproofing on underside of deck.

3. As a component part of a three-hour fire resistive floor construction with use of sprayed fireproofing on underside of deck.

1) Roof deck shall have UL approval as a component part of the specified fire resistive roof construction.

2) Recommendations or suggestions in the codes and references listed in this Article and under “References” shall be deemed to be mandatory unless they are in violation of the Building Code.

B. Certifications

1. Structural metal deck and stud shear connectors shall conform to the material acceptance, certification and inspection requirements of the BC.

2. Qualify welding processes and welding operators in accordance with AWS "Standard Qualification Procedure".

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver deck to site undamaged. With each deck unit bearing the UL label and marking for specific system detailed.

B. Store deck units off the ground with one end elevated to provide drainage. Protect units from the elements with a waterproof covering.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Metal Deck and Accessories

1. CANAM Steel Corporation
2. Wheeling Corrugating Co.
3. Nucor, Vulcraft Group

B. Stud Shear Connectors

1. Nelson Stud Welding Co.
2. Tru-Weld/Tru-Fit Products Corporation
3. Hilti, Inc.

C. Mechanical Fasteners

1. Hilti, Inc.
2. ITW Buildex

D. Sidelap Connectors

1. Hilti, Inc.
2. ITW Buildex
3. Elco Textron

2.02 MATERIALS

A. Steel for Composite Metal Deck:

1. Formed from galvanic steel sheets conforming to ASTM A653. Size of deck is to follow SDI requirements for thickness and tolerances.

2. Minimum yield strength of 40,000 psi.

3. Formed with integral locking lugs.

4. Formed with deformations to provide bond with concrete.

5. Deck to receive sprayed fireproofing shall be free of lubricants or oils that would impair the adhesion of the fireproofing material.

6. Metal deck that is not exposed to view with architectural paint finish shall have integral hanger tabs providing an approximate 0.5% uniformly distributed open area. The hanger tabs are used for venting purposes only.

B. Steel for Roof Deck:

1. Formed from galvanic steel sheets conforming to ASTM A653. Size of deck is to follow SDI requirements for thickness and tolerances.

2. Minimum yield point of 40,000 psi.

3. Deck to receive sprayed fireproofing shall be free of lubricants or oils that would impair the adhesion of the fireproofing material.

C. Acoustical Cellular Roof Deck:

1. Cellular Deck and Metal Accessories: Sheet steel conforming to ASTM A 611 Grade C or ASTM A 446 Grade A. Before fabrication, sheet steel shall receive ASTM A653, Class G 90, hot dip zinc coating. Accessories shall be fabricated of not lighter than 18 U.S. Standard Gauge sheet steel.

   a. Deck for Composite Construction: Galvanized deck uniformly deformed to insure a mechanical bond between concrete and steel. Metal accessories shall be galvanized.

2. Acoustical Deck: Cellular deck with bottom flat plate perforated directly below each cell and with deck manufacturer's standard sound absorbing elements consisting of an inert, non-organic, mineral fiber material which will produce a Noise Reduction Coefficient (NRC) of 0.70.

3. Self-Drilling Fasteners: No. 12-14 x 3/4 inch, hex washer head, self-drilling fastener with pilot point.

4. Cellular steel deck units shall be formed to provide smooth, completely enclosed raceways conforming to UL requirements. Deck units shall be carefully cut to required lengths at the factory within UL tolerances for length and squareness, to insure proper abutting of units at the site.

   a. Length: Furnish units of continuous length over 3 spans wherever possible.

   b. For steel deck properties and depth see contract drawings.

5. For cellular units, the ratio of distance between stiffened edges to metal thickness of any top horizontal surface shall not exceed 120.

6. Deck units shall have a continuous reinforcing web between top and bottom cell elements where cells are cut longitudinally 1-1/2 inches or more away from the vertical web.

7. Erect cellular steel deck and accessories under the direct supervision of the manufacturer's field advisor.

D. Miscellaneous Steel Shapes:

1. Shall conform to the requirements of ASTM A36 or A992. Members to receive sprayed fireproofing shall be unprimed and free of lubricants or oils that would impair the adhesion of the fireproofing material.

E. Shop Finish:

1. Metal deck: Steel sheet shall receive before being formed a coating of zinc conforming to ASTM A653 coating class G60 (both sides). Metal deck exposed to view, specified to be finish painted, such as in the gymnasium, shall be cleaned and phosphatized prior to priming. Primer shall be applied in the shop and shall be structural steel primer paint applied at a rate of 0.6 Mils DFT minimum). Color: Gray. Salt spray resistance of paint shall be 100+ hours when tested in accordance with ASTM B117.

2. Steel roof deck: Steel sheet shall receive before being formed a coating of zinc conforming to ASTM A653 coating class G90 (both sides). Roof deck exposed to view, specified to be finish painted, such as in the gymnasium, shall be cleaned and phosphatized prior to priming. Primer shall be applied in the shop and shall be structural steel primer or coil coating paint applied at a rate of 0.6 Mils DFT minimum). Color: Gray. Salt spray resistance of paint shall be 100+ hours when tested in accordance with ASTM B117.

F. Metal Deck Accessories (cants, pour stops, closure pieces, etc.):

1. Shall conform to the requirements of ASTM A653, coating class G60. Unless a thicker gage is required by design considerations, such as at cantilever edge conditions, minimum thickness shall be same gage as metal deck. Accessories to receive sprayed fireproofing shall be free of lubricants and oils that would impair the adhesion of the fireproofing material.

G. Headed Stud Type Shear Connector:

1. Shall conform to the provisions of ASTM A108, meeting chemical requirements of ASTM A29, Grade 1010 through 1020, and Article 7.2.6 of AWS D1.1. Welded studs shown on the Drawing are the Basis of Design.

2. Mechanical Studs of equivalent strength to welded studs. Unless shown on the Contract Drawings, the size, number of and location on the beam shall be in accordance with the manufacturer's published data and supported by test data.

a. Mechanical shear connectors shall be Hilti X-HVB Shear Connectors installed with Hilti X-ENP-21 HVB powder-actuated fasteners.

H. Welds and Fasteners:

1. Welds:

a. Material: Welding electrodes shall conform to either E60XX or E70XX classification of AWS A5.1 as selected by the licensed welder depending on the gauge of steel deck and strength of steel member being welded to and is subject to approval by the Engineer of Record.

b. Weld Washers: Use on steel roof deck thinner than 22 gauge

2. Mechanical Fasteners:

a. Material: AISI 1070 modified

b. Hardness: Minimum Rockwell Hardness C 54.5

c. Design and Manufacture: Knurled shank with forged ballistic point. Manufacturing process shall ensure steel ductility and prevent development of hydrogen embrittlement.

d. Washers:

1) For structural steel framing: Minimum 15 mm (0.591 in.) steel washers
2) For steel bar joist framing: Minimum 12 mm (0.472 in.) steel washers

e. Corrosion Resistance:

1) For steel roof decks with waterproofing membrane: 5 micron zinc electroplated in accordance with ASTM B 633 SC1 Type III
2) For exposed steel roof decks: Minimum AISI 304 stainless steel sealing caps with bonded neoprene washer shall be installed over each fastener

f. Design Requirements:

1) ICC-ES AC43 or SDI method for diaphragm shear strength and stiffness
2) FM wind uplift resistance
3) UL fire classification

g. Approved Types

1) For use with structural steel framing supports with top flange thickness 1/4 in. or thicker:

a) Hilti X-ENP-19 L15 (1/4 in. or thicker)
b) ITW/Ramset SP

2) For use with steel bar joist supports with top chord or flange thickness 1/8 in. to 3/8 in.:

a) Hilti X-EDNK22 THQ12 (1/8 in. up to and including 1/4 in.)
b) Hilti X-EDN19 THQ12 (3/16 in. up to and including 3/8 in.)
c) ITW/Ramset 1500K and 1600WK

I. Sidelap Connectors:

1. Acceptable types of sidelap connectors:

a. Top or side seam welds

1) 1½" long fillet welds in accordance with AWS D1.3 procedures.

b. Mechanical sidelap connectors

1) Drive mechanical sidelap connectors completely through adjacent lapped roof deck sheets to achieve positive engagement of adjacent sheets with a minimum of three thread penetration.
2) Material: ASTM A510 Grade 1022
3) Hardness: Minimum Vickers Surface Hardness of 450 HV0.3
4) Design and Manufacture: Hex washer head undercut with reverse serrations; self-piercing or stitch point at center

5) Corrosion Resistance:

a) steel roof decks with waterproofing membrane: 5 micron zinc electroplated in accordance with ASTM B633 SC1 Type III.
b) For exposed steel roof decks: AISI 410 or 304 stainless steel with bonded neoprene washer.

6) Design Requirements:

a) ICC-ES AC43 or SDI method for diaphragm shear strength and stiffness
b) FM wind uplift resistance

7) Approved Types:

a) Hilti S-SLC01 M HWH Sidelap Connector
b) Hilti S-SLC02 M HWH Sidelap Connector
c) Hilti S-MD 10-16x3/4 HWH #3 Stainless Steel Screw
d) Elco Textron
e) ITW Buildex Teks

c. Button punches

1) Standard or proprietary type button punches shall be deep and positively engage the male and female side edges of adjacent interlocking deck sheets in accordance with steel deck manufacturer recommendations

2) Approved Types

a) Wheeling Corrugating Gator Crimp
b) Verco Manufacturing Punchlok

J. Galvanizing Repair Paint

1. Shall conform to the requirements of ASTM A780 and comply with Military Specification MIL-P-21035.

K. Deck Fasteners (if used)

1. Deck fasteners of a type that will provide equal or greater uplift resistance than a 3/4” puddle weld.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Do not begin placement of metal deck until all surfaces and members are deemed acceptable to receive the deck. Do not proceed with Work until any unsatisfactory conditions have been corrected to the satisfaction of the deck installer.

3.02 ERECTION

A. General

1. Care should be taken to avoid overloading the supporting structural elements when placing bundles of metal deck or other construction loads on floors and roof.

2. Do not use floor deck units for storage or working platforms until they are permanently secured.

3. Employ a Licensed Professional Engineer or Land Surveyor to ensure accurate erection of the deck and end closures.

B. Metal Deck and Accessories Installation

1. Lay units in strict accordance with manufacturer's instructions and requirements and as shown on Drawings.

2. Adjust units in place before permanent fastening and accurately align end to end. Rectify inaccuracies in alignment and level of bearing before units are finally placed.

3. Provide proper bearing at all supports. Metal deck must be placed to bear fully on surface of beam flanges.

4. Provide angle and channel supports for metal deck at locations where deck cannot be properly seated due to obstructions by structural connections and as shown on Drawings. Coordinate with mechanical trades to adjust supports at columns if required to permit items to pass adjacent to column.

5. Anchor deck to steel member by welding directly through the bottom of the rib at all structural supports by welds not less than 3/4" in diameter or by using powder driven fasteners of equivalent strength, spaced not more than 12" across the width of the unit. All welds shall be of uniform size and appearance and free of pinholes, porosity, undercutting or other defects. Welds shall be free of sharp points or edges. Mechanical fasteners shall be fully engaged and washer snug and holding deck without damage. Where two units abut, each unit shall be so fastened to the steel framing. Add additional welds or fasteners where found defective.

6. Fasten side laps of adjacent units between supports by crimping or mechanically fastening with sheet metal screws of size and spacing required by manufacturer or as indicated on the Drawings to provide diaphragm strength required by seismic design. In no case shall fasteners exceed two feet. Fasteners for exposed to view roof deck shall be the minimum length possible to to ensure an aesthetic appearance.

7. Furnish, install, and weld in position all accessories, including pour stops, closures, cant strips, etc., where required.

    a. Furnish sheet metal pour stops and closures for open ends of all cell raceways at columns, walls, and openings shown on Drawings. Pour stop gage is to be selected by manufacturer based on overhang. Revise gage if survey shows overhang exceeds that designed. Provide additional supports to strengthen pour stop at wedge inserts if required.
    b. Provide sheet steel cover plate (or closure tape) as required to close panel end conditions where panels change direction or abut.
    c. Furnish material for column closures to close openings between panels and structural columns.
    d. Provide welding hole cover, with friction fastening, to close welding access holes when required.
    e. Provide smooth form wood edge at locations where edge of deck will be exposed to view, such as at stairwells.

C. Stud Shear Connector Welding:

1. Weld studs to steel beams through the steel deck with automatically-timed stud welding equipment.

2. Stud welding shall conform to the requirements of AWS D1.1 with respect to workmanship, quality control, and field inspection.

3. Manufacturer shall supply guidance and instruction in proper installation method

4. Additional requirements for stud welding with metal deck:

    a. Top flanges of beams must be free of paint, heavy rust, millscale, dirt, ice and water, and any other material that will interfere with the welding operation.
    b. Metal deck must be free of dirt, ice, water, and other foreign materials that will interfere with the welding operation.

D. Cutting, Drilling, and Reinforcing of Openings:

1. Where predetermined openings (such as stairs, elevators, etc.) are framed by structural steel beams on all sides (shown on the Drawings), the metal deck shall be engineered by the manufacturer to fit these conditions.

2. Any opening which is not framed by structural steel beams on all sides, and which is required in steel decking, shall be cut by the respective trades requiring it.

3. Reinforcing of Openings in Steel Deck

    a. Holes 6" or less in dimension need not be reinforced.
    b. Holes greater than 6" but less than 30" in any dimension shall be reinforced by the General Contractor as shown on the Structural Contract Drawings.

E. Field Touch Up

1. Clean scarred and rusted areas in galvanizing after deck installation is completed and paint welds and the scarred and rusted areas with the galvanizing repair paint. Apply in accordance with the manufacturer's instructions.

3.03 TOLERANCES

A. Edge of metal deck is to be within a tolerance of 1/4” of theoretical, set to a survey line, to ensure proper installation of masonry and installation of relieving angles. Where deck is found to be out of tolerance, make corrections and resurvey prior to placement of concrete.

3.04 FIELD QUALITY CONTROL

A. Welding/fastening of metal deck and shear studs is subject to Special Inspection and Testing and is included as part of the Quality Control Work of Section 051200 and includes but is not limited to.

1. Weld sizes and pattern.

2. Mechanical fastener placement location and washer condition.

3. Clamping of steel roof deck to supporting steel framing

B. The Contractor shall engage an engineer licensed in the state of New York to check tolerances and inspect the erection.

C. Contractors Surveys:

1. Provide survey of locations of edge of deck with respect to theoretical edge of deck and building survey line. Indicate discrepancies between actual installation and Contract Documents. Surveys are to be submitted in a timely manner such that corrections can be made prior to

placement of concrete. Do not proceed with placing concrete until the pour stop locations are corrected.

3.05 CLEANING

A. Metal deck and accessories to receive sprayed fireproofing shall be clean of dust, grease, excessive oils, loose materials, and any other matter which would impair the adhesion of the fireproofing material to the deck and accessories.

END OF SECTION

LIST OF SUBMITTALS

SUBMITTAL	**DATE SUBMITTED**	**DATE APPROVED**
Product Data:	_____	_____
1. Stud shear connector 2. Deck fastener (if used) 3. Primer Paint		
Shop Drawings:	_____	_____
1. Metal deck drawings 2. Calculations		
Certificates:	_____	_____
1. Deck materials 2. Welders qualifications & license 3. UL for materials 4. Steel deck manufacturer is SDI member		
Manufacturer's Instructions:	_____	_____
1. Deck installation		
Qualifications	_____	_____
1. Manufacturer 2. Erector 3. Welder 4. Mechanical fastener technician		
Survey:	_____	_____
1. Deck edges		

* * *

DIVISION 05 – METALS

SECTION 054000 – COLD FORMED METAL FRAMING

PART 1 - GENERAL

1.01 GENERAL

A. Furnish labor, materials, tools, and equipment necessary or required to perform and complete the installation of cold formed framing as indicated on the drawings and specified herein. Shapes, sizes and accessories as specified and detailed shall establish the type of units and materials to be used to provide the functional and finished aesthetic requirements desired.

B. Drawings and General Provision of Contract, including General Conditions, Supplementary Conditions (if applicable), and Division 01 - Specification Sections, apply to work of this Section.

1.02 SUMMARY

A. Extent of cold-formed metal framing is shown on drawings.

B. Types of cold-formed metal framing units include the following:

1. Load-bearing and non-load bearing wall framing.
2. Exterior non-load-bearing wall framing.
3. Floor joist framing.
4. Roof rafter framing.
5. Ceiling joist framing.
6. Soffit framing.

C. The following sections, when included in the Project Manual, are related to the work of this section:

1. Section 033000 – Cast-in-Place Concrete
2. Section 042000 – Unit Masonry
3. Section 051200 – Structural Steel Framing
4. Section 055000 – Metal Fabrications
5. Section 061000 – Rough Carpentry
6. Section 062000 – Finish Carpentry
7. Section 072100 – Building Insulation
8. Section 092900 – Gypsum Wallboard

1.03 REFERENCES

A. AISI – Specification for the design of cold-formed steel structural members, code of standard practice (COSP).
B. ASCE 7 – Minimum design loads for building or other structures.
C. ASTM A90 – Standard test method for weight (mass) of coating on iron and steel articles with zinc or zinc alloy coatings.
D. ASTM A370 – Standard test methods and definitions for mechanical testing of steel products.
E. ASTM A570 – Standard specification for Hot-Rolled Carbon Steel Sheet and Strip, Structural Quality.
F. ASTM A653 – Standard specification for steel sheet, zinc coated (galvanized) or zinc iron alloy coated (galvannealed) by the hot-dip process.
G. ASTM A780 – Standard practice for repair of damaged and uncoated areas of hot-dip galvanized coatings.
H. ASTM A924 – Standard specification for general requirements for steel sheet, metallic coated by

the hot-dip process.

I. ASTM A1003 – Standard specification for steel, sheet, cold rolled, carbon, structural, high strength low alloy and high strength low alloy with improved formability.
J. ASTM A1008 – Standard specification for steel, sheet and strip, hot rolled, carbon, structural, high strength low alloy and high strength low alloy with improved formability.
K. ASTM 1011 – Standard specification for steel, sheet and strip, hot rolled, carbon, structural, high strength low alloy and high strength low alloy with improved formability
L. ASTM B633 – Standard specification for elctrodeposited coatings of zinc and iron on steel.
M. ASTM C754 – Specification for installation of framing members to receive screw attached gypsum wallboard, backing board or water resistant backing board.
N. ASTM C840 – Standard specification for application and finishing of gypsum board.
O. ASTM C955 – Standard specification for load bearing (tranverse and axial) steel studs, runners (tracks), and bracing or bridging for screw application of gypsum panel products and metal plaster bases.
P. ASTM C1007 – Standard specification for installation of load bearing (transverse and axial) steel studs and related accessories.
Q. ASTM C1513 – Standard specification for steel taping screws for cold formed steel framing connections.
R. ASTM E84 – Standard test method for surface burning characteristics of building materials.
S. ASTM E90 – Method for laboratory measurement of airborne sound transmission loss of building partitions.

1.04 DESIGN REQUIREMENTS

A. Fire Resistive Rating: Where fire rated construction is indicated on drawings, provide materials and construction that are identical to those assemblies whose fire resistance rating has been determined per ASTM E119 by a testing and inspecting organization acceptable to authorities having jurisdiction.

   1. Meet or exceed fire resistance requirements outlined under provisions of the GA-600 Fire Resistance Design Manual for wall and ceiling assemblies.

   2. Meet or exceed flame/fuel/smoke requirements of ASTM E84 surface burning characteristics for finish materials

B. Sound Transmission Characteristics: For specified wall assemblies with STC ratings, provide materials and construction identical to those tested in assembly indicated according to ASTM E90 and classified according to ASTM E413 by a qualified independent testing agency.

C. AISI Specifications: Comply with AISI's current 'Specification for the Design of Cold-Formed Steel Structural Members' and the following for calculating structural characteristics of cold formed metal framing:

   1. CCFS Technical Bulletin: Current 'AISI Specification Provisions for Screw Connections'.

D. Fire Rated Assemblies: Where framing units are components of the assemblies indicated for a fire resistance rating, including those required for compliance with governing regulations, provide units which have been approved by governing authorities.

1.05 SUBMISSIONS

A. All submissions shall be made in accordance with Section 013300 – Submittal Procedures.

B. Product Data: For each type of cold-formed steel framing product and accessory, submit the following information:

1. Manufacturer's product data, including manufacturer's technical data sheet.
2. ICC-ES Reports.
3. Material Safety Data Sheets.
4. Preparation instructions and recommendations.
5. Storage and handling requirements and recommendations.
6. Installation methods.

C. Structural Calculations (For Structural Load Bearing or Supporting Assemblies):

1. Submit structural calculations prepared by manufacturer for approval. Submittal shall be sealed by a Professional Engineer registered in the state in which the project is located.
2. Description of design criteria.
3. Engineering analysis depicting stress and deflection (stiffness) requirements for each framing application.
4. Selection of framing components, accessories and welded connection requirements.
5. Verification of attachments to structure and adjacent framing components.
6. Engineer shall have a minimum of five (5) years experience with projects of similar scope.

D. Shop Drawings (For Structural Load Bearing or Supporting Assemblies):

1. Submit shop drawings prepared by the manufacturer showing plans, sections, elevations, layouts, profiles and product components locations, including anchorage, bracing, fasteners, accessories and finishes.
2. Show reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.
3. Show connection details with screw types and locations, weld lengths and locations and other fastener requirements.
4. Where prefabricated or prefinished panels are to be provided, provide drawings depicting panel configurations, dimensions and locations.

E. Welders Certificates: Submit manufacturers certificates, certifying welders employed on work, verifying AWS qualifications within the previous 12 months.

F. Mill Certificates: Signed by steel sheet producer indicating steel sheet complies with requirements, including uncoated steel thickness, yield strength, tensile strength, total elongation, chemical requirements, and galvanized-coating thickness.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Materials shall be provided by a firm that is experienced in manufacturing cold-formed metal framing similar to that indicated for this Project and with a record of successful in-service performance.

1. Assumes responsibility for designing cold-formed metal framing and connections to comply with performance requirements. This responsibility includes preparation of Shop Drawings and design calculations by a qualified professional engineer.

B. Installer Qualifications: Work shall be installed by an experienced installer who has completed cold-formed metal framing similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

C. Professional Engineer Qualifications: A professional engineer who is licensed to practice in the jurisdiction where project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of cold-formed metal framing that are similar to those indicated for this Project in material, design, and extent. Engage a qualified Professional Engineer to prepare design calculations, shop drawings

and other structural data.

D. Mock-Up: When requested by the Architect or owner, contractor shall provide a 4'x4' mock-up for evaluation of workmanship for each type of cold formed metal framing specified/required by the project.

1. Construct areas designated by Architect.
2. Do not proceed with remaining work until material, details, and workmanship are approved by Architect.
3. Refinish mock-up area as required to produce acceptable work.
4. Demolish mock-up at a time as a designated by the Architect.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturers unopened packaging until ready for installation.

B. Store materials protected from exposure to rain, snow or other harmful weather conditions, at temperature and humidity conditions per AISI COSP Section F3.

1.08 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturers absolute limits.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products of one of the following:

1. Marino/WARE
2. ClarkDietrich Building Systems.
3. CEMCO; California Expanded Metal Products Co.

B. Source Limitations: Provide components and materials specified in this section form a single manufacturer.

2.02 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified Professional Engineer registered in the state in which the project is located to design cold-formed steel framing.

B. Structural Performance: Provide cold-formed steel framing capable of withstanding design loads within limits and under conditions indicated.

1. Design Loads: As noted on the Drawings.

2. Deflection Limits:

a. Exterior Load-Bearing Wall Framing: Horizontal deflection of 1/240 of the wall height.
b. Interior Load-Bearing Wall Framing: Horizontal deflection of 1/240 of the wall height under a horizontal load of 5 lbf/sq. ft.
c. Interior Non-Load Bearing Assemblies: Horizontal deflection of 1/240 of the wall height under a horizontal load of 5 lbf/sq. ft.

d. Exterior Non-Load-Bearing Framing: Horizontal deflection of 1/240 of the wall height.
e. Floor Joist Framing: Vertical deflection of 1/360 for live loads and l/240 for total loads of the span.
f. Roof Rafter Framing: Vertical deflection of 1/120 of the horizontally projected span for live loads.
g. Ceiling Joist Framing: Vertical deflection of 1/120 of the span for live loads and 1/240 for total loads of the span.
h. Gypsum Board: 1/360 of span under total design loads.
i. Exterior Insulation Finish Systems: 1/360 of span under total design loads.
j. Plaster or Stucco: 1/360 of span under total design loads.
k. Brick Veneer: 1/600 of span under total design loads.

3. Design framing systems to provide for movement of framing members located outside the insulated building envelope without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F.

4. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:

a. Upward and downward movement of 1/2 inch.

5. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.

C. Cold-Formed Steel Framing Design Standards:

1. Floor and Roof Systems: AISI S210.
2. Wall Studs: AISI S211.
3. Headers: AISI S212.
4. Lateral Design: AISI S213.

D. AISI Specifications and Standards: Unless more stringent requirements are indicated, comply with AISI S100 and AISI S200.

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.

2.03 COLD-FORMED STEEL FRAMING

A. System Components: With each type of metal framing required, provide manufacturer's standard U-shaped steel runners (tracks), blocking, lintels, clip angles, shoes, reinforcements, fasteners, and accessories as recommended by manufacturer for applications indicated, as needed to provide a complete metal framing system as follows:

1. Load-Bearing Wall Framing:

a. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges.
b. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with straight flanges.
c. Headers and Jambs - Heavy-Duty Stud: Manufacturer's proprietary shape used to form header beams and jambs, columns or posts, of web depths indicated, unpunched, with

stiffened flanges.
   d. Steel Box or Back-to-Back Headers: Manufacturer's standard C-shapes used to form header beams, of web depths indicated, unpunched, with stiffened flanges.
   e. Steel Single- or Double-L Headers: Manufacturer's standard L-shapes used to form header beams, of web depths indicated.

2. Interior Non-Load Bearing Wall Framing:

   a. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges.
   b. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges.
   c. Vertical Deflection Clips, Interior: Manufacturer's standard head clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.
   d. Deflection Track and Firestop Track: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thicknesses not less than indicated for studs and in width to accommodate depth of studs.
   e. Slotted Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; punched with vertical slots in both legs. Studs should be positively attached to deep-leg track using vertical slots while allowing free vertical movement. Legs designed to support horizontal and lateral loads and transfer them to the primary structure.
   f. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal and lateral loads and transfer them to the primary structure. Install a continuous row of bridging, composed of 1-1/2-inch cold-formed channel secured to each stud with clip angle, or bridging, or spacer bar, at upper-most knockout, not more than 12 inches from top of wall.
   g. Firestop Track: Top track manufactured to allow partition heads to expand and contract with movement of 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.
   h. Bridging and Spacer Bar as required.

3. Exterior Non-Load Bearing Wall Framing:

   a. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges.
   b. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges.
   c. Vertical Deflection Clips: Manufacturer's standard clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.
   d. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal loads and transfer them to the primary structure.
   e. Double Deflection Tracks: Manufacturer's double, deep-leg, U-shaped steel tracks, consisting of nested inner and outer tracks; unpunched, with unstiffened flanges.

      1) Outer Track: Of web depth to allow free vertical movement of inner track, with flanges designed to support horizontal loads and transfer them to the primary structure.
      2) Inner Track: Of web depth indicated.

   f. Drift Clips: Manufacturer's standard bypass or head clips, capable of isolating wall stud

from upward and downward vertical displacement and lateral drift of primary structure through positive mechanical attachment to stud web and structure.

4. Floor Joist Framing:

    a. Steel Joists: Manufacturer's standard cold-formed steel joists, of web depths indicated, punched, with enlarged service holes, with stiffened flanges.
    b. Steel Joist Track: Manufacturer's standard cold-formed steel joist track, of web depths indicated, unpunched, with unstiffened flanges.

5. Roof Rafter Framing:

    a. Steel Rafters: Manufacturer's standard cold-formed steel joists used as rafters, of web depths indicated, punched with enlarged holes, with stiffened flanges.

6. Ceiling Joist Framing:

    a. Steel Ceiling Joists: Manufacturer's standard cold-formed steel joists, of web depths indicated, punched with enlarged service holes, with stiffened flanges.

7. Soffit Framing:

    a. Exterior Soffit Frame: Manufacturer's standard C-shaped steel sections, of web depths indicated, with stiffened flanges.

B. Materials and Finishes:

1. For 16-gauge and heavier units, fabricate metal framing components of structural quality steel sheet with a minimum yield point of 50,000 psi; ASTM A 653, A 570, or A 611.

2. For 18-gauge and lighter units, which will only be attached mechanically, fabricate metal framing components of commercial quality steel sheet with a minimum yield point of 37,000 psi; ASTM A 653, A 570, or A 611.

C. Provide galvanized finish to metal framing components complying with ASTM A525 for minimum G90 coating.

1. Finish of installation accessories to match that of main framing components, unless otherwise indicated.

D. Hat Shaped Furring Channels: 22 gauge with minimum 1/2” wide flanges. Minimum depth 3/4” unless otherwise noted on drawings.

E. Framing Accessories:

1. Fabricate steel-framing accessories from steel sheet, ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members.

2. Provide accessories of manufacturer’s standard thickness and configuration, unless otherwise indicated, as follows:

    a. Supplementary framing.
    b. Bracing, bridging and solid blocking.
    c. Web stiffeners.
    d. Utility angles.
    e. Rigid clips.

f. End clips.
g. Foundation clips.
h. Gusset plates.
i. Stud kickers and knee braces.
j. Joist hangers/Bridle hangers.
k. Hole reinforcing plates.
l. Backer plates.
m. U-Flex track.
n. Katz blocking.
o. BridgeRite clips.
p. Breakaway clips.

2.04 ANCHORS, CLIPS AND FASTENERS

A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.

B. Anchor Bolts: ASTM F 1554, Grade 36, threaded carbon-steel hex-headed bolts and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A 153/A 153M, Class C.

C. 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 per ASTM E 488.

D. 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 per ASTM E 1190 and as indicated on drawings.

E. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping, steel drill screws.

1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.

F. Welding Electrodes: Comply with AWS standards.

2.05 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: SSPC-Paint 20 or MIL-P-21035B.

B. Cement Grout: Portland cement, ASTM C 150, Type I; and clean, natural sand, ASTM C 404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.

C. Nonmetallic, Nonshrink Grout: Premixed, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, and plasticizing and water-reducing agents, complying with ASTM C 1107/C 1107M, with fluid consistency and 30-minute working time.

D. Shims: Load bearing, high-density multimonomer plastic, and nonleaching; or of cold-formed steel of same grade and coating as framing members supported by shims.

E. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to match width of bottom track or rim track members.

2.06 FABRICATION

A. Fabricate cold-formed steel framing and accessories plumb, square, and true to line, and with

connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section

1. Fabricate framing assemblies in jig templates to hold members in proper alignment and position and to assure consistent component placement.
2. Cut framing members by sawing or shearing; do not torch cut.
3. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, pneumatic pin fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.

    a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
    b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by no fewer than three exposed screw threads.

4. Fasten other materials to cold-formed steel framing by welding, bolting, pneumatic pin fastening, or screw fastening, according to Shop Drawings.

B. Framing components may be prefabricated into panels prior to erection. Perform lifting of prefabricated panels in a manner to prevent damage or distortion. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses.

C. Mechanical Fasteners: ASTM C1513, corrosion resistant coated, self- drilling, self-tapping steel drill screws. Minimum two (2) screws per connection.

D. Fabrication Tolerances: Fabricate assemblies level, plumb and true to line, to a maximum allowable tolerance variation of 1/8 inch in 10 feet, and as follows:

1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall exceed minimum fastening requirements of sheathing or other finishing materials.
2. Squareness: Fabricate each cold-formed metal framing assembly to a maximum out-of-square tolerance of 1/8 inch.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Pre-installation Conference: Prior to start of installation of metal framing systems, meet at project site with installers of other work including door and window frames and mechanical and electrical work. Review areas of potential interference and conflicts, and coordinate layout and support provisions for interfacing work.

1. Verify that concealed wood/sheet steel blocking has been installed the proper locations.

B. Examine substrates to which metal framed construction attaches or abuts. Verify pre-set hollow metal frames, cast in anchors, and structural framing for compliance with requirements for installation tolerances and other conditions affecting performance of wall framing. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Before sprayed fire-resistive materials are applied, attach continuous angles, supplementary framing, or tracks to structural members indicated to receive sprayed fire-resistive materials.

B. After applying sprayed fire-resistive materials, remove only as much of these materials as needed to complete installation of cold-formed framing without reducing thickness of fire-resistive materials below that are required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.

C. Install load bearing shims or grout between the underside of load-bearing wall bottom track and the top of foundation wall or slab at locations with a gap larger than 1/4 inch to ensure a uniform bearing surface on supporting concrete or masonry construction.

D. Install sealer gaskets at the underside of wall bottom track or rim track and at the top of foundation wall or slab at stud or joist locations.

3.03 INSTALLATION, GENERAL

A. Manufacturer's Instructions: Install metal framing systems in accordance with ASTM C 1007 and manufacturer's printed or written instructions and recommendations, unless otherwise indicated.

B. Runner Tracks: Install continuous tracks sized to match studs. Align tracks accurately to layout at base and tops of studs. Secure tracks as recommended by stud manufacturer for type of construction involved, except do not exceed 24" o.c. spacing for nail or power-driven fasteners. Provide fasteners at corners and ends of tracks.

1. Set studs plumb, except as needed for diagonal bracing or required for non-plumb walls or warped surfaces and similar requirements.
2. Where stud system abuts structural columns or walls, including masonry walls, anchor ends of stiffeners to supporting structure.
3. Install supplementary framing, blocking, and bracing in metal framing system wherever walls or partitions are indicated to support fixtures, equipment, services, casework, heavy trim, and furnishings, and similar work requiring attachment to the wall or partition. Where type of supplementary support is not otherwise indicated, comply with stud manufacturer's recommendations and industry standards in each case, considering weight or loading resulting from item supported.

C. Installation of Wall Stud System: Secure studs to top and bottom runner tracks by screw fastening at both inside and outside flanges.

1. Frame wall openings larger than 2'-0" square with double stud at each jamb of frame except where more than 2 are either shown or indicated in manufacturer's instructions. Install runner tracks and jack studs above and below wall openings. Anchor tracks to jamb studs with stud shoes or by welding, and space jack studs same as full-height studs of wall. Secure stud system wall opening frame in manner indicated.
2. Frame both sides of expansion and control joints, with separate studs; do not bridge the joint with components of the stud system. Independently frame both sides of joints.
3. Install horizontal stiffeners in the stud system, spaced (vertical distance) at not more than 4'-6" o.c. Mechanically fasten at each intersection.
4. Fasten hole reinforcing plates over web penetrations that exceed the size of the manufacturer’s standard punched openings.

D. Erection Tolerances: Bolt or weld wall panels (at both horizontal and vertical junctures) to produce flush, even, true to line joints.

1. Step in face and jog in alignment between panels not to exceed 1/16".

E. Insulation: Install insulation in exterior framing members, headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.

3.04 LOAD BEARING WALL INSTALLATION

A. Install continuous top and bottom tracks sized to match studs. Align tracks accurately and securely anchor at corners and ends, and at spacings as follows:

1. Anchor Spacing: To match stud spacing or as indicated on Shop Drawings.

B. Squarely seat studs against top and bottom tracks with gap not exceeding of 1/8 inch between the end of wall framing member and the web of track. Fasten both flanges of studs to top and bottom tracks. Space studs as indicated on drawings.

C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar configurations.

D. Align studs vertically where floor framing interrupts wall-framing continuity. Where studs cannot be aligned, continuously reinforce track to transfer loads.

E. Align floor and roof framing over studs according to AISI S200, Section C1. Where framing cannot be aligned, continuously reinforce track to transfer loads.

F. Anchor studs abutting structural columns or walls, including masonry walls, to supporting structure as indicated.

G. Install headers over wall openings wider than stud spacing. Locate headers above openings as indicated. Fabricate headers of compound shapes indicated or required to transfer load to supporting studs, complete with clip-angle connectors, web stiffeners, or gusset plates.

1. Frame wall openings with not less than a double stud at each jamb of frame as indicated on Shop Drawings. Fasten jamb members together to uniformly distribute loads.
2. Install runner tracks and jack studs above and below wall openings. Anchor tracks to jamb studs with clip angles or by welding, and space jack studs same as full-height wall studs.

H. Install supplementary framing, blocking, and bracing in stud framing indicated to support fixtures, equipment, services, casework, heavy trim, furnishings, and similar work requiring attachment to framing.

1. If type of supplementary support is not indicated, comply with stud manufacturer's written recommendations and industry standards in each case, considering weight or load resulting from item supported.

I. Install horizontal bridging in stud system, spaced vertically as indicated on Shop Drawings. Fasten at each stud intersection.

1. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs with a minimum of two screws into each flange of the clip angle for framing members up to 6 inches deep.
2. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
3. Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.

J. Install steel sheet diagonal bracing straps to both stud flanges, terminate at and fasten to reinforced top and bottom tracks. Fasten clip-angle connectors to multiple studs at ends of bracing and anchor to structure.

K. Install miscellaneous framing and connections, including supplementary framing, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-

framing system,

3.05 NON-LOAD BEARING WALL INSTALLATION

A. Install framing system components in accordance with spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.

1. Single-Layer Application: 16” o.c. unless otherwise indicated on the drawings.
2. Multilayer Application: 16” o.c. unless otherwise indicated on the drawings.
3. Tile Backing Panels: 16” o.c. unless otherwise indicated on the drawings

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 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 that penetrate 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 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 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 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 o.c.

F. Z-Shaped Furring Members:

1. Erect insulation, specified in Section 072100 – Building Insulation, vertically and hold in place with Z-shaped furring members spaced 24” 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 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 from corner and cut insulation to fit.

G. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

3.06 EXTERIOR NON-LOAD BEARING WALL INSTALLATION

A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.

B. Fasten both flanges of studs to top and bottom track unless otherwise indicated. Space studs as indicated on drawings.

C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.

D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.

1. Install single deep-leg deflection tracks and anchor to building structure.
2. Install double deep-leg deflection tracks and anchor outer track to building structure.
3. Connect vertical deflection clips to bypassing studs or infill studs and anchor to building structure.
4. Connect drift clips to cold-formed metal framing and anchor to building structure.

E. Install horizontal bridging in wall studs, spaced vertically in rows indicated on Shop Drawings but not more than 48 inches apart. Fasten at each stud intersection.

1. Top Bridging for Single Deflection Track: Install row of horizontal bridging within 12 inches of single deflection track. Install a combination of bridging and stud or stud-track solid blocking of width and thickness matching studs, secured to stud webs or flanges.

    a. Install solid blocking at centers indicated on Shop Drawings.

2. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
3. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
4. Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.

F. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.07 JOIST INSTALLATION

A. Install perimeter joist track sized to match joists. Align and securely anchor or fasten track to supporting structure at corners, ends, and spacings indicated on Shop Drawings.

B. Install joists bearing on supporting frame, level, straight, and plumb; adjust to final position, brace, and reinforce. Fasten joists to both flanges of joist track.

1. Install joists over supporting frame with a minimum end bearing of 1-1/2 inches.
2. Reinforce ends and bearing points of joists with web stiffeners, end clips, joist hangers, steel clip angles, or steel-stud sections as indicated on Shop Drawings.

C. Space joists not more than 2 inches from abutting walls, and as indicated on the drawings.

D. Frame openings with built-up joist headers consisting of joist and joist track, or another combination of connected joists if indicated.

E. Install joist reinforcement at interior supports with single, short length of joist section located directly over interior support, with lapped joists of equal length to joist reinforcement, or as indicated on Shop Drawings.

F. Install bridging at intervals indicated on Shop Drawings. Fasten bridging at each joist intersection as follows:

1. Bridging: Joist-track solid blocking of width and thickness indicated, secured to joist webs.
2. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and joist-track solid blocking of width and thickness indicated. Fasten flat straps to bottom flange of joists and secure solid blocking to joist webs.

G. Secure joists to load-bearing interior walls to prevent lateral movement of bottom flange.

H. Install miscellaneous joist framing and connections, including web stiffeners, closure pieces, clip angles, continuous angles, hold-down angles, anchors, and fasteners, to provide a complete and stable joist-framing assembly.

3.08 FIELD QUALITY CONTROL

A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Field and shop welds will be subject to testing and inspecting.

C. Testing agency will report test results promptly and in writing to Contractor and Architect.

D. Remove and replace work where test results indicate that it does not comply with specified requirements.

E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.09 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings and all welded areas on fabricated and installed cold-formed metal framing with galvanized repair paint, according to ASTM A 780 and manufacturer’s written instructions. Wire brush slag off of all welds.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed steel framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION

DIVISION 05 – METALS

SECTION 055000 – METAL FABRICATIONS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work included: Provide all miscellaneous metal and metal fabrications, complete and installed, as shown on the Drawings, specified herein, or needed for a complete and proper installation of all building components, which may not be specifically called for under other sections of these Specifications.

B. Drawings and General Provision of Contract, including General Conditions, Supplementary Conditions (if applicable), and Division 01 - Specification Sections, apply to work of this Section.

C. The following sections, when included in the Project Manual, are related to the work of this section:

1. Section 042000 – Unit Masonry
2. Section 051200 – Structural Steel
3. Section 052100 – Steel Joists and Girders
4. Section 053000 – Metal Decking
5. Section 054000 – Cold-Formed Metal Framing
6. Section 055200 – Metal Railings
7. Section 055210 – Aluminum Railings
8. Section 057300 – Decorative Metal Railings

1.02 QUALITY ASSURANCE

A. Standards: Comply with standards specified herein and as listed in Section 014219 – Applicable Standards.

B. Qualifications of Personnel: Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

C. Welding: Perform all shop and field welding required in connection with the work of this Section, adhering strictly to the current pertinent recommendations of the American Welding Society.

1.03 SUBMISSIONS

A. Comply with provisions of Section 013300 – Submittal Procedures and as modified below.

B. Product Data:

1. Complete materials list of all items proposed to be furnished and installed under this Section.

2. Manufacturers' product data, specifications, and other data required to demonstrate compliance with specified requirements.

C. Shop Drawings: The Contractor shall prepare and submit shop drawings covering all items of work of this section. The drawings shall show all dimensions and details of construction, installation and relation to adjoining and related work where same requires cutting or close fitting, and shall show all reinforcement, gauges of metal, anchorage, reinforcing, and other work required for complete installation.

1. Provide templates for bolts and/or anchorage installation by other trades.

1.04 COORDINATION

A. All work under this section shall be properly coordinated with the work of other sections and contracts which affects or is affected by work of this section. To this end, close cooperation shall exist between trades and/or Contractors installing other work in any way affecting or affected by work under this section.

B. Shop drawings shall be exchanged between the trades and/or Contractors so affected to the end that all work shall properly receive or be received by work under other sections, and the entire operation shall be a harmonious whole.

1.05 WORKMANSHIP AND INSTALLATION

A. All work included under this section shall be installed by the contractor at the proper time, and as rapidly as progress of the adjacent and connecting work will permit. All work to be set by others shall be delivered when required by them. The Contractor shall consult with the various other contractors installing adjoining work regarding the methods to be employed in connecting the several materials. Holes and connections for the work of other trades shall be provided as necessary.

B. All work shall be erected and secured plumb and true to line, and finished smooth and clean from fine and noticeable irregularities or file marks. Ferrous metals entering or adjoining exterior masonry surfaces shall be insulated from it with lead shields and by an approved non-staining elastic cement of approved color.

1.06 VERIFYING CONDITIONS

A. Verify all measurements in the field, as required, for work fabricated to fit conditions at the building. Before starting work, examine all adjoining work on which the work of this section is in any way dependent for perfect workmanship and fit. Do such corrective work to adjoining work as may be necessary to make the work of this section perfect in all respects.

1.07 PRODUCT HANDLING

A. 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.

B. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect and at no additional cost to the Owner.

PART 2 - PRODUCTS

2.01 GENERAL

A. All metals shall be free from defects impairing strength or durability, and of best commercial quality for purposes specified. Metals shall be made with structural properties to withstand safely the strains and stresses to which they will normally be subjected.

B. For fabrication of the work of this Section which will be exposed to view, use only those materials which are smooth and free from surface blemishes including pitting, seam marks, roller marks, rolled trade names, and roughness.

C. Standards: All materials shall comply with the latest version of the standard documents indicated:

1. Steel plates, shapes, and bars: ASTM A36.

2. Steel plates to be bent or cold formed: ASTM A283, Grade C.

3. Steel tubing, hot-formed, welded, or seamless: ASTM A501.

4. Steel bars and bar-size shapes: ASTM A306 Grade 65, or ASTM A36.

5. Cold-finished steel bars: ASTM A108, grade as selected by the fabricator.

6. Cold-rolled carbon steel sheets: ASTM A336.

7. Galvanized carbon steel sheets: ASTM A526, with ASTM A525, G90, zinc coating.

8. Stainless steel sheets: Type 302/304 of American Iron and Steel Institute, 24 gauge, with No. 4 finish.

9. Gray iron castings: ASTM A48, Class 30.

10. Malleable iron castings: ASTM A47, grade as selected by the fabricator.

11. Steel pipe: ASTM A53, type as selected, Grade A, black finish unless galvanizing is required, standard weight (Schedule 40) unless otherwise indicated.

12. Concrete inserts: Threaded or wedge type, galvanized ferrous castings, either malleable iron ASTM A47 or cast steel ASTM A27. Provide bolts, washers, and shims as required, hot-dip galvanized, ASTM A153.

13. Non-shrink non-ferrous grout: CE CRD C588.

14. Aluminum extrusions shall be free of roll marks, scratches, rolled-in streaks and any other defect which may affect the uniform appearance of finished surfaces.

15. Aluminum extrusions must be at least 0.8" thick and sheet or plate, at least No. 16 gauge.

16. Aluminum pipe: 6063-T6 alloy.

17. Schedule of Aluminum Finishes:

    a. Exposed exterior extrusions (except saddles, louvers, railings, and windows): 215-R1.

    b. Exposed exterior sheet and plate: 215-R1.

    c. Exposed interior extrusions: 204-R1.

    d. Exposed interior sheet and plate: 204-R1.

    e. Extrusion, sheet plate not exposed: Mill.

    f. Casting: F.

2.02 WORKMANSHIP

A. General workmanship requirements:

1. Use materials of size and thickness shown, or if not shown, of required size and thickness to

produce sufficient strength and durability in the finished product.

2. Work to dimensions shown or accepted on the Shop Drawings, using proven details of fabrication and support.

3. Use type of materials shown or specified for the various components of the work.

4. Form exposed work true to line and level, with accurate angles and surfaces and with straight, sharp edges.

5. Ease the exposed edges to a radius of approximately 0.8-mm (1/32") unless otherwise shown.

6. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

7. Weld corners and seams continuously, complying with AWS recommendations. At exposed connections, grind exposed welds smooth and flush; match and blend with adjoining surfaces.

8. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type shown or, if not shown, use Phillips flat-head (countersunk) screws or bolts.

9. Provide for anchorage of the type shown. Coordinate with supporting structure. Fabricate and space the anchoring devices to provide adequate support for intended use.

10. Cut, reinforce, drill, and tap miscellaneous metal work as indicated to receive finish hardware and similar items.

2.03 FABRICATIONS

A. Rough hardware:

1. Provide bent or otherwise custom fabricated bolts, plates, anchors, hangers, dowels, and other miscellaneous steel and iron shapes as required for framing and supporting woodwork, and for anchoring or securing woodwork to concrete and other structures.

2. Manufacture or fabricate items of sizes, shapes, and dimensions required.

3. Provide malleable iron washers for heads and nuts which bear on wood structural connections; elsewhere, furnish steel washers.

B. Loose bearing and leveling plates:

1. Provide loose bearing and leveling plates for steel items bearing on concrete construction, made flat, free from warps or twists, and of required thickness and bearing area.

2. Drill plates for anchor bolts and for grouting as required.

3. Galvanize after fabrication.

C. Miscellaneous framing and supports:

1. Provide miscellaneous steel framing and supports which are not part of structural steel framework, as required to complete work.

2. Fabricate miscellaneous units to sizes, shapes, and profiles shown; or, if not shown, of required

dimensions to receive adjacent other work to be retained by framing.

3. Fabricate the miscellaneous units from structural steel shapes, plates, and steel bars of welded construction with mitered joints for field connection, unless otherwise shown.

4. Cut, drill, and tap units to receive hardware.

5. Equip units with integrally welded anchors for casting into concrete or building into masonry, and furnish inserts if units must be installed after concrete is placed.

6. Except as otherwise shown on Construction Drawings, space anchors at 24" on centers, and provide minimum anchor units of 1-1/4" x 1/4" x 8" steel straps.

7. Galvanize miscellaneous frames and supports where indicated.

D. Loose Lintels:

1. Provide loose lintels for all trades, over all openings where lintels are not shown on structural drawings or where door bucks over 3'-0" wide are not reinforced. Provide loose lintels for all door bucks, greater than 5'-0" carrying masonry above. For each 4" thickness of masonry, provide one 3 1/2" x 3 1/2" x 5/16" angle at spans 3'-0" or less; 6" x 3 1/2" x 3/8" angle at spans 3'-0" to 6'-4". For 6" thick walls, provide WT 7 x 11 for spans 3'-0" to 6'-4". For spans 6'-4" to 8'-0" at 6" walls, provide WT 7 x 13. Provide lintels at heads of all aluminum bucks where not indicated on structural drawings.

2. All exterior lintels and miscellaneous framing to be galvanized.

E. Steel framed stairs:

1. General:

a. Use welding for joining pieces together, unless otherwise shown or specified. Fabricate units so that bolts and other fastenings do not appear on finish surfaces. Make joints true and tight, and make connections between parts lightproof tight. Provide continuous welds, ground smooth where exposed.

b. Construct stair units to conform to sizes and arrangements shown. Provide all components for the support of stairs and platforms.

2. Stair framing:

a. Fabricate stringers from structural steel channels, or plates, or a combination thereof as shown. Provide closures for ends of stringers.

b. Construct platforms of structural steel channel headers and miscellaneous framing members in the arrangement shown. Bolt or weld stringers to stringers.

3. Metal pan units: Form from structural steel sheet of the gauge shown on the drawings, and to the configuration shown on the drawings. Provide platforms of the same metal and gauge as indicated for pans, unless otherwise indicated.

F. Saddles:

1. Saddles shall be cast abrasive aluminum fitted to full width of frame opening.

2. Set level by shimming in full bed of mastic and fasten with FHCS screws.

2.04 FASTENERS

A. General: Provide zinc-coated fasteners for exterior use and where built into exterior walls. Select fasteners for the type, grade, and class required.

B. Standards: All fasteners shall comply with:

1. Bolts and nuts: Regular hexagon-head type, ASTM A307, Grade A.

2. Lag bolts: Square-head type, Fed. Spec. FF-B-561.

3. Machine screws: Cadmium plated steel, Fed. Spec. FF-S-92.

4. Wood screws: Flat-head carbon steel, Fed. Spec. FF-S-111.

5. Plain washers: Round, carbon steel, Fed. Spec. FF-W-92.

6. Masonry anchorage devices: Expansion shields, Fed. Spec. FF-S-325.

7. Toggle bolts: Tumble-wing type, Fed. Spec. FF-B-588, type, class, and style required.

8. Lock washers: Helical spring type carbon steel, Fed. Spec. FF-W-84.

2.05 PAINT/FINISHING

A. Shop priming:

1. Shop prime all ferrous miscellaneous metal work, except surfaces and edges to be field welded and galvanized surfaces, unless otherwise specified.

   a. Remove oil, grease, and similar contaminants in accordance with SSPC-SP-1.

   b. Clean off heavy rust and loose mill scale in accordance with SSPC-SP-2 or SSPC-SP-3.

   c. Immediately after surface preparation, brush or spray on primer in accordance with manufacturer's recommendations, and at a rate to provide the recommended dry film thickness.

2. Use painting methods which will result in full coverage of joints, corners, edges, and exposed surfaces.

3. Primer for ferrous metals: 10-1009 Gray Metal Primer by Tnemec Co., Inc.

4. Primer for Loose and Hung Steel Lintels: 50-330 Poly-Ura-Prime by Tnemec Co., Inc.

   a. Lintel angles for exterior veneer, either loose or hung, shall be hot dip galvanized. Final painting shall be after installation, but prior to installation of items such as windows or louvers that would conceal the lintel or portion thereof.

5. Non-visible ferrous metals, such as structural steel, bearing plates or anchorage, which will be exposed to building cavities or set below grade shall be painted with Benjamin more M47/M48 Coal Tar Epoxy.

6. All listed primers shall be compatible with finish coats of paint. Coordinate selection of metal primer with actual finish paint provided under Section 09900 of these Specifications.

2.06 GALVANIZING

A. Provide hot-dip zinc coating for those items shown or specified to be galvanized, as follows:

1. ASTM A153 for galvanizing iron and steel hardware.

2. ASTM A123 for galvanizing rolled, pressed, and forged steel shapes, plates, bar, and strip 3 mm (1/8") thick and heavier.

3. ASTM A386 for galvanizing assembled steel products.

B. Galvanizing repair paint: Use a high zinc dust content paint for regalvanizing welds in galvanized steel, or to repair damage incurred during handling and installation, complying with MIL SPEC MIL-P-21035.

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine the areas and conditions under which miscellaneous metal items are to be installed, and correct conditions detrimental to the proper and timely completion of the work. Do not proceed until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Furnish setting drawings, diagrams, templates, instructions, and directions for installation of anchorages, such as concrete inserts, anchor bolts, and miscellaneous items having integral anchors, which are to be embedded in concrete construction. Coordinate delivery of such items to project site.

3.03 INSTALLATION

A. Setting loose plates:

1. Clean concrete bearing surfaces free from bond-reducing materials, and roughen to improve bond to surfaces. Clean the bottom surface of bearing plates.

2. Set loose leveling and bearing plates on wedges, or other adjustable devices.

3. After the bearing members have been positioned and plumbed, tighten the anchor bolts. Do not remove wedges or shims; but if protruding, cut off flush with the edge of the bearing plate before packing with grout.

4. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

B. Setting lintels:

1. Bear 8" minimum at each side of opening wherever possible. Furnish clip angles or other approved connection securely anchored to supporting construction and bolt to lintels wherever 8" bearing is not possible.

C. Installing stairs:

1. Install in accordance with approved shop drawings, providing all anchorage, welding, or bearing as specified on said shop drawings.

D. Fastening to in-place construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction including threaded fasteners for concrete inserts, toggle bolts, through-bolts, lag bolts, wood screws, and other connectors as required.

E. Cutting, fitting, and placement:

1. Perform cutting, drilling, and fitting required for installation of miscellaneous metal fabrications.

2. Set work accurately in location, alignment, and elevation, and make plumb, level, true, and free from rack, measured from established lines and levels.

3. Provide temporary bracing or anchors in formwork for items which are to be built into concrete or similar construction.

4. Fit exposed connections accurately together to form tight hairline joints.

5. Weld connections which are not to be left as exposed joints, but cannot be shop welded because of shipping size limitations.

6. Grind exposed joints smooth, and touch up shop paint coat. Do not weld, cut, or abrade the surfaces of exterior units which have been hot-dip galvanized after fabrication and are intended for bolted or screwed field connections.

F. Field welding: Comply with AWS Code for procedures of manual shielded metal-arc welding, appearance and quality of weld made, and methods in correcting welding work.

G. Touch up painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting. Apply by brush or spray to provide minimum dry film thickness of 2.0 mils.

3.04 CLEANING, ACCEPTANCE, AND PROTECTION

A. All work shall be properly protected from defacement or damage. Defective work shall be satisfactorily repaired or removed and replaced at no additional cost to the Owner.

B. Upon completion, inspection, and approval by the Architect, the ornamental work of this section shall be cleaned with a mild soap and water or a petroleum distillate and all temporary protective coatings removed, except Methacrylate Lacquer.

C. All operative items shall be adjusted to work properly and the work left whole, clean, and in perfect condition.

END OF SECTION

DIVISION 05 – METALS

SECTION 055200 – METAL RAILINGS

PART 1 - GENERAL

1.01 RELATED WORK

A. Drawings and General Provision of Contract, including General Conditions, Supplementary Conditions (if applicable), and Division 01 - Specification Sections, apply to work of this Section.

1.02 WORK INCLUDED

A. Furnish and install all steel railing and related items indicated on the drawings and specified herein.

1.03 RELATED SECTIONS

A. The following sections, when included in the Project Manual, are related to the work of this section:

1. Section 033000 – Cast-in-Place Concrete
2. Section 051200 – Structural Steel
3. Section 055000 – Miscellaneous Metal
4. Section 079200 – Joint Sealants
5. Section 099000 – Painting

1.04 SUBMITTALS

B. All submission shall be made in accordance with Section 013300 – Submissions and as may be modified below.

C. Shop Drawings:

1. Submit shop drawings of all items specified in accordance with the requirements of the General Provisions.

2. Shop drawings shall show welding, fabrication and installation of railings including all plans, typical elevations, details of components, and attachment to other units of work.

3. Where installed products are indicated to comply with certain design loading, include structural computations material properties and other information needed for structural analysis review by the Architect.

D. Samples:

1. Submit samples of items requested to illustrate fabrication, detail, and finish, as per the requirements of the General Provisions.

2. Identify all samples completely describing material, gauge, treatment, texture, finish, and color.

1.05 SYSTEM PERFORMANCE REQUIREMENTS

A. Structural performance of railing systems:

1. Engineer, fabricate and install railing systems to withstand the following structural loads without exceeding the allowable design working stress of the materials for railings, anchors, and

connections. Apply each load to product the maximum stress in each of the respective components comprising railing systems.

a. Top rail of guardrail systems: Capable of withstanding the following loads applied as indicated:

1) Concentrated load of 200lbs applied at any point and in any direction.
2) Uniform load of 50lb per linear foot applied horizontally and concurrently with uniform load of 100lb per linear foot applied vertically downward.
3) Concentrated load need not be assumed to act concurrently with uniform loads.

b. Handrails not serving as top rails: Capable of withstanding the following loads applied as indicated:

1) Concentrated load of 200lbs applied at any point and in any direction.
2) Uniform load of 50lb per linear foot applied in any direction.
3) Concentrated load need not be assumed to act concurrently with uniform load.

c. Infill area of guardrail systems: Capable of withstanding the following loads applied as indicated:

1) Horizontal concentrated load of 200lbs applied to one square foot at any point in the system.
2) This concentrated load need not be assumed to act concurrently with any other load.

2. Control of corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1.06 EXAMINATION AND COORDINATION

A. The Contractor's attention is directed to the other specification sections to ascertain the scope of reinforcing, supporting, and attachment steel work specified therein. Supplementary parts necessary to complete each item of miscellaneous metals, though such parts are not shown or specified, shall be included.

B. Examine all surfaces to which this work is to be attached. Notify the General Contractor if any conditions exist which are detrimental to the proper and timely installation of this work.

C. Cooperate in the coordination and scheduling of the work of this section with the work of other trades. Anchors, sleeves, framing, fastenings, and other miscellaneous items to be embedded in concrete or masonry, or required for securing metal work to other construction, shall be furnished as required so as not to delay the progress of the work.

D. Verify, by measurements at the job site, all dimensions affecting this work. Where railings are to fit to other construction, check actual dimension other construction before fabrication. Field dimensions which are at variance with those on the approved shop drawings shall be brought to the attention of the Architect. Where field measurements cannot be made without delaying the work, obtain guaranteed dimensions in writing and proceed without field measurements if specifically directed to do so. Starting of work will be construed as acceptance of surfaces.

E. Furnish all necessary templates and patterns required by other sections.

1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver, receive, handle, and store all materials to prevent damage, deterioration, or delay. Remove defective materials from project site within 24 hours.

B. Store handrails and railing systems in clean, dry location away from uncured concrete and masonry, protected against damage.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Materials shall be new stock, free from defects impairing strength, durability or appearance and of best commercial quality for each intended purpose.

B. All steel posts, balusters, top and bottom rails shall be schedule 40 tubular or pipe carbon steel sections as indicated on the drawings, conforming to ASTM A53, Type S, Grade A.

1. In lieu of balusters, guardrail panels shall be provided as indicated and detailed on the drawings.

C. Handrails shall be steel, stainless steel, brass, or bronze as indicated on the drawings. If drawings do not indicate specific handrail material, then assume 1.5” dia. schedule 40 steel, painted.

D. Expansion shields, plugs, bolts, and other anchorage devices in masonry and concrete shall be of approved type. Ferrous types shall be galvanized. Fiber or wood plugs in masonry and concrete will not be accepted.

E. Galvanizing and Cadmium Plating:

1. Galvanizing of products after fabrication: ASTM A-123 and A-153.

2. Cadmium plating: ASTM A-165, Type TS.

2.02 MATERIAL STANDARDS

A. Steel Pipe - ASTM A-120.

B. Steel plates, shapes, and bars - ASTM A36.

C. Tubing - Hot-rolled, ASTD A501 or cold-rolled, ASTM A500.

D. Gray Iron Castings – ASTM A48, Class 30.

PART 3 - EXECUTION

3.01 FABRICATION AND ASSEMBLY

A. All work shall be fabricated in a first class manner by mechanics skilled in the trade, in accordance with basic details and information contained on the Construction Drawings.

B. All joints shall be as strong and rigid as adjoining sections. Welding shall be uniform and continuous along entire line of contact, except where spot welding is indicated or permitted.

C. Welding and bracing shall be of adequate strength and durability, with joining tight, flush, in plane, dressed, and smooth and clean.

D. Abutting bars shall pass through larger bars and be welded.

E. All welds shall be concealed where practical. Where exposed, welds shall be ground smooth.

F. Threaded connections shall be made up tight so that threads are entirely concealed. Removable members shall be carefully machined and fitted and secured by means of screws of bolts of proper size and approved spacing.

G. All fastening shall be concealed where practicable. Where exposed in finished surfaces, bolt and screw heads shall be flat and countersunk in exposed work and elsewhere as required unless otherwise shown or approved.

H. Long members shall be held together at end joints by concealed sleeves of similar shape, welded or braced in place, but designed to provide for expansion or contraction.

I. Fabrication, assembly, and fitting of the work shall be done in the shop, ready for installation at the site. Work which cannot be shop assembled shall be given a trial fit at the shop to insure proper field assembly.

3.02 GALVANIZING

A. If indicated on the Drawings, hot-dip galvanize assemblies and components in accordance with ASTM A-653 for G90 coating weight prior to painting.

3.03 PAINTING

A. Preparation:

1. All loose scale to be removed by blasting in accordance with SSPC-SP6. Blasting shall be done with an air compressor having a minimum capacity of 200 psi in an environmentally controlled environment with relative humidity not exceeding 80%. The blast media shall be cast steel grit; G25, G40, or G50 in accordance with SAE J1993.

2. The painting surface shall be clean and free of oil and dirt.

B. Painting:

1. The coating system shall be applied in a suitably designed paint spray booth capable of controlling environmental conditions. Paint shall not be applied when the air, steel, or paint materials are below 50˚ F or the humidity is above 80%.

a. Primer: Refer to Specification Section 099000 for primer requirements.

b. The modified epoxy primer shall be applied to achieve a dry film thickness in the range of 4.0 to 6.0 mils.

c. Primer must be fully cured prior to the application of the finish coatings.

d. Any cracks and crevices at scrolls, circles or at sandwiched components, etc., to be filled using Tremco Dymonic polyurethane caulking after primer has cured.

e. Finish: Refer to Specification Section 099000 for painting finish requirements.

f. Finish pant color shall be semi-gloss black, or other color as selected by the Architect.

g. The polyurethane finish paint shall be applied to achieve a dry film thickness to the range of 2.0 to 3.0 mils.

h. The paint shall be fully cured prior to installation.

C. The finished product shall be free of runs, sags, pinholes and holidays.

3.04 POWDER COATING (if identified in lieu of painting)

A. When noted on the Drawings, provide a two-coat powder coating system applied as per manufacturers specifications.

1. Clean all surfaces of oily or greasy residues, dirt, mill scale, oxidation, etc.

2. Mechanical pretreatment by abrasive blasting or liquid chemical pretreatment by zinc phosphate immersion.

3. Powder primer coat, Tiger Dryprotector 69/70111 or equivalent.

4. Powder finish coat, Tiger Drylac Series 75, semi-gloss, or equivalent.

B. Colors shall be as selected by Architect.

3.05 INSTALLATION

A. Perform cutting, drilling and fitting required for installation. Set products accurately in location, alignment and elevation, plumb, level and true, measured from established lines and levels.

B. Allow for thermal movement resulting from maximum change in ambient temperature, in the design, fabrication and installation of installed metal assemblies to prevent buckling, opening up of joints and overstressing of welds and fasteners.

C. Provide necessary lugs and brackets for assembly of units. Use concealed fasteners wherever possible.

D. Posts shall be set in concrete in accordance with any of the following methods:

1. Set in position during concrete pouring. Provide temporary bracing as required for setting of items until adequate cure time is achieved.

2. Core-drilling existing or new concrete, embedding posts a min. of 8” deep, and filling with anchoring cement. Top of anchoring cement must be slightly higher than surrounding concrete and sloped for drainage.

3. Setting sleeves in new concrete during pouring to accommodate posts in lieu of core-drilling. Follow setting instructions above.

4. In instances where railings are not associated with stairs, walls, or slabs, provide concrete footings, sizes as appropriate to the steel member being embedded, and submitted to and approved by the Architect. Footings shall be set 1” above finished grade and tops shall be sloped outwards for drainage.

E. Provide anchoring devices and fasteners where necessary for securing metalwork to existing construction; including threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws, etc. Such accessories shall be furnished in ample time for setting and securing in place.

F. Field Welding: Comply with applicable AWS specifications for procedures, for appearance and quality of welds made, and for methods used in correcting welding work. Field-welded connections,

which are not to be left as exposed joints, are only permissible where items cannot be shop welded, because of shipping size or other physical limitations. Grind exposed welded joints smooth and restore to match finish of adjacent surfaces.

G. Touch-up Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint and paint exposed areas with same material.

H. 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 as required, all at the discretion of the Architect.

3.06 CLEANING, ACCEPTANCE, AND PROTECTION

A. All work shall be properly protected from defacement or damage. Defective work shall be satisfactorily repaired or removed and replaced at no additional cost to the Owner.

END OF SECTION

DIVISION 06 – WOOD, PLASTICS AND COMPOSITES

SECTION 061000 – ROUGH CARPENTRY

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of contract, including General and Supplementary Conditions and Division 01 Specification sections, apply to work of this Section.

1.02 SUMMARY

A. Types of work in this section include rough carpentry for:

1. Framing with dimensional lumber as shown on the drawings and as specified herein.

2. Plywood, OSB, particleboard panels and/or other sheathing as shown on the drawings and as specified herein.

3. Wood blocking, nailers and/or sleepers.

1.03 RELATED SECTIONS

A. Section 061643 – Exterior Gypsum Sheathing
B. Section 061713 – Laminated Veneer Lumber
C. Section 062000 – Finish Carpentry
D. Section 072100 – Building Insulation
E. Section 072113 – Ultra Wall Insulation and Air Barrier System
F. Section 072423 – Direct Applied Exterior Finish Systems
G. Various Division 07 Roofing Specifications
H. Various Division 09 Finishes Specifications
I. If designated as a LEED project, then also:
   1. Section 013563 – LEED Requirements
   2. Section 017419 – Construction Waste Management

1.04 REFERENCES

A. AWPA – (American Wood Preservers Association) – All Timber Products Preservative Treatment by Pressure Process.

B. APA – American Plywood Association.

C. AITC – American Institute of Timber Construction.

D. US Department of Commerce (DOC):

1. DOC PS 1 – Performance Standard for Structural Plywood.
2. DOC PS 2 – Performance Standard for Wood-Based Structural Panels.

1.05 DEFINITIONS

A. Rough Carpentry: Carpentry work not specified as part of other sections and which is generally not exposed, except as otherwise indicated.

B. Exposed Framing: Framing not concealed by other construction.

C. Dimensional Lumber: Lumber of 2 inches nominal or greater, but less than 5 inches nominal in least dimension.

D. Timber: Lumber of 5 inches nominal or greater in least dimension.

1.06 QUALITY ASSURANCE

A. All materials shall be provided and all work shall be performed in accordance with the NYS Building Code requirements (current version).

B. Lumber shall be certified by the following authorities/grading agencies:

1. NELMA: Northeastern Lumber Manufacturers' Association.

2. NLGA: National Lumber Grades Authority.

3. RIS: Redwood Inspection Service.

4. SPIB: The Southern Pine Inspection Bureau.

5. WCLIB: West Coast Lumber Inspection Bureau.

6. WWPA: Western Wood Products Association.

7. FSC: Forest Stewardship Council.

1.07 SUBMISSIONS

A. All submissions shall be made in accordance with Section 013300 – Submittal Procedures and as modified below.

B. Material Certificates: Where dimensional lumber is provided to comply with minimum allowable unit stresses, submit a listing of species and grade selected for each use, and submit evidence of compliance with specified requirements. Compliance may be in forms of a signed copy of applicable portion of lumber producer's grading rules showing design values for selected species and grade. Design values shall be as approved by the Board of Review of American Lumber Standards Committee.

C. Evaluation Reports: For the following, from ICC-ES:

1. Wood-Preservative-treated wood.
2. Fire-retardant-treated wood.
3. Plywood.
4. Engineered wood products.
5. Shear panels.
6. Power-driven fasteners.
7. Powder-actuated fasteners.
8. Expansion anchors.
9. Metal framing anchors.

D. Wood Treatment Data: Submit chemical treatment manufacturer's instructions for handling, storing, installation, and finishing of treated material.

1. Preservative Treatment: For each type specified, include certification by treating plant stating

type of preservative solution and pressure process used, note amount of preservative retained, and conformance with applicable standards.

a. For water-borne treatment include statement that moisture content of treated materials was reduced to levels indicated prior to shipment to project site.

b. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

E. LEED Submittals; for projects requiring LEED certification, submit the following additional information:

1. Submit recycled content and regional materials documentation for each type of product provided under work of this Section in accordance with Section 013563 – LEED Requirements.

2. Credit EQ 4.1: Manufacturers' product data for interior field-applied construction adhesive, including printed statement of VOC content in accordance with Section 013563 – LEED Requirements.

3. Credit EQ 4.4: Composite wood manufacturer's product data for each composite wood product used indicating that product's bonding agent contains no urea formaldehyde in accordance with Section 013563 – LEED Requirements.

4. Forest Certification for the following wood products; materials produced from wood obtained from forests certified by a Forest Stewardship Council (FSC)-accredited certification body to comply with FSC 1.2, "Principles and Criteria":

a. Dimensional lumber framing.

b. Plywood.

1.08 DELIVERY, STORAGE AND PRODUCT HANDLING

A. Delivery and Storage: Keep materials under cover and dry. Protect against exposure to weather and contact with damp or wet surfaces. Stack lumber as well as plywood and other panels flat with spacers between each bundle to provide for air circulation around stacks and under coverings.

PART 2 - MATERIALS

2.01 LUMBER, GENERAL

A. Lumber Standards: Manufacture lumber to comply with *"Voluntary Lumber Standard"* DOC PS20-10, or most current edition, and with applicable grading rules of inspection agencies certified by American Lumber Standards Committee's (ALSC) Board of Review.

1. Grade Stamps: Factory-mark each piece of lumber with grade stamp of inspection agency evidencing compliance with grading rule requirements and identifying grading agency, grade, species, moisture content at time of surfacing, and mill..

2. Where nominal sizes are indicated, provide actual sizes required by DOC PS20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.

3. Provide dressed lumber, S4S, unless otherwise indicated.

4. Plywood Standards: Comply with the latest edition of U.S. Product Standard PSI and APA performance standards.

5. Provide seasoned lumber with 19 percent maximum moisture content at time of dressing and shipment for sizes 2" or less in nominal thickness, unless otherwise indicated.

B. Inspection Agencies: Inspection agencies and the abbreviations used to reference with lumber grades and species include the following:

1. SPIB: Southern Pine Inspection Bureau.
2. WWPA: Western Wood Products Association.

C. Grade Stamps: Factory-mark each piece of lumber with grade stamp of inspection agency evidencing compliance with grading rule requirements and identifying grading agency, grade, species, moisture content at time of surfacing and mill.

2.02 FRAMING LUMBER

A. For items of dimensional lumber size, provide Construction or No. 2 grade lumber with 15 percent maximum moisture content of any species, unless otherwise noted on the Construction Drawings.

1. Hem-fir (north); NLGA.

2. Mixed southern pine; SPIB.

3. Spruce-pine-fir; NLGA.

4. Hem-fir; WCLIB, or WWPA.

5. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.

6. Species group below includes hem-fir and spruce-pine-fir (south).

7. Western woods; WCLIB or WWPA.

8. Northern species; NLGA.

2.03 MISCELLANEOUS LUMBER

A. Provide wood for support or attachment of other work including cant strips, nailers, blocking, furring, grounds, stripping, rooftop equipment bases and support curbs, and similar members. Provide lumber sizes indicated, worked into shapes shown.

B. Grade: Standard grade light framing size lumber of any species or board size lumber as required. No. 3 Common or Standard grade boards per WCLIB or WWPA rules or No. 3 boards per SPIB rules.

2.04 PLYWOOD PANELS AND ROOF SHEATHING

A. Plywood must contain no urea-formaldehyde resins.

B. Telephone and Electrical Equipment Backing Panels: DOC PS1, Exposure 1, C-D Plugged, in thicknesses as indicated, not less than ½ inch nominal thickness.

C. Plywood Roof Sheathing: Exposure 1, Structural 1 sheathing.

1. Span Rating: Not less than 48/24.

2. Nominal Thickness: Not less than 23/32 inch.

2.05 MISCELLANEOUS MATERIALS

A. Fasteners and Anchorages: Provide size, type, material, and finish as indicated and as recommended by applicable standards, complying with applicable Federal Specifications for nails, staples, screws, bolts, nuts, washers, and anchoring devices. Provide metal hangers and framing anchors of the size and type recommended by the manufacturer for each use including recommended nails.

1. Where rough carpentry work is exposed to weather, in ground contact, pressure-preservative treated, or in areas of high relative humidity, provide fasteners and anchorages with a hot-dip zinc coating, complying with ASTM A153.

2. Nails, brads and staples shall comply with ASTM F 1667.

3. Power-Driven fasteners shall comply with NES NER-272.

4. Wood Screws shall comply with ASME B18.6.1.

5. Lag Bolts shall comply with ASME B18.2.1.

6. Bolts: Steel bolts shall comply with ASTM A307, Grade A; with ASTM A563 hex nuts and, where so indicated, flat washers.

7. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies 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 and inspecting agency.

a. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.

b. Material: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2.

B. Building Paper: Asphalt saturated felt, non-perforated conforming to ASTM D226.

C. In the absence of requirements of section 072713, provide a self-adhering vapor-permeable air barrier membrane; Blueskin Breather manufactured by Henry; a self-adhering membrane consisting of a microporous film laminate, backed with a specially applied adhesive, which allows water vapor to permeate through while acting as a barrier to air and rain water. Membrane shall have the following physical properties:

1. Air leakage: <0.002 CFM/ft2 @ 1.6 lbs/ft2 to ASTM E283-91.

2. Water vapor permeance: 37 perms to ASTM E 96.

3. Membrane Thickness: 17 mils.

4. Low temperature flexibility -40 degrees F: Pass to ASTM D3111.

5. Hydrostatic Water Resistance: 18 psi ASTM D751 Procedure

D. Sill Sealer Gaskets: Glass fiber resilient insulation fabricated in strip form for use as a sill sealer; 1" nominal thickness compressible to 1/32"; selected from manufacturer's standard widths to suit width of sill members indicated; in rolls of 50' or 100' in length.

E. Water-Repellent Preservative: (for exposed ends of posts and beams, not for treating cuts in preservative-treated lumber): NWWDA-tested and accepted formulation containing 3-iodo-2-propynyl butyl carbamate, combined with an insecticide containing chloropyrifos as its active ingredient.

F. Construction Adhesive: Use adhesives that have a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.06 METAL FRAMING ANCHORS

A. Basis-of-Design Products: Subject to compliance with requirements, provide products indicated on Drawings or engineered-approved equals by one of the following:

1. Simpson Strong-Tie Co., Inc.
2. USP Structural Connectors.

B. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer that meet or exceed those indicated 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.

C. Galvanized Steel Sheet: Hot-dip, zinc-coated steel sheet, complying with ASTM A 653, G60 (Z180) coating designation.

D. Joist Hangers: U-shaped joist hangers with 2-inch long seat and 1-1/4-inch wide nailing flanges at least 85 percent of joist depth.

1. Thickness: 0.062 inch.

E. I-Joist Hangers: U-shaped joist hangers with 2-inch long seat and 1-1/4-inch wide nailing flanges full depth of joist. Nailing flanges provide lateral support at joist top chord.

1. Thickness: 0.062 inch.

F. Top Flange Hangers: U-shaped joist hangers, full depth of joist, formed from metal strap with tabs bent to extend over and be fastened to supporting member.

1. Strap Width: 1-1/2 inches.
2. Thickness: 0.062 inch.

G. Bridging: Rigid, V-section, nail-less type, 0.050 inch thick, length to suit joist size and spacing.

H. Joist Ties: Flat straps, with holes for fasteners, for tying joists together over supports.

1. Width: 1-1/4 inches.
2. Thickness: 0.062 inch.
3. Length: As indicated.

I. Rafter Tie-Downs: Bent strap tie for fastening rafters or roof trusses to wall studs below, 1-1/2 inches wide by 0.050 inch thick. Tie fasteners to side of rafter or truss, face of top plates, and side of stud below.

J. Rafter Tie-Downs (Hurricane or Seismic Ties): Bent strap tie for fastening rafters or roof trusses to wall studs below, 2-1/4 inches wide by 0.062 inch thick. Tie fits over top of rafter or truss and fastens to both sides of rafter or truss, face of top plates, and side of stud below.

K. Floor-to-Floor Ties: Flat straps, with holes for fasteners, for tying upper floor wall studs to band joists and lower floor studs, 1-1/4 inches wide by 0.050 inch thick by 36 inches long.

L. Hold-Downs: Brackets for bolting to wall studs and securing to foundation walls with anchor bolts or to other hold-downs with threaded rods and designed with first of two bolts placed seven bolt diameters from reinforced base.

1. Bolt Diameter: 3/4 inch.
2. Width: 3-3/16 inches.
3. Body Thickness: 0.138 inch.
4. Base Reinforcement Thickness: 0.108 inch.

M. Wall Bracing: T-shaped bracing made for letting into studs in saw kerf, 1-1/8 inches (29 mm) wide by 9/16 inch deep by 0.034 inch thick with hemmed edges.

N. Wall Bracing: Angle bracing made for letting into studs in saw kerf, 15/16 by 15/16 by 0.040 inch thick with hemmed edges.

2.07 FIRE RETARDANT-TREATED LUMBER

A. General: Where fire-retardant-treated lumber and plywood are indicated, use materials impregnated with fire-retardant chemicals by a pressure process or other means acceptable to authorities having jurisdiction to produce products with the following fire-test-response characteristics:

1. Flame-spread index of not greater than 25 when tested according to ASTM E 84.

B. 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.

C. Exterior-Type Fire-Retardant Treatment: Organic-resin-based formulation that shows no increase in flame spread of treated material after being weathered according to ASTM D 2898, Method A.

D. Kiln-dry material after treatment to levels required for untreated material. Do not use material that does not comply with requirements for untreated material or is warped or discolored.

E. Acceptable pressure-impregnated products include Hoover’s Pyro-Guard for interior applications and Exterior Fire-X for exterior applications.

2.08 WOOD-PRESERVATIVE-TREATED LUMBER

A. Preservative Treatment by Pressure Process: Where lumber or plywood is indicated as "Trt-Wd" or "Treated," or is specified herein to be treated, comply with applicable requirements of AWPA Standards C2 (Lumber) and C9 (Plywood) and of AWPB Standards listed below, except that lumber that is not in contact with the ground and is continuously protected from liquid water may be treated according to AWPA C31 with inorganic boron (SBX). Mark each treated item with the AWPB Quality Mark Requirements, and with the quality mark of an inspection agency approved by the ALSC Board of Review.

1. Pressure-treat above-ground items with water-borne preservatives to comply with AWPB LP-2, acceptable to authorities having jurisdiction and containing no arsenic or chromium. After

treatment, kiln-dry lumber and plywood to a maximum moisture content, respectively, of 19 percent and 15 percent. Do not use material that is warped or does not comply with requirements for untreated material. Treat indicated items and the following:

a. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
b. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
c. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
d. Wood framing members less than 18" above grade, in crawl spaces or unexcavated areas.
e. Wood floor plates that are installed over concrete slabs-on-grade.

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

A. Discard units with material defects which might impair quality of work, and units which are too small to use in fabricating work with minimum joints or optimum joint arrangement.

B. Set carpentry work to required levels and lines, with members plumb and true to line and cut and fitted.

C. Coordination: Fit carpentry work to other work; scribe and cope as required for accurate fit. Correlate location of furring, nailers, blocking, grounds, and similar supports to allow attachment of other work.

D. Framing Standard: Comply with AF&PA's "Details for Conventional Wood Frame Construction," unless otherwise indicated.

1. Unless otherwise indicated on the Construction Drawings, framing shall be at 16” centers.

E. Metal Anchors for Engineered Wood Products (where applicable): Install metal anchors to comply with manufacturer's written instructions.

F. Sort and select lumber so that natural characteristics will not interfere with installation or with fastening other materials to lumber.

G. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.

1. Use inorganic boron for items that are continuously protected from liquid water.

2. Use copper naphthenate for items not continuously protected from liquid water.

H. Securely attach carpentry work to substrate by anchoring and fastening as shown and as required by recognized standards. Comply with Table 2304.10.1 – “Fastening Schedule” in ICC’s International Building Code. Provide all blocking and framing as indicated and as required in order to support facing materials, fixtures, specialty items, and trim.

I. Use common wire nails, except as otherwise indicated; use finishing nails for finish work. Select fasteners of size that will not penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting of wood; predrill as required.

J. Do not splice structural members between supports.

3.02 WOOD GROUNDS, NAILERS, BLOCKING, AND SLEEPERS

A. Provide wherever shown and where required for attachment to other work. Form to shapes as shown and cut as required for true line and level of work to be attached. Coordinate location with other work involved.

B. Attach to substrate as required to support applied loading. Countersink bolts and nuts flush with surfaces, unless otherwise indicated. Build into masonry during installation of masonry work. Where possible, anchor to formwork before concrete placement.

C. Provide permanent grounds of dressed, preservative treated, key-beveled lumber not less than 1-1/2" wide and of thickness required to bring face of ground to exact thickness of finish material involved. Remove temporary grounds when no longer required.

3.03 WALL AND PARTITION FRAMING

A. General: Provide single bottom plate and double top plates using members of 2-inch nominal thickness, whose widths equal that of studs. Fasten plates to supporting construction.

1. Space wood studs at 16 inches o.c., unless otherwise indicated.

2. Provide continuous horizontal blocking at mid-height of partitions more than 96 inches high, using members of 2-inch nominal thickness, and of same width as wall or partitions.

B. Construct corners and intersections with three (3) or more studs.

C. Frame openings with multiple studs and headers. Provide nailed header members of thickness equal to width of studs. Support headers on jamb (jack) studs.

1. For load-bearing walls, provide double-jamb (jack) studs for openings 60 inches and less in width, and triple-jamb (jack) studs for wider openings. Provide headers of depth indicated on the drawings.

D. Provide diagonal bracing in walls, at locations indicated, full-story height, unless otherwise indicated.

3.04 FLOOR JOIST FRAMING

A. Space joists at 16 inches o.c., unless otherwise indicated.

1. Set each joist with crown up.

2. Provide continuous horizontal blocking at mid-span of joists, using members of same nominal size of joists.

B. Frame openings with multiple studs and headers. Provide nailed header members of thickness equal to width of joists.

1. Provide double-joists, nailed together, directly beneath non-bearing partition walls when joist run parallel to said walls.

3.05 RAFTER FRAMING

A. Rafters: Notch to fit exterior wall plates and use metal framing anchors. Double rafters to form headers and trimmers at openings in roof framing, if any, and support with metal hangers. Where rafters abut ridge, place directly opposite each other and nail to ridge member, or use metal ridge

hangers.

1. Space wood rafters at 16 inches o.c., unless otherwise indicated.

2. Set each rafter with crown up.

B. Provide special framing as indicated for eaves, overhangs, dormers, and similar conditions, if any.

3.06 PLYWOOD SHEATHING

A. General: Comply with applicable recommendations in APA Form No. E30S, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.

B. Install with the long dimension of the panel across supports, except where noted, and with panel continuous over two or more spans. Suitable edge support shall be provided where indicated on drawings (or in recommendations of the American Plywood Association) by use of panel clips, tongue-and-groove panels, or lumber blocking between joists. Panel end joints shall occur over framing. Allow 1/8-inch spacing at panel ends and 1/4-inch at panel edges, unless otherwise recommended by the panel manufacturer.

C. Apply a continuous bead of glue to framing members at edges of wall sheathing panels.

D. Nail 6 inches o.c. along panel edges and 12 inches o.c. at intermediate supports, except that when supports are spaced 48 inches o.c. or more, space nails 6 inches o.c. at all supports. Use 6d common nails for panels 1/2-inch and less and 8d for greater thicknesses, except that when panels are 1-1/8 inch, use 8d ringshank or 10d common.

3.07 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.

END OF SECTION

DIVISION 06 – WOOD, PLASTICS AND COMPOSITES

SECTION 062000 – FINISH CARPENTRY

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of contract, including General and Supplementary Conditions, Division 01 Specification sections, apply to work of this section.

1.02 SUMMARY

A. Types of work in this section include finish carpentry for:

1. Exterior standing and running trim.
2. Interior standing and running trim.
3. Interior plywood.
4. Window stools & aprons.
5. Closet shelving.

B. Casework, cabinetry, countertops, and wainscot paneling systems are specified in other Division 06, Division 11, and Division 12 sections.

1.03 RELATED SECTIONS

A. Section 061000 – Rough Carpentry
B. Various Division 09 Finishes Specifications
C. If designated as a LEED project, then also:
   1. Section 013563 – LEED Requirements
   2. Section 017419 – Construction Waste Management

1.04 QUALITY ASSURANCE

A. Lumber: Comply with Voluntary Product Standard PS-20. Lumber shall bear grade and trademark of the association under whose rule it is produced.

1. Southern Forest Products Association (SFPA).
2. West Coast Lumber Inspection Bureau (WCLIB).
3. American Plywood Association (APA).
4. Western Wood Products Association (WWPA).
5. American Wood Preservers Bureau (AWPB).
6. National Woodwork Manufacturer's Association (NWMA).
7. National Hardwood Lumber Association (NHLA).
8. Architectural Woodwork Institute (AWI).
9. Wood Moulding and Millwork Producers (WM).

10. Forest Stewardship Council (FSC).

B. Plywood Grading Rules:

1. U.S. Product Standard PS 1-83 for Construction and Industrial Plywood.

2. American Plywood Association (A.P.A.).

C. Perform finish carpentry in accordance with AWI Quality Standards, "Custom" grade, unless otherwise noted.

1.05 SUBMISSIONS

A. All submissions shall be made in accordance with Section 013300 – Submittal Procedures and as modified below.

B. Submit shop drawings and product data for architectural woodwork. Indicate materials, component profiles, jointing details, finishes, and accessories.

1. If requested, provide 6” long samples of trim pieces.

C. LEED Submittals; for projects requiring LEED certification submit the following:

1. Submit recycled content and regional materials documentation for each type of product provided under work of this Section in accordance with Section 013563 “LEED Requirements”.

2. Credit EQ 4.1: Manufacturers' product data for interior field-applied construction adhesive, including printed statement of VOC content in accordance with Section 013563 “LEED Requirements”.

3. Credit EQ 4.4: Composite wood manufacturer's product data for each composite wood product used indicating that product’s bonding agent contains no urea formaldehyde in accordance with Section 013563 “LEED Requirements”.

4. Forest Certification for the following wood products; materials produced from wood obtained from forests certified by a Forest Stewardship Council (FSC)-accredited certification body to comply with FSC 1.2, "Principles and Criteria":

a. Finish lumber and moldings.

b. Finish plywood, veneers.

1.06 DELIVERY, STORAGE AND PRODUCT HANDLING

A. Keep materials under cover and dry. Protect against exposure to weather and contact with damp or wet surfaces. Stack lumber as well as plywood and other panels; provide for air circulation within and around stacks and under temporary coverings including polyethylene and similar materials.

B. Do not deliver finish carpentry materials, until painting, wet work, grinding, and similar operations which could damage, soil, or deteriorate woodwork have been completed in installation areas.

C. Deliver interior finish carpentry only when environmental conditions meet requirements specified for installation areas. If finish carpentry must be stored in other than installation areas, store only where environmental conditions meet requirements specified for installation areas.

1.07 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install interior finish carpentry 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.

PART 2 - MATERIALS

2.01 SEASONING

A. Moisture Content: Except grades and species having a definite moisture content limitation under established grading rules, lumber shall be kiln-dried to a maximum moisture content of twelve percent (12%).

2.02 EXTERIOR STANDING AND RUNNING TRIM

A. Trim shall be of sizes, configurations, and profiles as indicated on the drawings for the following applications.

1. Finished lumber.
2. Door and window casings.
3. Fascia, rake, and associated trim.
4. Other applications as may be detailed on the drawings.

B. Exterior applications shall be clear all-heart redwood, clear heart western red cedar, southern yellow pine, or black locust, unless otherwise noted on the drawings as a different species or resin-based, hardboard, or composite material.

1. Provide WM grade P for opaque/painted finish.
2. Provide WM grade N for natural/stained finish.

2.03 INTERIOR STANDING AND RUNNING TRIM

A. Trim shall be of sizes, configurations, and profiles as indicated on the drawings for the following applications.

1. Finished lumber.
2. Door and window casings.
3. Wall base molding.
4. Chair rails.
5. Crown moldings.
6. Picture moldings.
7. Other applications as may be detailed on the drawings.

B. Interior softwood applications shall be select eastern white pine or sapwood birch; hardwood applications shall be white oak, red oak, or hard maple, unless otherwise noted on the drawings as a different species or resin-based, hardboard, or composite material.

1. Provide WM grade P for opaque/painted finish.

2. Provide WM grade N for natural/stained finish.

2.04 INTERIOR PLYWOOD

A. Exposed finished plywood applications shall utilize furniture-grade plywood of a face species coordinating with specified trim or as indicated on the drawings.

1. Provide Type II interior sound grade for opaque/painted finish.

2. Provide Type II interior grade A for natural/stained finish.

B. Thicknesses shall be as indicated on the drawings.

1. Shelving plywood shall be nominal 3/4” minimum.

C. Comply with PS 1-83. Interior plywood in proximity to water (toilet rooms, sinks, etc.): manufactured with exterior glue.

1. Plywood must contain no urea-formaldehyde resins.

2.05 WINDOW STOOLS & APRONS

A. Window stools shall be constructed of hardwood lumber species as indicated on the drawings. If no species is indicated, bids shall be based upon red oak.

1. Utilize nominal 1” board stock for widths of 7-1/4” or less. For wider applications, utilize nominal 5/4” board stock.

2. Exposed edges shall be bullnosed.

B. Aprons shall be of similar species as window stools and shall be wide enough to cover rough wood blocking or GWB edge transition beneath.

2.06 MISCELLANEOUS MATERIALS

A. Fasteners and Anchorages: Provide nails, screws, and other anchoring devices of the proper types, size, material, and finish for application indicated to provide secure attachment, concealed where possible, and complying with applicable Federal Specifications and reference AWI standard.

PART 3 - EXECUTION

3.01 PREPARATION

A. Condition materials to average prevailing humidity conditions in installation areas prior to installing.

B. See Section 061000 – Rough Carpentry for installation of recessed wood blocking.

C. Prime and backprime lumber for painted finish exposed on the exterior. Comply with requirements for surface preparation and application in Section 099000 – Painting & Staining.

3.02 INSTALLATION

A. Discard units of material which are unsound, warped, bowed, twisted, improperly treated, not adequately seasoned or too small to fabricate work with minimum of joints or optimum jointing arrangements, or which are of defective manufacturer with respect to surfaces, sizes, or patterns.

B. Product joints which are true, tight, and well nailed with all members assembled in accordance with the Drawings. Field sand all finish trim material smooth, except Cedar, to remove saw marks, raised grain, etc. Cut all corners square and ease slightly.

C. Jointing: Make joints to conceal shrinkage; miter exterior joints; cope interior joints; miter or scarf end-to-end joints. Install trim in pieces as long as possible, jointing only where solid support is obtained.

1. Door and window casings shall be single lengths without splicing.

D. Fastening:

1. Install items straight, true, level, plumb, and firmly anchored in place.

2. Where blocking or backing is required, coordinate as necessary with other trades to ensure placement of required backing and blocking in a timely manner.

3. Nail trim with finish nails of proper dimension to hold the member firmly in place without splitting the wood.

4. Nail exterior trim with galvanized nails, making joints to exclude water.

5. On exposed work, set nails for putty.

E. Prime paint surfaces in contact with cementitious materials or separate with felt.

3.03 INSTALLATION OF OTHER ITEMS

A. Set items at locations shown, in perfect alignment and elevation, plumb, level, straight, true and free from rack, scribed to adjoining work.

B. Appearance: finished surface shall be free of tool marks.

3.04 ADJUSTMENT, CLEANING, FINISHING, AND PROTECTION

A. Keep premises in a neat, safe, and orderly condition at all times during execution of this portion of the work, free from accumulation of sawdust, cut-ends, and debris.

B. Repair damaged and defective finish carpentry work wherever possible to eliminate defects functionally and visually; where not possible to repair properly, replace woodwork. Adjust joinery for uniform appearance.

C. Clean finish carpentry work on exposed and semi-exposed surfaces. Touch up shop applied finishes to restore damaged or soiled areas.

D. Protection: Installer of finish carpentry work shall advise Contractor of final protection and maintain condition necessary to ensure that work will be without damage or deterioration at time of acceptance.

END OF SECTION

DIVISION 07 – THERMAL AND MOISTURE PROTECTION

SECTION 075423 – TPO ROOFING FULLY ADHERED

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

A. Related Documents:

1. Drawings and General Provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Extent of Work:

1. Provide and install a Fleeceback TPO System where shown on the drawings and specified herein. Work shall include, but not be limited to the following:

   a. Furnish and install TPO roofing system with flashings and all other incidental and accessory items to comprise a complete roofing system.
   b. Removal and legal disposal of all existing roofing, cover board, insulation, vapor barrier and membranes or plies down to the structural lightweight, concrete, steel or gypsum decks.
   c. Re-Securement of the decking; where applicable.
   d. Apply a vapor barrier to the decks, insulation and cover board to the vapor barrier with 2-part urethane adhesive, and fleece back TPO membrane in two-part urethane adhesive.
   e. New wall and base flashing, expansion joints.
   f. Cleaners, adhesives, sealants, seaming tapes, tape primers and fasteners.
   g. Flashing of all new roof penetrations.
   h. New gravel stops, wall copings and/or counter flashing and termination bars.
   i. Miscellaneous sheet metal or metal flashing.
   j. Provision and installation of new drains, connecting piping, and insulation where indicated.
   k. Manufacturer's guarantee.
   l. New wood blocking and anchor bolts around roof perimeter, roof penetrations, and similar locations, as required for the complete installation of the roofing system, and to meet new perimeter edge heights.
   m. Installation of new equipment curbs where indicated.
   n. Walkway pads where indicated.
   o. Provision of new tapered cants as required to meet new blocking at perimeter edges.
   p. Raising existing or installing new roof hatches as required to 8" above finish roof, as a result of the work required to raise finished roof surfaces.
   q. Raising existing skylights or installing new as required to 8" above finish roof, as a result of the work required to raise finished roof surfaces.
   r. Raising existing rooftop mechanical equipment curbs or installing new as required to 8" above finish roof, as a result of the work required to raise finished roof surfaces.
   s. Plumbing, mechanical or electrical modifications as required for completion of the installation.

C. Related Work/Requirements Specified Elsewhere:

1. Section 012100 – Allowances – where indicated.
2. Section 061000 – Rough Carpentry – for wood nailers, cants, curbs and blocking.
3. Section 076000 – Flashing and Sheet Metal – for metal roof penetration flashings, flashings and counter flashings.
4. Section 079200 – Joint Sealants.

1.02 GENERAL

A. The intention of this specification is to outline the entire roofing project, describing materials, methods, job conditions, etc., so that during the entire construction period, a complete watertight condition is maintained, and at completion, a new roofing system shall be installed.

B. The Instructions to Bidders, the General Conditions of the Contract for the Construction for Buildings prepared by the American Institute of Architects, the Supplementary General Conditions, and the General Requirements are part of this specification whether bound herewith or not, and the Contractor shall refer to them for instruction pertaining to his work.

1.03 ALTERNATES

A. Where so indicated the Contractor shall consult the "Bid Proposal Form" and read all alternates and assure him/herself whether or not they will add to, deduct from, or in any way affect the cost of the work under this section of the specifications. He/she shall include all such applicable alternates in his proposal.

1.04 REFERENCES

A. Factory Mutual (FM) Engineering Corporation - Roof Assembly Classifications.
B. Building Code of New York State
C. FS HH-I-526 - Insulation Board, Thermal (Mineral Fiber)
D. FS HH-I-529 - Insulation Board, Thermal (Mineral Aggregate)
E. FS HH-I-530 - Insulation Board, Thermal (Urethane)
F. FS HH-I-551 - Insulation Block and Boards, Thermal (Cellular Glass)
G. FS LLL-I-535 - Insulation Board, Thermal (Cellulosic Fiber)
H. National Roofing Contractors Association (NRCA) - Roofing and Waterproofing Manual
I. Underwriters Laboratories (UL) - Fire Hazard Classifications
J. Sheet Metal and Air-Conditioning Contractors National Association, Inc. (SMACNA)
K. CGSB 37GP56M Classification: Type 2, Class C, Grade 1
L. ANSI/SPRI/FM 4435/ES-1 – Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems.

1.05 PERFORMANCE REQUIREMENTS

A. General: Provide installed roofing membrane and base flashings that remain watertight; do not permit the passage of water; and resist specified uplift pressures, thermally induced movement, and exposure to weather without failure.

B. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by roofing manufacturer based on testing and field experience.

C. Jobsite Safety: Execute all operations and provide a safe work environment in accordance to OSHA standards and regulations. This requirement applies to all contractor personnel, associated subcontractors, workers in other trades, and jobsite visitors.

   1. Follow all industry fire prevention guidelines for storage of materials, staging areas, roof access, and application means and methods.

   2. Any applicable local fire codes supersede industry guidelines.

D. Wind Loads: Provide a roof system, including anchorage, capable of withstanding wind-load design pressures calculated according to requirements of the 2020 New York State Building Code or the American Society of Building Engineers' ASCE7, "Minimum Design Loads for Buildings and Other

Structures," 6.4.2, "Analytical Procedure," whichever is more stringent. **Refer to drawings for Wind Design Data.**

E. FMG Listing: Provide roofing membrane, base flashings, and component materials that comply with requirements in FMG 4450 and FMG 4470 as part of a roofing system and that are listed in FMG's "RoofNAV" for Class 1 or noncombustible construction, as applicable. Identify materials with FMG markings.

1. Fire/Windstorm Classification: Class 1A-105.

2. Hail Resistance: MH.

1.06 SYSTEM DESCRIPTION

A. For the purposes of this specification, the roofing system has been based upon products manufactured by ***Johns Manville Roofing Systems Group, Denver CO.***, or *an approved equal* by the Architect.

B. System Description: Vapor retarder, base ply insulation, tapered insulation, cover board, and a single ply TPO Fleeceback membrane system. All products must be from the membrane manufacturer. Include all membrane manufacturer's required pre-manufactured copings, gravel stops, and flashings and blocking as required, to provide complete roofing system warranty, whether detailed on the drawings or not.

1.07 SUBMITTALS

A. Comply with the requirements of Section 013300 – Submittal Procedures, and as modified below.

B. Manufacturer's product data sheets and installation instructions on all materials proposed for use.

C. Specimen copy of the manufacturer's standard 20-year NDL roofing warranty.

D. U.L. and F.M. compliance data: Contact roofing manufacturer for information.

E. Shop drawings indicating setting plan for tapered insulation. Exact locations of drains must be field verified prior to submittal.

F. Submit two 12-inch square samples of membrane illustrating the color and thickness to be used.

G. Submit a copy of the manufacturer's installation instructions.

H. Specified roof drain.

I. Shop drawings indicating proposed configuration of perimeter blocking and fastening, if different than that as shown on the Contract Documents.

1. Complete configuration of existing roof indicating layout of membrane sheets, seams between sheets, and location and type of all roof penetrations.

2. Complete details for attaching membrane at perimeter of roof, flashing of roof penetrations, blocking configurations, & other special details as required. This shall include, but not be limited to pre-manufactured gravel stops and copings. Note: Shop or Field-fabricated gravel stops & copings will not be permitted.

3. Complete layout of all tapered insulation indicating compliance with drainage patterns as shown on the drawings.

J. Submit list of at least five (5) successfully completed roofing projects using each of the TPO roofing systems proposed for use in this project. Include name, address, and telephone number of Owner's representatives. Identify square footage of total installation for each project listed.

K. If the above list of completed projects was not installed by the applicator, submit an additional list of at least four completed TPO roofing projects installed by the applicator. Include name, address, and telephone number of Owner's representative.

L. Certifications:

1. **All potential bidders shall submit notarized certification letters from the roofing manufacturer's main corporate offices indicating that the bidder has a minimum of five (5) years previous experience in the specific roofing system applications specified herein, and will provide a list of acknowledged projects to verify same. The contractor must be approved by the roofing system manufacturer for the installation of the primary roofing materials indicated, including membrane and flashing.**

2. Submit certification that roofing systems installed as part of this project comply with the specifications and installation instructions of the roofing system manufacturer.

3. Submit letter from roofing system manufacturer indicating that insulation has been approved by the roofing system manufacturer for use with the roofing system.

4. Submit letter of certification from roofing manufacturer that the specified TPO systems have been designed to satisfy the specified wind uplift criteria.

5. Submit letter of certification from the Contractor's NYS certified Structural Engineer that the proposed blocking and fastening systems have been designed to satisfy the specified wind uplift criteria necessary to carry the specified roofing system warranty.

6. Provide evidence of CERTA training for any installer of torch-applied modified bitumen membrane. Copies of certifications are required prior to award and must be maintained on the jobsite for inspection at any time.

1.08 QUALIFICATIONS

A. Applicator's Qualifications:

1. **Roofing applicator must be approved by the manufacturer prior to the bidding period and throughout the installation and able to present a copy of his certification as a part of the bid qualifications package required by this contract. This certification must be an original document as prepared directly by the manufacturer's corporate offices, specific for this contract. Submit certifications from manufacturer as per above.**

2. **Roofing applicator must have installed and successfully completed at least (5) five roofs of the same materials and methods specified for this project, completed over the last five years. Submit certifications from manufacturer pursuant to above section.**

3. **The selected bidder must be a single firm specializing in the types of roofing required, providing undivided responsibility for the performance of all component parts of the roofing system.**

4. **The contractor must be approved by the roofing system manufacturer for the installation of the primary roofing materials indicated, including membrane and flashing.**

5. **The contractor must have at least five (5) years of manufacturer-certified experience in installing commercial scale TPO roofing systems as required by this specification.**

6. **The contractor must employ roofing application foremen who have successfully completed all training offered by roofing systems manufacturer, including schools, seminars, etc.**

7. **Should the successful contractor opt to utilize the services of a subcontractor for any installations under this contract, the subcontractor shall also meet all requirements of experience and qualifications listed herein required for the Prime Contractor.** Note: No more than 25% of the required installations shall be made by manufacturer-certified subcontractors to the Prime Contractor, in conformance with the Instructions to Bidders section of the Project Manual.

B. Manufacturer's Qualifications:

1. The roofing system manufacturer must have a minimum of 10 years' experience in the marketing of TPO.

2. **For the work of this contract, the roofing system manufacturer must provide a factory-trained and factory-authorized field representative/technician, employed by the roofing system manufacturer, to supervise this project via a minimum of 10 on site visits, and to review installation procedures and advise applicator on procedures and precautions in use of roofing materials required for final inspection of the roofing system. The cost of this manufacturer's representative, and costs incurred for the supply of same, shall be considered inclusive within the contractor's Base Bid for this project. No exceptions will be made for this requirement. Work shall not begin on this project until this representative has arrived at the project, inspected it, and authorized for work to start. The manufacturer's representative shall sign-in upon each visit with the Construction Manager or designated owners' representative, so that accurate attendance records can be kept.**

   The intent of the site visits is that the manufacturer's representative will ensure the quality of the preparation and application of the roof system. The representative will inspect the project on a periodic basis to anticipate problems before they occur, answer questions quickly and look out for the best interest of the Owner.

   The manufacturer's representative will issue a written inspection report for each visit to be issued to the Owners Representative, Architect & Contractor.

3. The roofing system manufacturer must provide an NDL warranty (See paragraph 1.14 - "Warranty and Guarantees") upon satisfactory installation of the roofing system.

4. All roofing work, including terminations and other work covered under the roofing manufacturer's NDL Guarantee shall be performed by the Prime Contractor. No subcontractors will be permitted on this portion of the work.

1.09 REGULATORY REQUIREMENTS

A. Conform to applicable codes for roof assembly fire hazard requirements.

B. Factory Mutual Engineering and Research Corporation (FM):

1. Roof assembly classification of Class 1 Construction, wind uplift requirements as listed below.

a. Wind Uplift Certification: Submit a Letter from the manufacturer of the roofing system that all products manufactured by them including the specific insulation, adhesives and/or fasteners, are included in the specified Wind Uplift Performance: Roofing system shall be identical to systems that have been successfully tested by a qualified testing and inspecting agency to resist wind uplift pressure calculated in accordance with ASCE 7 for a **120 MPH three (3) second wind gust**.

b. All products shall be listed as Factory Mutual-certified a minimum of one (1) year prior to the date of installation. Submit certifications for both base and top plies as a part of the submittals required for this project.

c. Material Certification: Written certification from the roofing manufacturer certifying that the insulation, insulation fasteners, flashings and accessory products provided by the roofing manufacturer are approved for use with the roofing system and are included in the 20-year No Dollar Limit warranty.

2. Contact roofing manufacturer's technical representative for additional information.

C. Underwriters Laboratories, Inc. (UL):

1. Class A Fire Hazard Classification.

D. Insulation Criteria:

1. Polyisocyanurate foam insulation shall bear a label certifying that a thermal value was determined in accordance with ASTM C-1289-01.

2. Insulation supplied shall be acceptable to the membrane manufacturer.

E. ANSI/SPRI Wind Design Standard for Edge Systems used in Low Slope Roofs – all roof edge systems shall comply with the requirements of Chapter 16 of the current Building Code of New York State and tested for resistance in accordance with Test Methods RE-1, RE-2 and RE-3 of the current ANSI/SPRI System Requirements ES-1 Wind Design Standards.

1. Products shall be manufactured in specified manufacturer's facilities. Products fabricated by installer or other fabricator will not be acceptable unless fabricator can demonstrate to Architect's satisfaction that products have been tested for resistance in accordance with Test Method RE-1 and RE-2 of ANSI/SPRI ES-1.

1.10 PRELIMINARY / PRE-INSTALLATION ROOFING CONFERENCE

A. Convene prior to commencing work of this section at a time and location to be determined by the Owner or Owner's Representative.

1. All parties responsible for work of this section are required to attend including the Architect, Owner, Contractor, and any other trades involved in the roofing work.

B. The agenda for the pre-roofing conference shall include:

1. Review of all systems and materials to be used in the installation of new roofing, installation procedures and coordination required with related work.

2. Review and coordination of all substrate preparation and related work, including installation of curbs or similar items by others.

3. Review and modify roofing applicators proposed sequencing of the work.

4. Inspect and make notes of job conditions prior to installation.

5. Supply to the Owner's Representative, a letter from the corporate offices of the roofing manufacturer, which states the name, title, address and phone number of the factory-supplied representatives who will be assigned to this project. No exceptions will be made for this item.

C. Provide evidence of CERTA training for any installer of torch-applied modified bitumen membrane. Copies of certifications are required prior to award and must be maintained on the jobsite for inspection at any time.

1.11 DELIVERY, STORAGE, HANDLING AND DISPOSAL

A. Deliver all materials and store in their unopened original packaging and rolls with labels intact and legible, bearing the manufacturer's name, related standards, and any other specification or reference accepted as standard.

B. Deliver materials requiring fire resistance classification to the job with labels attached and packaged as required by labeling service.

C. Deliver materials in sufficient quantity to allow continuity of work.

D. Handle rolled goods as to prevent damage to edge or ends.

E. Select and operate material handling equipment so as not to damage existing construction or roofing.

F. Provide continuous protection of materials against wetting and moisture absorption.

G. Properly tie down insulation to prevent blow off. No material is to be stored on the roof at any time.

H. Protect materials against damage by construction traffic.

I. Comply with fire and safety regulations.

J. Protect membrane and flashing materials against coming in contact with coal tar pitch, petroleum, grease, oil, solvents, or other waste products. After exposure to pitch of other waste products, remove contaminated membrane and flashing material from site.

K. Protect materials during delivery to site. Keep materials in safe, dry storage at temperatures recommended by their manufacturers. Materials shall be labeled for ready identification; Label shall include name of manufacturer. Store all materials in a manner so as no direct contact is made with the ground.

Storage and Handling: Store materials in a dry, well-ventilated place protected from the weather.

1. Do not store materials so as to overload the deck or structural assembly.

2. Store all materials on raised platforms cover with properly secured breathable water-resistant covers. Slit shrink wrapping to not permit condensation and cover with breathable tarp.

3. Remove all materials that become wet from the site.

4. Store volatile liquids in a separate storage building or trailer. Or remove from the site at the end of each workday.

    a. Store volatile liquids at temperatures recommended by the manufacturer.

5. Do not remove materials from factory packaging until ready for use.

6. Store adhesives and sealants at temperatures between 60°F and 80°F.

L. Avoid stockpiling materials on roofs without first obtaining acceptance from the Architect/Engineer.

1.12 QUALITY ASSURANCE

A. Submit certification by the manufacturer of the system materials used that these specifications and drawing details are acceptable to them for the deck and surfacing to which they are to be applied.

1. If details for any manufacturer's system proposed in the Contract Documents are not acceptable to the manufacturer, submit corresponding details proposed for the particular application, together with the manufacturer's reasons for not accepting the conditions depicted in the specifications or drawings. No alternate details will be considered without evidence of valid objections on the part of the manufacturer to the contract requirements.

2. No deviation is to be made from this specification without prior written approval by the manufacturer; submit such approval to the Architect.

B. TPO Roofing Applicator Requirements: refer to 1.08A of this Section.

C. TPO Roofing Manufacturer Requirements: refer to 1.08B of this Section.

D. Material Requirements / Source Limitations:

1. Obtain all membrane sheets, flashings, prefabricated gravel stops and copings, all temporary roof materials and all surface coatings from a single manufacturer.

E. UL Rating:

1. Provide TPO membrane and insulation that has been classified by Underwriters Laboratories as a component of Class A roofing system.

F. **Wind Uplift:**

1. **Design adhered roofing systems and blocking configurations and attachments are to meet Factory Mutual wind uplift criteria (Factory Mutual Systems Loss Prevention Data Sheet 1-28). Refer to Article 1.09 of this Section.**

G. Inspection: Prior to, during installation, and at completion of the installation, an inspection shall be made by a representative of the manufacturer in order to ascertain that the roofing system has been installed according to their published specifications, standards, and details.

1. Warranty will be issued upon approval of the installation by the roofing manufacturer.

H. **Test Reports:** Provide:

1. **Roof drain and leader test or submit plumber’s verification.**

2. **Roof deck adhesive test to be completed by the selected contractor prior to start of their work by a third-party company.**

I. **Fire-Test-Response Characteristics:** Provide roofing materials with the fire-test-response characteristics indicated as determined by testing identical products per test method below by UL,

FMG, or another testing and inspecting agency acceptable to authorities having jurisdiction. Materials shall be identified with appropriate markings of applicable testing and inspecting agency.

1. Exterior Fire-test Exposure: Class A, ASTM E108, for application and roof slopes indicated.

1.13 JOB CONDITIONS

A. Surfaces on which the roofing membrane system is to be applied shall be clean, smooth, dry, and free of fins, sharp edges, loose and foreign materials, oil and grease.

1. Before beginning work, the authorized representative of the manufacturer shall examine the roof surfaces in order to ensure that all substrates are acceptable and will ensure the Total System / No Dollar Limit Warranty requirements of this contract.

B. Examine the substrate and the conditions under which roofing work is to be performed and notify the Architect in writing of unsatisfactory conditions. The Contractor will schedule a coordinated field meeting with the Architect and the authorized manufacturer’s representative to review said conditions prior to proceeding with the work. Do not proceed with any work until all unsatisfactory conditions have been corrected.

1. All surface voids greater than 1/4-inch-wide (or limitations as recommended by the roofing manufacturer) shall be properly filled with an acceptable fill material.

C. Moisture Protection:

1. Cover, seal or otherwise protect the roof and flashings so that water cannot accumulate or flow under completed portions. When and where necessary to accomplish this, provide temporary water cut-offs in accordance with the membrane manufacturer’s written specifications.

D. Environmental Conditions:

1. Do not smoke.

2. Do not apply insulation or roofing materials during rainstorms.

3. Do not apply roofing sheets when wind conditions are such that is difficult to handle the sheets.

4. Proceed with roofing work only when weather conditions are in compliance with manufacturer's recommended limitations, and when conditions will permit the work to proceed in accordance with requirements and the manufacturer's recommendations.

E. Protection:

1. Take necessary precautions to prevent damage of any kind to adjacent material and work for other trades.

2. Provide protection to prevent damage or staining of building surfaces, paved areas and plantings.

3. Provide enclosed chutes for removing debris from roof level, to roof level and to vehicles below. Do not throw debris from roof level.

4. Protect areas of deck repair at the end of each working day. Protection shall be watertight.

5. Provide and maintain operating water pumps on each roof area to keep areas free of water accumulation. Pump water through hoses of sufficient size to functioning roof drains.

6. **Drain Verification:**

    a. Prior to start of roofing removals, in the presence of the Owner's representative, verify that existing roof drains are operational and are not plugged.

    b. Submit in writing that the verification of roof drains has been performed. Include listing and location of non-operational drains.

F. Limit removal of existing roofing to the amount (or areas) that can be replaced with the complete new roofing system (including insulation, membrane, flashing, gravel stops, and related work) in a single working day, maintaining a completely watertight covering on the roof.

    1. At the end of each workday, or when weather conditions outside manufacturer's recommended limits are predicted, provide and install temporary water stops as recommended by the roofing manufacturer.

        a. Permanent roof insulation shall not be installed as base for temporary water stops.

        b. Remove temporary water stops completely before installing permanent roofing system.

1.14 WARRANTY AND GUARANTEES

A. Contractor's Guarantee: Furnish contractor's guarantee in accordance with Section 017000 for all materials and workmanship starting from date of Substantial Completion. Replace defective roofing at no expense to the Owner.

B. Manufacturer's Guarantee: Furnish manufacturer's twenty (20) year No Dollar Limit (NDL) guarantee and twenty-year membrane guarantee. Guarantee shall cover both labor and materials necessary to effect repairs, with No Dollar Limit as to effect roof repairs. Guarantee to cover membranes, flashings, insulation, expansion joints, adhesives, sealants, fasteners, fascia's and all materials installed as part of the roofing installation.

    1. **Guarantee shall include a wind rider for the repair of damages to the roofing system caused by winds up to and including three second gust of 120 MPH, 33 feet off the ground as defined by the 2020 New York State Building Code as adopted by New York State.**

C. These specifications may require more than what the manufacturer may require for providing a warranty for the roofing system. The specification where more stringent will take precedent.

D. The NDL Warranty shall be accompanied by a letter from the manufacturer's corporate office, attesting that the entire roofing installation was inspected during the complete course of the project by the factory-authorized representative, who shall be named, and that the entire installation is certified compliant to the manufacturer, and worthy of the required warranty.

    1. The NDL warranty shall include, but not be limited to the following conditions:

        a. Cracking due to expansion or contraction of the membrane.
        b. Deterioration due to exposure to the elements.
        c. Decomposition of membrane due to ponding water.
        d. Separation of factory and field fabricated seams and joints.
        e. Cracking or deterioration of membrane materials from trapped water vapor under membrane.
        f. Separation of or decomposition of membrane flashing.

2. Provide that in the event the roofing system fails to perform, the roofing systems manufacturer will, at its own expense, cause to be made the repairs or modifications to the roofing system necessary to affect water tightness and will re-inspect the roof and reissue the guarantee after reinspection.

3. In the event repairs are required due to natural disasters, unauthorized alterations, or other causes specifically excluded in the guarantee, the manufacturer will reinspect the roof and reissue the guarantee provided that the methods and materials used in the repair have received prior approval by the manufacturer and the repairs are accomplished by an approved applicator.

4. The manufacturer shall inspect the roof area under this contract every five (5) years of the duration of the warranty period and will provide written observation and associated specific maintenance recommendations, as applicable, to the Owner.

E. The Contractor is to cover damages to the building resulting from failure to prevent penetration of water during construction.

F. The Contractor is to guarantee all work against defects in materials and workmanship as per Section 017000 of this specification following final acceptance of the work.

1.15 LABORATORY TESTING

A. Upon request from the Owner or Architect, the roofing membrane manufacturers shall supply, at their expense, the results of mechanical and chemical testing performed on the materials supplied.

B. The tests shall be performed to certify compliance with the standards referenced under this section.

1.16 SITE PROTECTION

A. During roofing work, exposed surfaces of finished walls and ground shall be protected with tarps in order to prevent damage. Contractor shall assume full responsibility for any damage.

B. All work relative to this roof project shall include the use and installation of temporary partitions as necessary and required to adequately satisfy the needs for the separation of construction requirements of Section 013500.

PART 2 - PRODUCTS

2.01 GENERAL

A. For the purposes of this specification, and to identify a minimum level of quality, the design is based on the use of either:

1. *Johns Manville Roofing Systems Group*; Denver, Co.
2. *Carlisle Syntec Products; Carlisle, Pa.*
3. Or an approved equal by the Architect.

B. **Such references shall be construed only as establishing the quality of materials and workmanship to be used under this section, and shall not, in any way, be construed as limiting competition by other manufacturers offering products of identical material composition. Products used shall be those upon which the design is based, or shall be equal products, approved by the Architect. Equal products from GenFlex Building Products or Mulehide Products.**

C. **Bidders / Applicators seeking approval for substitute materials shall submit their request in writing to the Architect in accordance with the requirements of the project manual.**

2.02 ROOFING MEMBRANE

A. Membrane Layer

1. Single ply

a. Thermoplastic Polyolefin Fleeceback applications to be equal to Johns Manville **ST6PU C-I**.

2. Reference Standard

a. ASTM D6878-11a.

3. Products:

a. ***JM TPO 115 mil for Fleece Back Roofing System***

4. Typical Physical Properties of 115 mil Fleeceback

a. Tearing Strength D 751 >55 lbf (245 N) 90 lbf (403 N) 146 lbf (651 N)
b. Breaking Strength D 751 >220 lbf (978 N) 499 lbf (2,220 N) 450 lbf (2,003 N)
c. Overall Sheet Thickness D 6878 +15%, -10% 0.080 in. (2.032 mm)
d. Thickness of Coating Over Fabric Weather Side D 6878 >0.015 in. (.381 mm) 0.023 in. (0.584 mm)
e. Elongation at Reinforcement Break D 751 >15% 28% 26%
f. Ozone Resistance D 1149 No Cracks Pass
g. Heat Aging (Pass/Fail) D 573 Pass
h. Water Absorption D 471 ±3.0% max. 2.20%
i. Post Xenon Visual Inspection D 6878 Pass
j. Post Heat Aged Breaking Strength D 751 >90% retained values Pass, 519 lbf (2,311 N) Pass, 472 lbf (2,103 N)
k. Post Heat Aged Elongation at Reinforcement Break D 751 >90% retained values Pass, 33% Pass, 29%
l. Post Heat Aged Tearing Strength D 751 >60% retained values Pass, 90 lbf (403 N) Pass, 146 lbf (651 N)
m. Post Heat Aged Weight Change D 1204 ±1% max. <0.1%
n. Post Heat Aged Linear Dimension Change D 6878 ±1% max. <0.1%
o. Brittleness Point D 2137 -40°C (-40°F) Pass @ -40°C (-40°F)
p. Factory Seam Strength D 751 >66 (294) 171 lbf (761 N)
q. Weight NA 0.35 lb./ft2(0.015 kg/m2)

2.03 FLASHING

A. JM TPO membrane flashing.

B. Coping System: Manufacturer's factory fabricated coping consisting of a base piece and a Snap-On cap. Provide product manufactured and marketed by single-source membrane supplier that is included in the No Dollar Limit guarantee. Product: ***Presto-Lock Coping***

C. Fascia System: Manufacturer's factory fabricated fascia consisting of a base piece and a Snap-On cover. Provide product manufactured and marketed by single-source membrane supplier that is included in the No Dollar Limit guarantee. Product: ***Presto-Tite Fascia.***

2.04 FLEECEBACK BONDING ADHESIVES

A. Membrane Adhesive for TPO Fleeceback membrane; Product: ***JM Roofing System Urethane Adhesive (JM RSUA)***

2.05 FASTENING STRIP

A. Aluminum Bar, 1-1/2 inches by 1/8 inch. Pre-punched for fasteners, spacing maximum 12 inches on center.

2.06 TERMINATION STRIP

A. Polyester reinforced termination strip, 5 inches wide with a 3-inch self-adhering seam tape.

B. Tensile strength; 75 psi, peel strength; 8-10 psi.

2.07 LAP SEALANT

A. Lap sealant for sealing exposed edges of splices. Trowel or gun consistency.

2.08 WATER CUTOFF MASTIC

A. One-component, low viscosity, self-wetting butyl blend that has been designed for compatibility with TPO membrane.

2.09 PREFABRICATED ACCESSORIES

A. Two-piece molded TPO (thermoplastic polyolefin) pocket with a rigid vertical wall and preformed flange.

1. Product: ***JM TPO Penetration Pans***

B. A conically stepped pre-molded TPO membrane with a pressure sensitive tape on the flange.

1. Product: ***JM TPO Peel & Stick Pipe Boot***

C. A conically stepped pre-molded TPO membrane.

1. Product: ***JM TPO Pipe Boot***

D. A pre-molded inside corner manufactured with a non-reinforced TPO membrane.

1. Product: ***JM TPO inside Corner***

E. A pre-molded outside corner manufactured with a non-reinforced TPO membrane.

1. Product: ***JM TPO outside Corner***

2.10 WOOD BLOCKING, PLYWOOD AND CANTS

A. Blocking Thickness: Size as indicated or required to bring blocking flush with top surface of insulation and tapered edge strips.

B. Plywood Thickness: As required to bring wood blocking flush with top surface of insulation and tapered edge strips.

C. Install plywood on all masonry surfaces contaminated with asphalt or coal tar.

D. Species: Southern yellow pine.

E. Treated on all surfaces including field cuts.

F. All nailers and blocking material to be free of wane, shake, decay or checks, and pressure treated with water-borne preservatives for above ground use, AWPA LP-2. Standard and kiln dried to a maximum of 19% moisture content. Wood shall be dressed on all sides.

1. Shall be #2 or better lumber and conform to the current JM and NRCA recommendations on wood nailers as well as conform to the FM Global Loss Prevention Data Sheet 1-49. Creosote and asphaltic preservatives are not acceptable.

G. In order for to provide minimum tapered insulation profiles as necessary, the contractor may need to provide additional perimeter blocking (and fastening) details, based on verified field conditions. The cost of any field modifications required shall be at no additional cost to the Owner. **All blocking attachments shall be certified by a NYS licensed Professional Engineer (who is retained by the Contractor on a consultant basis) certifying that the connections as designed meet or exceed the wind uplift requirements of the roofing system.**

2.11 INSULATION

A. Tapered: ***JM Energy 3 Tapered and Tapered Crickets with a minimum R 30.***

1. Polyisocyanurate foam with fiberglass facer on both sides. Manufactured using Pentane as a blowing agent.
2. ASTM C1289-01, Type II, Class I, Grade II
3. Maximum Panel Size: 4 feet x 4 feet. R value: 5.7 per inch.
4. Tapered Insulation: 1/8 inch per foot slope with ¼ inch per foot crickets (Existing Buildings)
5. Tapered Insulation: ¼ inch per foot slope with ½ inch per foot crickets (New Buildings)
6. Compressive Strength: 20 psi minimum at any point. ASTM D1621-73.
7. Flame Spread: 25 or less, ASTM E-81-81.
8. Moisture vapor transmission: ASTM C355, less than 1 perm.
9. Water absorption: ASTM C209, less than 1%.
10. Dimensioned stability: ASTM D2126, 2% maximum 24 hours.
11. Factory Mutual approved and Underwriter's Laboratories listed.

B. Flat Stock: Base Layer – ***Energy 3- 20 psi with a minimum R Value of 30.*** (**Two (2) layers of 2.6 inch in Structurally Sloped areas).**

1. Polyisocyanurate foam, fiberglass facer on both sides, manufactured using Pentane as the blowing agent.
2. ASTM C-1289-01. Type II, Class I, Grade II
3. Maximum Panel Size: 4 feet x 4 feet. R value: 5.7 per inch
4. Compressive Strength: 20 psi minimum at any point, ASTM D1621-73
5. Flame Spread: 25 or less, ASTM E-81 81.

6. Moisture vapor transmission: ASTM C355, less than 1 perm.
7. Water Absorption: ASTM C209, less than 1%.
8. Dimensioned stability: ASTM D2126, 2% maximum 24 hours.
9. Factory Mutual approved and Underwriter's Laboratories listed.

C. All insulation shall meet or exceed the following requirements when tested in accordance with ASTM E-84:

1. Flame spread less than 25.
2. Smoke developed less than 450.
3. Fuel contributed less than 100.

2.12 ROOF COVER BOARDS (one of the following)

A. Cover Boards

1. Top Layer: ***Johns Manville's ProtectoR HD Cover Board.*** Product shall conform to the requirements of ASTM C 1289, Type II, Class 4, Grade 1.

a. Cover Board: ½ Inch thick.
b. High Density closed cell polyisocyanurate foam board with clay-coated fiber glass facer.
c. Minimum Compressive strength: Grade 1 – 109 psi (751 kPa).
d. Flexural Strength: 675 psi (4654 kPa), ASTM D 1037; 40 lbf (0.18 kN) ASTM 1037
e. Dimensional Stability: >0.5%, ASTM 2126
f. Moisture Vapor Permeance: <1 perm, 57.5 ng/(Pa•s•m^2) ASTM E 96
g. R-Value: 2.5 (hr•ft2•˚F)/Btu, ASTM C 518
h. Water Absorption (max) 1.5%, ASTM C 209
i. Surface Water Absorption: <1 gram, ASTM C473
j. Mold Resistance: Pass, ASTM D 3273
k. Weight per 4 x 8 Sheet: 12 lbs. (5.4 kg)

2. Top Layer: ***JM DEXcell FA Glass Mat Roof Board***

a. Provide Gypsum Core panel acceptable to the roofing system manufacturer and complying with Factory Mutual requirements for FM approval for Class 1.

b. Gypsum core panel shall be 5/8-inch-thick primed fire stop, treated gypsum core with a heavy-duty coated fiberglass facer, ***JM DEXcell FA Glass Mat Roof Board by National Gypsum*** *or Equal*. Gypsum core panel shall be fire resistant with zero flame spread and zero smoke developed when tested per ASTM E-84 tunnel test method.

2.13 GYPSUM SUBSTRATE BOARD FOR CEMENTITIOUS WOOD FIBER, STEEL DECKS AND GYPSUM DECKS

A. Provide Gypsum Core panel acceptable to the roofing system manufacturer and complying with Factory Mutual requirements for FM approval for Class 1.

B. Gypsum core panel shall be ½-inch-thick primed fire stop, treated gypsum core with a heavy-duty coated fiberglass facer, ***JM DEXcell FA Glass Mat Roof Board by National Gypsum*** or Equal.

C. Gypsum core panel shall be fire resistant with zero flame spread and zero smoke developed when tested per ASTM E-84 tunnel test method.

D. Provide Gypsum core panel on all steel and concrete decks when they are in the same roof section as the Cementitious Wood Fiber decks.

2.14 SBS-SELF ADHERED VAPOR BARRIER FOR DECKS WITH SUBSTRATE BOARD

A. Tri-laminate woven polyethylene, nonslip, UV-protected top surface, with an SBS Rubber and asphalt blend with low air and vapor permeability.

Basis of Design: ***JM Vapor Barrier SA***

B. Primer: ***JM SA Primer Low VOC***

2.15 SBS-MODIFIED VAPOR BARRIER FOR STRUCTURAL LIGHT WEIGHT AND CONCRETE DECKS

A. SBS Membrane Vapor Barrier: Thermally fused, Fiberglass reinforced, SBS Modified asphalt sheet; smooth surfaced; suitable for application method specified; ***Johns Manville DynaBase HW*** or approved equal by the Architect. Product shall conform to the requirements of ASTM D 6163, Type I, Grade S.

1. Description: *DynaBase HW* is composed of selected SBS modified bitumen applied onto a fiber-glass mat with a sanded underside and high brush sanded topside surface. Nominal thickness – 114 mils.

2. Physical Properties:

   a. Minimum Thickness: 90 mil (2.29 mm), minimum.
   b. Tensile Strength @ 0°F (-18°C):
      1) Machine Direction: 105 lbs. force/in. width (18.4 kN/m), minimum.
      2) Cross Machine Direction: 95 lbs. force/in. width (16.6 kN/m), minimum.
   c. Elongation @ 0°F (-18°C):
      1) Machine Direction: 5%
      2) Cross Machine Direction: 5%
   d. Tensile-Tear:
      1) Machine Direction: 100 lbs. force/in. width (17.5 kN/m), minimum.
      2) Cross Machine Direction: 90 lbs. force/in. width (15.75 kN/m), minimum.
   e. Low Temperature Flexibility: -30°F (-34°C).
   f. Dimensional Stability:
      1) Machine Direction: 0.1% change.
      2) Cross Machine Direction: 0.1% change.

2.16 PRIMER

A. ***JM Asphalt Primer***

2.17 INSULATION AND COVER BOARD SECUREMENT FOR CONCRETE DECKS

A. Urethane Adhesive: Manufacturer's two component urethane adhesive formulated to adhere insulation to substrate and insulation to insulation. Basis of Design: ***JM Two Part Urethane Insulation Adhesive***

2.18 FASTENERS

A. Wood Blocking

1. No. 14 screws with fluorocarbon coating that penetrate the nailers below 1 ¼ inches. Set in two rows staggered at 12 inches on center. Designed for securing wood to wood.

2. Spiral shanked galvanized nails that penetrate the nailers below 1 ¼ inch. Set in two rows staggered at 12 inches on center.

2.19 DECK REPAIR

A. Furnish and install a fast setting concrete mix, Product: ***Quikrete Fast-Set***.

2.20 ROOF CURBS

A. Provide a minimum of one row of wood blocking to top of existing curb to raise the flashing a minimum of 12 inches.

2.21 EXPANSION JOINTS (Where indicated on drawings)

A. Provide new expansion joint cover; ***JM Expand-O-Flash***, curb to wall and/or curb formed, 4" wide and 4" vertical.

2.22 ROOF DRAINS

A. ***For New Construction roofs,***

1. Single Drain (Primary Only) Model ZC100-DP-EA-VP as manufactured by Zurn or approved equal by Architect.

2. Double Drain (Primary with Overflow) Model ZC163-DP-EA-VP-W4 as manufactured by Zurn or approved equal by Architect.

3. Overflow Drain Downspout nozzle Z-199 SS as manufactured by Zurn or approved equal by Architect.

B. ***For Existing Construction Roofs,*** The Contractor shall remove the existing Roof Drain Dome Strainers and Flashing Clamp Rings and discard, clean and prep remaining drain bowl assembly for new roofing. Contractor to Install New Cast Iron Dome Strainers, Flashing Clamp rings and 2" Cast Iron Static Extension Ring, replace all missing or damaged components with new to match existing as manufactured by Zurn, or approved equal by Architect.

PART 3 – EXECUTION

3.01 REMOVAL

A. Removal of existing roofing, cover board, insulation, vapor barrier and the existing roofs down to the deck, along with all fasteners and plates, removing only that portion that can be made watertight at the completion of the workday or before any inclement weather.

B. **Care shall be taken to not cause damage to the existing structural deck. NTB Type Tectum Roof Fasteners must be backed out of the deck in lieu of pulling/yanking them out as this will cause damage to the CWF (Tectum)decking.**

C. Verify deck is clean and smooth, free of depressions, waves, or projections. All surfaces must be clean, smooth, dry, compatible and free of dirt, debris, oil/grease and gravel. Damaged or missing decking material must have new like materials installed so as to meet the requirements of the manufacture's written instructions for application of the new roofing.

D. Do not apply roofing materials to damp, frozen, dirty, dusty, or deck surfaces unacceptable to the manufacturer.

E. Remove and Replace all deteriorated or broken decking. Report this to the Owners Representative.

3.02 PHASE APPLICATION

A. Apply primer and vapor barrier to the areas indicated during the same day that the roof is removed, or before inclement weather, including making all areas watertight. All seams are to be sealed each day.

3.03 CONDITION OF SURFACE

A. Surfaces that will receive roofing shall be in a condition ready to receive the required roofing per the manufacturer's requirements.

B. Clean the substrate of projections and substances detrimental to the work.

C. Install cant strips and similar accessories as shown and as recommended by the roofing systems manufacturer even though not shown.

1. Install wood nailers at the perimeter of the entire roof and around penetrations as indicated.

a. Anchor nailers roof deck in accordance with Article 3.05, G, H and I.

D. Coordinate roofing with flashings and other adjoining work to insure proper sequencing of the entire work.

3.04 PREPARATION

A. No trace of surface water shall be present. Materials under roofing shall be completely dry. Sweep surface clean of dust, debris, and loose and foreign materials.

B. Start of application of roofing signifies acceptance of existing conditions.

3.05 WOOD BLOCKING, CANTS AND PLYWOOD

A. Wood Blocking is required, as indicated in the details and drawings.

B. Provide new treated wood blocking where existing wood blocking, that is not indicated to be removed, is deteriorated.

C. Provide treated wood blocking at perimeter of roofing membrane, all sides of penetrations by roof accessories, mechanical curbs, and other areas where blocking is required by membrane manufacturer to nail membrane and flashing in place.

D. Blocking Thickness: Equal to total thickness of insulation and cover boards.

E. Provide wood blocking to raise existing equipment curbs flashing heights. Maintain 8 inches minimum height above membrane.

F. Provide treated wood blocking, and plywood at locations indicated.

G. In all areas where nailers are required, they shall be firmly anchored to the deck to resist a minimum force of 200 lbs./lineal foot (2.9 kN/m) in any direction. A ½ inch (15 mm) of each end. Spacing and fastener embedment shall conform to FM Global Loss Prevention Data Sheet 1-49.

H. Secure wood blocking to wood blocking with 16 p nails at 6 inches on center. Stagger nails on each side of blocking.

I. All woodwork to be reused shall resist a minimum force of 200 lbs. / lineal foot (2.9 kN/m) in any direction and shall be free of rot. If any existing woodwork is questionable, it shall be removed and replaced with suitable new materials.

3.06 INSTALLATION OF VAPOR BARRIER TO CONCRETE AND LIGHTWEIGHT DECKS

A. GENERAL

1. Vapor Barrier shall be installed in accordance with the manufacturer's current published specifications and recommendations.

2. Install the Base Ply sheet to the Concrete deck as per FM Global Data sheet 1-29.

   a. Install the concrete primer as per the manufactures written instructions but not less than 1 gallon per 100 sq. ft.

   b. Allow to dry thoroughly prior to installing vapor barrier.

   c. Thermally fuse as per the manufacturer's recommendation and details the SBS vapor barrier to the primed concrete deck only, lapping end laps 6 inches and side laps 3 inches.

   d. ***Contractor shall supply a fire-watch crew for a minimum of two (2) hours past the point of completion of the day's work on any areas where a torch is being used. A separate fire-watch crew shall be assigned to interior space and exterior space. All employees of the contractor using or assisting with the installation of torched products must be NRCA CERTA trained in the use of torched applications.***

3.07 INSTALLATION OF VAPOR BARRIER ON CEMENTITIOUS WOOD FIBER, STEEL AND CONCRETE DECKS THAT ARE IN THE SAME ROOF SECTIONS AS CEMENTITIOUS WOOD FIBER DECKS

A. General

1. Install the Substrate Gypsum board as per the manufactures written instructions but with not less than 16 fasteners per 4'x4' board on steel decks.

2. Set Substrate Gypsum board on CWF (tectum)and concrete decks in a serpentine fashion using two part urethane insulation adhesive applied in a 3/4 inch wide bead on the back side of the substrate gypsum board and when material is ready to be set flip the board into place. Install at the following minimum rates:

   a. Perimeter: Beads at 4 inches on center
   b. Corners: Beads at 4 inches on center
   c. Field: Beads at 4 inches on center

3. **SA Primer** is to be mixed well before use. Do not thin. Apply with roller or spray can. Apply uniformly with no streaks or puddles. Allow to dry completely. Primer should be tacky but should not transfer to a clean dry finger.

B. Roll out **Vapor Barrier SA** membrane over the areas that have received the **SA Primer Low VOC**. Be sure to stagger the end laps and overlap the side laps by a minimum of 3". Once the membrane is in the desired location, hold the membrane tight while peeling away the silicone release liner at an angle. Install additional rolls in the same way, with 3" side laps and 6" end laps. A minimum 75-pound split linoleum roller should be used over the entire surface and a 4" rubber roller should be used in the overlap areas.

3.08 INSULATION AND COVER BOARD INSTALLATION

A. Adhered Insulation: Install each layer of maximum 4'x4' insulation and cover board and adhere to substrate as follows:

B. Starting at the low edge of the roof, install thermal layer and thermal protective layer in specified urethane adhesive.

C. Install boards with long joints continuous.

D. Stagger all joints from the board below.

E. Butt joints tightly.

F. "Occasional" joint widths up to 1/8" will be allowed. Fill all any widths greater than 1/8" with scrap thermal layer to achieve consistent surface.

G. Set thermal layer in a serpentine fashion using 2-part urethane insulation adhesive applied in ¾-inch-wide beads at the following minimum rates:

1. Field: Beads at **4** inches on center
2. Perimeter: Beads at **4** inches on center
3. Corner: Beads at **4** inches on center

H. Place board into the adhesive while it is still tacky.

1. If adhesive reaches its tack-free state, remove and re-apply adhesive.

I. Press the thermal layer into the adhesive to a firm and uniform bearing.

1. Use ballast (sandbags or bagged rocks) on all four corners of the board for a minimum of 30 minutes to ensure contact of material and adhesive, if necessary.

J. Keep insulation absolutely dry at all times. Discard insulation that contains moisture.

K. Install only as much insulation as can be covered with roofing membrane the same day.

L. Repair any defects or installation errors prior to next phase of roof system installation.

3.09 MEMBRANE INSTALLATION FOR FLEECEBACK SYSTEM

A. Install Johns Manville roofing membrane specification **ST6PU C-I** in the areas over vapor barrier on the deck specified. Install roofing according to membrane roofing system manufacturer's written instructions or these specifications whichever are more stringent. Unroll roofing membrane and allow to-relax before installing.

B. Start installation of roofing membrane in the presence of membrane roofing system manufacturer's technical personnel.

C. Accurately align roofing membrane and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

1. Once the membrane has been properly positioned, fold the sheet back half of the sheet's length.

D. Apply Roof System Urethane Adhesive in a ¾ (three quarters) bead in the following minimum pattern.

   a. Field: Beads at **4** inches on center
   b. Perimeter: Beads at **4** inches on center
   c. Corner: Beads at **4** inches on center

E. Mechanically fasten roofing membrane securely at terminations, penetrations, and perimeter of roofing.

F. Apply a heavy smooth surface roller over the entire roof as soon as the membrane is set in place.

G. Apply roofing membrane with side laps shingled with slope of roof deck where possible.

H. Seams: Clean seam areas, overlap roofing membrane, and hot-air weld side and end laps of roofing membrane according to manufacturer's written instructions to ensure a watertight seam installation.

   1. Test lap edges with probe to verify seam weld continuity.
   2. Apply lap sealant to seal cut edges of roofing membrane.
   3. Verify field strength of seams a minimum of twice daily and repair seam sample areas.
      a. Remove and repair any unsatisfactory sections before proceeding with Work.
   4. Repair tears, voids, and lapped seams in roofing membrane that do not meet requirements.

I. Spread sealant or mastic bed over deck drain flange at deck drains and securely seal roofing membrane in place with clamping ring.

3.10 MEMBRANE FLASHING

A. General: TPO membrane shall be used for flashing of all straight walls, large curbs, and all large, straight sided penetrations. TPO Flashing or TPO Peel & Stick Flashing shall be used for flashing of all pourable sealer penetration pockets, vent pipes, scuppers, curbs, T-Joints, inside/outside corners of wall flashings, etc.

B. All pipe penetrations are to be flashed with TPO Flashing, TPO peel & Stick Flashing or TPO Pre-Molded Pipe Boots. Refer to all applicable TPO Detail Drawings.

C. Straight run wall and curb flashing shall be flashed with TPO. **Note: All flashings are to extend a minimum height of 8" (200 mm) above the roof level.**

D. On all re-roofing applications, loose flashing materials must be removed down to a sound substrate and replaced with new flashing. To ensure proper drainage of the existing structure, weep holes must never be covered by new flashings.

E. Terminations utilizing aluminum compression bars or surface-mounted counter flashings must be secured directly to a smooth and sealed wall surface.

F. TPO wall flashings terminated with metal copings must be fully extended under the coping and mechanically fastened a minimum 1-1/2" (40 mm) down the face of the wall.

G. TPO Flashing Membrane shall be adhered to the substrate using TPO Bonding Cement. Follow the TPO instructions for correct application of this cement. The flashing membrane shall be rolled carefully into the substrate. Care must be taken to ensure that the flashing does not bridge at any change of direction, such as from the base of a parapet wall to the roof deck.

3.11 INSTALLATION OF ROOF EDGING SYSTEMS

A. Verify that the roof edging installation will not disrupt other trades.

B. Verify that the substrate is dry, clean and free of foreign matter.

C. Report and correct defects prior to any installation.

D. Submit product design drawings for review and approval to Architect or Specifier before fabrication.

E. Check as-built conditions and verify the manufacturer's roof edge details for accuracy to fit the wall assembly prior to fabrication.

F. Comply with the roof edging manufacturer's installation guide when setting edging.

G. Use provided fasteners consistent with manufacturer's instructions, suitable for the substrate to which it is being installed.

H. Install water cut-off, as recommended by the membrane manufacturer, under the anchor bar.

I. Roof Edge Flashing Strips

1. Install flashing strips in longest lengths possible to minimize laps under anchor bar.

J. Follow manufacturer's application method for installing flashing strips.

1. Minimum 8 inches into the field of the roof.
2. Down outside face of the wall, ½-inch past wood nailers.
3. Miter and Scupper Bar.

K. Splice Plates

1. Apply 3/8-inch bead of non-curing sealant to both sides of spacer and on deck flange.

L. Anchor Bars

1. Remove all dirt, dust and debris from anchor bar.

2. Apply a 3/8-inch-wide and ¼-inch-thick band of mastic to the back of the anchor bar.

3. Position 12-foot sections of anchor bar with applied mastic overlapping splice plate and butting securely to EPDM gasket.

4. Allow ½-inch space between anchor bars.

5. Install splice plate at opposite end of 12-foot anchor bar.

6. Fasten anchor bar at 12 inches on center intervals through out.

7. Use 2" stainless steel fasteners provided by manufacturer.

8. Field cut sections as necessary.

M. Fascia Panels

1. Install panels left to right.

2. Position 12’ fascia panels on top of anchor bar.

3. Overlap preceding panel by 1 inch at notches provided.

4. With panels in correct position snap each section into anchor panel.

3.12 FLASHING

A. Follow same procedures as described for cleaning, adhesive application, and lap sealant application.

B. Install field sheet up and over wood blocking at all fascia or coping areas fastening the sheet on the outside face of the wood blocking.

C. At vertical surfaces apply TPO flashing over polyester reinforced termination strip.

D. Extend flashing 4 inch minimum onto the roof surface and full height of curbs and vertically up walls a minimum of 12 inches unless indicated otherwise. Remove roof top equipment to extend flashing over the top of the curbs. Provide deck overlayment on vertical surfaces.

E. Remove roof top power ventilators, extend top of curb to minimum 12 inches above roof line. Extend flashing over top of curb. Reset equipment.

F. Provide termination strip and continuous bead of sealant under counter flashing.

G. Straight run wall and curb flashings shall be flashed with TPO membrane. **Note: All flashings are to extend a minimum height of 8” (200mm) above the roof level.**

H. On all re-roofing applications, loose flashing materials must be removed down to a sound substrate and replaced with new flashing. To ensure proper drainage of the existing structure, weep holes must never be covered by new flashings.

I. Terminations utilizing aluminum compression bars are surface-mounted counter-flashings must be secured directly to a smooth and sealed wall surface.

J. TPO wall flashings terminated with metal copings must be fully extended under the coping and mechanically fastened to the face of the outside wall covering all wood blocking a minimum 1 ½” past where wood terminates(40mm).

K. TPO Flashing Membrane shall be adhered to substrate using TPO bonding cement. Follow the TPO adhered instructions for correct application of this cement. The flashing membrane shall be rolled carefully into the substrate. Care must be taken to ensure that the flashing does not bridge at any change of direction, such as from the base of a parapet wall to the roof deck.

3.13 WALKWAY PADS

A. Provide manufacturer’s standard TPO walkway pads at each roof ladder (Top and Bottom), at each roof hatch and completely around each HVAC unit and any other areas designated on the drawings. Install in accordance with manufacturers requirements with lap cement or seam tape.

3.14 EXPANSION JOINT

A. Install a new expansion joint cover, curb to wall, curbed formed as per the manufacturers’ specifications.

3.15 WATERSTOPS

A. Install temporary cutoffs around incomplete edges of roofing assembly at the end of each workday and when work must be postponed due to inclement weather. Straighten the insulation line using loosely laid pieces of insulation. Seal the JM TPO membrane to the deck or existing membrane by performing the following procedure: Fold the edge of the roofing membrane back a minimum of 12" (300mm). Clean the surface of the folded-back membrane with JM TPO Primer/Wash or other approved cleaning method. Apply a 1/4-inch (8mm) bead of JM Lap Caulk or Pourable Sealer on the cleaned area of the sheet. If the roofing membrane installation is to be delayed for 14 days or more, of if the substrate surface is rough, apply two 1/4-inch (8mm) beads of sealant.

B. Remove the temporary seams completely when work resumes, cutting out the contaminated membrane. Remove all sealant, contaminated membrane, insulation fillers, etc. from the work area and properly dispose off-site.

3.16 INSPECTIONS

A. All work shall be subject to inspection by Architect and Owner. Work found to be in violation of specifications or not in accordance with established workmanship practices and standards will be subject to complete removal and proper replacement with new materials at contractor's expense.

3.17 CLEANING

A. Clean up and remove daily from the site all wrappings, empty containers, paper, loose particles, and other debris resulting from these operations.

B. Remove markings from finished surfaces.

C. Repair or replace defaced or disfigured finishes caused by work of this section.

3.18 PROTECTION

A. Provide traffic ways, erect barriers, temporary interior partitions and enclosures, fences, guards, rails, enclosures, chutes, and the like to protect personnel, roofs, and structures, vehicles and utilities.

B. Plywood for traffic ways required for material movement over existing roofs shall be not less than 5/8" thick.

C. In addition to the plywood listed above, an underlayment of minimum ½-inch recovery board is required on new roofing.

D. Special permission must be obtained from the manufacturer before any traffic will be permitted over new roofing.

E. Provide reinforced polyethylene membrane over the finished roof area and held in place with a removable double-sided tape installed at the completion of each day.

F. Provide tape in such a manner that the wind will not blow the 6-mil poly off the competed roof area. Area of complete roofing must be kept clean at all times.

3.19 FIELD CONTROL

A. Field inspection will be performed as outlined under 1.08B of this section.

3.20 ROOF DRAINS

A. New Roofs:

1. Set drain flange tight to roof deck.

2. Secure roof drain to roof deck with approved mounting plate or under deck clamp bolted to underside of drain body.

3. Insulate roof drain sump and horizontal piping.

4. Coordinate with types, locations, and quantities as indicated on plans.

B. Existing Roofs:

1. The Contractor shall remove the existing Roof Drain Dome Strainers and Flashing Clamp Rings, Roof flashings and discard.

2. Clean and prep remaining drain bowl assembly for new roofing.

3. Drill and tap broken drain bolts and replace if necessary.

4. Repair or replace broken drain components.

5. Contractor to Install New Cast Iron Dome Strainers, Flashing Clamp rings and 2” Cast Iron Static Extension Ring, replace all missing or damaged components with new to match as manufactured by Zurn, or approved equal by Architect.

C. Provide a smooth transition from drain bowl to deck surface.

1. Taper insulation back from drain a minimum of 24” to provide for positive drainage.

2. Prime all metal surfaces.

D. Install TPO membrane at drain bowl.

1. Proceed with installations only after unsatisfactory conditions have been corrected.

2. Extend membrane 1" beyond the inside edge of the drain bowl.

3. **Position membrane so as to avoid the occurrence of any seams at roof drain locations.**

E. Install clamping ring and drain covers supplied with drain.

F. Test all drains for proper flow and water-tightness. Correct any and all defects.

3.21 VENT STACKS AND PENETRATIONS

A. Use pre-molded pipe boot for vent stacks.

B. Use peel and stick pipe boots for all hot pipe penetrations.

C. Use roof penetration pocket flashing with nailers and pourable sealer for all angles and unusual penetrations.

3.22 POSITIVE DRAINAGE

A. The General Construction Contractor or the roofing contractor (if separate prime contract) shall be responsible for installing the roof slope and drainage in accordance with N.R.C.A. standards. Additionally, the Contractor shall be responsible for the installation of structural steel, roof decking, roof drains, tapered insulation, perlite, crickets, roof plies, etc. in accordance with and to the tolerances indicated in the contract documents.

There should be no standing water on any portion of the entire roof surface 48 hours after a rainfall, during ambient drying conditions.

END OF SECTION

DIVISION 07 – THERMAL AND MOISTURE PROTECTION

SECTION 076000 – FLASHING AND SHEET METAL

PART 1 - GENERAL

1.01 SUMMARY

A. Provide and install new cap, counterflashing, wall and base flashing as required for proper installation, as shown on drawings and specified herein.

B. Related Sections include the following:

1. Section 033000 – Cast-in-Place Concrete - for concrete fill and reinforcing steel.
2. Section 042000 – Unit Masonry - for work adjacent to work of this Section.
3. Section 051200 – Structural Steel Framing - for work adjacent to work of this Section.
4. Section 053000 – Metal Decking - for work adjacent to work of this Section.

1.02 DELIVERY AND STORAGE

A. Delivered materials shall be in the manufacturer's original packages and containers, clearly marked with the approved manufacturer's name and trademark for every item.

B. Store all materials in a dry, ventilated place off the ground. During adverse weather conditions and job delays, store materials under cover or in a totally enclosed space. Use of wet materials will not be permitted.

1.03 PREPARATION

A. Wood blocking and nailers for flashing cleats shall have been rigidly anchored in place.

B. Dissimilar materials in contact shall be fully isolated from each other. Unprimed, abraded, or otherwise corrosive surfaces of metal shall receive a coat of the bituminous paint, and allow to dry before assembling.

1.04 SUBMITTALS

A. Comply with requirements of Section 013300 – Submittal Procedures and as modified below.

B. Product Data:

1. Submit manufacturer's product specifications, installation instructions, and general recommendations for each specified sheet metal material and fabricated product.

C. Samples:

1. Submit two 8" square samples of specified sheet materials to be exposed as finished surfaces.

2. Submit two 12" long completely finished units of specified fabricated products exposed as finished work.

D. Shop Drawings:

1. Submit shop drawings showing layout, joining, profiles, and anchorages of fabricated work, including major counter flashings, trim/fascia units.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Aluminum: ASTM B209, .032" thick aluminum alloy 3003-H14.

B. Copper: ASTM B370, 16 oz. and 20 oz. soft temper. Copper exposed to weather shall be lead coated as per ASTM B101. Class "A".

C. Solder: As recommended by the copper manufacturer. Conform to ASTM B32 - min. tin content for lead coated copper 60 percent.

D. Stainless Steel: Sheets or strips - ASTM A240 or ASTM A666, Type 302 or 304 gauge. .015 inch - 8-to-10-foot lengths. Finish - 2D. Solder - ASTM B32 - 60-40% block tin and piglead. Flux - Acid type. Sealant - single component synthetic rubber - color as selected by Architect.

E. Nails: For copper work, 3/8" diameter head, solid copper.

F. Pop Rivets: Noncorrosive metal, may be used where watertightness of fastener is not a factor or if waterproof rivets are used.

G. Standard of Workmanship: Methods of forming and joining copper shall be as specified and detailed in the booklet "Copper and Common Sense", published by Revere Copper and Brass Incorporated, except as modified herein and suggested guide specifications for "Stainless Steel Roofing and Flashing" published by International Nickel Company, Inc.

H. Pipe Flashing: Flashing around pipes and vents extending above the roof shall consist of copper stainless zinc tubes of proper diameter, extending at least 12" above the finished roof surface, and extending at least 6" beyond opening.

I. Mechanical Equipment Flashing: Examine plans and specifications for mechanical and electrical trades and note extent of flashing covered herein. Provide all flashing in addition thereto as necessary.

PART 3 - EXECUTION

3.01 EXAMINATION

A. The installer shall examine the substrate and the conditions under which flashing work is to be performed, and notify the Contractor in writing of unsatisfactory conditions. Do not proceed with the work until unsatisfactory conditions have been corrected in an acceptable manner.

3.02 PREPARATION

A. Coordination:

1. Coordinate flashing work with other work for correct sequencing of items making up entire system of waterproofing and rain drainage.

2. Do not proceed with the installation of flashing work until curb and substrate construction, cant strips, blocking, reglets, and other construction to receive the work are complete.

3.03 INSTALLATION

A. Comply with manufacturer's instructions for handling and installation of flashing work.

1. Unless otherwise recommended by manufacturer, comply with recommendations of NRCA's "The NRCA Roofing Manual" and SMACNA's "Architectural Sheet Metal Manual" for items shown on drawings.

2. Sheet Metal Standard for Copper: Comply with CDA's "Copper in Architecture Handbook" Conform to dimensions and profiles shown unless more stringent requirements are noted on the drawings.

3. Comply with details and profiles shown on drawings.

B. For non-moving seams, provide soldered flat lock seams, except as otherwise indicated. Comply with metal producer's recommendations for tinning, soldering, and cleaning the joints.

1. Flashing and trim: 10'-0" maximum spacing, and 2'-0" from corners and intersections.

2. Conceal fasteners and expansion provisions wherever possible. Fold back edges on concealed side of exposed edges to form a hem.

3. Insert flashings into reglets where shown. Anchor by mechanical means, including driven wedges of lead or other compatible metal, space 2'-0". Seal the joint with sealant as indicated.

4. Separate copper work from dissimilar metals by a 15 mil dry film thickness bituminous coating or by a heavy tinning of solder at spot contacts.

5. Fabricate, support, and anchor rain drainage in a manner which will withstand thermal expansion stresses and full loading by water or ice, without damage, deterioration, or leakage.

6. On bituminous membranes, provide not less than 4" embedment of flashing in membrane, and cover edge with tape or stripping set in roofing cement.

3.04 MISCELLANEOUS WORK AND CLEANING

A. Do all necessary cutting, patching fitting in connection with the flashing work required to coordinate this work with that of other trades.

B. On completion, flashing work shall be left in perfect condition. Neutralize excess flux which may cause acid stains in washing soda.

END OF SECTION

DIVISION 07 – THERMAL AND MOISTURE PROTECTION

SECTION 076219 – FABRICATED GRAVEL STOPS AND FASCIA

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included:

1. Provide and install new metal fascia, coping, gravel stop, drip edge, and coping cap as required for installation of new roof cover as specified in the roofing section and as shown on Drawings.

1.02 RELATED SECTIONS

A. Section 061000 – Rough Carpentry
B. Section 072100 – Building Insulation
C. Section 074213 – Metal Wall Panels
D. Section 074293 – Metal Fascia and Soffit Panels
E. Various Division 07 Roofing Specifications

1.03 REFERENCES

A. ANSI/SPRI/FM 4435/ES-1 – Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems.
B. Florida Building Code, including the High Velocity Hurricane Zone
C. Miami-Dade County NOA No. 03-0108.06
D. Factory Mutual Research Corporation Approval Guide
E. SPRI Single Ply Roofing Industry Standards

1.04 SUBMITTALS

A. Comply with requirements of Section 013300 – Submittal Procedures and as modified below.

B. Product Data: Manufacturer's data sheets on each product to be used, including:

1. Preparation instructions and recommendations.
2. Storage and handling requirements and recommendations.
3. Installation methods.

C. Shop Drawings: Show profiles, joining method, location of accessory items, anchorage and flashing details, adjacent construction interface, and dimensions.

D. Selection Samples: For each finish product specified, two complete sets of color charts representing manufacturer's full range of available colors and patterns.

E. Verification Samples: For each finish product specified, two sample chips representing actual product, color, and patterns.

F. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

G. Edge Securement and Design Criteria:

1. ANSI/SPRI Wind Design Standard for Edge Systems used in Low Slope Roofs – all roof edge systems shall comply with the requirements of Chapter 16 of the current Building Code of New

York State and tested for resistance in accordance with Test Methods RE-1, RE-2 and RE-3 of the current ANSI/SPRI System Requirements ES-1 Wind Design Standards.

2. Products shall be manufactured in specified manufacturer's facilities. Products fabricated by installer or other fabricator will not be acceptable unless fabricator can demonstrate to Architect's satisfaction that products have been tested for resistance in accordance with Test Method RE-1 and RE-2 of ANSI/SPRI ES-1.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing Products specified in this section with minimum twenty five years documented experience.

B. Installer Qualifications: Company specializing in the installation of products specified in this section with minimum five years documented experience.

C. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.

1. Finish areas designated by Architect.
2. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.
3. Refinish mock-up area as required to produce acceptable work.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store materials in a dry, protected, well-vented area.

C. Remove protective plastic surface film immediately before installation.

D. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.07 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.08 WARRANTY

A. Wind Warranty Period: Warranted in wind conditions up to 215 mph with a Lifetime wind warranty. Warranty specified for individual products below.

B. Wind Warranty Period: Warranted in wind conditions up to 120 mph with a 20 Year wind warranty. Warranty specified for individual products below.

C. Warranty Period, Product: 5-year workmanship warranty covering replacement or repair of products that are defective in material or workmanship.

D. Warranty Period, Finish: Limited 30-year warranty for prefinished coil-coated steel and aluminum coated with Kynar 500 standard colors covering fade, chalk, and film integrity.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturer: Metal Era, Inc., which is located at: 1600 Airport Rd.; Waukesha, WI 53188; Toll Free Tel: 800-558-2162; Tel: 262-549-6900; Fax: 800-373-9156; Email: request info (info@metalera.com); Web: www.metalera.com; or Architect approved equal.

2.02 ROOF EDGE PRODUCTS

A. Anchor-Tite Standard Fascia: Decorative metal fascia with continuous extruded aluminum bar.

1. Construction:

a. Fascia metal gauge:

1) .040 inch thick formed aluminum.
2) 24 gauge galvanized steel.

b. Aluminum Finish:

1) Standard color Kynar-500 as selected by the Architect from roof edge manufacturer's color chart or custom Kynar-500 color as selected by the Architect.

c. Fascia: Standard 12 feet 0 inches lengths.

d. Extruded bar: Shall be continuous 6063-T6 alloy aluminum at 12 feet 0 inches standard lengths with pre-punched slotted holes. All bar miters are welded.

1) Injection Molded EPDM Bar Splice to allow thermal movement expansion of extruded aluminum anchor bar.
2) Fasteners: 2 inch stainless steel with driver.

2. Fully Adhered or Mechanically Attached Single-Ply Version

a. Model:

1) AF-55 or as indicated on the drawings.

b. Performance:

1) Lifetime, 215 mph Wind Warranty.
2) Tested per ANSI/SPRI ES-1 Standard to a design pressure of 290 lbs./ft to comply with the current New York State Building Code.
3) Factory Mutual 1-645 approved for wind up lift protection.
4) Miami-Dade Approved (No. 13-0419.03 12/11/18) to comply with the "High Velocity Hurricane Zone of the Florida Building Code".

3. Built-Up or Modified Version

a. Model:

1) AFM-55 or as indicated on the drawings.

b. Performance:

1) Lifetime, 215 mph Wind Warranty.
2) Tested per ANSI/SPRI ES-1 Standard to a design pressure of 290 lbs./ft to comply with the current New York State Building Code.
3) Factory Mutual 1-645 approved for wind up lift protection.
4) Miami-Dade Approved (No. 13-0419.03 12/11/18) to comply with the "High Velocity Hurricane Zone of the Florida Building Code".

B. Anchor-Tite Extended Fascia: A three-part assembly consisting of a continuous extruded aluminum bar, exterior fascia and continuous formed galvanized steel cleat with fasteners.

1. Construction:

a. Fascia Metal:

1) 063 inch thick-formed aluminum.

b. Aluminum Finish:

1) Standard color Kynar-500 as selected by the Architect from roof edge manufacturer's color chart or custom Kynar-500 color as selected by the Architect.

c. Fascia: standard 12 feet 0 inches lengths with matching concealed joint splice plates.

d. Extruded bar: Shall be continuous 6063-T6 alloy aluminum at 12 feet 0 inches (3.65 m) standard lengths with pre-punched slotted holes. All bar miters are welded.

1) Injection Molded EPDM Bar Splice to allow thermal movement expansion of extruded aluminum anchor bar.
2) Fasteners: 2 inch stainless steel and 1/4 inch by 1-1/4 inch masonry/wood with driver.

e. Anchor Bar Cleat: Standard 12 feet 0 inches lengths of commercial type 20 gauge G-90 galvanized steel with pre-punched holes.

2. Fully Adhered or Mechanically Attached Single-Ply Version

a. Model:

1) AEF-100 or as indicated on the drawings.

b. Performance:

1) Lifetime, 215 mph Wind Warranty.
2) Tested per ANSI/SPRI ES-1 Standard to a design pressure of 190 lbs./ft to comply with the current New York State Building Code.
3) Factory Mutual 1-270 approved for wind up lift protection.
4) Miami-Dade Approved (No. 13-0419.03 12/11/18) to comply with the "High Velocity Hurricane Zone of the Florida Building Code".

3. Built-Up or Modified Version

a. Model:

1) AEFM-100 or as indicated on the drawings.

b. Performance:

1) Lifetime, 215 mph Wind Warranty.
2) Tested per ANSI/SPRI ES-1 Standard to a design pressure of 190 lbs./ft to comply with the current New York State Building Code.
3) Factory Mutual 1-270 approved for wind up lift protection.
4) Miami-Dade Approved (No. 13-0419.03 12/11/18) to comply with the "High Velocity Hurricane Zone of the Florida Building Code".

C. Anchor-Tite Canted Fascia: Three-part assembly consisting of a continuous extruded aluminum bar, exterior fascia and continuous formed galvanized steel cleat with fasteners.

1. Construction:

a. Fascia Metal:

1) 063 inch thick-formed aluminum.

b. Aluminum Finish:

1) Standard color Kynar-500 as selected by the Architect from roof edge manufacturer's color chart or custom Kynar-500 color as selected by the Architect.

c. Fascia: standard 12 feet 0 inches lengths with matching concealed joint splice plates.

d. Extruded bar: Shall be continuous 6063-T6 alloy aluminum at 12 feet 0 inches (3.65 m) standard lengths with pre-punched slotted holes. All bar miters are welded.

1) Injection Molded EPDM Bar Splice to allow thermal movement expansion of extruded aluminum anchor bar.
2) Fasteners: 2 inch stainless steel and 1/4 inch by 1-1/4 inch masonry/wood with driver.

e. Waterdam: Standard 12 feet 0 inches lengths of commercial type 24 gauge G-90 galvanized steel with pre-punched slotted holes.

f. Anchor Bar Cleat: Standard 12 feet 0 inches lengths of commercial type 20 gauge G-90 galvanized steel with pre-punched holes.

2. Galvanized Waterdam Version.

a. Model:

1) AEFC-1052 or as indicated on the drawings.

b. Performance:

1) Lifetime, 215 mph Wind Warranty.
2) Tested per ANSI/SPRI ES-1 Standard to a design pressure of 190 lbs./ft to comply with the current New York State Building Code.
3) Factory Mutual 1-270 approved for wind up lift protection.
4) Miami-Dade Approved (No. 13-0419.03 12/11/18) to comply with the "High Velocity Hurricane Zone of the Florida Building Code".

D. Perma-Tite Continuous Cleat Coping.

1. Construction:

a. Fascia Metal:

1) 063 inch aluminum.

b. Aluminum Finish:

1) Standard color Kynar-500 as selected by the Architect from roof edge manufacturer's color chart or custom Kynar-500 color as selected by the Architect.

c. Construction:

1) Coping cap: length of 12 feet 0 inches, widths to 24 inch manufactured to job requirements. True radii may be built to template.
2) Coping vertical face and back leg: 2-1/4 inch to 12-1/2 inch manufactured to job requirements.
3) Concealed splice plates: 8 inch wide. Finish to match finish of coping cap with factory applied dual non-curing sealant strips.
4) Continuous Cleat: 20 gauge pre-punched galvanized cleat with stainless steel spring mechanically locked to cleat normally 12 inch wide at 4 foot 0 inch on center. Mechanically fastened as indicated and detailed.

d. Fasteners: 1-1/2 inch Stainless Steel with driver

2. Tapered Version

a. Performance:

1) 20 Year, 110 mph Wind Warranty.
2) Tested per ANSI/SPRI ES-1 Standard to comply with the current New York State Building Code.
3) Factory Mutual 1-90 approved for wind up lift protection.
4) Miami-Dade Approved (No. 13-0419.03 12/11/18) to comply with the "High Velocity Hurricane Zone of the Florida Building Code".

2.03 ACCESSORIES

A. Miters and end caps shall be fabricated by manufacturer to suit the conditions indicated on the Drawings.

B. Provide fasteners consistent with manufacturer's instructions for each product that is suitable for the substrate to which it is being installed.

C. Provide Fascia Extenders with offset with continuous cleat where necessary to cover wood blocking.

D. For metal work, provide the type solder recommended by the producer of the metal sheets for fabrication and installation. All fastenings shall be done with stainless steel screws (type as approved by the Architect).

E. Roofing cement: ASTM D-2822, asphaltic.

F. Bituminous coating: FS TT-C-494, or SSPC Paint 12, solvent-type bituminous mastic, compounded for 15 mil dry film thickness coating.

G. Reglets: Metal or plastic units of the type and profile indicated; compatible with flashing indicated; non-corrosive.

H. Metal accessories: Provide sheet metal clips, anchoring devices, and similar accessory units as

required for installation of work, matching or compatible with material being installed, non-corrosive, size and gauge required for performance.

PART 3 - EXECUTION

3.01 EXAMINATION

A. The installer shall examine the substrate and the conditions under which gravel stop and fascia work is to be performed, and notify the Contractor in writing of unsatisfactory conditions. Do not proceed with the work until unsatisfactory conditions have been corrected in an acceptable manner.

B. Examine roof edge areas, including roofing and blocking, to receive fascia system.

C. Verify surfaces to support fascia system are clean, dry, straight, secure, and of proper dimensions.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Verify the manufacturer's roof edge details for accuracy to fit the assembly prior to fabrication.

3.03 INSTALLATION

A. Install in accordance with manufacturer's installation instructions.

1. Comply with details and profiles shown on drawings.

B. Fasteners:

1. Install fascia system using concealed fasteners in accordance with manufacturer’s instructions.
2. Do not penetrate Horizontal roofing surface with fasteners.

C. Sealant: Apply continuous beads of sealant in accordance with manufacturer’s instructions.

D. Thermal Expansion: Create gap between retainer sections and between fascia sections in accordance with manufacturer’s instructions to allow for thermal expansion.

E. Review lengths of straight pieces of exterior fascia covers before cutting to avoid creating relatively short sections adjacent to full-length sections.

F. Isolate fascia system from ACQ treated wood blocking or other galvanically incompatible material with appropriate material.

3.04 CLEANING

A. Clean fascia system promptly after installation in accordance with manufacturer’s instructions.

B. Remove clear protective vinyl film.

C. Do not use harsh cleaning materials or methods that could damage finish.

3.05 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

DIVISION 07 – THERMAL AND MOISTURE PROTECTION

SECTION 078413 – PENETRATION FIRESTOPPING

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 work of this section.

1.02 DEFINITIONS

A. Firestopping: Material or combination of materials used to retain integrity of fire-rated construction by maintaining an effective barrier against the spread of flame, smoke, and hot gases through penetrations in fire rated wall and floor assemblies.

1.03 GENERAL DESCRIPTION OF THE WORK OF THIS SECTION

A. Only tested firestop systems shall be used in specific locations as follows:

B. Penetrations for the passage of duct, cable, cable tray, conduit, piping, electrical busways and raceways through fire-rated vertical barriers (walls and partitions), horizontal barriers (floor/ceiling assemblies), and vertical service shaft walls and partitions.

C. Blank openings through fire-rated vertical barriers (walls and partitions), horizontal barriers (floor/ceiling assemblies), and vertical service shaft walls and partitions.

D. Openings and penetrations in fire-rated partitions or walls containing fire doors.

E. Openings around structural members which penetrate floors or walls.

1.04 RELATED WORK OF OTHER SECTIONS

A. Coordinate work of this section with work of other sections as required to properly execute the work and as necessary to maintain satisfactory progress of the work of other sections, including:

1. Section 033000 - Cast-In-Place Concrete
2. Section 042000 - Unit Masonry
3. Section 078443 - Joint Firestopping
4. Section 079200 - Joint Sealants
5. Section 092900 - Gypsum Wall Board
6. Section 210000 - Fire Suppression
7. Section 220000 - Plumbing
8. Section 230000 - Heating, Ventilating, and Air Conditioning
9. Section 260000 - Electrical

1.05 REFERENCES

A. Test Requirements: ASTM E 814, "Standard Method of Fire Tests of Through Penetration Fire Stops"

B. Test Requirements: UL 1479, “Fire Tests of Through-Penetration Firestops”

C. Underwriters Laboratories (UL) of Northbrook, IL publishes tested systems in their "FIRE RESISTANCE DIRECTORY" that is updated annually.

1. UL Fire Resistance Directory:
   a. Firestop Devices (XHJI)
   b. Fire Resistance Ratings (BXRH)
   c. Through-Penetration Firestop Systems (XHEZ)
   d. Fill, Voids, or Cavity Material (XHHW)
   e. Forming Materials (XHKU)

D. International Firestop Council Guidelines for Evaluating Firestop Systems Engineering Judgments

E. ASTM E 84, Standard Test Method for Surface Burning Characteristics of Building Materials.

F. Inspection Requirements: ASTM E 2174, “Standard Practice for On-site Inspection of Installed Fire Stops.”

G. Building Code of New York State.

H. NFPA 101 - Life Safety Code

I. NFPA 70 - National Electric Code

1.06 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: Provide through-penetration fire stop systems that comply with specified requirements of tested systems.

B. Firestop System installation must meet requirements of ASTM E 814, UL 1479 or UL 2079 tested assemblies that provide a fire rating equal to that of construction being penetrated.

C. Proposed firestop materials and methods shall conform to applicable governing codes having local jurisdiction.

D. Firestop Systems do not reestablish the structural integrity of load bearing partitions/assemblies, or support live loads and traffic. Installer shall consult the structural engineer prior to penetrating any load bearing assembly.

E. For those firestop applications that exist for which no qualified tested system is available through a manufacturer, an engineering judgment derived from similar qualified tested system designs or other tests will be submitted to local authorities having jurisdiction for their review and approval prior to installation. Engineering judgment documents must follow requirements set forth by the International Firestop Council.

1.07 SUBMITTALS

A. Submit Product Data: Manufacturer's specifications and technical data for each material including the composition and limitations, documentation of qualified firestop systems to be used and manufacturer's installation instructions to comply with Section 013300.

B. Manufacturer's engineering judgment identification number and drawing details when no qualified tested system is available for an application. Engineering judgment must include both project name and contractor’s name who will install firestop system as described in document.

C. Submit safety data sheets provided with product delivered to job-site.

1.08 INSTALLER QUALIFICATIONS

A. Engage an experienced Installer who is certified, licensed, or otherwise qualified by the firestopping manufacturer as having been provided the necessary training to install manufacturer's products per specified requirements. A supplier's willingness to sell its firestopping products to the Contractor or to an Installer engaged by the Contractor does not in itself confer qualification on the buyer.

B. The work is to be installed by a contractor with at least one of the following qualifications:

1. FM 4991 Approved Contractor
2. UL Approved Contractor
3. Hilti Accredited Fire Stop Specialty Contractor

C. Firm with not less than 3 years experience with fire stop installation.

1.09 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials undamaged in manufacturer's clearly labeled, unopened containers, identified with brand, type and UL label where applicable.

B. Coordinate delivery of materials with scheduled installation date to allow minimum storage time at job-site.

C. Store materials under cover and protect from weather and damage in compliance with manufacturer's requirements, including temperature restrictions.

D. Comply with recommended procedures, precautions or remedies described in material safety data sheets as applicable.

E. Do not use damaged or expired materials.

1.10 PROJECT CONDITIONS

A. Do not use materials that contain flammable solvents.

B. Schedule installation of firestopping after completion of penetrating item installation but prior to covering or concealing of openings.

C. Verify existing conditions and substrates before starting work. Correct unsatisfactory conditions before proceeding.

D. Weather conditions: Do not proceed with installation of firestop materials when temperatures exceed the manufacturer's recommended limitations for installation printed on product label and product data sheet.

E. During installation, provide masking and drop cloths to prevent firestopping materials from contaminating any adjacent surfaces.

PART 2 - PRODUCTS

2.01 FIRESTOPPING - GENERAL

A. Provide firestopping composed of components that are compatible with each other, the substrates forming openings, and the items, if any, penetrating the firestopping under conditions of service

and application, as demonstrated by the firestopping manufacturer based on testing and field experience.

B. Provide components for each firestopping system that are needed to install fill material. Use only components specified by the firestopping manufacturer and approved by the qualified testing agency for the designated fire-resistance-rated systems.

C. Penetrations in Fire Resistance Rated Walls: Provide firestopping with ratings determined in accordance with UL 1479 or ASTM E 814.

1. F-Rating: Not less than the fire-resistance rating of the wall construction being penetrated.

D. Penetrations in Horizontal Assemblies: Provide firestopping with ratings determined in accordance with UL 1479 or ASTM E 814.

1. F-Rating: Minimum of 1-hour rating, but not less than the fire-resistance rating of the floor construction being penetrated.

2. T-Rating: when penetrant is located outside of a wall cavity, minimum of 1-hour rating, but not less than the fire-resistance rating of the floor construction being penetrated.

E. Penetrations in Smoke Barriers: Provide firestopping with ratings determined in accordance with UL 1479 or ASTM E 814.

1. L-Rating: Not exceeding 5.0 cfm/sq. ft. of penetration opening at both ambient and elevated temperatures.

F. Mold Resistance: Provide penetration firestopping with mold and mildew resistance rating of zero (0) as determined by ASTM G21.

G. Firestopping Materials are either “cast-in-place” (integral with concrete placement) or “post installed.” Provide cast-in-place firestop devices prior to concrete placement.

2.02 MANUFACTURERS

A. Subject to compliance with through penetration firestop systems (XHEZ) listed in Volume II of the UL Fire Resistance Directory, provide products of the following manufacturer as identified below:

B. Basis of Design: Hilti, Inc., Plano, Texas, 800-879-8000, www.us.hilti.com.

2.03 MATERIALS

A. Use only firestop products that have been UL 1479, ASTM E 814 or UL 2079 tested for specific fire-rated construction conditions conforming to construction assembly type, penetrating item type, annular space requirements, and fire-rating involved for each separate instance.

B. Pre-formed firestop devices for use with noncombustible and combustible pipes (closed and open systems), conduit, and/or cable bundles penetrating concrete floors the following products are acceptable:

1. Hilti Cast-In Place Firestop Device (CP 680-P)
   a. Add Aerator Adaptor when used in conjunction with aerator system.
2. Hilti Cast-In Place Firestop Device (CP 680-M) for use with noncombustible penetrants.
3. Hilti Cast-in Place Firestop System for Metal Decks (CFS CID MD P) including all components as described by manufacturer for proper installation.

4. Hilti Cast-in Place Firestop System for Metal Decks (CFS CID MD M) including all components as described by manufacturer for proper installation, for use with noncombustible penetrants.
5. Hilti Tub Box Kit (CP 681) for use with tub installations.
6. Hilti Firestop Speed Sleeve (CP 653) for use with cable penetrations.
7. Hilti Firestop Drop-In Device (CFS-DID) for use with noncombustible and combustible penetrants.
8. Hilti Firestop Block (CFS-BL)
9. Hilti Closet Stub (CFS-CID CS)

C. Sealants, caulking materials, or foams for use with non-combustible items including steel pipe, copper pipe, rigid steel conduit and electrical metallic tubing (EMT), the following products are acceptable:

1. Hilti Intumescent Firestop Sealant (FS-ONE MAX)
2. Hilti Fire Foam (CP 620)
3. Hilti Flexible Firestop Sealant (CP 606)
4. Hilti Firestop Silicone Sealant Gun Grade (CFS-S SIL GG)
5. Hilti Firestop Silicone Sealant Self Leveling (CFS-S SIL SL)

D. Sealants or caulking materials for use with sheet metal ducts, the following products are acceptable:

1. Hilti Silicone Sealant Gun Grade (CFS-S SIL GG)
2. Hilti Firestop Silicone Sealant Self Leveling (CFS-S SIL SL)
3. Hilti Flexible Firestop Sealant (CP 606)
4. Hilti Intumescent Firestop Sealant (FS-ONE MAX)

E. Intumescent sealants, caulking materials for use with combustible items (penetrants consumed by high heat and flame) including insulated metal pipe, PVC jacketed, flexible cable or cable bundles and plastic pipe, the following products are acceptable:

1. Hilti Intumescent Firestop Sealant (FS-ONE MAX)

F. Foams, intumescent sealants, or caulking materials for use with flexible cable or cable bundles, the following products are acceptable:

1. Hilti Intumescent Firestop Sealant (FS-ONE MAX)
2. Hilti Fire Foam (CP 620)
3. Hilti Flexible Firestop Sealant (CP 606)
4. Hilti Firestop Silicone Sealant Gun Grade (CFS-S SIL GG)
5. Hilti Firestop Silicone Sealant Self Leveling (CFS-S SIL SL)

G. Non-curing, re-penetrable intumescent putty or foam materials for use with flexible cable or cable bundles, the following products are acceptable:

1. Hilti Firestop Putty Stick (CP 618)
2. Hilti Firestop Plug (CFS-PL)

H. Wall opening protective materials for use with U.L. listed metallic and specified nonmetallic outlet boxes, the following products are acceptable:

1. Hilti Firestop Putty Pad (CFS-P PA)
2. Hilti Firestop Putty Pad (CP 617)
3. Hilti Firestop Box Insert

I. Firestop collar or wrap devices attached to assembly around combustible plastic pipe (closed and open piping systems), the following products are acceptable:

1. Hilti Firestop Collar (CP 643N)
2. Hilti Firestop Collar (CP 644)
3. Hilti Wrap Strips (CP 648-E/648-S)

J. Materials used for large openings and complex penetrations made to accommodate cable trays and bundles, multiple steel and copper pipes, electrical busways in raceways, the following products are acceptable:

1. Hilti Firestop Block (CFS-BL)
2. Hilti Composite Sheet (CFS-COS)
3. Hilti Firestop Mortar (CP 637)
4. Hilti Fire Foam (CP 620)
5. Hilti Firestop Board (CP 675T)

K. Non curing, re-penetrable materials used for large size/complex penetrations made to accommodate cable trays and bundles, multiple steel and copper pipes, electrical busways in raceways, the following products are acceptable:

1. Hilti Firestop Block (CFS-BL)
2. Hilti Firestop Board (CP 675T)

L. Re-penetrable, round cable management devices for use with new or existing cable bundles penetrating gypsum or masonry walls, the following products are acceptable:

1. Hilti Firestop Speed Sleeve (CP 653) with integrated smoke seal fabric membrane.
2. Hilti Firestop Cable Collar (CFS-CC)
3. Hilti Firestop Sleeve (CFS-SL SK)
4. Hilti Retrofit Sleeve (CFS-SL RK) for use with existing cable bundles.
5. Hilti Gangplate (CFS-SL GP) for use with multiple cable management devices.
6. Hilti Gangplate Cap (CFS-SL GP CAP) for use at blank openings in gangplate for future penetrations.

M. For blank openings made in fire-rated wall or floor assemblies, where future penetration of pipes, conduits or cables is expected, the following products are acceptable:

1. Hilti Firestop Block (CFS-BL)
2. Hilti Firestop Plug (CFS-PL)

N. For single or cable bundles up to one inch diameter penetrating gypsum, masonry, concrete walls or wood floor assemblies the following product is acceptable:

1. Hilti Firestop Cable Disc (CFS-D)

PART 3 - EXECUTION

3.01 PREPARATION

A. Verification of Conditions: Examine areas and conditions under which work is to be performed and identify conditions detrimental to proper or timely completion.

1. Verify penetrations are properly sized and in suitable condition for application of materials.

2. Surfaces to which firestop materials will be applied shall be free of dirt, grease, oil, rust, laitance, release agents, water repellents, and any other substances that may affect proper adhesion.
3. Provide masking and temporary covering to prevent soiling of adjacent surfaces by firestopping materials.
4. Comply with manufacturer's recommendations for temperature and humidity conditions before, during and after installation of firestopping.
5. Do not proceed until unsatisfactory conditions have been corrected.

3.02 COORDINATION

A. Coordinate construction of openings, penetrations and construction joints to ensure that the fire stop systems are installed according to specified requirements.

B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-penetration fire stop systems. Coordinate construction and sizing of joints to ensure that fire-resistive joint systems are installed according to specified requirements.

C. Coordinate fire stopping with other trades so that obstructions are not placed in the way prior to the installation of the fire stop systems.

D. Do not cover up through-penetration fire stop and joint system installations that will become concealed behind other construction until each installation has been examined by the building inspector, per requirements of Section 109, International Building Code 2000, ed.

3.03 INSTALLATION

A. Regulatory Requirements: Install firestop materials in accordance with UL Fire Resistance Directory.

B. Manufacturer's Instructions: Comply with manufacturer's instructions for installation of through-penetration materials.

1. Seal all holes or voids made by penetrations to ensure an air and water resistant seal.

2. Consult with mechanical engineer, project manager, and damper manufacturer prior to installation of UL firestop systems that might hamper the performance of fire dampers as it pertains to duct work.

3. Protect materials from damage on surfaces subjected to traffic.

3.04 FIELD QUALITY CONTROL

A. Examine sealed penetration areas to ensure proper installation before concealing or enclosing areas.

B. Keep areas of work accessible until inspection by applicable code authorities.

C. Inspection of through-penetration firestopping shall be performed in accordance with ASTM E 2174, “Standard Practice for On-Site Inspection of Installed Fire Stops” or other recognized standard.

D. Perform under this section patching and repairing of firestopping caused by cutting or penetrating of existing firestop systems already installed by other trades.

E. Manufacturer’s Field Services: Contractor to ensure a manufacturer’s direct representative is on-site during initial installation of firestop systems to train appropriate contractor personnel in proper

selection and installation procedures. Training will be done per manufacturer's written recommendations published in their literature and drawing details. During installation, contractor shall have manufacturer's representative provide periodic visual observations and written documentation of the results. Contact Hilti for support at 800.879.8000.

3.05 IDENTIFICATION & DOCUMENTATION

A. The firestop contractor is to supply documentation for each single application addressed. This documentation is to identify each penetration and joint location on the entire project.

1. A.1 The Documentation Form for through penetrations is to include:
2. A Sequential Location Number
3. The Project Name
4. Date of Installation
5. Detailed Description of the Penetration's Location
6. Tested System or Engineered Judgment Number
7. Type of Assembly Penetrated
8. A Detailed Description of the Size and Type of Penetrating Item
9. Size of Opening
10. Number of Sides of Assemblies Addressed
11. Hourly Rating to be Achieved
12. Installer's Name

B. Copies of these documents are to be provided to the general contractor at the completion of the project.

C. Identify through-penetration firestop systems with pressure-sensitive, self-adhesive, preprinted vinyl labels. Attach labels permanently to surfaces of penetrated construction on both sides of each firestop system installation where labels will be visible to anyone seeking to remove penetrating items or firestop systems. Include the following information on labels:

1. The words: "Warning: Through Penetration Firestop System – Do Not Disturb. Notify Building Management of Any Damage."
2. Contractor's name, address and phone number.
3. Through-penetration firestop system designation of applicable testing and inspecting agency.
4. Date of installation.
5. Through-penetration firestop system manufacturer's name.
6. Installer's name.

D. A firestop documentation manager software shall be used to document, track, and maintain the passive firestop systems throughout the construction and maintenance phase of the facility. The software solution shall be used to track and document every firestop system installed on the project and each subsequent addition, change, or removal of the firestop system. The firestop documentation shall be managed with a cloud-based software which allows the installer to use a standard smartphone or tablet device (either iOS, Android or Windows capable) to capture the relevant information for the installation. The following data shall be tracked for each penetration within the facility: product installed, system installed, date of installation, location of the penetration including a notation on the 2D plan image, F-rating, name of installer, photo (pre-installation and post-installation), and inspection status. The Owner and/ or Construction Manager may designate additional items to be tracked. The firestop documentation manager software must perform the following basic functions:

E. Create multiple projects/ facilities, add/create/ remove users for each project, upload documents including UL systems, 2D floor plans, product data, engineering judgments, etc.

F. Define data to track using pre-defined input fields or creating custom input fields as desired.

G. Capture multiple photos for each penetration, including a pre-installation and post-installation photo.

H. Scan QR Code on Hilti identification label to link the program data to a specific penetration location.

I. Annotate (mark) location of penetration on 2D floor plan.

J. Create reports by filtering data and utilizing report templates.

K. Online/ offline (for use in areas where data service is unavailable) synchronization of data between mobile device, online application and cloud-based system.

L. Ability to transfer ownership of projects from one customer to another from construction phase to facility maintenance.

Permanently attach Hilti identification labels to surfaces adjacent to and within 6 inches (150 mm) of firestopping edge so labels will be visible to anyone seeking to remove or change penetrating items or firestopping. Labels shall have a unique QR code for each penetration which can be scanned by the firestop documentation software to quickly identify the penetration attributes.

Acceptable Software: Hilti CFS-DM, from Hilti Inc., Tulsa, OK. Tel (800) 879-8000 or Hilti (Canada) Corporation, Mississauga, Ontario (800) 363-4458 website: www.us.hilti.com or www.hilti.ca.com

M. Single Source: Obtain firestop documentation manager software and firestop systems for each type of penetration and construction condition indicated only from a single manufacturer.

3.06 ADJUSTING AND CLEANING

A. Remove equipment, materials and debris, leaving area in undamaged, clean condition.

B. Clean all surfaces adjacent to sealed holes and joints to be free of excess firestop materials and soiling as work progresses.

3.07 LABOR USE TO INSTALL FIRESTOP SYSTEMS

A. To ensure complete harmony on the project site, the installation of each scope of work is to be performed jurisdictionally correct per existing trade agreements.

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3.07 SCHEDULE OF THROUGH PENETRATION FIRESTOP SYSTEMS

CONCRETE FLOORS			CONCRETE OR BLOCK WALLS		
TYPE OF PENETRANT	**F-RATING (HR)**	**BASIS OF DESIGN UL SYSTEM**	**TYPE OF PENETRANT**	**F-RATING (HR)**	**BASIS OF DESIGN UL SYSTEM**
CIRCULAR BLANK OPENINGS	1	F-A-0006, C-AJ-0055, C-AJ-0090	CIRCULAR BLANK OPENINGS	1	C-AJ-0055, C-AJ-0090
	2	F-A-0006, C-AJ-0055, C-AJ-0090		2	C-AJ-0055, C-AJ-0090
	3	F-A-0006, C-AJ-0055, C-AJ-0086,		3	C-AJ-0055, C-AJ-0086
SINGLE METAL PIPES OR CONDUIT	1	C-AJ-1226, F-A-1028, F-A-1017	SINGLE METAL PIPES OR CONDUIT	1	C-AJ-1226, W-J-1067, W-J-1020
	2	C-AJ-1226, F-A-1028, F-A-1017		2	C-AJ-1226, W-J-1067, W-J-1020, W-J-1248
	3	C-AJ-1226, F-A-1017		3	C-AJ-1226, W-J-1041, W-J-1068
	4	C-BJ -1037, C-BJ-1034		4	C-BJ-1034, C-BJ-1037, W-J-1041, W-J-1042, W-J-1068
SINGLE NON-METALLIC PIPE OR CONDUIT (I.E. PVC, CPVC, ABS, FRP, ENT)	1	F-A-2053, F-A-2025, C-AJ-2109, C-AJ-2098, C-AJ-2271, C-AJ-2167,	SINGLE NON-METALLIC PIPE OR CONDUIT (I.E. PVC, CPVC, ABS, FRP, ENT)	1	C-AJ-2109, C-AJ-2098, C-AJ-2167, C-AJ-2371, C-AJ-2342
	2	C-AJ-2098, C-AJ-2271, C-AJ-2167, C-BJ-2021, C-AJ-2371, C-AJ-2342		2	C-AJ-2109, C-AJ-2098, C-AJ-2167, C-AJ-2371, C-AJ-2342
	3	F-A-2054, C-AJ-2109, C-AJ-2098, C-AJ-2371, C-AJ-2342		3	C-AJ-2109, C-AJ-2098, C-AJ-2371, C-AJ-2342
	4	C-BJ 2016, C-AJ-2017		4	W-J-2057, W-J-2091
SINGLE/CABLE BUNDLES	1	F-A-3007,C-AJ-3095,C-AJ-3180, C-AJ-3283	SINGLE/CABLE BUNDLES	1	W-J-3036, C-AJ-3095, C-AJ-3180, W-J-3060, W-J-3167
	2	F-A-3007,C-AJ-3095,C-AJ-3334, F-A-3060		2	W-J-3036, C-AJ-3095, C-AJ-3180, W-J-3060, W-J-3167, W-J-3189
	3	F-A-3007, C-AJ 3095, C-AJ-3285		3	C-AJ-3095, C-AJ-3180, W-J-3167
				4	W-J-3050
CABLE TRAY	1	C-AJ-4034, C-AJ-4035	CABLE TRAY	1	W-J-4027, C-AJ-4034, C-AJ-4035
	2	C-AJ-4034, C-AJ-4035		2	W-J-4027, C-AJ-4034, C-AJ-4035
	3	C-AJ-4034, C-AJ-4035		3	C-AJ-4034, C-AJ-4035
				4	W-J-8007
SINGLE INSULATED PIPES	1	F-A 5015, F-A 5017, C-AJ-5090, C-AJ-5091, C-AJ-5090, C-AJ-5048	SINGLE INSULATED PIPES	1	C-AJ-5090, C-AJ-5091, C-AJ 5061, W-J-5042
	2	F-A 5015, F-A 5017, C-AJ-5090, C-AJ-5091, C-AJ-5090		2	C-AJ-5090, C-AJ-5091, C-AJ-5061, W-J-5042
	3	F-A 5016, C-AJ-5090, F-A-5018		3	C-AJ-5090, C-AJ-5061
	4	C-BJ-5006		4	C-BJ-5006, W-J-5028
ELECTRICAL BUSWAY	1	C-AJ-6006, C-AJ-6017, F-A-6002, C-AJ-6036	ELECTRICAL BUSWAY	1	C-AJ-6006, C-AJ-6017, C-AJ-6036
	2	C-AJ-6006, C-AJ-6017, F-A 6042, C-AJ-6036		2	C-AJ-6006, C-AJ-6017, C-AJ-6036
	3	C-AJ-6006, C-AJ-6017		3	C-AJ-6006, C-AJ-6017
MECHANICAL DUCTWORK WITHOUT DAMPERS NON-INSULATED	1	C-AJ-7046, C-AJ-7051, C-AJ-7084	MECHANICAL DUCTWORK WITHOUT DAMPERS NON-INSULATED	1	C-AJ-7046, C-AJ-7051, W-J-7021, W-J-7022
	2	C-AJ-7046, C-AJ-7051, C-AJ-7085		2	C-AJ-7046, C-AJ-7051, W-J-7021, W-J-7022
	3	C-AJ-7046, C-AJ-7051		3	C-AJ-7046, C-AJ-7051
MECHANICAL DUCTWORK WITHOUT DAMPERS INSULATED	N/A**	N/A**	MECHANICAL DUCTWORK WITHOUT DAMPERS INSULATED	1	W-J-7029, W-J-7124
				2	W-J-7091, W-J-7112, W-J-7124
MIXED PENETRANTS	1	C-AJ 8099, C-AJ-8056, C-AJ-8143	MIXED PENETRANTS	1	C-AJ 8099, C-AJ 8056, W-J 8007, C-AJ 8143
	2	C-AJ-8099, C-AJ-8056, C-AJ-8143		2	C-AJ 8099, C-AJ 8056, W-J 8007, C-AJ 8143
	3	C-AJ-8099, C-AJ-8056		3	C-AJ 8041, C-AJ 8056, W-J 8007, C-AJ 8099
	4	C-AJ-8095		4	C-AJ 8095, W-J 8007
WOOD FLOORS			**GYPSUM WALLS**		
TYPE OF PENETRANT	**F-RATING (HR)**	**BASIS OF DESIGN UL SYSTEM**	**TYPE OF PENETRANT**	**F-RATING (HR)**	**BASIS OF DESIGN UL SYSTEM**
METAL PIPES OR CONDUIT	1	F-C-1009, F-C-1059, F-C-1168	METAL PIPES OR CONDUIT	1	W-L-1054, W-L-1058, W-L-1164, W-L-1506
	2	F-C-1009, F-C-1059, F-C-1168		2	W-L-1054, W-L-1058, W-L-1164, W-L-1506
				4	W-L-1110, W-L-1111, W-L-1165
NON-METALLIC PIPE OR CONDUIT	1	F-C-2232, F-C-2030, F-C-2160, F-C-2389	NON-METALLIC PIPE OR CONDUIT	1	W-L-2078, W-L-2075, W-L-2128
	2	F-C-2029, F-C-2030, F-C-2128, F-C-2160		2	W-L-2078, W-L-2075, W-L-2128
				4	W-L-2184, W-L-2245
SINGLE OR BUNDLED CABLES	1	F-C-3012, F-C-3110, F-C-3044	SINGLE OR BUNDLED CABLES	1	W-L-3065, W-L-3111, W-L-3112, W-L-3334, W-L-3414, W-L-3396
	2	F-C-3012, F-C-3110		2	W-L-3065, W-L-3111, W-L-3112, W-L-3334, W-L-3414, W-L-3396
				3	W-L-3385, W-L-3277
				4	W-L-3139, W-L-3334
INSULATED PIPES	1	F-C-5004, F-C-5037, F-C-5036	CABLE TRAY	1	W-L-4011, W-L-4019, W-L-4081
				2	W-L-4011, W-L-4019, W-L-4081
				4	W-L 8014
	2	F-C-5004, F-C-5037	INSULATED PIPES	1	W-L-5028, W-L-5029, W-L-5047
				2	W-L-5028, W-L-5029, W-L-5047
				4	W-L-5073
NON-INSULATED MECHANICAL DUCTWORK WITHOUT DAMPERS	1	F-C-7013	NON-INSULATED MECHANICAL DUCTWORK WITHOUT DAMPERS	1	W-L 7017, W-L-7040, W-L-7042, W-L-7155
				2	W-L-7040, W-L-7042, W-L-7155
INSULATED MECHANICAL DUCTWORK WITHOUT DAMPERS	1	N/A**	INSULATED MECHANICAL DUCTWORK WITHOUT DAMPERS	1	W-L-7059, W-L-7153, W-L-7156, W-L-7151
	2	N/A**		2	W-L-7059, W-L-7153, W-L-7156, W-L-7151
MIXED PENETRANTS	1	F-C-8009, F-C-8014, F-C-8026	MIXED PENETRANTS	1	W-L-1095, W-L-8013
				2	W-L-1095, W-L-8013
				4	W-L-8014

COMPOSITE METALDECK FLOORS			
TYPE OF PENETRANT	**FLOOR COVERAGE**	**F-RATING (HR)**	**BASIS OF DESIGN UL SYSTEM**
CIRCULAR BLANK OPENINGS	2-1/2”	2	F-A-0040
	4-1/2”	2	F-A-0040, F-A-0041
SINGLE METALLIC PIPE OR CONDUIT (STEEL, IRON, COPPER)	2-1/2”	2	F-A-1192, F-A-1193
	4-1/2”	3	F-A-1192, F-A-1193
	4-1/2”	2	F-A-1194
SINGLE NON-METALLIC PIPE OR CONDUIT (I.E. PVC, CPVC, ABS, FRP, ENT)	2-1/2’	2	F-A-2310, FA-2311
	4-1/2”	2	F-A-2313, F-A-2314, F-A-2315, F-A-2316
	4-1/2”	3	F-A-2310, FA-2311, F-A-2312
SINGLE/CABLE BUNDLES	2-1/2”	3	F-A-3071, F-A-3072
SINGLE INSULATED PIPES	2-1/2”	2	F-A-5069, F-A-5070, F-A-5071
	4-1/2”	3	F-A-5069, F-A-5070, F-A-5071
MIXED PENETRANTS	4-1/2”	3	F-A-8055

END OF SECTION

DIVISION 07 – THERMAL AND MOISTURE PROTECTION

SECTION 079200 – JOINT SEALANTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and Division 01 Specification sections, apply to work of this section.

B. Related Sections include the following:

1. Section 042000 – Unit Masonry
2. Various Division 07 Roofing Specifications
3. Section 084113 – Aluminum Entrances and Storefronts
4. Section 084413 – Glazed Aluminum Curtain Walls
5. Section 085113 – Aluminum Windows
6. Section 093013 – Ceramic Tile

1.02 WORK INCLUDED

A. The work covered by this section of the specifications consists of furnishing all plant, labor, equipment, appliances, and materials and performing all operations in connection with the application of caulking complete, in strict accordance with this section of the specifications and the applicable drawings, and subject to the terms and conditions of the contract.

1. It is the intent of the caulking work under this Section to provide waterproof seals at all joints where shown on drawings.

B. Joint sealants to be as per the exterior and interior joint sealant schedules at the end of this section.

1.03 REFERENCE STANDARDS

A. ASTM International (ASTM):

1. ASTM C 661 - Standard Test Method for Indentation Hardness of Elastomeric Type Sealants by Means of a Durometer
2. ASTM C 794 - Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants
3. ASTM C834 - Specification for Latex Sealants
4. ASTM C 920 - Specification for Elastomeric Joint Sealants
5. ASTM C 1087 - Test Method for Determining Compatibility of Liquid-Applied Sealants with Accessories Used in Structural Glazing Systems
6. ASTM C 1193 - Guide for Use of Joint Sealants
7. ASTM C 1248 - Test Method for Staining of Porous Substrate by Joint Sealants
8. ASTM C 1311 - Specification for Solvent Release Sealants
9. ASTM C 1330 - Cylindrical Sealant Backing for Use with Cold Liquid Applied Sealants
10. ASTM D 412 - Test Methods for Vulcanized Rubber and Thermoplastic Elastomers—Tension
11. ASTM D 624 - Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers
12. ASTM D 2240 - Test Method for Rubber Property - Durometer Hardness
13. ASTM E 283 - Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen
14. ASTM E 331 - Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference

B. NSF International (NSF):

1. Standard 51: Food Equipment Materials

C. Sealant, Waterproofing, and Restoration Institute (SWRI):

1. SWRI Validation Program

1.04 SUBMISSIONS

A. Submissions shall be in accordance with Section 013300 - Submittal Procedures, and as modified below.

B. Manufacturer's Data, Sealants and Caulking:

1. Submit three copies of manufacturer's specifications, recommendations, and installation instructions for each type of sealant, caulking compound, and associated miscellaneous material required. Include manufacturer's published data, or letter of certification, or certified test laboratory report indicating that each material complies with the requirements and is intended generally for the applications shown.

C. Samples, Sealants and Caulking:

1. Submit three 12" long samples of manufacturer's standard colors for each type of sealant or caulking compound for selection by Architect.

a. Install sample between two strips of material similar to or representative of typical surfaces where sealant or compound will be used, held apart to represent typical joint widths. Samples will be reviewed by Architect for color and texture only. Compliance with all other requirements is the exclusive responsibility of the Contractor.

D. Guarantee, Sealants:

1. Submit three copies of written guarantee agreeing to repair or replace sealants which fail to perform as air tight and watertight joints; or fail in joint adhesion, cohesion, abrasion resistance, weather resistance, extrusion resistance, migration resistance, stain resistance, or general durability, or appear to deteriorate in any other manner not clearly specified as in inherent quality of the material by submitted manufacturer's data. Provide guarantee in conformance with the requirements of the Contractor’s Guarantee within Specification Section 017000, signed by the installer and Contractor.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Experienced Installer equipped and trained for application of joint sealants required for this Project with record of successful completion of projects of similar scope.

B. Single Source Responsibility: Provide glazing sealants by a single manufacturer responsible for testing of Project substrates to verify compatibility and adhesion of joint sealants.

C. Preconstruction Manufacturer Laboratory Compatibility, Staining, and Adhesion Testing: Submit [four] samples of each material that will be in contact with or affect joint sealants. Test sealants with substrate materials using ASTM C794 or manufacturer's standard test methods to determine requirements for joint preparation, including cleaning and priming. Test sealants with related materials to verify compatibility.

D. Preconstruction Field-Adhesion Testing: Prior to installing joint sealants, field test adhesion to joint

substrates using ASTM C1193 Method A or method recommended by manufacturer. Verify adhesion is adequate. Modify joint preparation recommendations for failed joints and re-test. Submit written report to Architect.

E. Mockups: Provide joint sealant application within mockups required in other sections identical to specified joint sealants and installation methods.

1.06 WARRANTY

A. Special Installer's Warranty: Original statement on Installer's letterhead in which Installer agrees to repair or replace joint sealants that demonstrate deterioration or failure within warranty period specified.

1. Warranty Period: As per the Contractor’s Guarantee within Specification Section 017000.

B. Special Manufacturer's Warranty: Manufacturer's standard form in which joint sealant manufacturer agrees to furnish joint sealants to repair or replace those that demonstrate deterioration or failure under normal use within warranty period specified.

1. Warranty Period for Silicone Sealants: 20 years date of Substantial Completion.

C. Warranty Conditions: Special warranties exclude deterioration or failure of joint sealants in normal use due to structural movement resulting in stresses on joint sealants exceeding sealant manufacturer's written specifications, joint substrate deterioration, mechanical damage, or normal accumulation of dirt or other contaminants.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Basis-of-Design Product: Provide joint sealant products manufactured by The Dow Chemical Company, Midland MI; (877) SEALANT ((877) 732-5268); email: construction@dow.com; dow.com/construction; or Architect approved equivalent.

2.02 MATERIALS, GENERAL

A. VOC Content for Interior Applications: Provide sealants and sealant primers complying with the following VOC content limits per 40 CFR 59, Subpart D (EPA Method 24).

1. Architectural Sealants: 250 g/L.
2. Sealant Primers for Nonporous Substrates: 250 g/L.
3. Sealant Primers for Porous Substrates: 775 g/L.

B. Low-Emitting Sealants for Interior Applications: Provide sealants and sealant primers complying 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.”

C. Compatibility: Provide joint sealants and accessory materials that are compatible with one another, with joint substrates, and with materials in close proximity under use conditions, as demonstrated by sealant manufacturer by testing and related experience.

D. Joint Sealant Standard: Comply with ASTM C 920 and other specified requirements for each liquid-applied joint sealant.

E. Stain Test Characteristics: Where sealants are required to be nonstaining, provide sealants tested per ASTM C 1248 as non-staining on porous joint substrates indicated for Project.

F. Food Contact Suitability: Where sealants are required to be suitable for contact with food provide sealants complying with 21 CFR 177.2600.

2.03 LIQUID JOINT SEALANTS

A. Joint Sealant #1 – Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 100/50, for Use T, NT; SWRI validation.

1. Basis of Design Product: DOWSIL™ 790 Silicone Building Sealant.
2. Hardness, ASTM C 661: 15 durometer Shore A.
3. Volatile Organic Compound (VOC) Content: 26 g/L maximum.
4. Staining, ASTM C 1248: None on concrete, granite, limestone, and brick.
5. Color: As selected by Architect from manufacturer's full line of not less than 10 colors.

B. Joint Sealant #2 – Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 50, for Use NT; SWRI validation.

1. Basis of Design Product: DOWSIL™ 756 SMS Building Sealant.
2. Hardness, ASTM C 661: 35 durometer Shore A.
3. Volatile Organic Compound (VOC) Content: 60 g/L maximum.
4. Staining, ASTM C 1248: None on white marble.
5. Color: As selected by Architect from manufacturer's full line of not less than 8 colors.

C. Joint Sealant #3 – Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 50, Use NT, G, M and A; SWRI validation.

1. Basis of Design Product: DOWSIL™ 791 Silicone Weatherproofing Sealant.
2. Hardness, ASTM C 661: 34 durometer Shore A.
3. Volatile Organic Compound (VOC) Content: 30 g/L maximum.
4. Staining, ASTM C 1248: None on concrete, granite, limestone, and brick.
5. Color: As selected by Architect from manufacturer's full line of not less than 6 colors.

D. Joint Sealant #4 – Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 50, for Use NT, G, A, and O; SWRI validation.

1. Basis of Design Product: DOWSIL™ 795 Silicone Building Sealant.
2. Hardness, ASTM C 661: 35 - 45 durometer Shore A.
3. Volatile Organic Compound (VOC) Content: 32 g/L maximum.
4. Staining, ASTM C 1248: None on concrete, granite, limestone, and brick.
5. Color: As selected by Architect from manufacturer's full line of not less than 10 colors.

E. Joint Sealant #5 – Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C920, Type S, Grade NS, Class 50, for Use NT; SWRI validation.

1. Basis of Design Product: DOWSIL™ 995 Silicone Structural Sealant.
2. Hardness, ASTM D 2240: 35 - 45 durometer Shore A.
3. Volatile Organic Compound (VOC) Content: 34 g/L maximum.
4. Ultimate Tensile, ASTM C 1135: 160 psi (1.1 MPa), at 21 day cure (TA Joint).
5. Color: As selected by Architect from manufacturer's full line of not less than 3 colors.

F. Joint Sealant #6 – Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Use NT; SWRI validation.

1. Basis of Design Product: DOWSIL™ 758 Silicone Weather Barrier Sealant.
2. Hardness, ASTM D 2240: 45 durometer Shore A.
3. Volatile Organic Compound (VOC) Content: 61 g/L maximum.
4. Color: White.

G. Joint Sealant #7 – Single-Component, Nonsag, Acid-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Use NT.

1. Basis of Design Product: DOWSIL™ 999A Silicone Building & Glazing Sealant.
2. Hardness, ASTM D 2240: 25 durometer Shore A minimum.
3. Volatile Organic Compound (VOC) Content: 36 g/L maximum.
4. Ultimate Tensile, ASTM D 412: 325 psi (1.2 MPA) at 21 day cure (Dumbbell).
5. Color: As selected by Architect from manufacturer's full line of not less than 6 colors.

H. Joint Sealant #8 – Mildew-Resistant, Single-Component, Nonsag, Acid-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Use NT.

1. Basis of Design Product: DOWSIL™ 786 Silicone Sealant.
2. Hardness, ASTM D 2240: 25 durometer Shore A.
3. Volatile Organic Compound (VOC) Content: 36 g/L maximum.
4. NSF Standard 51 and FDA Regulation No. 21 CFR 177.2600 compliant.
5. Color: As selected by Architect from manufacturer's standard colors.

I. Latex Joint Sealant: Siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.

J. Butyl-Rubber-Based Joint Sealant: ASTM C 1311.

2.04 PRE-FORM JOINT SEALANTS

A. Preformed Silicone Elastomer Extrusion: Highly flexible low-modulus flashing and transition material for bonding to substrates with silicone sealant. SWRI validation.

1. Basis of Design Product: DOWSIL™ 123 Silicone Seal.
2. Surface: Smooth matte, Textured or Grooved to facilitate bending.
3. Bonding Sealant: Manufacturer's recommended neutral-curing silicone.
4. Hardness, ASTM D 2240: 25 durometer Shore A, minimum.
5. Color: As selected by Architect from manufacturer's full line.

B. Preformed Silicone Elastomer Custom Two- and Three- Dimension Extrusion: Highly flexible flashing and transition material for bonding to substrates with silicone sealant.

1. Basis of Design Product: DOWSIL™ 123 Silicone Seal Custom Design H. C.
2. Formulation: General Purpose or High Tear.
3. Shape: Multi-dimensional as indicated on drawings and approved shop drawings and as required to fit and functionally seal specific application and prevent air and water penetration
4. Bonding Sealant: Manufacturer's recommended neutral-curing silicone.
5. Color: As selected by Architect from manufacturer's full line.

2.05 WEATHER BARRIER TRANSITIONS

A. Silicone Elastomer Weather Barrier Transition: Highly flexible clear flashing and transition strip and pre-molded corners for bonding with silicone sealant to weather barrier substrates and to adjacent curtain wall, storefront, and window frames and other transition substrates.

1. Basis of Design Product: DOWSIL™ 123 Silicone Transition Strip (STS).
2. Hardness, ASTM D 2240: 50 - 60 durometer Shore A.

3. Color: Translucent
4. Air Infiltration, ASTM E 283: Maximum 0.025 cfm/sq. ft. (0.127 L/s per sq. m) at 6.24 lbf/sq. ft. (300 Pa).
5. Water Penetration under Static Pressure, ASTM E 331: None at 15 lbf/sq. ft. (720 Pa)
6. Movement Capability: Not less than plus 200, minus 75 percent.
7. Tensile Strength, ASTM D 412: Not less than 800 psi (5.5 MPa).
8. Tear Strength, ASTM D 624: Not less than 200 psi (16 kN/m).
9. Elongation, ASTM D 412: Not less than 400 percent.
10. Bonding Sealant: Manufacturer's recommended neutral-curing silicone.

2.06 ACCESSORIES

A. Joint Substrate Primers: Substrate primer recommended by sealant manufacturer for application.

B. Premolded Joints for Floors and Paving:

1. Rescor Expansion Joint (W. R. Meadows) or approved equivalent, 1/2-inch thick or as shown; leave 1/2-inch clear space at top to receive sealant.

C. Cylindrical Sealant Backing: ASTM C 1330, Type B non-absorbent, bi-cellular material with surface skin, or Type O open-cell polyurethane, as recommended by sealant manufacturer for application.

1. Plastic Foam Joint Fillers: Preformed, compressible, resilient, non-waxing, non-extruding strips of plastic foam of material indicated below, and of size, shape, and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

a. Either flexible, open-cell polyurethane foam or non-gassing, closed-cell polyethylene foam, unless otherwise indicated, subject to approval of sealant manufacturer.

2. Elastomeric Tubing Joint Fillers: Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D 1056, non-absorbent to water and gas, capable of remaining resilient at temperatures down to -26°F (-15°C). Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth and otherwise contribute to optimum sealant performance.

D. Bond Breaker Tape: Polymer tape compatible with joint sealant materials and recommended by sealant manufacturer for preventing bond between sealant and joint filler or other materials at back of joint.

E. Primer: As recommended by joint sealer manufacturer where required for adhesion of sealant to joint substrates indicated.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine joint profiles and surfaces to determine if work is ready to receive joint sealants. Verify joint dimensions are adequate for development of sealant movement capability. Proceed with joint sealant work once conditions meet sealant manufacturer's recommendations.

3.02 PREPARATION

A. Joint Surface Cleaning: Clean joints prior to installing joint sealants using materials and methods recommended by sealant manufacturer.

1. Remove laitance, form-release agents, dust, and other contaminants.
2. Clean nonporous and porous surfaces utilizing chemical cleaners acceptable to sealant manufacturer.

3.03 SEALANT APPLICATION

A. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

B. Masking: Mask adjacent surfaces to prevent staining or damage by contact with sealant or primer.

C. Joint Priming: Prime joint substrates when recommended by sealant manufacturer or when indicated by preconstruction testing or experience. Apply recommended primer using sealant manufacturer's recommended application techniques.

D. Joint Backing: Select joint backing materials recommended by sealant manufacturer to be compatible with sealant material. Install backing material at depth required to produce profile of joint sealant allowing optimal sealant movement.

   1. Install bond breaker tape over substrates when sealant backings are not used.

E. Liquid Sealant Application: Install sealants using methods recommended by sealant manufacturer, in depths recommended for application. Apply in continuous operation from bottom to top of joint vertically and horizontally in a single direction. Apply using adequate pressure to fill and seal joint width.

   1. Tool sealants immediately with appropriately shaped tool to force sealants against joint backing and joint substrates, eliminating voids and ensuring full contact.

   2. Using tooling agents approved by sealant manufacturer for application.

F. Cleaning: Remove excess sealant using materials and methods approved by sealant manufacturer that will not damage joint substrate materials.

   1. Remove masking tape immediately after tooling joint without disturbing seal.

   2. Remove excess sealant from surfaces while still uncured.

3.04 PREFORMED JOINT SEALANT APPLICATION

A. Preparation: Prepare surfaces in accordance with sealant manufacturer's written instructions. Perform field adhesion testing to determine need for application of primer. Clean surfaces to dust free, and perform solvent wipe where recommended. Mask edges of surface to be treated.

B. Application: Apply bead of recommended liquid joint sealant to each side of joint in bead size recommended by manufacturer. Press extrusion into sealant using roller to ensure uniform and complete contact. Lap vertical and horizontal joints as indicated in manufacturer's instructions. Trim preformed joint sealant. Remove masking tape and excess sealant.

3.05 WEATHER BARRIER TRANSITION APPLICATION

A. Preparation: Prepare field of weather barrier surface and surface of adjacent substrate in accordance with sealant manufacturer's written instructions. Perform field adhesion testing to determine need for application of primer. Clean surfaces to dust free, and perform solvent wipe where recommended.

B. Application: Apply bead of recommended liquid joint sealant to each side of joint in bead size recommended by manufacturer. Press transition extrusion into sealant using roller to ensure uniform and complete contact. Lap vertical and horizontal joints as indicated in manufacturer's instructions. Trim transition material. Remove excess sealant.

3.06 FIELD QUALITY CONTROL

A. Field-Adhesion Testing: Perform adhesion tests in accordance with manufacturer's instructions and with ASTM C 1193, Method A.

1. Perform 5 tests for the first 1000 feet of joint length for each kind of sealant and joint substrate, and one test for each 1000 feet of joint length thereafter or 1 test per each floor per building elevation, minimum.

2. For sealant applied between dissimilar materials, test both sides of joint.

B. Remove sealants failing adhesion test, clean substrates, reapply sealants, and re-test. Test adjacent sealants to failed sealants.

C. Submit report of field adhesion testing to Architect indicating tests, locations, dates, results, and remedial actions taken.

3.07 EXTERIOR JOINT-SEALANT SCHEDULE

A. Exterior construction joints in cast-in-place concrete.

1. Joint Sealant #1: Single-component neutral-curing non-staining silicone sealant.
2. Color: As selected by Architect from manufacturer's full range.

B. Exterior movement joints in concrete unit masonry.

1. Joint Sealant #4: Single-component neutral-curing non-staining silicone sealant.
2. Color: As selected by Architect from manufacturer's full range.

C. Exterior movement joints in brick masonry.

1. Joint Sealant #4: Single-component neutral-curing non-staining silicone sealant.
2. Color: As selected by Architect from manufacturer's full range.

D. Exterior movement joints in stone masonry.

1. Joint Sealant #2: Single-component neutral-curing non-staining silicone sealant.
2. Color: As selected by Architect from manufacturer's full range.

E. Exterior joints within exterior insulation finish systems (EIFS).

1. Joint Sealant #1: Single-component neutral-curing non-staining silicone sealant.
2. Color: As selected by Architect from manufacturer's full range.

F. Exterior exposed joints in metal panel cladding systems.

1. Joint Sealant #2: Single-component neutral-curing non-staining silicone sealant.
2. Color: As selected by Architect from manufacturer's full range.

G. Exterior concealed watertight joints in cladding systems.

1. Joint Sealant #3: Single-component neutral-curing silicone sealant.
2. Color: As selected by Architect from manufacturer's full range.

H. Exterior joints between different materials listed above.

1. Joint Sealant #4: Single-component neutral-curing non-staining silicone sealant.
2. Color: As selected by Architect from manufacturer's full range.
3. Multiple colors required to match several conditions.

I. Exterior perimeter joints at frames of doors, windows, storefront frames, curtain wall frames, and louvers.

1. Joint Sealant #4: Single-component neutral-curing non-staining silicone sealant.
2. Color: As selected by Architect from manufacturer's full range.
3. Multiple colors required to match several conditions.

J. Exterior joints within aluminum storefront framing, curtain walls, and window systems.

1. Joint Sealant #4: Single-component neutral-curing non-staining silicone sealant.
2. Color: As selected by Architect from manufacturer's full range.

K. Exterior joints within structural glazing and protective glass sealant.

1. Joint Sealant #5: Single-component, nonsag, neutral-curing silicone sealant.

L. All other exterior non-traffic joints.

1. Joint Sealant #1: Single-component neutral-curing silicone sealant.
2. Color: As selected by Architect from manufacturer's full range.

M. Exterior horizontal traffic and traffic isolation joints.

1. Joint Sealant #1: Single-component pourable silicone sealant.
2. Color: As selected by Architect from manufacturer's full range.

3.08 INTERIOR JOINT-SEALANT SCHEDULE

A. Interior movement joints in exterior concrete and unit masonry.

1. Joint Sealant #4: Single-component neutral-curing silicone sealant.
2. Color: As selected by Architect from manufacturer's full range.

B. Interior perimeter joints of exterior frames.

1. Joint Sealant #3: Single-component neutral-curing silicone sealant.
2. Color: As selected by Architect from manufacturer's full range.

C. Interior movement joints in interior unit masonry.

1. Joint Sealant #4: Single-component neutral-curing silicone sealant.
2. Color: As selected by Architect from manufacturer's full range.

D. Interior perimeter joints of interior frames.

1. Joint Sealant #3: Single-component neutral-curing silicone sealant.
2. Color: As selected by Architect from manufacturer's full range.

E. Interior sanitary joints between plumbing fixtures and food preparation fixtures and casework and adjacent walls, floors, and counters.

1. Joint Sealant #8: Mildew-Resistant, Single-Component, nonsag, acid-curing silicone joint sealant.
2. Color: As selected by Architect from manufacturer's full range to match multiple conditions.

F. Interior traffic joints in floor and between floor and wall construction.

1. Joint Sealant #1: Single-component, nonsag, neutral-curing silicone joint sealant.
2. Color: As selected by Architect from manufacturer's full range.

G. Interior non-moving joints between interior painted surfaces and adjacent materials.

1. Joint Sealant: Siliconized acrylic latex.
2. Color: White; paintable.

H. Interior concealed sealants at thresholds and sills.

1. Joint Sealant: Butyl-rubber-based joint sealant.

I. Interior exposed and non-exposed acoustical applications.

1. Joint Sealant: Acoustical sealant specified in Section 079219 Acoustical Joint Sealants.

END OF SECTION

DIVISION 08 – OPENINGS

SECTION 084113 – ALUMINUM ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provision of Contract, including General Conditions, Supplementary Conditions (if applicable), and Division 01 - Specification Sections, apply to work of this Section.

1.02 SUMMARY

A. This Section covers the following:

1. Architectural Aluminum Storefront Systems, including perimeter trims, stools, accessories, shims and anchors, and perimeter sealing of storefront units.

2. Aluminum Entrances, Aluminum Thermal Entrances, FRP Entrances, glass and glazing, and door hardware and components.

B. The extent of aluminum entrances and frames is shown on the drawings.

C. The following sections, when included in the Project Manual, are related to the work of this section:

1. Section 072713 – Self-Adhered Non-Permeable Air Barrier Membrane
2. Section 079200 – Joint Sealants
3. Section 084413 – Glazed Aluminum Curtain Walls
4. Section 085113 – Aluminum Windows
5. Section 085659 – Aluminum Voice Around Transaction Security Window
6. Section 087100 – Door Hardware
7. Section 088000 – Glazing
8. Section 281500 – Integrated Access Control Hardware Devices

1.03 DEFINITIONS

A. For fenestration industry standard terminology and definitions, refer to the Fenestration & Glazing Industry Alliance (FGIA) Glossary (AAMA AG-13).

1.04 ALUMINUM STOREFRONT SYSTEMS PERFORMANCE REQUIREMENTS

A. General Performance:

1. Provide aluminum entrance and storefront systems to comply with the specified performance requirements without failure due to defective manufacture, fabrication, installation, or other defects in construction, as determined by testing of aluminum storefront systems representing those indicated for this project.
2. Aluminum storefront systems 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.
3. Failure includes any of these events:
   a. Air infiltration and water penetration exceeding specified limits.
   b. Thermal stresses transferring to building structure.
   c. Glass breakage.

d. Loosening or weakening of fasteners, attachments, and other components.
e. Failure of operating units.

4. Framing members transferring stresses, including those caused by thermal and structural movement, to glazing units.

B. Delegated Design:

1. Design aluminum storefront systems, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

C. Wind Loads:

1. Provide entrance and storefront systems, including anchorage, capable of withstanding wind-load design pressures calculated according to requirements of the 2020 International Building Code or the American Society of Civil Engineers' ASCE 7, "Minimum Design Loads for Buildings and Other Structures," 6.4.2, "Analytical Procedure," whichever are more stringent. Refer to drawings for Wind Design Data.
2. Test Pressure: 150 percent of inward and outward wind-load design pressures.
3. Duration: As required by design wind velocity; fastest 1 mile of wind for relevant exposure category.

D. Air Leakage:

1. The test specimen shall be tested in accordance with ASTM E 283.
2. With interior seal, air leakage rate shall not exceed 0.06 cfm/ft^2 (0.3 l/s · m^2) at a static air pressure differential of 6.2 psf (300 Pa).
3. Without interior seal, air leakage rate shall not exceed 0.06 cfm/ft^2 (0.3 l/s · m^2) at a static air pressure differential of 1.6 psf (75 Pa).
4. CSA A440 Fixed Rating.

E. Water Resistance:

1. Provide entrance and storefront systems that do not evidence water leakage through fixed glazing and frame areas when tested according to ASTM E 331 at minimum differential pressure of 20% of inward-acting wind-load design pressure as defined by ASCE 7, "Minimum Design Loads for Buildings and Other Structures," but not less than 6.24 lbf/sq. ft. Water leakage is defined as follows:
   a. Uncontrolled water infiltrating systems or appearing on systems' normally exposed interior surfaces from sources other than condensation. Water controlled by flashing and gutters that is drained back to the exterior and cannot damage adjacent materials or finishes is not water leakage.
   b. There shall be no leakage at a minimum static air pressure differential of 8 psf (383 Pa) as defined in AAMA 501.

F. Uniform Load:

1. A static air design load of 35 psf (1680 Pa) shall be applied in the positive and negative direction in accordance with ASTM E 330.
2. There shall be no deflection in excess of L/175 of the span of any framing member.
3. At a structural test load equal to 1.5 times the specified design load, no glass breakage or permanent set in the framing members in excess of 0.2% of their clear spans shall occur.
4. Provide entrance- and storefront-system members that do not deflect an amount which will reduce glazing bite below 75 percent of design dimension when carrying full dead load.
5. Provide entrance and storefront systems, including anchorage, that accommodate the supporting structures' deflection from uniformly distributed and concentrated live loads

indicated without failure of materials or permanent deformation.

G. Seismic:

1. When tested to AAMA 501.4, system must meet design displacement (elastic) of 0.010 x the story height and ultimate displacement (inelastic) of 1.5 x the design displacement.
2. Provide entrance and storefront systems, including anchorage, capable of withstanding the effects of earthquake motions calculated according to requirements of authorities having jurisdiction or ASCE 7, "Minimum Design Loads for Buildings and Other Structures," Section 9, "Earthquake Loads," whichever are more stringent.
3. Provide entrance and storefront systems that accommodate structural movements including, but not limited to, sway and deflection.

H. Thermal Movements:

1. Provide entrance and storefront systems, including anchorage, that accommodate thermal movements of systems and supporting elements resulting from the following maximum change (range) in ambient and surface temperatures without buckling, damaging stresses on glazing, failure of joint sealants, damaging loads on fasteners, failure of doors or other operating units to function properly, and other detrimental effects.
   a. 0°F to 180°F maximum change (range) in ambient and surface temperatures.
   b. 75°F test interior ambient air temperature.
2. Test performance shows 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 for a minimum 3 cycles.

I. Thermal Transmittance (U-Factor):

1. Thermal transmittance test results are based upon 1" (25.4 mm) clear high-performance insulating glass [1/4" (e=0.035, #2), 1/2" warm edge spacer and argon fill gas, 1/4"].
2. When tested to AAMA Specification 1503, the thermal transmittance (U-factor) shall not be more than:
   a. Glass to Exterior – 0.38 (low-e) BTU/hr/ft2/°F.
   b. Glass to Center – 0.38 (low-e) BTU/hr/ft2/°F.
   c. Glass to Interior – 0.38 (low-e) BTU/hr/ft2/°F
3. Entrance Door Thermal Transmittance Coefficient (U-factor): When tested to ASTM C236 and AAMA Specification 1503, the conductive thermal transmittance (U-factor) shall not be more than 0.61 BTU/hr/sf/°F

J. Solar Heat Gain Coefficient (SHGC):

1. The glazing solar heat gain coefficient (SHGC) shall not be more than 0.36.

K. Condensation Resistance Factor (CRF):

1. The glass to exterior CRF, when tested to AAMA Specification 1503, shall not be less than 70_{frame} and 69_{glass} (low-e) or 69_{frame} and 58_{glass} (clear).
2. The glass to center CRF, when tested to AAMA Specification 1503, shall not be less than 62_{frame} and 68_{glass} (low-e) or 63_{frame} and 56_{glass} (clear).
3. The glass to interior CRF, when tested to AAMA Specification 1503, shall not be less than 56_{frame} and 67_{glass} (low-e) or 54_{frame} and 58_{glass} (clear).

L. Sound Transmission Class (STC) and Outdoor-Indoor Transmission Class (OITC):

1. Sound transmission loss test results in accordance with AAMA 1801 are based upon 1" (25.4 mm) clear double laminated insulating glass with PVB interlayer (1/8", 0.030", 1/8", 1/2" AS,

1/8", 0.030", 1/8).
2. The glass to exterior ratings, when tested to ASTM E1425 and ASTM E90, shall not be less than STC 38 and OITC 31.
3. The glass to center ratings, when tested to ASTM E1425 and ASTM E90, shall not be less than STC 37 and OITC 30.
4. The glass to interior ratings, when tested to ASTM E1425 and ASTM E90, shall not be less than STC 38 and OITC 30.

M. Impact Resistance Performance:

1. The test specimen shall be tested in accordance with ASTM E 1886, information in ASTM E 1996 and TAS 201/203.
2. Large-Missile Impact: For aluminum-framed systems located within 30 feet (9.1 m) of grade.
3. Small-Missile Impact: For aluminum-framed systems located above 30 feet (9.1 m) of grade.

N. Glazing:

1. Physically and thermally isolate glazing from framing members.
2. Provide a minimum 1/8-inch clearance between members and top of glazing or other fixed part immediately below.

O. Structural Silicone-Sealant Joints: Provide systems with structural silicone-sealant joints complying with the following requirements:

1. Must comply with ASTM C 1401, “Guide for Structural Sealant Glazing” for design and installation of structural-sealant-glazed systems.
2. Tensile or shear stress in joints is less than 20 psi.
3. Structural sealant withstands tensile and shear stresses imposed by storefront systems without failing adhesively or cohesively. When tested for adhesive compatibility with each substrate and condition required, provide sealant that fails cohesively before it fails adhesively. Adhesive and cohesive failure are defined as follows:
   a. Adhesive failure occurs when sealant pulls away from a substrate cleanly, leaving no sealant material behind.
   b. Cohesive failure occurs when sealant breaks or tears within a joint but does not separate from each substrate because sealant-to-substrate bond strength exceeds sealant's internal strength.

1.05 ALUMINUM FRAMED ENTRANCE ADDITIONAL PERFORMANCE REQUIREMENTS

A. General Performance:

1. Aluminum-framed entrance system shall withstand the effects of the following performance requirements without failure due to defective manufacture, fabrication, installation, or other defects in construction.

B. Air Infiltration:

1. For single acting offset pivot or butt hung entrances in the closed and locked position, the test specimen shall be tested in accordance with ASTM E 283 at a pressure differential of 1.57 psf (75 PA) for single and pairs of doors. A single 3'0" x 7'0" (915 mm x 2134 mm) entrance door and frame shall not exceed 1.0 cfm/ft2. A pair of 6'0" x 7'0" (1830 mm x 2134 mm) entrance doors and frame shall not exceed 1.0 cfm/ft2.

C. Structural Performance:

1. Corner strength shall be tested per the Kawneer dual moment load test procedure and certified by an independent testing laboratory to ensure weld compliance and corner integrity. Testing procedure and certified test results available upon request.

D. Thermal Performance: (Insulclad™ Thermal Entrances)

1. Computer simulation testing shall be in accordance with NFRC 100/200/500 and AAMA 507-03.

1.06 FLUSHLINE FRP DOORS PERFORMANCE REQUIREMENTS

A. General Performance:

1. Aluminum-framed flush entrance system shall withstand the effects of the following performance requirements without failure due to defective manufacture, fabrication, installation, or other defects in construction.

B. Air Infiltration: The test specimen shall be tested in accordance with ASTM E 283.

C. Uniform Load:

1. The test specimen shall be tested in accordance with ASTM E 330.
2. There shall be no deflection in excess of L/175 of the span of any framing member. At a structural test load equal to 1.5 times the specified design load, no glass breakage or permanent set in the framing members in excess of 0.2% of their clear spans shall occur.

D. Energy Efficiency:

1. Thermal Transmittance (U-factor): When tested to AAMA Specification 1503, the thermal transmittance (U-factor) shall not be more than:
   a. Aluminum-Framed Flush Entrance Doors with glass lites – with FRP Panel = 0.66.

E. Solar Heat Gain Coefficient (SHGC):

1. Provide entrances with a SHGC minimum and maximum range of:
   a. Aluminum-Framed Flush Entrance Doors with 1/4 Vision Lite – with FRP Panel = (0.03 – 0.12) determined according to NFRC 200 procedures.

F. Visible Transmittance (VT):

1. Provide entrances with a VT minimum and maximum range of:
   a. Aluminum-Framed Flush Entrance Doors with 1/4 Vision Lite – with FRP Panel = (0.01 – 0.09) determined in accordance with NFRC 200 procedures.

G. Impact Resistance Performance:

1. The test specimen shall be tested in accordance with ASTM E 1886, information in ASTM E 1996 and TAS 201/203.
2. Large-Missile Impact: For aluminum-framed systems located within 30 feet (9.1 m) of grade.

H. Forced Entry:

1. Tested in accordance with AAMA 1304.

I. Surface Burning Characteristics, FRP Doors and Panels, ASTM E 84:

1. Flame Spread: Maximum of 200, Class C.
2. Smoke Developed: Maximum of 450, Class C.

J. Surface Burning Characteristics, Class A Option On Interior Faces of FRP Exterior Panels and Both Faces of FRP Interior Panels, ASTM E 84:

1. Flame Spread: Maximum of 25.
2. Smoke Developed: Maximum of 450.

K. Impact Strength, FRP Doors and Panels, Nominal Value, ASTM D 256: 14.0 foot-pounds per inch of notch.

L. Tensile Strength, FRP Doors and Panels, Nominal Value, ASTM D 638: 13,000 psi.

M. Flexural Strength, FRP Doors and Panels, Nominal Value, ASTM D 790: 21,000 psi.

N. Water Absorption, FRP Doors and Panels, Nominal Value, ASTM D 570: 0.20 percent after 24 hours.

O. Indentation Hardness, FRP Doors and Panels, Nominal Value, ASTM D 2583: 55.

P. Gardner Impact Strength, FRP Doors and Panels, Nominal Value, ASTM D 5420: 120 in-lb.

Q. Abrasion Resistance, Face Sheet, Taber Abrasion Test, 25 Cycles at 1,000 Gram Weight with CS-17 Wheel: Maximum of 0.029 average weight loss percentage.

R. Stain Resistance, ASTM D 1308: Face sheet unaffected after exposure to red cabbage, tea, and tomato acid. Stain removed easily with mild abrasive or FRP cleaner when exposed to crayon and crankcase oil.

S. Chemical Resistance, ASTM D 543. Excellent rating.
1. Acetic acid, Concentrated.
2. Ammonium Hydroxide, Concentrated.
3. Citric Acid, 10%.
4. Formaldehyde.
5. Hydrochloric Acid, 10%
6. Sodium hypochlorite, 4 to 6 percent solution.

T. Compressive Strength, Foam Core, Nominal Value, ASTM D 1621: 79.9 psi.

U. Compressive Modulus, Foam Core, Nominal Value, ASTM D 1621: 370 psi.

V. Tensile Adhesion, Foam Core, Nominal Value, ASTM D 1623: 45.3 psi.

W. Thermal and Humid Aging, Foam Core, Nominal Value, 158 Degrees F and 100 Percent Humidity for 14 Days, ASTM D 2126: Minus 5.14 percent volume change.

1.07 SUBMISSIONS

A. Submissions shall be in accordance with Section 013300 – Submittal Procedures and as modified below.

B. Product Data:

1. Submit manufacturer's construction details, material descriptions, dimensions of individual components and profiles, hardware, finishes and installation instructions for components of

aluminum door and frame assemblies required for the project.

2. Maintenance Manual: Submit three copies of bound maintenance manual for aluminum door and frame assemblies, including manufacturer's product literature on all components and manufacturer's instructions for cleaning, repair, and general maintenance of all components.

C. Shop Drawings:

1. Submit shop drawings for the fabrication and installation of aluminum entrance assemblies and associated components of the work. Include plans, elevations, sections, details of components, provisions for expansion and contraction, attachments to other work, operational clearances and installation details. Show anchors, hardware, operators, and other components not included in manufacturer's standard data, including glazing details. Include hardware schedule and indicate operating hardware types, quantities, and locations.

2. Engineering Responsibility: Prepare data for entrance and storefront systems, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project. Include structural calculations required to show compliance with wind pressure loading requirements, deflection requirements, and movements in the work.

a. Shop drawings must be signed and sealed by NYS licensed Professional Engineer, who is responsible for the identification of applicable codes and the structural design of the system and anchorage components.

D. Samples:

1. Submit three samples of each required aluminum finish on 12" long extrusions or 6" square sheets of the alloys to be used for the work. Where normal color and texture variations are to be expected, include two or more units in each samples to show the range of such variations. Samples will be reviewed by the Architect for color and texture only. Compliance with other requirements is the exclusive responsibility of the Contractor.

E. Installer Certificates: Submit installer certificates signed by manufacturer, certifying that installers comply with specified requirements.

F. Product Test Reports: Based on evaluation of tests performed by manufacturer and witnessed by a qualified independent testing agency, indicate compliance of entrance and storefront systems with requirements based on comprehensive testing of current systems. Submit certified test reports showing compliance with specified performance characteristics for framing and door components. Provide tests reports certified with an ICC-Evaluation Service Test Report for FRP doors when required.

G. Structural-Sealant Joints: Design reviewed and approved by structural-sealant manufacturer.

H. Entrance Door Hardware Schedule:

1. Schedule shall be prepared by or under the supervision of supplier.
2. Schedule shall detail fabrication and assembly of entrance door hardware, including procedures and diagrams.
3. 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.

1.08 QUALITY ASSURANCE

A. The aluminum/FRP doors, frames, and associated work shall be done by a single firm specializing

in the type of work required, so that there will be undivided responsibility for the specified performance of all component parts, including the following:

1. Glazing of aluminum/FRP doors.
2. Installation of all hardware.

B. Details shown are based upon standard details by one manufacturer. It is intended that similar details by other manufacturers will be acceptable, provided they comply with the size requirements, with minimum/maximum profile requirements as shown, and with the specified structural and performance requirements.

C. Installer Qualifications: Engage an experienced installer to assume engineering responsibility and perform work of this Section who has specialized in installing entrance and storefront systems similar to those required for this Project and who is acceptable to manufacturer.

D. Manufacturer Qualifications: Manufacturer capable of providing field service representation during construction, approving acceptable installer and approving application method. Manufacturer must be capable of providing aluminum-framed storefront systems that meet or exceed performance the stated performance requirements. Manufacturer must document this performance by the inclusion of test reports and calculations.

E. Engineering Responsibility: Prepare data for entrance and storefront systems, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.

F. Source Limitations: Obtain each type of entrance and storefront system through one source from a single manufacturer.

1. Building Enclosure System: When aluminum entrances are a part of a building enclosure system, including entrances, framing, windows, curtain wall system and related products. Provide building enclosure system products from a single source manufacturer.

G. Fabrication Tolerances: Fabricate aluminum entrances in accordance with entrance manufacturer’s prescribed tolerances.

H. Product Options: Drawings indicate size, profiles, and dimensional requirements of entrance and storefront systems and are based on the specific systems indicated. Other manufacturers' systems with equal performance characteristics may be considered. Refer to Division 01 Section "Substitutions."

1. Do not modify size and dimensional requirements.
2. Do not modify intended aesthetic effect, as judged solely by Architect, except with Architect's approval and only to the extent needed to comply with performance requirements. Where modifications are proposed, submit comprehensive explanatory data to Architect for review.

I. Preconstruction Sealant Testing: Perform sealant manufacturers' standard tests for compatibility and adhesion of sealants with each material that will come in contact with sealants and each condition required by system.

J. Test a minimum of 8 samples of each metal, glazing, and other material.

K. Prepare samples using techniques and primers required for installed systems.

L. Perform tests under environmental conditions that duplicate those under which systems will be installed. For materials that fail tests, determine corrective measures required to prepare each material to ensure compatibility with and adhesion of sealants, including, but not limited to, specially

formulated primers. After performing these corrective measures on the minimum number of samples required for each material, retest materials.

M. Welding Standards: Comply with applicable provisions of AWS D1.2, "Structural Welding Code--Aluminum."

1.09 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of aluminum-framed storefront openings by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.10 DELIVERY, STORAGE AND HANDLING

A. Ordering: Comply with the manufacturer’s ordering instructions and lead-time requirements to avoid construction delays.

B. Packing, Shipping, Handling and Unloading: Deliver materials in manufacturer’s original, unopened, undamaged containers with identification labels intact.

C. Storage and Protection: Store materials protected from exposure to harmful weather conditions. Handle entrance doors and components to avoid damage. Protect entrance doors against damage from elements, construction activities, and other hazards before, during and after entrance installation.

1.11 CLEANING AND PROTECTION

A. The Contractor shall maintain the doors, frames, and side light components in a reasonably clean condition throughout the construction period, so that it will be without any evidence of deterioration or damage (other than the effects of normal weathering) at the time of final acceptance. Select methods of cleaning which will promote the achievement of uniform appearance and stabilized colors and textures for materials that weather or age with exposure.

B. The door installer shall advise the General Contractor to proper and adequate means for protecting portions of the work, which are exposed to likely sources of damage during the remainder of the construction period, including the probable areas of glass breakage.

C. Immediately before the time of final acceptance, the Contractor shall clean the doors thoroughly, inside and out. Demonstrate proper cleaning methods to the Owner's maintenance personnel during this final cleaning. Prepare a "Cleaning and Maintenance Manual" listing the types of cleaning compounds, cleaning methods, and the types of sealants and glazing materials to be used for cleaning, repair, and maintenance of the work.

1.12 WARRANTY

A. General Warranty: The special 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. Special Warranty: Submit a written warranty executed by the manufacturer agreeing to repair or replace components of entrance and storefront systems that fail in materials or workmanship within the specified warranty period. Failures include, but are not limited to, the following:

1. Structural failures including, but not limited to, excessive deflection.
2. Adhesive sealant failures.

3. Failure of system to meet performance requirements.
4. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
5. Failure of operating components to function normally.
6. Water leakage through fixed glazing and frame areas.

Warranty Period: 2 years from date of Substantial Completion. In addition, welded door corner construction shall be supported with a limited lifetime warranty for the life of the door under normal use.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. As Basis-of-Design, details and specifications have been based on the following products by Kawneer Company, Inc. 555 Guthridge Court, Technology Park / Atlanta, Norcross, GA 30092 (tel) 770-449-5555; (fax) 770-734-1560:

1. Framing: Trifab® VersaGlaze® 451T Framing System.

    a. 2" x 4-1/2" nominal dimension.
    b. Thermal.
    c. Front, center, back, multi-plane, structural silicone or weatherseal (type B) glazed.
    d. Shear block frame construction.

2. Aluminum Doors: Kawneer Standard Entrance Series

    a. The door stile and rail face dimensions of the 500 Wide Stile entrance door will be as follows:

        1) Vertical stile: 5".
        2) Top rail: 7-1/2".
        3) Optional Cross Rail: 6”.
        4) Optional Bottom Rail: 10”.
        5) Final rail dimensions to be coordinated with construction documents.

    b. Major portions of the door members to be 0.125" (3.2) nominal in thickness and glazing molding to be 0.05" (1.3) thick.
    c. Glazing gaskets shall be either EPDM elastomeric extrusions or a thermoplastic elastomer.
    d. Provide adjustable glass jacks to help center the glass in the door opening.

3. Aluminum Doors: Insulclad™ Thermal Entrances Series

    a. The door stile and rail face dimensions of the 560 thermal entrance door will be as follows:

        1) Vertical stile: 5".
        2) Top rail: 7-1/2".
        3) Optional Cross Rail: 6”.
        4) Optional Bottom Rail: 10”.
        5) Final rail dimensions to be coordinated with construction documents.

    b. Major portions of the door members to be 0.125" (3.2) nominal in thickness and glazing molding to be 0.05" (1.3) thick.
    c. Glazing gaskets shall be either EPDM elastomeric extrusions or a thermoplastic elastomer.
    d. Provide adjustable glass jacks to help center the glass in the door opening.

4. FRP Doors: Kawneer Flushline™ Entrance Series

    a. The door stile and rail face dimensions of the Flushline™ Entrance door will be as follows:
    b. The door face sheet shall be Pebble textured fiberglass reinforced polyester (FRP) 0.090”.
    c. Vision lites: Aluminum framed vision lite (AVL).
    d. Glass for Visions Lites – Refer to Specification Section 088000.
    e. Vision lite glazing shall be with foam glazing tape.

B. References to named manufacturers shall be construed only as establishing the quality of materials and workmanship to be used under this section, as shall not, in any way, be construed as limiting competition. Products used shall be those upon which the design is based or shall be equal products approved in advance by the Architect. Requests for substitutions will be considered in accordance with provisions of the General Conditions. All permitted equals must be approved in writing by the Architect or Engineer-or-Record. All applications for substitution must include samples and technical data.

C. Substitution Documentation:

    1. Product Literature and Drawings: Submit product literature and drawings modified to suit specific project requirements and job conditions.

    2. Certificates: Submit certificate(s) certifying substitute manufacturer (1) attesting to adherence to specification requirements for entrance system performance criteria, and (2) has been engaged in the design, manufacturer and fabrication of aluminum entrances for a period of not less than ten (10) years.

    3. Test Reports: Submit test reports verifying compliance with each test requirement required by the project.

    4. Product Sample and Finish: Submit product sample, with specified finish and color.

D. Substitution Acceptance: Acceptance will be in written form, either as an addendum or modification, and documented by a formal change order signed by the Owner and Contractor.

2.02 FRAMING MATERIALS

A. Aluminum Extrusions: Framing members, transition members, mullions, adapters, and mountings: Extruded aluminum with alloy and temper as recommended by manufacturer to comply with strength, corrosion resistance and finish requirements, and temper recommended by manufacturer for type of use and finish indicated, not less than 0.070" wall thickness at any location for the main frame, complying with the requirements of standards indicated below.

    1. Sheet and Plate: ASTM B 209.
    2. Extruded Bars, Rods, Shapes, and Tubes: ASTM B 221 - 6063-T6 alloy and temper.
    3. Extruded Structural Pipe and Tubes: ASTM B 429.
    4. Bars, Rods, and Wire: ASTM B 211.
    5. Welding Rods and Bare Electrodes: AWS A5.10.
    6. Steel Reinforcement: Complying with ASTM A 36 for structural shapes, plates, and bars; ASTM A 611 for cold-rolled sheet and strip; or ASTM A 570 for hot-rolled sheet and strip.
    7. Glazing as specified in Specification Section 088000 – Glazing.

B. Thermal Barrier: Kawneer IsoLock® Thermal Break with dual nominal 1/4" (6.4 mm) separation consisting of a two-part chemically curing, high-density polyurethane, which is mechanically and adhesively joined to aluminum storefront sections. Thermal break shall be designed in accordance with AAMA TIR-A8 and tested in accordance with AAMA 505.

C. Screws, miscellaneous fastening devices, and internal components: Stainless steel or plated or corrosion resistant materials of sufficient strength to perform the functions for which they are used. Aluminum, nonmagnetic stainless steel or other materials must be non-corrosive and compatible with aluminum members, trim hardware, anchors, and other components. When steel anchors are used, provide insulation between steel material and aluminum material to prevent galvanic action.

D. Spacers, Setting Blocks, Gaskets, and Bond Breakers: Manufacturer's standard permanent, non-migrating types in hardness recommended by manufacturer, compatible with sealants, and suitable for system performance requirements. Manufacturer's standard corrosion-resistant, non-staining, non-bleeding fasteners and accessories must be compatible with adjacent materials. Where exposed, fasteners and accessories shall be stainless steel. Glazing gaskets shall be either EPDM elastomeric extrusions or a thermoplastic elastomer. Thermal separators for door cladding shall be rigid polyvinylchloride (PVC) extrusions. Provide adjustable glass jacks to help center the glass in the door opening.

E. Anchors, Clips, and Accessories: Aluminum, nonmagnetic stainless steel, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions or other suitable zinc coating. Anchors, clips, and accessories shall provide sufficient strength to withstand the design pressure indicated.

F. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with non-staining, non-ferrous shims for aligning system components.

G. Reinforcing Members: Aluminum, nonmagnetic stainless steel, or nickel/chrome-plated steel complying with ASTM B 456 for Type SC 3 severe service conditions, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions or other suitable zinc coating. Reinforcing members must provide sufficient strength to withstand the design pressure indicated.

H. Structural Silicone Sealant: Type recommended by sealant and system manufacturers that complies with ASTM C 1184 requirements, is compatible with system components with which it comes in contact, and is specifically formulated and tested for use as a structural sealant. Color as selected by the Architect from manufacturer's full range of colors. Tensile Strength: 100 psi minimum. Provide sealant with modulus of elasticity that will not allow movement of more than 25% of joint width, unless less movement is required by structural-sealant-glazed systems' design. Use neutral-cure silicone sealant with insulating-glass units.

I. Secondary Sealant: For use as weatherseal, compatible with structural silicone sealant and other system components with which it comes in contact, and that accommodates a 50 percent increase or decrease in joint width at the time of application when measured according to ASTM C 719. Color as selected by the Architect from manufacturer's full range of colors. Use neutral-cure silicone sealant with insulating-glass units. Framing system gaskets, sealants, and joint fillers as recommended by manufacturer for joint type.

J. Tolerances: References to tolerances for wall thickness and other cross-sectional dimensions of storefront members are nominal and in compliance with AA Aluminum Standards and Data.

K. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements, except containing no asbestos, formulated for 30-mil thickness per coat.

2.03 FRAMING SYSTEM FABRICATION

A. General: Provide complete aluminum vestibule assemblies, including doors, frames, glass, and related accessories. Fabricate components that, when assembled, will have accurately fitted joints with ends coped or mitered to produce hairline joints free of burrs and distortion. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings. Fabricate components for shear-block frame construction. Fabricate components for assembly

using manufacturer's standard installation instructions.

1. Fabricate framing member components that, when assembled, have the following characteristics:

    a. Profiles that are sharp, straight, and free of defects or deformations.
    b. Accurately fitted joints that are flush, hairline, and weatherproof.
    c. Means to drain water passing joints, condensation within framing members, and moisture migrating within the system to exterior.
    d. Physical and thermal isolation of glazing from framing members.
    e. Accommodations for thermal and mechanical movements of glazing and framing that maintain required glazing edge clearances.
    f. Provisions for field replacement of glazing.
    g. Fasteners, anchors, and connection devices that are concealed from view to the greatest extent possible

2. Prepare components to receive concealed fasteners and anchor and connection devices.

3. Fabricate components to drain water passing joints and condensation and moisture occurring or migrating within the system to the exterior.

4. Welding: Weld components to comply with referenced AWS standard. Weld before finishing components to greatest extent possible. 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.

5. Glazing Channels: Provide minimum clearances for thickness and type of glass indicated according to FGMA's "Glazing Manual."

6. Metal Protection: Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

7. Storefront: Fabricate framing in profiles indicated for flush glazing (without projecting stops). Provide subframes and reinforcing of types indicated or, if not indicated, as required for a complete system. Factory assemble components to greatest extent possible. Disassemble components only as necessary for shipment and installation.

8. Entrances: Fabricate door framing in profiles indicated. Reinforce as required to support imposed loads. Factory assemble door and frame units and factory install hardware to greatest extent possible. Reinforce door and frame units as required for installing hardware indicated. Cut, drill, and tap for factory-installed hardware before finishing components.

B. Entrance System Fabrication:

1. Full tubular sections, 2" x 4 ½" nominal dimension; front, center or back fabrication as show in Construction Document details with the following wall thicknesses:

    a. Exposed faces and sides: 3/16" minimum.
    b. Recessed sidewalls receiving mortised or concealed hardware: 1/4" minimum.
    c. Flush glazing pockets: 1/8" minimum.

2. Machine bolt door opening framing components to other framing components and plug holes to match framing finish. Connect framing components functioning as glass holding assemblies with standard frame clips and screws.

3. Provide fully resilient glass settings with moldings and trim inserts not less than 1/16" thick.

C. Mechanically Glazed Framing Members:

1. Fabricate for flush glazing without projecting stops.

D. Structural-Sealant-Glazed Framing Members:

1. Include accommodations for using temporary support device to retain glazing in place while structural sealant cures.

2.04 ENTRANCE DOOR MATERIALS

A. Aluminum Extrusions: Alloy and temper recommended by aluminum-framed entrance door manufacturer for strength, corrosion resistance, and application of required finish and not less than 0.090” wall thickness at any location for the main frame and door leaf members. Extrusions shall be 6063-T5 alloy and temper (ASTM B 221 alloy G.S. 10A-T5). Major portions of the door stiles shall be .125" thick, and glazing molding shall be .050" thick.

B. Fasteners: Aluminum, nonmagnetic stainless steel or other materials to be non-corrosive and compatible with aluminum-framed entrance door members, trim hardware, anchors, and other components. Fasteners, where exposed, shall be aluminum, stainless steel, or plated steel in accordance with ASTM A 164. Perimeter anchors shall be aluminum or steel, providing the steel is properly isolated from the aluminum.

C. Anchors, Clips, and Accessories: Aluminum, nonmagnetic stainless steel, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions or other suitable zinc coating; provide sufficient strength to withstand design pressure indicated. Glazing gaskets shall be elastomeric extrusions.

D. Reinforcing Members: Aluminum, nonmagnetic stainless steel, or nickel/chrome-plated steel complying with ASTM B 456 for Type SC 3 severe service conditions, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions or other suitable zinc coating; provide sufficient strength to withstand design pressure indicated.

E. Weather Seals: Provide weather stripping with integral barrier fin or fins of semi-rigid, polypropylene sheet or polypropylene-coated material. Comply with AAMA 701/702.

2.05 ENTRANCE DOOR FABRICATION

A. Fabricate aluminum-framed entrance doors in sizes indicated. Include a complete system for assembling components and anchoring doors.

1. Exposed portions of door cladding moldings shall be 3/32” thick.

2. Brackets and Reinforcements: Provide manufacturer's standard brackets and reinforcements that are compatible with adjacent materials. Provide non-staining, nonferrous shims for aligning system components.

3. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials. Reinforce members as required to retain fastener threads. Arrange for fasteners and attachments to be concealed from view.

4. Do not use exposed fasteners, except for hardware application. For hardware application, use

countersunk Phillips flat-head machine screws finished to match framing members or hardware being fastened, unless otherwise indicated.

5. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123 or ASTM A 153 requirements.

6. Concealed Flashing: Dead-soft, 0.018-inch thick stainless steel, complying with ASTM A 666, of type selected by manufacturer for compatibility with system.

B. Fabricate aluminum-framed glass doors that are reglazable without dismantling perimeter framing.

1. Door corner construction shall consist of mechanical clip fastening, SIGMA deep penetration plug welds and 1-1/8" long fillet welds inside and outside of all four corners. Glazing stops shall be hook-in type with EPDM glazing gaskets reinforced with non-stretchable cord.

2. Accurately fit and secure joints and corners. Make joints hairline in appearance.

3. Prepare components with internal reinforcement for door hardware.

4. Arrange fasteners and attachments to conceal from view.

C. Weather-stripping: Provide weather-stripping locked into extruded grooves in door panels or frames as indicated on manufacturer's drawings and details and as follows:

1. The door weathering on a single acting offset pivot or butt hung door and frame (single or pairs) shall be Kawneer Sealair weathering. This is comprised of a thermoplastic elastomer weathering on a tubular shape with a semi-rigid polymeric backing.

2. The door weathering on a double acting, center pivoted door and frame (single or pairs) shall be pile cloth. The meeting stiles on pairs of doors shall be equipped with an adjustable astragal utilizing wool pile with polymeric fin.

3. Sill Sweep Strips: EPDM blade gasket sweep strip in an aluminum extrusion applied to the interior exposed surface of the bottom rail with concealed fasteners. (Necessary to meet the specified performance testing).

4. PVC separators shall be applied to the interior side of door structure with screws spaced not more than 9-3/4" on centers. Aluminum cladding shall be interlocked with PVC separators at both edges and mechanically secured to door without adhesives. There shall be no metal to metal contact, direct or indirect, between the cladding or the cladding attachments and the door structure.

5. Compression Weather Stripping: Molded neoprene complying with ASTM D 2000 requirements or molded PVC complying with ASTM D 2287 requirements.

6. Sliding Weather Stripping: Wool, polypropylene, or nylon woven pile with nylon-fabric or aluminum-strip backing complying with AAMA 701 requirements.

D. Hardware: Refer to Section 087100 and Door Schedule.

1. General: Provide heavy-duty hardware units indicated in sizes, number, and type recommended by manufacturer for entrances indicated for all hardware not depicted within hardware sets described within Section 087100. Finish exposed parts to match door finish, unless otherwise indicated.

2. Threshold: Extruded aluminum, one piece per door opening, with ribbed surface.

3. For balance of hardware, refer to Specification Section 087100.

2.06 GLAZING SYSTEMS

A. Glazing to meet requirements in Division 08 Glazing Section. Provide 1” Insulated Glass for exterior applications and 1/4” Tempered Glass for interior applications unless otherwise noted - Refer to Section 088000 for glass types as indicated on drawings.

B. Glazing Gaskets:

1. Manufacturer's standard compression types.
2. Replaceable, extruded EPDM rubber.

C. Spacers and Setting Blocks:

1. Manufacturer's standard elastomeric type.

D. Bond-Breaker Tape:

1. Manufacturer's standard TFE-fluorocarbon or polyethylene material to which sealants will not develop adhesion.

E. Glazing Sealants for structural-sealant-glazed systems as recommended by manufacturer for joint type, and as follows:

1. Structural Sealant:

a. ASTM C 1184.
b. Single-component neutral-curing silicone formulation that is compatible with the system components with which it comes in contact.
c. Specifically formulated and tested for use as structural sealant and approved by a structural-sealant manufacturer for use in the aluminum-framed systems indicated.
d. Color: Black.

2. Weatherseal sealant:

a. ASTM C 920 for Type S, Grade NS, Class 25, Uses NT, G, A, and O.
b. Single-component neutral-curing formulation that is compatible with the structural sealant and other system components with which it comes in contact.
c. Recommended by structural-sealant, weatherseal-sealant, and aluminum-framed-system manufacturers for this use.
d. Color: Matching structural sealant.

2.07 FLUSHLINE™ FIBERGLASS REINFORCED POLYESTER (FRP) DOORS

A. Fabricate aluminum-framed flush entrance doors in sizes indicated. Include a complete system for assembling components and anchoring doors.

1. Material Standard: (ASTM B 221); 6063-T6 alloy and temper.

B. Fabricate aluminum-framed flush entrance doors that are reglazeable, when vision lites are used, without dismantling perimeter framing.

1. Door corner construction shall consist of mechanical clip fastening, SIGMA deep penetration plug welds and 1-1/8" long fillet welds inside and outside of all four corners.

2. Accurately fit and secure joints and corners. Make joints hairline in appearance.

3. Face sheets shall lap and interlock with stile and rails to create a hollow cavity for the froth-in-place urethane core.

4. Prepare components with internal reinforcement for door hardware.

5. Door face sheets shall be embossed fiberglass reinforced polyester (F.R.P.) 0.120" thick.

    a. Pebble texture (FRP) fiberglass reinforced polyester. Color: As selected by Architect.
    b. Door facing to be metal having a minimum thickness of 0.032 inch aluminum or steel having a base metal thickness of not less than 0.016 inch at any point; or must have been tested to perform equivalent to this construction. Provide tests reports certified with an ICC-Evaluation Service Test Report.

6. Interior door face sheets shall have 'Class A' finish.

    a. Class A flame spread and smoke developed rating on interior faces of exterior panels and both faces of interior panels.
    b. Flame Spread, ASTM E 84: Maximum of 25.
    c. Smoke Developed, ASTM E 84: Maximum of 450.

7. Aluminum-Framed Flush Entrance Door Core: Shall be urethane foam injected at 5 lb./cu.ft. density and shall have "0" O.D.P. = "Zero" Ozone Depletion Potential and contains no Chlorofluorocarbons (CFC's) or Hydro chlorofluorocarbons (HCFC's).

8. Glass for vision lites to be insulated – See Glass & Glazing Section 088000.

9. Tolerances: Reference to tolerances for wall thickness and other cross-sectional dimensions of entrance members are nominal and in compliance with Aluminum Standards and Data, published by the Aluminum Association.

10. Glazing gaskets shall be either EPDM elastomeric extrusions or a thermoplastic elastomer.

C. Accessories:

1. Fasteners: Where exposed, shall be Stainless steel.

2. Perimeter Anchors: Aluminum, when steel anchors are used, provide insulation between steel material and aluminum material to prevent galvanic action.

D. Hardware: Refer to Section 087100 and Door Schedule

1. Weather-stripping: Provide weather-stripping locked into extruded grooves in door panels or frames as indicated on manufacturer's drawings and details and as follows:

    a. The door weathering on a single acting offset pivot or butt hung door and frame (single or pairs) shall be Kawneer Sealair weathering. This is comprised of a thermoplastic elastomer weathering on a tubular shape with a semi-rigid polymeric backing.

    b. The door weathering on a double acting, center pivoted door and frame (single or pairs) shall be pile cloth. The meeting stiles on pairs of doors shall be equipped with an adjustable astragal utilizing wool pile with polymeric fin.

    c. Sill Sweep Strips: EPDM blade gasket sweep strip in an aluminum extrusion applied to the interior exposed surface of the bottom rail with concealed fasteners. (Necessary to

meet the specified performance testing).

d. PVC separators shall be applied to the interior side of door structure with screws spaced not more than 9-3/4" on centers. Aluminum cladding shall be interlocked with PVC separators at both edges and mechanically secured to door without adhesives. There shall be no metal to metal contact, direct or indirect, between the cladding or the cladding attachments and the door structure.

e. Compression Weather Stripping: Molded neoprene complying with ASTM D 2000 requirements or molded PVC complying with ASTM D 2287 requirements.

f. Sliding Weather Stripping: Wool, polypropylene, or nylon woven pile with nylon-fabric or aluminum-strip backing complying with AAMA 701 requirements.

E. FRP Entrance System Fabrication:

1. Top and bottom rails shall be joined to tubular door stiles by mechanical clip fastening and SIGMA deep penetration plug welds and 1-1/8” (29) long fillet welds inside and outside of all four corners. Face sheets shall lap and interlock stiles and rails to create a hollow cavity for the froth-in-place urethane core.

2. Vertical door sections shall be 1-3/4” (45) overall depth with integral reglets to receive and conceal edges of face sheets on both sides of door.

3. Doors shall be reinforced internally to receive surface applied and mortised hardware.

2.08 ALUMINUM FINISHES

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations relative to applying and designating finishes. 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.

B. Finish designations prefixed by AA conform to the system established by the Aluminum Association for designating aluminum finishes.

1. Apply the specified finish to visible aluminum surfaces of all aluminum entrance assemblies. Apply a compatible and durable matching finish to visible fasteners or hardware.

2. Prepare the surfaces for finishing in accordance with recommendations of the aluminum producer and the finisher or processor for the specified finish.

3. Three coat process finish on doors and immediate or adjacent frames. Class I, Color Kynar Finish: Architectural Class I, integrally colored or electrolytically deposited color coating 0.018 mm or thicker) complying with AAMA2605. Color as selected by Architect from the full range of industry colors and color densities.

a. Primer coat: Kynar.
b. Kynar finish color coat:

1) Provide Fluoropolymer finish (Kynar 500) based laminated coating similar to "Duranar" (70% PVDF) by PPG Industries.
2) Color as indicated on the drawings or as selected and approved by Architect.

c. Clear coat: One (1) coat clear Kynar protective finish over all painted doors and frames.

4. Contractor to provide and utilize "Air Dry" paint provided by Kawneer to touch up all doors, frames, and ancillary hardware by spray on method.

2.09 STEEL PRIMING

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations relative to applying primer.

B. Surface Preparation: Perform manufacturer's standard cleaning operations to remove dirt, oil, grease, or other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel.

C. Priming: Apply manufacturer's standard corrosion-resistant primer immediately after surface preparation and pretreatment.

PART 3 - EXECUTION

3.01 EXAMINATION

A. With installer present, examine openings, substrates, structural support, anchorage, and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of work. Do not proceed with installation until unsatisfactory conditions have been corrected.

1. Verify rough opening dimensions.
2. Verify levelness of sill plate.
3. Verify operational clearances.
4. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components for proper water management.
5. Masonry Surfaces:

   a. Masonry surfaces must be visibly dry and free of excess mortar, sand, and other construction debris.

6. Framed Walls:

   a. Framed walls must be dry, clean, sound, well nailed/ screwed, free of voids, and without offsets at joints.
   b. Ensure that nail/ screw heads are driven flush with surfaces in opening and within 3" of opening.

7. Metal Surfaces:

   a. Metal surfaces must be dry and clean (free of grease, oil, dirt, rust, corrosion, and welding slag).
   b. Ensure that metal surfaces are without sharp edges or offsets at joints.

B. Site Verification of Conditions: Verify substrate conditions (which have been previously installed under other sections) are acceptable for product installation in accordance with manufacturer’s instructions. Verify openings are sized to receive entrance system and sill is level in accordance with manufacturer’s acceptable tolerances.

C. Field Measurements: Verify actual measurements/openings by field measurements before

fabrication; show recorded measurements on shop drawings. Coordinate field measurements, fabrication schedule with construction progress to avoid construction delays.

3.02 INSTALLATION

A. Pre-Installation Meetings: Conduct pre-installation meeting to verify project requirements, substrate conditions, manufacturer's installation instructions, and manufacturer's warranty requirements.

B. Comply with the manufacturer's written specifications and recommendations for protecting, handling, assembly and installation of entrance assemblies and other components of the work. Do not install damaged components. Fit frame joints to produce hairline joints free of burrs and distortion. Rigidly secure nonmovement joints. Seal joints watertight.

C. Comply with Drawings, Shop Drawings, and manufacturer's written instructions for installing aluminum-framed storefront system and entrance doors, accessories, and other components.

D. Metal Protection: Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

E. General: Install entrance system in accordance with manufacturer's instructions and AAMA storefront and entrance guide specifications manual.

F. Set units plumb, level, and true to line, in alignment with established lines and grades, without warp or rack of frames, sash, doors, or panels. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities. Provide alignment attachments and shims to permanently fasten system to the building structure. Anchor securely in place. Separate aluminum and other corrodible metal surfaces from sources of corrosion or electrolytic action at points of contact with other materials.

G. Make suitable provision for thermal expansion in assembly of groups of units. Install components to drain condensation, water penetrating joints, and moisture migrating within aluminum-framed storefront system to the exterior.

H. Set sill member, thresholds, and other members in a full bed of sealant compound as shown or with joint fillers or gaskets as shown to provide weathertight construction, and secure. Comply with requirements of Section 079200 – Joint Sealants.

I. Provide suitable gaskets or coatings where dissimilar metals are in contact. Lubricate operating hardware and other moving parts according to hardware manufacturers' written instructions.

J. Install surface-mounted hardware according to manufacturer's written instructions using concealed fasteners to greatest extent possible. Adjust doors and hardware to provide a tight fit at contact points and at weatherstripping (if any) for smooth operation and weathertight closure.

K. Clean aluminum surfaces promptly after installation of units. Remove excess glazing and sealant compounds, dirt, and other substances. Lubricate hardware and other moving parts.

L. Where protective coating has been damaged, remove coating completely as soon as the completion of construction activities no longer requires its retention.

M. Install glazing to comply with requirements of Section 088000 – Glazing, unless otherwise indicated.

N. Prepare surfaces that will contact structural sealant according to sealant manufacturer's written

instructions to ensure compatibility and adhesion.

O. Preparation includes, but is not limited to, cleaning and priming surfaces.

P. Install structural silicone sealant according to sealant manufacturer's written instructions.

Q. Mechanically fasten glazing in place until structural sealant is cured. Remove excess sealant from component surfaces before sealant has cured.

R. Install secondary-sealant weatherseal according to sealant manufacturer's written instructions to provide weatherproof joints. Install joint fillers behind sealant as recommended by sealant manufacturer.

S. Erection Tolerances: Install entrance and storefront systems to comply with the following maximum tolerances:

1. Variation from Plane: Limit variation from plane or location shown to 1/8 inch in 12 feet; 1/4 inch over total length.

2. Alignment: Where surfaces abut in line, limit offset from true alignment to 1/16 inch. Where surfaces meet at corners, limit offset from true alignment to 1/32 inch.

3. Diagonal Measurements: Limit difference between diagonal measurements to 1/8 inch.

3.03 FIELD QUALITY CONTROL

A. Field Tests:

1. Architect shall select storefront units to be tested as soon as a representative portion of the project has been installed, glazed, perimeter caulked and cured.
2. Conduct tests for air infiltration and water penetration with manufacturer’s representative present.
3. Tests that do not meet the specified performance requirements and units that have deficiencies shall be corrected as part of the contract amount.
4. Testing shall be performed per AAMA 503 by a qualified independent testing agency. Refer to Testing Section for payment of testing and testing requirements.
5. Air Infiltration Tests:

    a. Conduct tests in accordance with ASTM E 783.
    b. Allowable air infiltration shall not exceed 1.5 times the amount indicated in the performance requirements or 0.09 cfm/ft^2, whichever is greater.

6. Water Infiltration Tests:

    a. After completing the installation of test areas indicated, test storefront system for water penetration according to AAMA 501.2 requirements.
    b. Conduct tests in accordance with ASTM E 1105.
    c. No uncontrolled water leakage is permitted when tested at a static test pressure of two-thirds the specified water penetration pressure but not less than 6.2 psf.

B. Repair or remove and replace Work that does not meet requirements or that is damaged by testing; replace to conform to specified requirements.

C. Manufacturer's Field Services:

1. Upon owner’s written request, provide periodic site visit by manufacturer’s field service

representative.

3.04 ADJUSTING, CLEANING AND PROTECTION

A. Adjusting: Adjust doors and hardware to provide tight fit at contact points and weather stripping, smooth operation, and weathertight closure.

B. Protection:

1. Provide final protection and maintain conditions, in a manner acceptable to the manufacturer and installer, that ensure entrance and storefront systems are without damage or deterioration at the time of Substantial Completion.
2. Protect installed product’s finish surfaces from damage during construction.
3. Protect aluminum entrances from damage from grinding and polishing compounds, plaster, lime, acid, cement, or other harmful contaminants.
4. Remove and replace damaged aluminum entrances at no extra cost.

C. Cleaning:

1. Clean glass immediately after installation.

    a. Comply with glass manufacturer's written recommendations for final cleaning and maintenance.
    b. Remove non-permanent labels and clean surfaces.

2. Clean aluminum surfaces.
3. Avoid damaging protective coatings and finishes.
4. Remove excess sealants, glazing materials, dirt, and other substances.
5. Repair or replace damaged installed products.
6. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during the construction period.
7. Remove construction debris from project site and legally dispose of debris.

END OF SECTION

SECTION 087100 - DOOR HARDWARE

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:

1. Mechanical and electrified door hardware
2. Electronic access control system components

B. Section excludes:

1. Windows
2. Cabinets (casework), including locks in cabinets
3. Signage
4. Toilet accessories
5. Overhead doors

C. Related Sections:

1. Division 01 "General Requirements" sections for Allowances, Alternates, Owner Furnished Contractor Installed, Project Management and Coordination.
2. Division 06 Section "Rough Carpentry"
3. Division 06 Section "Finish Carpentry"
4. Division 07 Section "Joint Sealants" for sealant requirements applicable to threshold installation specified in this section.
5. Division 08 Sections:
   a. "Metal Doors and Frames"
   b. "Flush Wood Doors"
   c. "Aluminum-Framed Entrances and Storefronts"
   d. "Entrances"
6. Division 26 "Electrical" sections for connections to electrical power system and for low-voltage wiring.
7. Division 28 "Electronic Safety and Security" sections for coordination with other components of electronic access control system and fire alarm system.

1.02 REFERENCES

A. UL LLC

1. UL 10B - Fire Test of Door Assemblies
2. UL 10C - Positive Pressure Test of Fire Door Assemblies
3. UL 1784 - Air Leakage Tests of Door Assemblies
4. UL 305 - Panic Hardware

B. DHI - Door and Hardware Institute

1. Sequence and Format for the Hardware Schedule
2. Recommended Locations for Builders Hardware
3. Keying Systems and Nomenclature
4. Installation Guide for Doors and Hardware

C. NFPA – National Fire Protection Association

1. NFPA 70 – National Electric Code
2. NFPA 80 – Standard for Fire Doors and Other Opening Protectives
3. NFPA 101 – Life Safety Code
4. NFPA 105 – Smoke and Draft Control Door Assemblies
5. NFPA 252 – Fire Tests of Door Assemblies

D. ANSI - American National Standards Institute

1. ANSI A117.1 – 2017 Edition – Accessible and Usable Buildings and Facilities
2. ANSI/BHMA A156.1 - A156.29, and ANSI/BHMA A156.31 - Standards for Hardware and Specialties
3. ANSI/BHMA A156.28 - Recommended Practices for Keying Systems
4. ANSI/WDMA I.S. 1A - Interior Architectural Wood Flush Doors
5. ANSI/SDI A250.8 - Standard Steel Doors and Frames

1.03 SUBMITTALS

A. General:

1. Submit in accordance with Conditions of Contract and Division 01 Submittal Procedures.
2. Prior to forwarding submittal:
   a. Review drawings and Sections from related trades to verify compatibility with specified hardware.
   b. Highlight, encircle, or otherwise specifically identify on submittals: deviations from Contract Documents, issues of incompatibility or other issues which may detrimentally affect the Work.

B. Action Submittals:

1. Product Data: Submit technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.
2. Samples for Verification: If requested by Architect, submit production sample of requested door hardware unit in finish indicated and tagged with full description for coordination with schedule.
   a. Samples will be returned to supplier. Units that are acceptable to Architect may, after final check of operations, be incorporated into Work, within limitations of key coordination requirements.

3. Door Hardware Schedule:
   a. Submit concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate fabrication of other work critical in Project construction schedule.
   b. Submit under direct supervision of a Door Hardware Institute (DHI) certified Architectural Hardware Consultant (AHC) or Door Hardware Consultant (DHC) with hardware sets in vertical format as illustrated by Sequence of Format for the Hardware Schedule published by DHI.
   c. Indicate complete designations of each item required for each opening, include:
      1) Door Index: door number, heading number, and Architect's hardware set number.
      2) Quantity, type, style, function, size, and finish of each hardware item.
      3) Name and manufacturer of each item.
      4) Fastenings and other pertinent information.

5) Location of each hardware set cross-referenced to indications on Drawings.
6) Explanation of all abbreviations, symbols, and codes contained in schedule.
7) Mounting locations for hardware.
8) Door and frame sizes and materials.
9) Degree of door swing and handing.
10) Operational Description of openings with electrified hardware covering egress, ingress (access), and fire/smoke alarm connections.

4. Key Schedule:
   a. After Keying Conference, provide keying schedule that includes levels of keying, explanations of key system's function, key symbols used, and door numbers controlled.
   b. Use ANSI/BHMA A156.28 "Recommended Practices for Keying Systems" as guideline for nomenclature, definitions, and approach for selecting optimal keying system.
   c. Provide 3 copies of keying schedule for review prepared and detailed in accordance with referenced DHI publication. Include schematic keying diagram and index each key to unique door designations.
   d. Index keying schedule by door number, keyset, hardware heading number, cross keying instructions, and special key stamping instructions.
   e. Provide one complete bitting list of key cuts and one key system schematic illustrating system usage and expansion. Forward bitting list, key cuts and key system schematic directly to Owner, by means as directed by Owner.
   f. Prepare key schedule by or under supervision of supplier, detailing Owner's final keying instructions for locks.

C. Informational Submittals:

1. Provide Qualification Data for Supplier, Installer and Architectural Hardware Consultant.
2. Provide Product Data:
   a. Certify that door hardware approved for use on types and sizes of labeled fire-rated doors complies with listed fire-rated door assemblies.
   b. Include warranties for specified door hardware.

D. Closeout Submittals:

1. Operations and Maintenance Data: Provide in accordance with Division 01 and include:
   a. Complete information on care, maintenance, and adjustment; data on repair and replacement parts, and information on preservation of finishes.
   b. Catalog pages for each product.
   c. Final approved hardware schedule edited to reflect conditions as installed.
   d. Final keying schedule
   e. Copy of warranties including appropriate reference numbers for manufacturers to identify project.
   f. As-installed wiring diagrams for each opening connected to power, both low voltage and 110 volts.

E. Inspection and Testing:

1. Submit written reports to the Owner and Authority Having Jurisdiction (AHJ) of the results of functional testing and inspection for:
   a. Fire door assemblies, in compliance with NFPA 80.
   b. Required egress door assemblies, in compliance with NFPA 101.

1.04 QUALITY ASSURANCE

A. Qualifications and Responsibilities:

1. Supplier: Recognized architectural hardware supplier with a minimum of 5 years documented experience supplying both mechanical and electromechanical door hardware similar in quantity, type, and quality to that indicated for this Project. Supplier to be recognized as a factory direct distributor by the manufacturer of the primary materials with a warehousing facility in the Project's vicinity. Supplier to have on staff, a certified Architectural Hardware Consultant (AHC) or Door Hardware Consultant (DHC) available to Owner, Architect, and Contractor, at reasonable times during the Work for consultation.
2. Installer: Qualified tradesperson skilled in the application of commercial grade hardware with experience installing door hardware similar in quantity, type, and quality as indicated for this Project.
3. Architectural Hardware Consultant: Person who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project and meets these requirements:
   a. For door hardware: DHI certified AHC or DHC.
   b. Can provide installation and technical data to Architect and other related subcontractors.
   c. Can inspect and verify components are in working order upon completion of installation.
   d. Capable of producing wiring diagram and coordinating installation of electrified hardware with Architect and electrical engineers.

4. Single Source Responsibility: Obtain each type of door hardware from single manufacturer.

B. Certifications:

1. Fire-Rated Door Openings:
   a. Provide door hardware for fire-rated openings that complies with NFPA 80 and requirements of authorities having jurisdiction.
   b. Provide only items of door hardware that are listed products tested by UL LLC, Intertek Testing Services, or other testing and inspecting organizations acceptable to authorities having jurisdiction for use on types and sizes of doors indicated, based on testing at positive pressure and according to NFPA 252 or UL 10C and in compliance with requirements of fire-rated door and door frame labels.

2. Smoke and Draft Control Door Assemblies:
   a. Provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105
   b. Comply with the maximum air leakage of 0.3 cfm/sq. ft. (3 cu. m per minute/sq. m) at tested pressure differential of 0.3-inch wg (75 Pa) of water.

3. Electrified Door Hardware
   a. Listed and labeled as defined in NFPA 70, Article 100, by testing agency acceptable to authorities having jurisdiction.

4. Accessibility Requirements:
   a. Comply with governing accessibility regulations cited in "REFERENCES" article 087100, 1.02.D3 herein for door hardware on doors in an accessible route. This project must comply with all Federal Americans with Disability Act regulations and all Local Accessibility Regulations.

C. Pre-Installation Meetings

1. Keying Conference

a. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including:
    1) Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
    2) Preliminary key system schematic diagram.
    3) Requirements for key control system.
    4) Requirements for access control.
    5) Address for delivery of keys.

2. Pre-installation Conference
    a. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
    b. Inspect and discuss preparatory work performed by other trades.
    c. Inspect and discuss electrical roughing-in for electrified door hardware.
    d. Review sequence of operation for each type of electrified door hardware.
    e. Review required testing, inspecting, and certifying procedures.
    f. Review questions or concerns related to proper installation and adjustment of door hardware.

3. Electrified Hardware Coordination Conference:
    a. Prior to ordering electrified hardware, schedule and hold meeting to coordinate door hardware with security, electrical, doors and frames, and other related suppliers.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up for hardware delivered to Project site. Promptly replace products damaged during shipping

B. Tag each item or package separately with identification coordinated with final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package. Deliver each article of hardware in manufacturer's original packaging.

C. Maintain manufacturer-recommended environmental conditions throughout storage and installation periods.

D. Provide secure lock-up for door hardware delivered to Project. Control handling and installation of hardware items so that completion of Work will not be delayed by hardware losses both before and after installation.

E. Handle hardware in manner to avoid damage, marring, or scratching. Correct, replace or repair products damaged during Work. Protect products against malfunction due to paint, solvent, cleanser, or any chemical agent.

F. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.

1.06 COORDINATION

A. Coordinate layout and installation of floor-recessed door hardware with floor construction. Cast anchoring inserts into concrete.

B. Installation Templates: Distribute for doors, frames, and other work specified to be factory or shop 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.

C. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.

D. Electrical System Roughing-In: Coordinate layout and installation of electrified door hardware with connections to power supplies and building safety and security systems.

1.07 WARRANTY

A. Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within published warranty period.

1. Warranty does not cover damage or faulty operation due to improper installation, improper use or abuse.
2. Warranty Period: Beginning from date of Substantial Completion, for durations indicated in manufacturer's published listings.
    a. Mechanical Warranty
        1) Locks
            a) Schlage L Series: 10 years
            b) Schlage ND Series: 10 years
        2) Exit Devices
            a) Von Duprin: 10 years
        3) Closers
            a) LCN 4000 Series: 30 years
        4) Automatic Operators
            a) LCN: 2 years
    b. Electrical Warranty
        1) Locks
            a) Schlage: 3 years
        2) Exit Devices
            a) Von Duprin: 3 years

1.08 MAINTENANCE

A. Furnish complete set of special tools required for maintenance and adjustment of hardware, including changing of cylinders.

B. Turn over unused materials to Owner for maintenance purposes.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. The Owner requires use of certain products for their unique characteristics and project suitability to ensure continuity of existing and future performance and maintenance standards. After investigating available product offerings, the Awarding Authority has elected to prepare proprietary specifications. These products are specified with the notation: "No Substitute."

1. Where "No Substitute" is noted, submittals and substitution requests for other products will not be considered.

B. Approval of alternate manufacturers and/or products other than those listed as "Scheduled Manufacturer" or "Acceptable Manufacturers" in the individual article for the product category are only to be considered by official substitution request in accordance with section 01 25 00.

C. Approval of products from manufacturers indicated in "Acceptable Manufacturers" is contingent upon those products providing all functions and features and meeting all requirements of scheduled manufacturer's product.

D. Where specified hardware is not adaptable to finished shape or size of members requiring hardware, furnish suitable types having same operation and quality as type specified, subject to Architect's approval.

2.02 MATERIALS

A. Fabrication

1. Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. provide screws according to manufacturer’s recognized installation standards for application intended.
2. Finish exposed screws to match hardware finish, or, if exposed in surfaces of other work, to match finish of this other work including prepared for paint surfaces to receive painted finish.
3. Provide concealed fasteners wherever possible for hardware units exposed when door is closed. Coordinate with “Metal Doors and Frames”, “Flush Wood Doors”, “Stile and Rail Wood Doors” to ensure proper reinforcements. Advise the Architect where visible fasteners, such as thru bolts, are required.

B. Provide screws, bolts, expansion shields, drop plates and other devices necessary for hardware installation.

1. Where fasteners are exposed to view: Finish to match adjacent door hardware material.

C. Cable and Connectors:

1. Where scheduled in the hardware sets, provide each item of electrified hardware and wire harnesses with number and gage of wires enough to accommodate electric function of specified hardware.
2. Provide Molex connectors that plug directly into connectors from harnesses, electric locking and power transfer devices.
3. Provide through-door wire harness for each electrified locking device installed in a door and wire harness for each electrified hinge, electrified continuous hinge, electrified pivot, and electric power transfer for connection to power supplies.

2.03 HINGES

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
   a. Ives 5BB series

2. Acceptable Manufacturers and Products:
   a. No Substitute

B. Requirements:

1. Provide hinges conforming to ANSI/BHMA A156.1.
2. Provide five knuckle, ball bearing hinges.
3. 1-3/4 inch (44 mm) thick doors, up to and including 36 inches (914 mm) wide:
   a. Exterior: Standard weight, bronze or stainless steel, 4-1/2 inches (114 mm) high
   b. Interior: Standard weight, steel, 4-1/2 inches (114 mm) high

4. 1-3/4 inch (44 mm) thick doors over 36 inches (914 mm) wide:
   a. Exterior: Heavy weight, bronze/stainless steel, 5 inches (127 mm) high
   b. Interior: Heavy weight, steel, 5 inches (127 mm) high

5. 2 inches or thicker doors:
   a. Exterior: Heavy weight, bronze or stainless steel, 5 inches (127 mm) high
   b. Interior: Heavy weight, steel, 5 inches (127 mm) high

6. Adjust hinge width for door, frame, and wall conditions to allow proper degree of opening.
7. Provide three hinges per door leaf for doors 90 inches (2286 mm) or less in height, and one additional hinge for each 30 inches (762 mm) of additional door height.
8. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:
   a. Steel Hinges: Steel pins
   b. Non-Ferrous Hinges: Stainless steel pins
   c. Out-Swinging Exterior Doors: Non-removable pins
   d. Out-Swinging Interior Lockable Doors: Non-removable pins
   e. Interior Non-lockable Doors: Non-rising pins

9. Provide hinges with electrified options as scheduled in the hardware sets. Provide with number and gage of wires enough to accommodate electric function of specified hardware. Locate electric hinge at second hinge from bottom or nearest to electrified locking component. Provide mortar guard for each electrified hinge specified.

2.04 CONTINUOUS HINGES

A. Manufacturers:

1. Scheduled Manufacturer:
   a. Ives

2. Acceptable Manufacturers:
   a. No Substitute

B. Requirements:

1. Provide aluminum geared continuous hinges conforming to ANSI/BHMA A156.26, Grade 1.
2. Provide aluminum geared continuous hinges, where specified in the hardware sets, fabricated from 6063-T6 aluminum.
3. Provide split nylon bearings at each hinge knuckle for quiet, smooth, self-lubricating operation.
4. Provide hinges capable of supporting door weights up to 450 pounds, and successfully tested for 1,500,000 cycles.
5. On fire-rated doors, provide aluminum geared continuous hinges classified for use on rated doors by testing agency acceptable to authority having jurisdiction.
6. Provide aluminum geared continuous hinges with electrified option scheduled in the hardware sets. Provide with number and gage of wires enough to accommodate electric function of specified hardware.
7. Provide hinges 1 inch (25 mm) shorter in length than nominal height of door, unless otherwise noted or door details require shorter length and with symmetrical hole pattern.

2.05 EXIT DEVICES

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
   a. Von Duprin 98/35A series

2. Acceptable Manufacturers and Products:
   a. No Substitute

B. Requirements:

1. Provide exit devices tested to ANSI/BHMA A156.3 Grade 1 and UL listed for Panic Exit or Fire Exit Hardware.
2. Cylinders: Refer to "KEYING" article, herein.
3. Provide smooth touchpad type exit devices, fabricated of brass, bronze, stainless steel, or aluminum, plated to standard architectural finishes to match balance of door hardware.
4. Touchpad must extend a minimum of one half of door width. No plastic inserts are allowed in touchpads.
5. Provide exit devices with deadlatching feature for security and for future addition of alarm kits and/or other electrified requirements.
6. Provide exit devices at pool gates with weather resistant components that can withstand harsh conditions of various climates and corrosive cleaners used in outdoor pool environments.
7. Provide flush end caps for exit devices.
8. Install exit devices at height recommended by exit device manufacturer, allowable by governing building codes, and approved by Architect.
9. Provide exit devices with manufacturers’ approved strikes.
10. Mount mechanism case flush on face of doors or provide spacers to fill gaps behind devices. Where glass trim or molding projects off face of door, provide glass bead kits.
11. Provide cylinder or hex-key dogging as specified at non fire-rated openings.
12. Removable Mullions: 2 inches (51 mm) x 3 inches (76 mm) steel tube. Where scheduled as keyed removable mullion, provide type that can be removed by use of a keyed cylinder, which is self-locking when re-installed.
13. Provide factory drilled weep holes for exit devices used in full exterior application, highly corrosive areas, and where noted in hardware sets.
14. Provide electrified options as scheduled.
15. Top latch mounting: double- or single-tab mount for steel doors, face mount for aluminum doors eliminating requirement of tabs, and double tab mount for wood doors.
16. Provide exit devices with optional trim designs to match other lever and pull designs used on the project.

2.06 KEYSWITCHES

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
   a. Schlage 650 series

2. Acceptable Manufacturers and Products:
   a. No Substitute

B. Requirements:

1. Provide key switches capable of being configured to momentary or maintained action.

2. Provide key switches that accept a mortise cylinder. Cylinders: Refer to "KEYING" article, herein.

2.07 CYLINDERS

A. Manufacturers:

1. Scheduled Manufacturer and Product:
   a. Arrow

2. Acceptable Manufacturers and Products:
   a. No Substitute

B. Requirements:

1. Provide cylinders/cores to match Owner’s existing key system, compliant with ANSI/BHMA A156.5; latest revision; cylinder face finished to match lockset, manufacturer’s series as indicated. Refer to “KEYING” article, herein.

2.08 KEYING

A. Scheduled System:

1. Existing non-factory registered system:
   a. Provide cylinders/cores keyed into Owner’s existing keying system managed by Owner’s locksmith, complying with guidelines in ANSI/BHMA A156.28, incorporating decisions made at keying conference. Contact:
      1) Firm Name:
      2) Contact Person:
      3) Telephone:

B. Requirements:

1. Construction Keying:
   a. Temporary Construction Cylinder Keying.
      1) Provide construction cores that permit voiding construction keys without cylinder removal, furnished in accordance with the following requirements.
         a) Split Key or Lost Ball Construction Keying System.
         b) 3 construction control keys, and extractor tools or keys as required to void construction keying.
         c) 12 construction change (day) keys.
      2) Owner or Owner’s Representative will void operation of temporary construction keys.

2. Permanent Keying:
   a. Provide permanent cylinders/cores keyed by the manufacturer according to the following key system.
      1) Master Keying system as directed by the Owner.
   b. Forward bitting list and keys separately from cylinders, by means as directed by Owner. Failure to comply with forwarding requirements will be cause for replacement of cylinders/cores involved at no additional cost to Owner.
   c. Provide keys with the following features:
      1) Material: Nickel silver; minimum thickness of .107-inch (2.3mm)
      2) Patent Protection: Keys and blanks protected by one or more utility patent(s).

d. Identification:
    1) Mark permanent cylinders/cores and keys with applicable blind code for identification. Do not provide blind code marks with actual key cuts.
    2) Identification stamping provisions must be approved by the Architect and Owner.
    3) Stamp cylinders/cores and keys with Owner's unique key system facility code as established by the manufacturer; key symbol and embossed or stamped with "DO NOT DUPLICATE" along with the "PATENTED" or patent number to enforce the patent protection.
    4) Failure to comply with stamping requirements will be cause for replacement of keys involved at no additional cost to Owner.
    5) Forward permanent cylinders/cores to Owner, separately from keys, by means as directed by Owner.
e. Quantity: Furnish in the following quantities.
    1) Permanent Control Keys: 3.
    2) Master Keys: 6.
    3) Change (Day) Keys: 3 per cylinder/core that is keyed differently
    4) Key Blanks: Quantity as determined in the keying meeting.

2.09 KEY CONTROL SYSTEM

A. Manufacturers:

1. Scheduled Manufacturer:
    a. HPC

2. Acceptable Manufacturers:
    a. Lund

B. Requirements:

1. Provide key control system, including envelopes, labels, tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet, all as recommended by system manufacturer, with capacity for 150% of number of locks required for Project.
    a. Provide complete cross index system set up by hardware supplier, and place keys on markers and hooks in cabinet as determined by final key schedule.
    b. Provide hinged-panel type cabinet for wall mounting.

2.10 DOOR CLOSERS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
    a. LCN 4010/4110/4020 series

2. Acceptable Manufacturers and Products:
    a. No Substitute

B. Requirements:

1. Provide door closers conforming to ANSI/BHMA A156.4 Grade 1 requirements by BHMA certified independent testing laboratory. Certify surface mounted mechanical closers to meet fifteen million (15,000,000) full load cycles. ISO 9000 certify closers. Stamp units with date of manufacture code.

2. Provide door closers with fully hydraulic, full rack and pinion action with high strength cast iron cylinder, and full complement bearings at shaft.
3. Cylinder Body: 1-1/2-inch (38 mm) diameter with 11/16-inch (17 mm) diameter double heat-treated pinion journal.
4. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
5. Spring Power: Continuously adjustable over full range of closer sizes, and providing reduced opening force as required by accessibility codes and standards.
6. Hydraulic Regulation: By tamper-proof, non-critical valves, with separate adjustment for latch speed, general speed, and backcheck.
7. Provide closers with solid forged steel main arms and factory assembled heavy-duty forged forearms for parallel arm closers. When closers are parallel arm mounted, provide closers which mount within 6-inch (152 mm) top rail without use of mounting plate so that closer is not visible through vision panel from pull side.
8. Pressure Relief Valve (PRV) Technology: Not permitted.
9. Finish for Closer Cylinders, Arms, Adapter Plates, and Metal Covers: Powder coating finish which has been certified to exceed 100 hours salt spray testing as described in ANSI/BHMA Standard A156.4 and ASTM B117, or has special rust inhibitor (SRI).
10. Provide special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other door hardware items interfering with closer mounting.

2.11 MAGNETIC HOLD-OPENS

A. Manufacturers:

1. Scheduled Manufacturer:
   a. LCN SEM7800 Series

2. Acceptable Manufacturers:
   a. No Substitute

B. Requirements:

1. Provide wall or floor mounted electromagnetic door release as specified with minimum of 25 pounds of holding force. Coordinate projection of holder and armature with other hardware and wall conditions to ensure that door sits parallel to wall when fully open. Connect magnetic holders on fire-rated doors into the fire control panel for fail-safe operation

2.12 DOOR TRIM

A. Manufacturers:

1. Scheduled Manufacturer:
   a. Ives

2. Acceptable Manufacturers:
   a. No Substitute

B. Requirements:

1. Provide push plates, push bars, pull plates, pulls, and hands-free reversible door pulls with diameter and length as scheduled.

2.13 PROTECTION PLATES

A. Manufacturers:

1. Scheduled Manufacturer:
   a. Ives

2. Acceptable Manufacturers:
   a. No Substitute

B. Requirements:

1. Provide protection plates with a minimum of 0.050 inch (1 mm) thick, beveled four edges as scheduled. Furnish with sheet metal or wood screws, finished to match plates.
2. Sizes plates 2 inches (51 mm) less width of door on single doors, pairs of doors with a mullion, and doors with edge guards. Size plates 1 inch (25 mm) less width of door on pairs without a mullion or edge guards.
3. At fire rated doors, provide protection plates over 16 inches high with UL label.

2.14 OVERHEAD STOPS AND OVERHEAD STOP/HOLDERS

A. Manufacturers:

1. Scheduled Manufacturers:
   a. Glynn-Johnson

2. Acceptable Manufacturers:
   a. No Substitute

B. Requirements:

1. Provide overhead stop at any door where conditions do not allow for a wall stop or floor stop presents tripping hazard.

2.15 SILENCERS

A. Manufacturers:

1. Scheduled Manufacturer:
   a. Ives

2. Acceptable Manufacturers:
   a. No Substitute

B. Requirements:

1. Provide "push-in" type silencers for hollow metal or wood frames.
2. Provide one silencer per 30 inches (762 mm) of height on each single frame, and two for each pair frame.
3. Omit where gasketing is specified.

2.16 THRESHOLDS, SEALS, DOOR SWEEPS, AUTOMATIC DOOR BOTTOMS, AND GASKETING

A. Scheduled Manufacturer:

1. Zero International

B. Acceptable Manufacturers:

1. No Substitute

C. Seals and Gasketing: Provide continuous gasketing on exterior openings, to the head and jambs, forming a continuous seal between the door and the frame. Provide smoke, light, or sound gasketing on interior doors where indicated.

1. Provide self-tapping fasteners for aluminum extruded gasketing being applied to hollow metal frames.
   a. Provide non-corrosive fasteners for all exterior applications.
   b. Provide security fasteners where indicated.

2. Provide neoprene, EPDM, silicone, or nylon brush inserts as specified in hardware sets. Provide non brush inserts of solid or sponge cell, as specified in hardware sets. Vinyl inserts are not allowed except where specified in hardware sets.

D. Smoke Labeled Gasketing: At all smoke labeled openings, provide smoke listed perimeter gasketing assemblies complying with NFPA 105 listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction for smoke control ratings indicated based on testing according to UL 1784.

E. Fire Listed Gasketing: Assemblies complying with NFPA 80 that are listed by a testing and inspecting agency acceptable to authorities having jurisdiction for fire ratings indicated based on testing according to UL-10C.

1. Where frame-applied intumescent seals are required by the manufacturer, provide gaskets that comply with UL10C Standard for Positive Pressure Fire Tests of Door Assemblies and UBC 7-2, Fire Tests of Door Assemblies.

F. Sound-Rated Gasketing: Provide acoustic gasketing to meet Sound Transmission Class (STC) rating required.

G. Meeting-Stile Gasketing: Provide meeting-stile gasketing that fastens to the meeting stiles forming a continuous seal when doors are closed.

H. Door Sweeps or Shoes: Apply to the bottom of the door to close the gap between the door bottom and finished floor or saddle threshold.

1. Provide solid neoprene, EPDM, silicone, or nylon brush type of seal as specified in hardware sets. Vinyl inserts are not allowed except where specified in hardware sets.

I. Automatic Door Bottoms:

1. Provide closed cell sponge, bulb neoprene. or EPDM type of seal as specified in hardware sets.
2. Door bottom to be mortised, semi mortised, or surface mount as with a minimum thickness as specified in hardware sets.

J. Rain Drips:

1. Provide overhead rain drips for out-swinging hollow metal doors that are not covered against 45 degree blowing rain. Aluminum extrusion to be a minimum of .088 inches thick and extend 2.50 inches from the face of the frame, in anodized finish to match door.
2. Door sweeps or shoes with integral rain drip must meet ADA requirements

K. Thresholds: Provide threshold units not less than 4 inches wide, formed to accommodate change in floor elevation where indicated, and fabricated to accommodate door hardware and fit door frames.

1. Threshold extrusion to be a minimum thickness as specified in hardware sets.

2.17 MAGNETIC HOLDERS

A. Manufacturers:

1. Scheduled Manufacturer:
   a. LCN

2. Acceptable Manufacturers:
   a. No Substitute

B. Requirements:

1. Provide wall or floor mounted electromagnetic door release as specified with minimum of 25 pounds of holding force. Coordinate projection of holder and armature with other hardware and wall conditions to ensure that door sits parallel to wall when fully open. Connect magnetic holders on fire-rated doors into the fire control panel for fail-safe operation.

2.18 FINISHES

A. FINISH: BHMA 626/652 (US26D); EXCEPT:

1. Hinges at Exterior Doors: BHMA 630 (US32D)
2. Aluminum Geared Continuous Hinges: BHMA 628 (US28)
3. Push Plates, Pulls, and Push Bars: BHMA 630 (US32D)
4. Protection Plates: BHMA 630 (US32D)
5. Overhead Stops and Holders: BHMA 630 (US32D)
6. Door Closers: Powder Coat to Match
7. Wall Stops: BHMA 630 (US32D)
8. Latch Protectors: BHMA 630 (US32D)
9. Weatherstripping: Clear Anodized Aluminum
10. Thresholds: Mill Finish Aluminum

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of hardware, examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance. Verify doors, frames, and walls have been properly reinforced for hardware installation.

B. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.

C. Submit a list of deficiencies in writing and proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Mount door hardware units at heights to comply with the following, unless otherwise indicated or required to comply with governing regulations.

1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
2. Custom Steel Doors and Frames: HMMA 831.
3. Interior Architectural Wood Flush Doors: ANSI/WDMA I.S. 1A
4. Installation Guide for Doors and Hardware: DHI TDH-007-20

B. Install door hardware in accordance with NFPA 80, NFPA 101 and provide post-install inspection, testing as specified in section 1.03.E unless otherwise required to comply with governing regulations.

C. Install each hardware item in compliance with manufacturer's instructions and recommendations, using only fasteners provided by manufacturer.

D. Do not install surface mounted items until finishes have been completed on substrate. Protect all installed hardware during painting.

E. Set units level, plumb and true to line and location. Adjust and reinforce attachment substrate as necessary for proper installation and operation.

F. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.

G. Install operating parts so they move freely and smoothly without binding, sticking, or excessive clearance.

H. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than quantity recommended by manufacturer for application indicated.

I. Lock Cylinders:

1. Install construction cores to secure building and areas during construction period.
2. Replace construction cores with permanent cores as indicated in keying section.
3. Furnish permanent cores to Owner for installation.

J. Wiring: Coordinate with Division 26, ELECTRICAL and Division 28 ELECTRONIC SAFETY AND SECURITY sections for:

1. Conduit, junction boxes and wire pulls.
2. Connections to and from power supplies to electrified hardware.
3. Connections to fire/smoke alarm system and smoke evacuation system.
4. Connection of wire to door position switches and wire runs to central room or area, as directed by Architect.
5. Connections to panel interface modules, controllers, and gateways.
6. Testing and labeling wires with Architect's opening number.

K. Key Control System: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.

L. Continuous Hinges: Re-locate the door and frame fire rating labels where they will remain visible so that the hinge does not cover the label once installed.

M. Door Closers & Auto Operators: Mount closers/operators on room side of corridor doors, inside of exterior doors, and stair side of stairway doors from corridors. Mount closers/operators so they are not visible in corridors, lobbies and other public spaces unless approved by Architect.

N. Overhead Stops/Holders: Mount overhead stops/holders on room side of corridor doors, inside of exterior doors, and stair side of stairway doors.

O. Power Supplies: Locate power supplies as indicated or, if not indicated, above accessible ceilings or in equipment room, or alternate location as directed by Architect.

P. Thresholds:

1. Set thresholds in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants."
2. Aluminum thresholds to be cut-in, and scribed around mullions, frame members, and stops. Do not butt to thresholds. Provide a continuous surface across full width of opening from jamb to jamb.
3. Where aluminum panic-type (rabbeted) thresholds with neoprene inserts are specified, undercut doors as required to properly mate with seal in threshold.

Q. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they may impede traffic or present tripping hazard.

R. Perimeter Gasketing:

1. Apply to head and jamb, forming seal between door and frame.
2. Install gasketing in a manner eliminating need to cut any seal to install surface mounted hardware. Install compatible mounting bracket for surface mounted hardware unless minimum 1/4 inch thick solid aluminum seals are provided for mounting of surface applied hardware.

S. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.

T. Door Bottoms and Sweeps: Apply to bottom of door, forming seal with threshold when door is closed.

3.03 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

1. Spring Hinges: Adjust to achieve positive latching when door can close freely from an open position of 30 degrees.
2. Electric Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.

3. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.

B. Occupancy Adjustment: Approximately three to six months after date of Substantial Completion, examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors and door hardware.

3.04 CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by door hardware installation.

B. Clean operating items per manufacturer's instructions to restore proper function and finish.

C. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of Substantial Completion.

3.05 DOOR HARDWARE SCHEDULE

A. The intent of the hardware specification is to specify the hardware for interior and exterior doors, and to establish a type, continuity, and standard of quality. However, it is the door hardware supplier's responsibility to thoroughly review existing conditions, schedules, specifications, drawings, and other Contract Documents to verify the suitability of the hardware specified.

B. Discrepancies, conflicting hardware, and missing items are to 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.

C. Hardware items are referenced in the following hardware schedule. Refer to the above specifications for special features, options, cylinders/keying, and other requirements.

D. Hardware Sets:

Abbreviation	Name
ARR	Arrow Lock Manufacturing
GLY	Glynn-Johnson Corp
IVE	H.B. Ives
LCN	LCN Commercial Division
SCE	Schlage Electronic Security
VON	Von Duprin
ZER	Zero International Inc

Legend:
Link to catalog cut sheet
Electrified Opening

Hardware Group No. 03

For use on Door #(s):
1 2

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 5 X 4.5 NRP		652	IVE
1	EA	PASSAGE SET	ND10S SPA		626	SCH
1	EA	SURFACE CLOSER	4111 SCUSH		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
3	EA	SILENCER	SR64		GRY	IVE

Hardware Group No. 04

For use on Door #(s):
3

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER			FINISH	MFR
2	EA	CONT. HINGE	224HD EPT			US28	IVE
2	EA	POWER TRANSFER	EPT10 CON		✓	689	VON
1	EA	REMOVABLE MULLION	KR4854 STAB			SP28	VON
1	EA	ELEC FIRE EXIT HARDWARE	RX-QEL-98-EO W/CYL HOLE-F-CON 24 VDC		✓	626	VON
1	EA	ELEC FIRE EXIT HARDWARE	RX-QEL-98-EO-F-CON 24 VDC		✓	626	VON
1	EA	RIM CYLINDER	AS REQUIRED			626	
1	EA	MORTISE CYLINDER	AS REQUIRED				
2	EA	IC CORE	MATCH OWNER'S EXISTING SYSTEM			626	ARR
1	EA	DOOR PULL	VR810 DT			630	IVE
1	EA	DOOR PULL	VR810 NL			630	IVE
1	EA	SURF. AUTO OPERATOR	9553IQ REG2 LESS TRACK COV2 RSA		✓	ANCLR	LCN
2	EA	ACTUATOR, TOUCHLESS	8310-810D		✓	630	LCN
2	EA	SURFACE MOUNT BOX	8310-867S		✓	689	LCN
1	EA	GASKETING	BY FRAME/DOOR MFG				B/O
2	EA	WIRE HARNESS	CON-32P		✓		SCH
2	EA	WIRE HARNESS	CON-6W				SCH
1	EA	MULTITECH READER	BY SECURITY INTEGRATOR		✓	BLK	SCE
2	EA	DOOR POSITION SWITCH-DPDT	GRI 19512W		✓	WHT	GEN
1	EA	POWER SUPPLY	PS902 900-4RL KL900 120/240 VAC		✓	LGR	SCE

OPERATIONAL DESCRIPTION:

DOORS ARE NORMALLY LOCKED AND LATCHED.
FREE EGRESS AT ALL TIMES. INSIDE ACTUATOR ALWAYS ACTIVE.
VALID CARD READ OR ACCESS CONTROL SYSTEM TIME ZONE UNLOCKS DOORS AND ACTIVATES OUTSIDE ACTUATOR.
UPON LOSS OF POWER DOORS REMAIN LOCKED AND LATCHED.
DOORS MONITORED.
RX SWITCH SHUNTS DOOR CONTACT.

END OF SECTION

DIVISION 09 – FINISHES

SECTION 092900 – GYPSUM WALLBOARD

PART 1 - GENERAL

1.01 WORK INCLUDED

A. The work of this section is subject to all applicable provisions of the "General Conditions" and "Division 01 - General Requirements" which form part of this specification.

B. Provide all labor, materials, equipment, and services and perform all operations required to complete the installation of all work of this section and related work as indicated on the drawings and specified herein, including, but not necessarily limited to, the following:

1. Light gauge interior metal drywall studs for partitions and bulkhead framing.
2. Gypsum wallboard as specified, anchorages and control joints.
3. All trim, battens, corners, and similar items.
4. All required fastenings, framing, and attachments.
5. All adhesive, tapes, and joint compound systems as required.
6. Wall to wall corner expansion joints.
7. Metal drywall ceiling framing, furring and accessories.
8. Acoustical insulation and sealants.

C. Products installed but furnished under other sections and trades:

1. Metal drywall suspended ceiling grid system.
2. Metal wall/ceiling access panels furnished by other trades, as appropriate to project.
3. Metal lighting fixture plaster frames and rings, etc., within gypsum board ceiling system.
4. Cementitious backer units: Section 093013 – Porcelain and Glazed Ceramic Tile.

1.02 RELATED WORK

A. Related work specified under other sections of the specifications:

1. Section 054000 – Cold Metal Framing
2. Section 061000 – Rough Carpentry
3. Section 079200 – Joint Sealants
4. Section 081113 – Hollow Metal Doors and Frames
5. Section 081416 – Flush Wood Doors
6. Section 093013 – Porcelain and Glazed Ceramic Tile: for cementitious backer units.
7. Section 099000 – Painting
8. Section 265100 – Interior Lighting: ceiling lighting fixtures with plaster frames and/or rings for recessing fixtures in gypsum board ceiling systems.

1.03 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM):

1. ASTM A525 – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.
2. ASTM A641 – Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
3. ASTM A645 – Standard for Nonstructural Framing Members.
4. ASTM A653 – Standard Specification for Steel Sheet, Zinc-Coated, (Galvanized) by the Hot-Dipped Process.
5. ASTM C442 – Standard Specification for Gypsum Backing Board, Gypsum Coreboard and Gypsum Shaftliner Board.
6. ASTM C473 – Standard Test Methods for Physical Testing of Gypsum Panel Products.
7. ASTM C475 – Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
8. ASTM C518 – Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
9. ASTM C635 – Standard Specifications for Metal Suspension Systems.
10. ASTM C636 – Recommended Practice for Installation of Metal Suspension Systems.
11. ASTM C645 – Standard Specification for Non-Bearing (Axial) Steel Studs, Runners, (Track), and Rigid Furring Channels for Screw Application of Gypsum Board.
12. ASTM C665 – Mineral Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
13. ASTM C754 – Specification for Installation of Steel framing Members to Receive Screw-Attach Gypsum Boards.
14. ASTM C840 – Standard Specification for Application and Finishing of Gypsum Board.
15. ASTM C955 – Standard Specification for Cold-Formed Steel Structural Framing Members.
16. ASTM C1002 – Steel Drill Screws for the Application of Gypsum Board.
17. ASTM C1047 – Accessories for Gypsum Wallboard and Gypsum Veneer Base.
18. ASTM C1178 – Standard Specification for Coated Glass Mat Water-Resistant Gypsum Backing Panel.
19. ASTM C1278 – Standard Specification for Fiber-Reinforced Gypsum Panels.
20. ASTM C1396 – Standard Specification for Gypsum Board.
21. ASTM C1629, Standard Classification for Abuse-Resistant Nondecorated Interior Gypsum Panel Products and Fiber-Reinforced Cement Panels.
22. ASTM D3273 – Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.
23. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials.
24. ASTM E136 – Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750º C.
25. ASTM E119 – Standard Test Methods for Fire Tests of Building Construction and Materials.
26. ASTM F1267 – Specification for Metal, Expanded, Steel.

B. Gypsum Association (GA):

1. GA-214 – Recommended Levels of Gypsum Board Finish.
2. GA-216 – Recommended Specifications for the Application and Finishing of Gypsum Board.
3. GA-600 – Fire Resistance and Sound Control Design Manual.
4. GA-801 – Handling and Storage of Gypsum Panel Products.

C. Underwriters Laboratory, Inc. (UL):

1. UL US-22 – Wallboard, Gypsum.
2. UL 40-U18 – Fire Resistance Classification.

D. Steel Structures Painting Council (SSPC):

1. SSPC – Painting Manual.

1.04 QUALITY ASSURANCE

A. To assure compatibility, studs, runner track, clips, etc. shall be the product of the same manufacturer.

B. Comply with the minimum requirements of the following except where more stringent requirements are specified herein. All gypsum wallboard shall be asbestos free.

1. Gypsum Wallboard: ASTM C-1396.
2. Joint Treatment: ASTM C-475.
3. Non-load bearing steel studs, runners, and rigid furring channels for screw attachment of gypsum wallboard: ASTM C-645.

C. Perform work in accordance with ASTM C754, ASTM C840 and GA-216.

D. Maintain copies of GA-216 documents on site.

E. When fire-resistive construction is detailed or noted on the Contract Drawings, perform work in accordance with GA-600.

1.05 QUALIFICATIONS

A. Erector Qualifications: Company specializing in the erection of metal stud framing and gypsum wallboard systems on at least three (3) acceptable projects equal in scope to work specified.

1.06 SUBMITTALS

A. Shop Drawings, Product Data and Samples: Shall be submitted in accordance with Division 01.

B. Shop Drawings: Indicate all special details associated with fireproofing, acoustical seals, and ceiling and bulkhead framing.

C. Product Data: Provide manufacturer’s descriptive literature on metal framing, gypsum board, joint tape, and installation instructions and procedures.

D. Manufacturer’s verification that gypsum wallboard contains 100% post-consumer and post-industrial recycled content.

E. Manufacturer’s verification that VOC content of interior sealants is less than 250 g/L.

F. Manufacturer’s verification that VOC content of gypsum wallboard adhesive is less than 50 g/L.

G. Manufacturer’s verification that steel studs and framing contain at least 35% combined post-consumer and post-industrial recycled content.

H. Samples:

1. Submit samples for the Architect's approval in accordance with the applicable provisions of the contract documents.

2. Submit three (3) samples of each of the following:

a. Gypsum wallboard: 12" by 12" each type and finish.

b. Trim: 6" lengths of each type and finish.

c. Compound: 1 pint cans.

d. Tape: 12" lengths.

e. Screws and fastenings: Each size and type.

f. Submit shop drawings and engineering calculations for special areas as requested by the Architect.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Comply with manufacturer's instructions, GA-216 and GA-801. Stack product flat on a level surface. As individual sheets are removed for installation, raise products carefully on edge and carry in a vertical position. Take care to avoid impact, undue flexing and damage to edges, ends and corners.

B. Deliver all materials in unopened, original containers bearing manufacturer's labels. Store materials in a clean, dry, protected place and do not leave exposed to weather. Handle all materials with proper care to prevent damage. Handle and protect all materials and metal accessories from damage, dampness or wetting.

C. Remove all items delivered in broken, damaged, rusted or unlabeled condition from site immediately.

D. Storage:

1. Store all materials inside under cover, providing protection from damage and exposure to the elements, stacked flat, and off-floor.

2. Stack wallboard so that lengths are not over short lengths, avoid overloading floor system.

3. Store adhesives and ready-mixed joint compound in dry area; provide protection against freezing at all times.

4. Damaged, frozen, and deteriorated materials shall be removed from the job site.

1.08 JOB CONDITIONS

A. Environmental Conditions:

1. Temperature: During cold weather, in areas receiving wallboard installation and joint finishing, maintain temperature range between 55° to 70° F for one week prior to attachment or joint treatment, and until joint treatment is complete and dry.

2. Do not install gypsum board when ambient temperature is below 40°F.

B. Ventilation:

1. Provide adequate ventilation to carry off excess moisture during and following adhesive and joint compound treatment applications.

2. Use temporary air circulators in enclosed areas lacking natural ventilation. Under slow drying conditions, allow additional drying time between coats of joint treatment.

3. Protect installed materials from drafts during hot, dry weather.

4. Protection: Protect adjacent surfaces against damage and stains.

1.09 COORDINATION WITH OTHER WORK

A. General:

1. Coordinate with other work including mechanical and electrical work and partition systems. Installation of conduit and ductwork above suspension system shall be complete before installation of suspension system.

B. Protection:

1. Follow good safety and industrial hygiene practices during handling and installation of all products and systems, with personnel to take necessary precautions and wear appropriate personal protective equipment as needed. Read Material Safety Data Sheets and related literature for important information on products before installation. Contractor to be solely responsible for all personal safety issues during and subsequent to installation; architect, specifier, owner and manufacturer will rely on contractor's performance in such regard.

PART 2 - PRODUCTS

2.01 METAL FRAMING MATERIALS

A. Provide metal wall and bulkhead framing materials in accordance with GA 216.

B. Metal Studs - Drywall Type: ASTM C645: non-load bearing, galvanized sheet steel, ASTM A525; Cee-shaped, size as indicated on the drawings or noted below, conforming to the following:

1. Rated/non-rated, non-bearing metal stud partitions with single/double layer drywall: 20 gauge (up to 11 feet-6 inches in height; 18 gauge over 11'-6" in height.

2. Rated/non-rated, load bearing metal stud partition with single/double layer drywall: 20 gauge.

3. Ceiling and Wall Furring Channels: 1-3/8" face x 7/8" deep as manufactured by USG Corporation or approved equal. "Z" furring channels, 26 gauge hot dipped galvanized, 1-1/2" deep as manufactured by USG Corporation or approved equal.

4. Metal stud partitions with gypsum board/tile backerboard and ceramic tile finish: 20 gauge or heavier.

5. Metal stud framing at hollow metal door and light openings: 20 gauge.

6. Metal studs for infill framing at renovation/alteration areas: 25 gauge. Runners: Of same material and thickness as studs, bent leg retainer notched to receive studs.

C. Ceiling Runner: Where required, provide with extended leg retainer. Furring, Bridging and Bracing: Of same material as studs; thickness to suit purpose. Sheet Metal Backing: 20 gauge thickness, galvanized steel.

D. Fasteners: GA-216.

E. Touch-Up Primer for Galvanized Surfaces: SSPC SP 20, zinc rich.

F. Anchorage to Substrate: Tie wire, screws, nails and other metal supports, of type and size to suit application; to rigidly secure materials in place.

2.02 CEILING FRAMING

A. Channels: Fabricated of 16 gauge (1.5 mm) cold-rolled steel, factory applied black asphaltum rust-resistant paint. Minimum weight per 1,000 lineal feet:

1. Depth: 2 inches, 590 lbs.

2. Depth: 1 1/2-inches, 300 lbs.

B. Furring Channels: Screw-type, hat-shaped, 25 gauge (0.5 mm)

C. Optional Framing: Metal stud, ASTM C645 and GA 216, galvanized sheet steel, screw-type, Cee-shaped, minimum 25 gauge.

D. Ceiling Hangers: Minimum 8 gauge, galvanized, annealed steel wire.

E. Tie Wire: 16 gauge, galvanized, annealed steel wire.

F. Anchorage to Substrate: Tie wire, screws, nails and other metal supports, of type and size to suit application; to rigidly secure materials in place.

2.03 SUSPENDED GYPSUM BOARD CEILING GRID SYSTEM

A. USG Drywall Suspension Systems – Commercial quality, cold-rolled steel, hot dipped galvanized finish.

1. Main Tees: Fire-Rated Heavy-Duty classification 1.617” high x 144” long, integral reversible splice with knurled face. (DGLW-26 1-1/2” Face and 1.617” high)

   a. Cross Members: Fire-Rated members with knurled face. Cross Tees: DGLW-424 cross tee 1-1/2” high x 48” long with 1-1/2” wide face; DGLW-224 Fire-Rated: 1-1/2” high x 24” long with 1-1/2” face.

2. Quick release cross tee ends for positive locking and removability without tools.

3. Accessory Cross Tees: Cross tees must have knurled faces and quick release cross tee ends for positive locking and removability without tools.

   a. DGW-6026DM: 1.617” high x 5’ long with a 1-1/2” face
   b. DGW-7226DM: 1.617” high x 6’ long with a 1-1/2” face
   c. DGW-8426DM: 1.617” high x 7’ long with a 1-1/2” face
   d. DGW-9626DM: 1.617” high x 8’ long with a 1-1/2” face

4. Wall Moldings: Single web with knurled face

   a. DGWM-24: 1-1/2” x 1” x 144” long wall molding
   b. DGCM-27: 144” x 1-5/8” x 1” x 1” channel molding
   c. DGLC-12: 144” x 1-3/4” x 1” x 1” index channel molding

5. Accessories

   a. DGSC-180: Splice Clip
   b. DGTC-90: Transition Clip
   c. DGWC: Wall Attachment Clip
   d. DGSP-180: Splice Plate

e. DGHUB: Dome Hub
f. CMAC-1: Close Mount Attachment Clip

6. Wire: Hanger Wire 12 ga., galvanized or as noted on drawings

B. USG Drywall Wall-to-Wall Suspension Systems – Commercial quality, cold-rolled steel, hot dipped galvanized finish for use in corridors and short span applications.

1. Main Tees: Fire-Rated Heavy Duty classification 1.617" high x 6', 8', 10', 12', 14' or Custom long, integral reversible splice with 1-1/2" knurled face.
2. Wall Moldings: Single web with knurled face, 1-1/2" x 1" x 12' long, DGWM24
3. Wall Channel: Single web with knurled face, 1-5/8" x 1" x 12' long, DGCM27
4. Locking Wall Channel: Single web with knurled face, 1-3/4" x 1" x 12' long, DGLC-12

C. Grid Suspension Assemblies: Listed products establish standard of quality and are manufactured by United States Gypsum Company (USG), Chicago, IL or architect approved equal.

2.04 MANUFACTURERS – GYPSUM BOARD

A. Subject to compliance with requirements, provide products by one of the following:

1. USG Corporation
2. Gold Bond Building Products
3. Lafarge
4. Georgia-Pacific Co.

B. Limitations:

1. Do not expose to sustained temperatures exceeding 125º F.

2. Do not expose to excessive, repetitive or continuous moisture before, during or after installation. Eliminate sources of moisture immediately.

3. Not suitable for use in high-moisture areas such as tub and shower enclosures, gang showers and other areas subject to direct water exposure.

4. Non-loadbearing.

5. For abuse-resistant construction over steel framing, minimum 20-gauge studs at a maximum of 16" on center are required.

6. Application of Sheetrock Mold Tough AR gypsum panels over insulating blanket, installed continuously across the framing members is not recommended. Blankets should be recessed and blanket flanges attached to sides of studs or joists.

C. Finishing and Decorating:

1. Painting products and systems should be used that comply with recommendations and requirements in Appendices of ASTM C-840. For priming and decorating with paint, texture or wall covering, follow those manufacturer's directions for materials used.

2. All surfaces, including applied joint compound, must be thoroughly dry, dust-free and not glossy. Prime with Sheetrock brand First Coat primer, or with an undiluted, interior latex flat paint with high-solids content. Allow to dry thoroughly before decorating.

3. To improve fastener concealment, where gypsum panel walls and ceilings will be subjected to

severe artificial or natural side lighting and be decorated with a gloss paint (eggshell, semi-gloss or gloss), the gypsum panel surface should be skim-coated with joint compound. This equalizes suction and texture differences between the drywall face paper and the finished joint compound before painting. As an alternative to skim coating, or when a Level 5 finish is required, use manufacturer's Tuff Hide primer-surfacer.

D. Fire Protection:

1. 5/8" panels are UL Classified. Provide one- and two-hour Fire Ratings when used in accordance with UL designs U420, U442, U445, U451, U465, U466, U467 and U468. The gypsum core meets requirements for noncombustible construction.

2.05 GYPSUM PANEL PRODUCTS

TYPE I – ABUSE - MOISTURE - AND MOLD-RESISTANT TYPE X GYPSUM PANEL
To be used at all rated and non-rated interior gypsum board partitions and rated ceiling assemblies.

A. ASTM C1396, Standard Specification for Gypsum Board, for 5/8 in., Type X and water-resistant gypsum wallboard.

B. Basis of Design: Subject to compliance with project requirements, the design is based on the following: United States Gypsum Company, USG Sheetrock® Brand Mold Tough® AR Firecode® X Panels.

1. UL Type Designation: "AR".

2. ASTM E136 Noncombustibility.

3. Meets the following ASTM E84 Surface-Burning Characteristics.

a. Flame Spread: 15
b. Smoke Developed: 5
c. Class A

4. Meets the following ASTM C473, Standard Test Methods for Physical Testing of Gypsum Panels Products.

a. Core Hardness
1) Field - Not less than 11 lbf
2) End - Not less than 11 lbf
3) Edge - Not less than 11 lbf

b. Flexural Strength
1) Parallel - Not less than 46 lbf
2) Perpendicular - Not less than 147 lbf

c. Nail Pull Resistance - Not less than 87 lbf
d. Humidified Deflection - Not greater than 5/8 in.
e. Average Water Absorption - Not greater than 5% by weight after two-hour immersion

5. ASTM D3273, Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber. Meets ASTM C1396 specifications.

6. Thickness: 5/8 in.

7. Length: 8-12 ft.

8. Width: 4 ft.

9. Weight: 2.8 lb./sq. ft.

10. Edge: Tapered

C. ASTM C1629, Standard Classification for Abuse-Resistant Nondecorated Interior Gypsum Panel Products and Fiber-Reinforced Cement Panels

1. Abrasion Resistance per ASTM D4977: Level 2
2. Indentation Resistance per ASTM D5240: Level 1
3. Soft-Body Impact Resistance per ASTM C1629: Level 2
4. Hard-Body Impact Resistance per ASTM C1629: Level 1

TYPE IA – HIGH – ABUSE – MOISTURE - AND MOLD-RESISTANT TYPE X GYPSUM PANEL

To be used at all rated and non-rated interior gypsum board partitions requiring High Impact wall Assemblies as noted on the Drawings.

A. ASTM C1396, Standard Specification for Gypsum Board, for 5/8 in., Type X and water-resistant gypsum wallboard.

B. Basis of Design: Subject to compliance with project requirements, the design is based on the following: United States Gypsum Company, USG Sheetrock® Brand Mold Tough® VHI Firecode® X Panels.

1. UL Type Designation: “AR”.

2. ASTM E136 Noncombustibility.

3. Meets the following ASTM E84 Surface-Burning Characteristics.

a. Flame Spread: 15
b. Smoke Developed: 5
c. Class A

4. Meets the following ASTM C473, Standard Test Methods for Physical Testing of Gypsum Panels Products.

a. Core Hardness
1) Field - Not less than 11 lbf
2) End - Not less than 11 lbf
3) Edge - Not less than 11 lbf

b. Flexural Strength
1) Parallel - Not less than 46 lbf
2) Perpendicular - Not less than 147 lbf

c. Nail Pull Resistance - Not less than 87 lbf
d. Humidified Deflection - Not greater than 5/8 in.
e. Average Water Absorption - Not greater than 5% by weight after two-hour immersion

5. ASTM D3273, Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber. Meets ASTM C1396 specifications.

6. Thickness: 5/8 in.

7. Length: 8-12 ft.

8. Width: 4 ft.

9. Weight: 2.8 lb./sq. ft.

10. Edge: Tapered

C. ASTM C1629, Standard Classification for Abuse-Resistant Nondecorated Interior Gypsum Panel Products and Fiber-Reinforced Cement Panels

1. Abrasion Resistance per ASTM D4977: Level 2
2. Indentation Resistance per ASTM D5240: Level 2
3. Soft-Body Impact Resistance per ASTM C1629: Level 3
4. Hard-Body Impact Resistance per ASTM C1629: Level 3

TYPE II – GLASS-MAT TILE BACKERBOARD

To be used at all wall surfaces scheduled to receive wall tile finishes.

A. ASTM C1178, Standard Specification for Coated Glass Mat Water-Resistant Gypsum Backing Panel, for 5/8” in., Glass-Mat Tile Backerboard.

1. Basis of Design: Subject to compliance with project requirements, the design is based on the following: USG Durock™ Glass-Mat Tile Backerboard.

a. Thickness: 5/8 inch.

b. Board Length: 8 feet.

c. Board Width: 48 inches.

d. Mold Resistance: ASTM D 3273, score of 10.

2. Fastener Requirements: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and application.

a. Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: DUROCK Tile Backer Screws 1-5/8 inch.

b. Wood Screws: DUROCK Tile Backer Screws for wood framing 1-5/8 inch.

3. Panel Installation Requirements:

a. Install backerboard with ends and edges closely abutted but not forced together. Stagger end joints in successive courses.

b. For flooring applications over a wood-based substrate, laminate USG Durock™ Glass-Mat Tile Backerboard to subfloor using Type 1 organic adhesive or latex-modified thin-set mortar suitable for bonding cement board. Fasten to subfloor with 1-1/4" USG Durock™ Brand Tile Backer Screws for wood framing (or equivalent) spaced 8" o.c. in both directions with perimeter fasteners at least 3/8" and less than 5/8" from ends and edges. Drive screws so bottoms of heads are flush with panel surface to ensure firm panel contact with subfloor. Do not overdrive fasteners. Prefill joints with tilesetting mortar or adhesive and then immediately embed USG Durock™ Brand Tile Backer Tape and level joints.

c. For wall application, fasten USG Durock™ Glass-Mat Tile Backerboard to framing with

specified fasteners. Drive fasteners into field of panels first, working toward ends and edges. Hold panels in firm contact with framing while driving fasteners. Space fasteners maximum 8" o.c. for walls, 6" o.c. for ceilings, with perimeter fasteners at least 3/8" and less than 5/8" from ends and edges. Drive screws so bottoms of heads are flush with panel surface. Do not overdrive fasteners. Approved fasteners include: USG Durock™ Tile Backer Screws for steel framing (or equivalent), 1-5/8" for 14- to 20-gauge steel framing; USG Durock™ Tile Backer Screws for wood framing (or equivalent), 1-5/8" for wood framing. Prefill joints and then immediately embed USG Durock™ Tile Backer Tape and level joints. Maintain 1/4" gap between USG Durock™ Glass-Mat Tile Backerboard and tub surround.

d. Panels should be cut to size with a knife and straight edge. A power saw should be used only if it is equipped with a dust-collection device. Installer should wear NIOSH/MSHA-approved dust mask.

e. If waterproofing is required, treat joints and fastener penetrations with USG Durock™ Brand Waterproofing Membrane or equivalent ANSI A118.10 waterproofing membrane. Refer to the current USG Durock™ Brand Waterproofing Membrane submittal sheet (CB595) or waterproofing membrane manufacturer's installation recommendations. For technical assistance, call USG Technical Service at 800 874-4968.

f. In areas where standing water could occur on horizontal surfaces, such as shower benches or niches, waterproofing is required with USG Durock™ Waterproofing Membrane or equivalent ANSI A118.10 waterproofing membrane. Refer to the current USG Durock™ Brand Waterproofing Membrane submittal sheet (CB595) or waterproofing membrane manufacturer's installation recommendations.

4. Application Limitations:

a. Tile must be applied on the gray-coated side of panel. Panels are designed for interior use only and should not be used around fireplaces or areas where prolonged exposure to heat exceeds 125°F (52°C) or for exterior applications. Use framing or furring when applying over concrete or masonry block. Install vapor retarders suitable for bonding tiles on the face of the panels.

b. For wall applications, maximum stud spacing: 16" o.c. (24" o.c. for cavity shaft wall assembly). Framing shall be designed (based on stud properties alone) not to exceed L/360 deflection for tile and thin brick. Maximum fastener spacing: 8" o.c. for wood and steel framing; 6" o.c. for ceiling applications.

c. Floor applications, maximum joist spacing 24" o.c. The subfloor system should be designed with a maximum deflection limit of L/360 for the span. Some finish materials may require a more rigid subassembly (such as large format tile and natural stone products). In these cases, follow the manufacturer's minimum requirements. The subfloor shall be APA Span-Rated Plywood or OSB with an Exposure 1 classification or better with tongue and groove or back blocked at the unsupported edges.

d. Ceiling maximum dead load 7.5 psf.

e. Steel framing must be 20-gauge equivalent or heavier.

f. Consult manufacturers information on finishing limitations.

1) Do not use drywall screws or drywall nails.
2) Do not use drywall joint tape.
3) Do not use with vinyl flooring or over a concrete subfloor.

g. USG Durock™ Glass-Mat Tile Backerboard is not designed for use as a structural panel.

h. Panels should not be used in select wet areas including commercial saunas or steam rooms, gang showers, or shower pan bases.

i. Waterproofing membrane must be used over USG Durock™ Glass-Mat Tile Backerboard in select wet areas including indoor hot tub decks, shower benches and niches, tiled wall and ceiling applications in indoor pool areas, and tiled wall and ceiling applications in residential steam rooms, per ANSI A118.10.

TYPE III – MOISTURE- AND MOLD-RESISTANT TYPE X GYPSUM SHAFTLINER PANEL

To be used at all rated and non-rated interior gypsum board shaft wall and area separation wall systems.

A. ASTM C1396, Standard Specification for Gypsum Board, for 1 in., Type X and water-resistant shaftliner board.

B. Basis of Design: Subject to compliance with project requirements, the design is based on the following: United States Gypsum Company, USG Sheetrock® Brand Mold Tough® Gypsum Liner Panels.

1. UL Type Designation: “SLX”.

2. ASTM E136 Noncombustibility.

3. Meets the following ASTM E84 Surface-Burning Characteristics.

   a. Flame Spread: 20
   b. Smoke Developed: 0
   c. Class A

4. Meets the following ASTM C473, Standard Test Methods for Physical Testing of Gypsum Panels Products.

   a. Core Hardness
      1) Field - Not less than 11 lbf
      2) End - Not less than 11 lbf
      3) Edge - Not less than 11 lbf

   b. Flexural Strength
      1) Parallel - Not less than 77 lbf
      2) Perpendicular - Not less than 228 lbf

   c. Nail Pull Resistance - (Not Required)
   d. Humidified Deflection - (Not Required)
   e. Average Water Absorption - Not greater than 5% by weight after two-hour immersion

5. ASTM D3273, Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber. Meets ASTM C1396 specifications.

6. Thickness: 1 in.

7. Length: 8 ft., 10 ft. 12 ft.

8. Width: 2 ft.

9. Weight: 4.0 lb./sq. ft.

10. Edge: Double-beveled

TYPE IV – LIGHTWEIGHT MOISTURE - AND MOLD-RESISTANT GYPSUM PANEL
To be used at all non-rated ceilings and soffits.

A. ASTM C1396, Standard Specification for Gypsum Board, for 1/2 in., water-resistant gypsum wallboard.

B. Basis of Design: Subject to compliance with project requirements, the design is based on the following: United States Gypsum Company, USG Sheetrock® Brand UltraLight Panels Mold Tough®.

1. UL Type Designation: Not applicable

2. ASTM E136 Noncombustibility.

3. Meets the following ASTM E84 Surface-Burning Characteristics.

   a. Flame Spread: 15
   b. Smoke Developed: 0
   c. Class A

4. Meets the following ASTM C473, Standard Test Methods for Physical Testing of Gypsum Panels Products.

   a. Core Hardness
      1) Field - Not less than 11 lbf
      2) End - Not less than 11 lbf
      3) Edge - Not less than 11 lbf

   b. Flexural Strength
      1) Parallel - Not less than 36 lbf
      2) Perpendicular - Not less than 107 lbf

   c. Nail Pull Resistance - Not less than 77 lbf
   d. Humidified Deflection - Not greater than 1-1/4 in.
   e. Average Water Absorption - Not greater than 5% by weight after two-hour immersion

5. ASTM D3273, Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber. Meets ASTM C1396 specifications.

6. Thickness: 1/2 in.

7. Length: 8-12 ft.

8. Width: 4 ft.

9. Weight: 1.35 lb./sq. ft.

10. Edge: Tapered

2.06 GYPSUM BOARD ACCESSORIES

A. Provide gypsum wallboard accessories in accordance with GA 216.

B. Each interior sealant and adhesive product must meet the VOC limits specified in Section 013563 "*LEED Requirements*".

C. Fasteners: Screws ASTM C1002, self-drilling, self-tapping, Bugle Head, for use with power driven tool.

1. Type "S": for wallboard application to sheet metal framing

2. Type "W": for wallboard application to wood framing.

3. Length:

a. 1 inch (25 mm) for single layer construction.

b. 1 5/8-inches (41 mm) for double layer construction.

4. For Fire Rated Construction: Same type and size as used in fire rating test.

5. For Other Applications: Type and size as recommended by gypsum board manufacturer.

D. Metal Trim Accessories: Size required for thickness of wallboard used, fabricated from galvanized steel and roll-formed zinc, or other corrosion-resistant treatment. All metal trim shall be 25 gauge, manufactured by *USG Corporation* under the following numbers or approved equal:

1. Corner Beads: Formed galvanized steel angle, 1/8-inch round bead, 1-1/4-inch perforated metal flanges, ASTM C1047, similar or equal to *"Dura-Bead"*.

2. Edge Trim: Formed galvanized steel casing bead, 0.014-inch-thick base steel, face nailed, reveal bead and exposed metal flange surface finished with joint compound, ASTM C1047.

3. Control Joints: Manufacturer's standard roll-formed zinc with 1/4-inch; "V"-shaped slot protected by plastic tape, for face application, exposed flange surfaces finished with joint compound, ASTM C1047; similar or equal to No. 093.

4. Casings: No. 400.

5. Wall to Wall (corner) Expansion Joints: *Wabo ECC-200* corner coverplate, aluminum alloy 6063-TS or 6061-T6, mill finish. Paint as per Section 099000.

E. Joint Treatment Materials:

1. Joint Tape: ASTM C475; paper reinforcing tape, perforated.

2. Joint Compound: ASTM C475; drying type pre-mixed vinyl base compounds, as manufactured by the approved manufacturer of the gypsum board.

3. Laminating Adhesive: Manufacturer's recommended laminating adhesive or liquid contact adhesive for double-layer systems.

F. Adhesive: Similar or equal to USG Durabond 90.

G. Adhesive VOC content must be less than 50 g/L.

H. Special Architectural Metal Drywall Profiles: Furnish and install, where indicated on Contract Drawings, extruded and roll-formed Architectural profiles *"Softforms"* as manufactured by *Pittcon*

Industries, Inc., Riverdale, MD. Subject to compliance with requirements, provide the named product or a comparable product.

1. Designs:

   a. Corners: Custom Inside Corner, Model #SI-LRt, 6-inch inside radius by 90 degrees.

   b. Reveals: Wall Reveal, Model #SWR-200-050, 2-inch wide by 15/32-inch deep.

   c. Grooves: V-Groove, Model #SWR-100V-050, 1-inch wide by 45 degrees.

2. Material: Extrusions shall be of 6063 T5 aluminum alloy, and roll formed shapes shall be of 3003 H-14 aluminum alloy.

3. Construction: Profile shall incorporate continuous integral tapering fins for surface contact, 7/8-inch wide. Fins shall be punched with ¼-inch holes staggered ½-inch o.c. to accept standard screw fastening.

4. Finish: Profiles shall receive a factory-applied, high porosity, corrosion-resistant primer compatible with materials commonly in use in conjunction with commercial interiors, i.e. – joint compound, latex or enamel paints, and wall covering adhesives.

2.07 ACOUSTICAL ACCESSORIES

A. Sound Attenuation Fire Blankets:

1. Manufactured from slag wool fiber.

2. Unfaced batts in manufacturers' standard thickness to fit cavity in compliance with manufacturers Sound and Fire-Rated SAFB Assemblies.

3. Length: 48 inches.

4. Batts shall have a density of 2.5 lbs. per cu.ft.

5. R-Value, per 1-inch thickness: 3.7.

6. Flame Spread and Smoke Developed (ASTM E84, Surface Burning Characteristics): 0.

B. Basis-of-Design Product: The design for Slag Wool Fiber is based on *Thermafiber, Sound Attenuation Fire Blankets* (SAFB). Subject to compliance with requirements, provide the named product or a comparable product by one of the following:

1. Owens Corning.
2. Fibrex Insulations, Inc.

C. Acoustical Sealant: Non-hardening, non-skinning, for use in conjunction with gypsum board; type as recommended by gypsum manufacturer.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that site conditions are ready to receive work and opening dimensions are as indicated on Contract Drawings and approved shop drawings.

3.02 METAL STUD INSTALLATION - GENERAL

A. Install metal stud framing in accordance with manufacturer's instructions, and ASTM C754, except as otherwise specified herein.

B. Install members true to lines and levels to provide surface flatness with maximum variation of 1/8-inch in 10 feet in any direction.

C. Align all partitions accurately according to layout. Runners shall be attached to concrete slab or other type of floor 24 inches on center with concrete stub nails or power-driven anchors, to suspended ceilings with toggle bolts, or to slab above where indicated.

D. Position studs vertically in runners, spaced 16 inches on center maximum.

E. Anchor all studs adjacent to door frames and at partition intersections and corners, to runner flanges with metal lock fasteners, or positive screw engagement through each stud and runner flange.

F. When necessary, studs shall be spliced by nesting 2 studs with a minimum lap of 8 inches, attaching flanges with 2 screws per flange.

G. Provide horizontal bracing of studs at mid-point in partition height. Bracing shall be standard metal stud cut to fit and secured to studs.

H. Metal studs at door frames shall be erected 2" maximum from frames and as follows:

1. Anchor door frame clips to studs securely by bolt or screw attachment.

2. Doors 2'-6" and wider shall be framed with double studs, placed back to back.

3. Over door frames, install a section (cut to length) of runner with slip flanges and bent web to allow flanges to overlap adjacent vertical studs; screw attach all components.

4. Position a stud at the locations of vertical joints in wallboard over door frames. Stud shall extend from frame header to the ceiling runner.

I. Unless otherwise indicated or specified, the suspension system for gypsum board ceilings and soffits shall consist of runner channels and furring channels, suspended by hanger bars or hanger rods.

3.03 INSTALLATION OF FLOOR AND CEILING TRACKS

A. Align floor and ceiling tracks.

B. Attach metal runners at floor and ceiling to structural elements with appropriate power-driven fasteners.

C. Attach tracks to structure with fasteners located 2 inches from each end and spaced at a maximum of 24 inches on center.

D. Maintain clearance under structural building members to avoid deflection transfer to studs. Provide extended leg ceiling runners.

3.04 INSTALLATION OF METAL STUD

A. Plumb and align studs.

B. Space studs at 16 inches on center, unless otherwise indicated.

C. Attach studs to floor and ceiling tracks by crimping flange of runner track, screwing, tack welding or method as recommended by stud manufacturer.

D. If necessary, splice studs by nesting with minimum lap of 8 inches.

E. Refer to Contract Drawings for indication of partitions extending to finished ceiling only, and for partitions extending through the ceiling to the structure above.

3.05 INSTALLATION OF FRAMING AROUND DOORS AND LIGHT OPENINGS

A. Install double studs at each jamb of door, continuous for full height of partition.

B. Attach stud track horizontally on each side of opening, at frame head height.

1. Install jack studs at 16 inches on centers over head of door frame.

2. Attach jack studs to runner track and anchor top in same manner as provided for full studs.

3. Screw, bolt or weld stud to jamb anchors of frame, as recommended by stud manufacturer.

4. Anchor a second stud to stud at doorjamb, as recommended in manufacturer's printed instructions, nested to form a box.

5. Provide headers above and below framed wall openings having an area of 2 square feet or more.

3.06 CORNERS AND INTERSECTIONS

A. Form corners and intersection of partitions with three studs as detailed in ASTM C754, Fig. 2 and Fig.3, as detailed on drawings. Two stud corner construction is not acceptable.

B. Place studs forming internal corners 2 inches (50 mm) from point of partition intersections.

3.07 BLOCKING

A. Bolt or screw steel channels to studs. Install blocking for support of plumbing fixtures, toilet partitions, wall cabinets, toilet accessories, hardware, and other similar items.

3.08 INSTALLATION – WALL FURRING

A. Attach wall furring for direct attachment to concrete block and/or concrete walls.

B. Erect furring channels horizontally or vertically; space maximum 16" (400 mm) on center, not more than 4 inches (100 mm) from floor and ceiling lines or abutting walls. Secure in place on alternate channel flanges at maximum 24" on center.

C. Where furring channels are installed directly to exterior walls and a possibility of moisture penetration through walls exists, install asphalt felt paper protection strip between the channel and wall.

3.09 INSTALLATION – CEILING FRAMING

A. Space 8 gauge hanger wire 48" on centers along carrying channels and within 6" of ends of channel run.

B. Install carrying channels 48" on centers and within 6" of walls.

C. Position channels for proper ceiling height, level, and secure with hanger wire saddle-tied along channel.

D. Interlock flanges, at channel splices, and overlap ends 12" and secure each end with double-strand 18 gauge tie wire.

E. Erect metal furring channels at right angles to carrying channels or support members. Space furring channels 16” o.c. and within 6" of walls.

F. Secure furring to carrying channels with clips or saddle-tie with double-strand 16 gauge tie wire.

G. Nest furring channels at least 8" at splices, and securely wire-tie each end with double-strand 18 gauge tie wire.

3.10 INSTALLATION – SUSPENDED CEILING GRID SYSTEM

A. General Installation Requirements:

1. Standard reference: Install grid members in accordance with ASTM C636, CISCA installation standards, and other applicable references.

2. Manufacturer’s reference: Install in accordance with manufacturer’s current printed recommendations.

3. Drawing reference: Install in accordance with approved shop drawings and locate ceiling in accordance with main tee dimensions relative to elevations.

4. Install in accordance with reference standards and manufacturer's instructions and as required to comply with seismic requirements.

B. Flat Ceiling Applications

1. Hanger Wire Installation: Secure hanger wires to upper structural elements and space hangers so that each hanger wire supports a maximum of 16 sq. ft.

2. Space main tee members a maximum span of 48” on center (or as specified by the UL Fire Resistance Directory)

3. Space cross tees recommended 16” o.c. (5/8” SHEETROCK Brand gypsum Board or 5/8” FIBEROCK Interior panels can span 24” o.c. Check USG AC3095, for maximum allowable spacing based on wind load) (or as specified by the UL Fire Resistance Directory) Install extra cross tees where butt joints occur, 8” from each side of the butt joint.

4. Install compression struts per manufacturer’s specifications and spacing, in accordance with wind load if applicable. Adjust main and cross tee spacing as necessary for loading conditions. (See AC3095, USG)

5. Install fiber glass insulation in plenum, resting on top of main tees and cross members, as indicated on the drawings.

6. Do not install insulation within 3” of light fixtures unless fixtures are approved for use with insulation.

7. Limit insulation thickness so that combined weight of supported panels and insulation on grid

main tees does not exceed 16 plf.

8. Attach SHEETROCK gypsum Board or FIBEROCK Interior panels to the suspension system main runners, cross tees, and cross channels with 1-1/4" bugle head screws – single layer of board spaced 16" o.c. – SHEETROCK gypsum Board and 8" o.c.- FIBEROCK in the field and at the perimeter of the panels, locate 3/8" in from panel edges. Hold panels in firm contact with framing while driving fasteners. Drive fastener heads flush with, or slightly below surface.

9. Install trim, and similar accessories as necessary and as applicable to meet project requirements where indicated on drawings.

10. Install control joints at locations of properly detailed control joints, including additional cross tees as necessary, per direction of architect and/or design professional.

11. Finish boards as described to achieve 'Level of Finish' specified.

C. Corridor (Wall-to-Wall) Applications

1. Hanger Wire Installation: Secure hanger wires to upper structural elements and space hangers so that each hanger wire supports a maximum of 16 sq. ft.

   a. Note:
   If using ½" single layer of drywall no hangers are required for spans up to 7'-0" (L/240 uniform load, single span design).
   If using 5/8" single layer of drywall no hangers are required for spans up to 6'-0" (L/240 uniform load, single span design).
   If using ½" single layer of drywall for spans over 7'-0" to 14'-0" one hanger at mid span per each main is required (L/240 uniform load, single span design).
   If using 5/8" single layer of drywall for spans over 6'-0" to 12'-0" one hanger at mid span per each main is required (L/240 uniform load, single span design).
   If using 5/8" single layer of drywall for spans over 12'-0" to 14'-0" two hangers at 1/3 point per each main is required (L/240 uniform load, single span design).

2. Space main tee members as required by span and design load

   a. Note:

Maximum load (lbs/sf)	Unsupported span	Main tee spacing
18	4'-0"	16" o.c.
12	4'-0"	24" o.c.
9.2	5'-0"	16" o.c.
6.1	5'-0"	24" o.c.
5.3	6'-0"	16" o.c.
3.6	6'-0"	24" o.c.
3.4	7'-0"	16" o.c.

3. Attach SHEETROCK gypsum board and FIBEROCK interior panels to the suspension system main runners, cross tees, and cross channels with 1-1/4" bugle head screws – single layer of board spaced 16" o.c. – SHEETROCK gypsum Board and 8" o.c.- FIBEROCK in the field and at the perimeter of the panels, locate 3/8" in from panel edges. Hold panels in firm contact with framing while driving fasteners. Drive fastener heads flush with, or slightly below surface.

4. Install trim, and similar accessories as necessary and as applicable to meet project requirements where indicated on drawings.

5. Install control joints at locations of properly detailed control joints, including additional cross tees as necessary, per direction of architect and/or design professional.

6. Finish boards as described to achieve 'Level of Finish' specified.

D. Curved, vaults, or dome applications

1. Drawing reference: Install in accordance with approved shop drawings and locate ceiling in accordance with main tee dimensions relative to elevations.

2. Hanger Wire Installation: Secure hanger wires to upper structural elements and space hangers so that each hanger wire supports a maximum of 12 sq. ft.

   a. Note: Curved surfaces can be achieved with the attachment of panels, however, in order to achieve the best application, plaster is recommended. Due to the width of the grid flange (greater than ¾") STRUCTO-BASE gypsum basecoat plaster should be used to reduce cracking. If other gypsum plasters or portland plaster are being used then it is recommended to secure narrow flanged framing members or offset the metal lath to reduce cracking due to reduced mechanical key at framing/lath intersection. Total weight of ceiling membrane plus overlaid insulation and surface finish material (e.g. ceramic tile) supported by the grid assembly should not exceed 4.0 psf. If the load exceeds 4.0 psf, then spacing of the hanger wires and/or main tees must be reduced (see sample calculation below). For guidance the following are design weights:

1/2" SHEETROCK Exterior Gypsum Ceiling Board	2.0 psf
5/8" SHEETROCK Exterior Gypsum Ceiling Board	2.5 psf
1/2" FIBEROCK Sheathing	2.2 psf
5/8" FIBEROCK Sheathing	3.0 psf

   b. If main tee hanger wires are at 4' o.c., the mains' load capacity is: 4 FT * 4 psf = 16 #/LF.
   By reducing the hanger wires to 3' o.c., the mains can carry 32 #/LF.
   By reducing the hanger wires to 2' o.c., the mains can carry 64 #/LF.

   3/4" of plaster wet would be about 8.75 #/SF + 5/8" FIBEROCK Sheathing at 3 #/SF for about 12 #/SF.

   Mains are at 4 ft centers with 4' hangers; this load would be 12 #/SF * 4 FT = 48 #/LF.
   If the Mains are at 2 ft centers with 4' hangers; this load would be 12 #/SF * 2 FT = 24 #/LF.

   Therefore, there are two options:

   1) Space the main tees at 4' o.c. with the 12 ga. hanger wire at 24" o.c. and within 8" from any wall, cross tees at 16" o.c. with hanger wire support at midspan and/or within 8" from any wall.
   2) Space the main tees at 2' o.c. with the 12 ga. hanger wire at 36" o.c. and within 8" from any wall, cross tees at 16" o.c.

3. Space main and cross tee members so the maximum span of metal lath is (16") (12")

4. Secure self-furring metal lath to tee members with screws spaced 6" o.c. max., applied at lath dimples. Lap metal lath ends and edges and secure with 18 gauge tie wire spaced 6-inches o.c.

5. Mix STRUCTO-BASE Gypsum Plaster with sand in proportions of 2 cu. ft. of sand per 100 lbs. of plaster for scratch and brown coats. Apply plaster to metal lath to a thickness of 5/8” (min.) Measured from the face of the lath.

6. Select a plaster mix for the finish coat to provide a smooth trowel or sand float (textured) finish. (Reference SA 920)

7. Use template(s) to insure uniform and even curvature of the finished surface.

3.11 FURRING FOR FIRE RATINGS

A. Install furring for fire resistance ratings in accordance with appropriate UL requirements and/or Design Numbers indicated.

3.12 INSPECTION PRIOR TO WALLBOARD INSTALLATION

A. Check framing for adequate spacing and alignment.

B. Verify that spacing of installed framing does not exceed maximum allowable for thickness of wallboard to be used.

C. Verify that frames are set for thickness of wallboard to be used.

D. Do not proceed with installation of wallboard until deficiencies are corrected and surface to receive wallboard are acceptable.

E. Protrusions of framing, twisted framing members, or unaligned members must be repaired before installation of wallboard is started.

F. Commencing installation of wallboard means “acceptance” of existing conditions.

3.13 WALLBOARD INSTALLATION - GENERAL

A. Unless otherwise specified, methods of installation shall be in accordance with the requirements of the Gypsum Association (GA-216) and the approved manufacturer’s instructions.

B. Stockpile wallboard, flat on floor in piles. Leave in original wrappings or containers until ready for use. Protect wallboard from moisture from any source.

C. Butt all wallboard joints loosely together with a 1/4" cap. Butt ends shall not be placed against tapered edges.

D. Install in maximum practical lengths to span walls without butt joints. If butt joints do occur, stagger joints and locate as far as possible from center of walls or ceilings.

E. Abut wallboard without forcing. Neatly fit ends and edges of wallboard. Do not place butt ends against tapered edges.

F. Support end joints on studs. Apply end joint compound to the back of the board along end joints.

G. No end joints shall align with edges of openings. Install expansion and/or control joints where shown or required.

H. Install metal trim at corners, edges, and elsewhere as shown in accordance with the manufacturer's instructions and recommendations.

I. Openings cut in wallboard to fit mechanical and electrical items shall fit snugly and be small enough to be covered by escutcheons and plates. Both face and back paper shall be cut when cutouts are not made with a saw.

J. Adhesive and joint finishing compounds shall be mixed in strict accordance with the manufacturer's instructions. Mix only enough at one time to be used during the recommended pot life of the compound.

K. Fasteners shall be installed as follows:

1. Install no closer than 3/8-inch to end or edge.

2. Begin from center of wallboard and proceed to outer edge.

3. Pressure shall be applied on wallboard adjacent to fasteners being driven to ensure a tight fit of wallboard to the studs.

L. Drive screws with a power screwdriver as recommended by the manufacturer. Surface of head shall finish below the surface of the paper without puncturing the paper.

M. Minimum temperature in areas where gypsum board is to be installed shall be 65°F for 24 hours before, during, and after installation. Provide adequate heat and ventilation to remove any moisture.

N. Install continuous sound absorbing blanket in partitions indicated on drawings. Installation shall be in accordance with manufacturer's directions. Sound absorbing blanket insulation shall be paperless, semi-rigid mineral fiber batts 1" thick "Thermafiber" sound attenuation blanket, flame spread rating of 15 (ASTM E-84) as manufactured by *Owens Corning* or approved equal.

3.14 INSTALLATION - WALLBOARD OVER FRAMING

A. Single Layer Construction:

1. Ceilings:

a. Gypsum wallboard shall be applied first to ceiling with long dimension at right angles to framing using panels of maximum practical length.
b. Position end joints over framing members and stagger in adjacent rows.
c. Fit ends and edges closely, do not force together. Fasten panels to furring with mechanical fasteners, spaced 12” o.c., in field of panels and along abutting ends and edges.

2. Walls:

a. Apply wallboard horizontally for wall height of 8’-0” or less, and vertically for wall height greater than 8’-0”. When installing wallboard horizontally, attach upper panel first.
b. Apply single layer fire rated wallboard vertically, with edges occurring over firm bearing.
c. Stagger end joints to occur on different framing members on opposite sides of partition.

3. Mechanical Fastening:

a. Screws:

1) Attach single layer of wallboard to metal framing with power driven screws.
2) Minimum edge clearance from mechanical fastener: 3/8”.
3) Stagger mechanical fasteners opposite each other on adjacent ends and edges.
4) Sand abutting ends or edges over support surface.

5) Space screws 16” o.c. when framing is spaced 16” o.c., or 12” o.c. when framing is spaced 24” o.c.
6) Drive screws with a positive clutch electric screwgun.

B. Double Layer Construction:

1. Ceilings:

a. Apply wallboard face layer perpendicular to edges of base layer.
b. Position end joints of face layer to offset base layer joints by at least 10”.
c. Gypsum wallboard shall be installed in such a manner to provide two-hour fire resistant rating shown, when indicated, and in accordance with requirements of UL.

2. Walls:

a. Apply wallboard base layer vertically.
b. Stagger vertical joints of base layer on opposite side of partition to occur on different framing members.
c. Apply face layer horizontally, minimum offset of joints between face layer and face layer shall be at least 10".
d. Gypsum wallboard shall be installed in such manner to provide two hour fire resistant ratings indicated, and in accordance with requirements of UL.

3. Adhesive Lamination:

a. Apply adhesive with notched spreader or caulking gun, as recommended by wallboard manufacturer, for this particular application and job condition.

4. Permanent Attachment:

a. Permanently attach face layer with specified fasteners in accordance with UL requirements for systems selected.

3.15 CONTROL JOINTS

A. Non-Rated Gypsum Construction: Gypsum panel surfaces shall be isolated with control joints or other means, as detailed and at locations indicated on the drawings, if not shown, where:

1. Partition, furring or column fireproofing abuts a structural element (except floor) or dissimilar wall or ceiling;

2. Ceiling or soffit abuts a structural element, dissimilar wall or partition or other vertical penetration;

3. Construction changes within plane of partition or ceiling;

4. Partition or furring run exceeds 30 ft.;

5. Ceiling dimensions exceed 50 ft. in either direction with perimeter relief, 30 ft. without relief;

6. Exterior soffits exceed 30' in either direction;

7. Wings of “L”, “U” and “T” shaped ceiling areas are joined;

8. Expansion or control joints occur in the exterior wall.

9. Less-than-ceiling height door/light frames shall have control joints extending to the ceiling from both opening corners. Ceiling height doorframes may be used as control joints.

B. Fire-Rated Gypsum Construction: Gypsum panel surfaces shall be isolated with control joints or other means, as detailed and at locations indicated on the drawings, if not shown, where:

1. A partition, wall, or ceiling traverses a construction joint (expansion, seismic, or building control element) in the base building structure.

2. Where a wall or partition runs in an uninterrupted straight plane exceeding 30 lineal feet. NOTE: Full height door frames may be considered a control joint.

3. Interior Ceilings With Perimeter Relief: Control joints shall be installed so that linear dimensions between control joints shall not exceed 50 ft. and total areas between control joint shall not exceed 2500 sq.ft.

4. Interior Ceilings Without Perimeter Relief: Control joints shall be installed so that linear dimensions between control joints shall not exceed 30 ft. and total areas between control joint shall not exceed 900 sq.ft.

5. Exterior Ceilings and Soffits: Control joints shall be installed so that linear dimensions between control joints shall not exceed 30 ft. and total area between control joints shall not exceed 900 sq.ft.

6. A control joint or intermediate blocking shall be installed where ceiling framing members change direction.

7. A control joint is desired or incorporated as a design accent or Architectural feature.

C. Install vertical control joints in gypsum sheathing to relieve stress caused by movement in accordance with ASTM C840-08, Section 20.3.1-20.3.5

1. Control joints shall be installed where a partition, wall or ceiling traverse a construction joint (expansion, seismic or building control element) in the base building structure.

2. Control joints shall be installed where a wall or partition runs in an uninterrupted straight plan exceeding 30 linear feet.

3. Control joints in interior ceilings with perimeter relief shall be installed so that the linear dimensions between control joints do not exceed 50 feet and total area between control joints does not exceed 2,500 sq. ft.

4. Control joints in interior ceilings without perimeter relief shall be installed so that the linear dimensions between control joints do not exceed 30 feet and total area between control joints does not exceed 900 sq. ft.

5. Control joints in interior ceilings with perimeter relief shall be installed so that the linear dimensions between control joints do not exceed 30 feet and total area between control joints does not exceed 900 sq. ft.

6. Control joint or intermediate blocking shall be installed where ceiling framing members change direction.

7. Where control joints occur in an acoustical or fire rated system, blocking shall be provided behind the control joint by using a backing material such as 5/8” Type X gypsum board, mineral fiber, or other tested equivalent.

3.16 INSTALLATION – ACOUSTICAL ACCESSORIES

A. Place acoustical insulation in partitions tight within spaces, around cut openings, behind and around electrical and mechanical items within or behind partitions, and tight to items passing through partitions.

B. Apply acoustical sealant within partitions in accordance with manufacturer's instructions and recommended procedures.

3.17 INSTALLATION – METAL ACCESSORIES

A. Install corner beads and edge trim as specified in ASTM C840.

B. Install corner beads at all external corners.

C. Install edge trim at perimeter of openings and at juncture with other materials except, where covered by casings or flanges.

3.18 JOINT TREATMENT SYSTEM

A. Execute joint treatment in accordance with the manufacturer's printed instructions and these specifications.

B. Reinforce wall corners and angles with tape folded to conform to the contour and embed in compound.

C. Flanges of corner beads and trim shall be concealed by 2 coats of compound. Feather cut compound 9 inches from beads.

D. Sand compound when thoroughly dry; avoid roughing surfaces of finish wallboard.

E. Leave all surfaces smooth and uniform, ready to receive paint.

F. Gypsum Board Finish Levels: Finish panels to levels indicated below, according to ASTM C 840.

1. Level 4 – Provide at Flat or Eggshell Painted walls or ceilings.

2. Level 5 – Provide at Gloss, Semi-Gloss, Enamel, Special Wallcoverings, or where severe lighting conditions occur.

G. Taping and Finishing Joints:

1. Taping and Embedding Joints:

   a. Apply compound in thin uniform layers to all joints and angles to be reinforced.
   b. Apply reinforcing tape immediately.
   c. Center tape over joint, and seat tape into compound.
   d. Leave approx. 1/64" to 1/32" compound under tape to provide bond.
   e. Apply skim coat immediately following tape embedment, but not to function as fill or second coat.
   f. Fold tape and embed in at inside corners to provide true angle.
   g. Allow embedding coat to thoroughly dry prior to application of fill coat.

2. Filling:

   a. Apply second coat of joint compound over embedding coat.

b. Fill taper flush with surface.
c. Apply fill coat to cover embedding coat.
d. Feather out fill coat beyond embedding coat and previous joint compound line.
e. Joints with no taper: Feather out at least 4” on either side of tape.
f. Do not apply fill coat on interior angles.
g. Allow fill coat to thoroughly dry prior to application of finish coat.

3. Finishing:

a. Spread joint compound evenly over and beyond fill coat on all joints.
b. Feather coats onto adjoining surfaces so that camber is maximum 1/32” to 1/16”., and to a smooth, uniform finish.
c. Apply finish coat to taped inside angles to cover tape and taping compound.
d. Sand final application of compound to provide a smooth surface, ready for decoration.

H. Filling and Finishing Depressions:

1. Apply joint compound as first coat to fastener and other depressions.
2. Apply at least two additional coats of compound after first coat is dry.
3. Leave filled and finished depressions level with plane of surface.

I. Finish Beads and Trim:

1. First Fill Coat:

a. Apply joint compound to beam and trim.
b. Feather out first coat from ground to plane of wallboard surface.
c. Allow compound to thoroughly dry prior to application of second fill coat.

2. Second Fill Coat:

a. Apply joint compound in same manner as first coat.
b. Extend beyond first coat onto face of wallboard.
c. Allow compound to thoroughly dry prior to application of finish coat.

3. Finish Coat:

a. Apply joint compound in same manner as second coat.
b. Extend beyond second fill coat.
c. Feather out finish coat from ground to plane of wallboard surface.
d. Sand finish coat to provide a flat surface ready for decoration.

4. Taping, filling and sanding is not required at surfaces behind adhesive applied ceramic tile.

3.19 AIRTIGHT DRYWALL OR RETURN AIR PLENUM SPACES

A. Finish all drywall plenum construction below access floor or above finished ceiling.

1. Finish Level: Level 1.

a. Seal all pipes, ducts, conduit and other penetrations.
b. Seal perimeter of all drywall to floors and deck above with sealant.

3.20 INSTALLATION OF ACCESS PANELS

A. Install metal access panels and rigidly secure in place, as required by other sections and other

trades.

B. Install in accordance with manufacturer's printed instructions and requirements of regulatory agencies, when applicable.

C. Coordinate the installation of rough bucks, anchors, blocking, mechanical and electrical work which is to be placed in or behind wall framing and ceiling furring. Allow such items to be installed after framing and furring is complete.

3.21 TOLERANCES

A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8” in 10 feet, in any direction.

3.22 PATCHING AND REPAIRING

A. After trim is applied, correct all surface damage and defects as required, to the Architect's satisfaction, so that blemishes will not show through the decoration.

B. If, in the opinion of the Architect, the wallboard is irreparable, the Contractor shall remove same and replace it with new material at no extra cost to the Owner.

C. Punctures:

1. When face paper is punctured, drive new nail approximately 1 1/2" from defective fastening and remove defective fastener.

2. Fill all damaged surface areas with compound.

3. Leave clear depression to receive tape.

4. Permit prefill joint compound to harden prior to application of tape.

D. Ridging:

1. Do not repair ridging until condition has fully developed; approximately six months after installation of one heating season.

2. Sand ridges to receive reinforcing tape without cutting through tape.

3. Fill concave areas on both sides of ridge with topping compound.

4. After fill is dry, blend in topping compound over repaired areas.

E. Cracks:

1. Fill all cracks with compound and finish smooth and flush.

3.23 INSPECTION

A. Wall surface, when prepared for painting, shall be inspected and approved by the Architect before proceeding further.

END OF SECTION

DIVISION 09 – FINISHES

SECTION 095000 – ACOUSTICAL CEILING SYSTEMS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Conditions of Contract, including General and Supplementary Conditions and Division 01 Specification sections apply to work of this section.

1.02 SUMMARY

A. Ceiling Types:

1. The extent of each type of acoustic ceiling is shown on the drawings and in schedules.
2. The types of acoustical ceilings required are as follows:

    a. Mineral fiber acoustic panels in exposed grid suspension system.

B. Related Work:

1. Section 092900 – Gypsum Wall Board
2. Section 099000 – Painting

C. Related Work in Other Contracts:

1. Heating, Ventilating, and Air Conditioning Work:

    a. Grilles, diffusers, and similar air distribution components installed in acoustic ceiling system. Refer to Division 23.

2. Electric Work:

    a. Lighting fixtures, smoke detection systems, sound systems, and similar electrical components installed in acoustic ceiling system. Refer to Division 26, 27 & 28.

1.03 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. ASTM A 1008 Standard Specification for Steel, Sheet, Cold Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability
2. ASTM A 641 Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire
3. ASTM A 653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process
4. ASTM C 423 Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method
5. ASTM C 635 Standard Specification for Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings
6. ASTM C 636 Recommended Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels
7. ASTM D 3273 Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber
8. ASTM E 84 Standard Test Method for Surface Burning Characteristics of Building Materials

9. ASTM E 119 Standard Test Methods for Fire Tests of Building Construction and Material
10. ASTM E 580 Installation of Metal Suspension Systems in Areas Requiring Moderate Seismic Restraint
11. ASTM E 1111 Standard Test Method for Measuring the Interzone Attenuation of Ceilings Systems
12. ASTM E 1414 Standard Test Method for Airborne Sound Attenuation Between Rooms Sharing a Common Ceiling Plenum
13. ASTM E 1264 Classification for Acoustical Ceiling Products

B. ASHRAE Standard 62.1-2004, Ventilation for Acceptable Indoor Air Quality

C. NFPA 70 National Electrical Code

D. ASCE 7 American Society of Civil Engineers, Minimum Design Loads for Buildings and Other Structures

E. International Code Council-Evaluation Services - AC 156 Acceptance Criteria for Seismic Qualification Testing of Non-structural Components

F. International Code Council-Evaluation Services Report - Seismic Engineer Report

1. ESR 1308 - Armstrong Suspension Systems

G. International Association of Plumbing and Mechanical Officials - Seismic Engineer Report

1. 0244 - Armstrong Single Span Suspension System

1.04 SUBMISSIONS

A. Submissions shall be in accordance with Section 013300 - Submissions, and as modified below.

B. Product Data:

1. Submit manufacturer's technical data for each type of acoustical ceiling unit and suspension system required.

C. Samples:

1. Architect's review will be for color and texture only. Compliance with all other requirements is the exclusive responsibility of the contractor.

2. Submit samples of the following: (Only when submitting equivalents or substitutions)

a. Exposed grids: Submit three 8" long samples of each type exposed runner.
b. Moldings: Submit three 8" long samples of each type required.
c. Acoustic units: Submit 3 sets of 6” x 6” square samples for each different acoustic unit required. Each set of samples shall show the full range of color and texture to be expected in the completed work.

D. Shop Drawings: Layout and details of acoustical ceilings show locations of items that are to be coordinated with or supported by the ceilings.

E. Certifications: Manufacturer's certifications that products comply with specified requirements, including laboratory reports showing compliance with specified tests and standards. For acoustical performance, each carton of material must carry an approved independent laboratory classification of NRC, CAC, and AC.

F. Maintenance Instructions:

1. Submit two copies of the manufacturer's recommendations for cleaning and refinishing each type of acoustic unit used in the work. Include precautions against materials and methods which may be detrimental to finishes and acoustic efficiency. Submit to Architect for transmittal to Owner.

1.05 QUALITY ASSURANCE

A. Single-Source Responsibility: Provide acoustical panel units and grid components by a single manufacturer.

B. Fire Performance Characteristics: Identify acoustical 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 ASTM E 1264 Classification.

2. Fire Resistance: As follows tested per ASTM E119 and listed in the appropriate floor or roof design in the Underwriters Laboratories Fire Resistance Directory.

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. Installer Requirements:

1. Acceptable to manufacturer of primary acoustic materials.

1.06 DELIVERY AND STORAGE

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. Handle acoustical ceiling units carefully to avoid chipping edges or damaged units in any way.

1.07 PROJECT CONDITIONS

A. Environmental Requirements:

1. Do not install interior ceilings until space is enclosed and weatherproof and HVAC system is operational; wet work in place is completed and nominally dry; work above ceilings is complete; and ambient conditions of temperature and humidity are continuously maintained at values near those intended for final occupancy. Building areas to receive ceilings shall be free of construction dust and debris.

2. Locate materials onsite at least 24 hours before beginning installation to allow materials to reach temperature and moisture equilibrium.

3. Maintain the following conditions in areas where acoustical materials are to be installed 24 hours before, during and after installation:

   a. Relative Humidity: 65-75%
   b. Uniform Temperature: 55-70ºF

1.08 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.

B. Warranty Period:

   1. Acoustical panels: One (1) year from date of substantial completion.
   2. Cirrus: Ten (10) years from date of substantial completion.
   3. Grid: Ten (10) 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.

1.09 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 quantity of full-size units equal to 5.0 percent of amount installed.

   2. Exposed Suspension System Components: Furnish quantity of each exposed suspension component equal to 2.0 percent of amount installed.

PART 2 - PRODUCTS

2.01 SUSPENSION SYSTEMS

A. Quality Standard:

   1. Provide direct hung suspension system complying with ASTM C 635 for the following structural classifications:

      a. Intermediate duty, unless otherwise indicated.

B. Manufacturers:

   1. Provide suspension systems for acoustic ceilings as produced by one of the following:

a. Armstrong World Industries, Inc.
b. Rockfon North America
c. Certainteed Architectural
d. USG Corporation

C. Hangers:

1. Provide hangers as recommended by suspension system manufacturer to comply with specified structural classification.

a. If suspension system manufacturer does not indicate hanger recommendation, provide not less than 9 gauge galvanized, soft annealed, mild steel wire.

2. Where hanger wires cannot be directly wire-tied to structural or intermediate framing members, provide attachment devices designed for the type of construction used in the work and with a carrying capacity of not less than 5 times the design loads involved.

D. Edge Moldings:

1. Provide manufacturer's standard angle or channel molding for edges and penetrations of ceiling, with single flange of molding exposed, white baked enamel finish.

E. Exposed Grid Suspension System:

1. Provide Class A fire rated single web steel main runners, matching interlocking cross runners, adapters, and accessories with exposed cross runners coped to lay flush with main runners.

2. Finish: Smooth, matte white baked enamel.

F. Protective Coatings and Finish:

1. Provide manufacturer's standard coatings and finishes for normal use environments (ASTM C 635), except as noted.

2. In toilet rooms, provide protective coatings and finishes complying with High Humidity Test Requirements (ASTM C 635).

2.02 ACOUSTIC CEILING UNITS

A. Manufacturers:

1. For convenience, details and specifications have been based on products indicated by the following manufacturers:

a. Mineral fiber acoustic panels and tiles: Armstrong World Industries, Inc.

2. Other manufacturers offering mineral fiber acoustic panels and tiles complying with the requirements include:

a. Certainteed Architectural
b. USG Corporation

B. Mineral Fiber Acoustic Panels:

1. Provide Class A Finish units, not less than 5/8" thick, with flame spread of 25 or less; smoke developed index rating of less than 450; complying with performance requirements and

physical characteristics of the specified panels indicated in the construction documents (ASTM E84, NFPA 255, UL 793).

2. Classrooms and meeting rooms shall be provided with an acoustic ceiling tile with a minimum NRC rating of 0.65.

3. Food Storage, food preparation, and food serving areas, toilet rooms, showers and similar areas shall receive non-absorbent, impervious tile to facilitate cleaning as specified in the construction documents.

2.03 ACCESSORIES

A. Hold Down Clips:

1. Provide manufacturer's standard spring steel clips spaced as recommended by said manufacturer in the following spaces:

a. All gymnasiums.
b. All recreation rooms.
c. All Locker rooms including toilet rooms within.
d. All High School corridors.
e. All Middle School corridors.

PART 3 - EXECUTION

3.01 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, unless expressly permitted by manufacturer's printed recommendations.

3.02 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.

3.03 INSTALLATION OF SUSPENSION SYSTEMS

A. General:

1. Coordination: Prior to start of acoustic ceiling work, consult other trades and contractors involved to determine areas of potential interference. Do not start installation of suspension systems until interferences have been resolved.

2. Provide framed openings around all sides of openings receiving items set in or attached to ceilings.

3. Install suspension systems in accordance with manufacturer's printed instructions and to comply with the requirements of ASTM C 636.

B. Hangers:

1. Space not more than 6" from each end and not more than 4' o.c. between ends of members to be supported. Provide additional hangers for support of light fixtures and other items to be

supported by the ceiling suspension system including clips to securely fasten all framing members (used to support fixtures) to each other to prevent eccentric deflection or rotation of supporting runners.

C. Moldings:

1. Provide edge moldings where ceilings meet walls, partitions, and other vertical elements.

2. Corners: Miter cut inside and outside corners or install corner caps.

D. Runners:

1. Support main runners directly from hangers; do not bear on walls or partitions. Space main runners to support acoustic panels and other work resting in or on the ceiling, as required to comply with specified performance requirements. Interlock cross-runners with either main runners or with cross-runners structurally classified as main runners. Install moldings with exposed leg in same plane as bottom flange of runners.

E. Where ceiling suspension systems are attached directly to the bottom chord of joists, ceiling extensions (either an extended bottom chord element or a separate unit, to suit manufacturer’s standards, or sufficient strength to support ceiling construction) shall be provided. Extend ends to within 1/2” of finished wall surface unless otherwise indicated.

3.04 INSTALLATION OF ACOUSTIC CEILING UNITS

A. General:

1. Do not install acoustic ceilings until installation areas meet the following requirements:

a. Exterior openings have been closed and roofs are weathertight.
b. Mechanical, electrical, and other work above ceilings has been completed.
c. Wet work has been installed.
d. Temperature and relative humidity have reached levels which comply with acoustic material manufacturer's recommendations for the units to be used in the work and are acceptable to the installer.

2. Install materials in accordance with manufacturer's printed instructions and other recommendations applicable to the work.

3. Balance border areas to avoid units of less than 1/2 unit width wherever possible. Wherever ceiling area is a multiple of full size acoustic units used in the work, balance alignment to be square and true and install only full size units for entire ceiling including borders.

B. Installation of Acoustic Panels in Exposed Grid Suspension Systems:

1. Install square edge panels to rest on flanges of grid tees with border units supported by moldings.

a. Field cut border units square and support on wall moldings.

2. Provide hold-down clips for panel areas where indicated; omit clips where access areas are shown.

a. Install 2 clips per panel at center of opposite sides of long dimension.
b. Install 4 clips per panel at midpoint of each side.

3.05 CLEAN UP AND PROTECTION

A. Clean exposed surfaces of acoustical ceilings, including trim, edge moldings, and suspension members. Comply with manufacturer's instructions for cleaning and touch up of minor finish damage. Remove and replace units and members which are damaged or cannot be cleaned.

END OF SECTION

DIVISION 09 – FINISHES

SECTION 096519 – RESILIENT TILE FLOORING

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. Provide flooring and accessories as shown on the drawings and schedules and as indicated by the requirements of this section.

1.02 RELATED SECTIONS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
B. Section 033000 – Cast-in-Place Concrete
C. Section 035413 – Self-Leveling Gypsum Underlayment
D. Section 035416 – Self-Leveling Cementitious Underlayment
E. Section 061000 – Rough Carpentry
F. Section 090561.13 – Moisture Vapor Emission Control

1.03 REFERENCES

A. ASTM International:

1. ASTM E 84 Standard Test Method for Surface Burning Characteristics of Building Materials
2. ASTM E 648 Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source
3. ASTM E 662 Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials
4. ASTM F 710 Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring
5. ASTM F 1066 Standard Specification for Vinyl Composition Tile
6. ASTM F 1482, Standard Guide to Wood Underlayment Products Available for Use Under Resilient Flooring
7. ASTM F 1700 Standard Specification for Solid Vinyl Tile
8. ASTM F 1861 Standard Specification for Resilient Wall Base
9. ASTM F 1869 Standard Test Method for Measuring Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride
10. ASTM F 2170 Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes

B. National Fire Protection Association (NFPA):

1. NFPA 253 Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source
2. NFPA 258 Standard Test Method for Measuring the Smoke Generated by Solid Materials
3. NFPA 255 Standard Test Method of Test of Surface Burning Characteristics of Building Materials

1.04 SYSTEM DESCRIPTION

A. Performance Requirements: Provide flooring which has been manufactured, fabricated, and installed to performance criteria certified by manufacturer without defects, damage, or failure.

B. Administrative Requirements

1. Pre-installation Meeting: Conduct an on-site pre-installation meeting to verify project requirements, substrate conditions, manufacturer's installation instructions and manufacturer's warranty requirements. Comply with Division 1 Project Management and Coordination (Project Meetings) Section.

2. Pre-installation Testing: Conduct pre-installation testing as follows: [Specify testing (i.e., moisture tests, bond test, pH test, etc).

C. Test Installations/Mock-ups: (Only if indicated on the Drawings) Install at the project site a job mock-up using acceptable products and manufacturer approved installation methods, including concrete substrate testing. Obtain Owner's and Consultant's acceptance of finish color, texture and pattern, and workmanship standards.

1. Mock-Up Size: 4' x 4'.

2. Maintenance: Maintain mock-up during construction for workmanship comparison; remove and legally dispose of mock-up when no longer required.

3. Incorporation: Mock-up may be incorporated into the final construction with Owner's approval.

D. Sequencing and Scheduling

1. Install flooring and accessories after the other finishing operations, including painting, have been completed. Close spaces to traffic during the installation of the flooring.

2. Do not install flooring over concrete slabs until they are sufficiently dry to achieve a bond with the adhesive, in accordance with the manufacturer's recommended bond, moisture tests and pH test.

1.05 SUBMITTALS

A. Submittals shall be in accordance with Section 013300 – Submittal Procedures and as modified below.

B. Product Data:

1. Submit manufacturer's technical data and installation instructions for each type of resilient flooring, adhesives and accessories.

2. Include manufacturer's written instructions for recommended maintenance practices for each type of resilient flooring and accessories.

C. Samples: (Digital Sample Cards only)

1. For projects requiring initial selection of color and pattern by Architect, submit samples in form of actual sections of resilient flooring, including accessories, showing manufacturer's full range of colors and patterns available, for each type of resilient flooring required.

2. For projects in which selections are included in the CD package, no physical samples are required. Provide digital color cards only for verification of selections.

D. Submit Safety Data Sheets (SDS) available for adhesives, moisture mitigation systems, primers, patching/leveling compounds, floor finishes (polishes) and cleaning agents and Material Information Sheets for flooring products.

E. Closeout Submittals: Submit the following:

1. Operation and Maintenance Data: Operation and maintenance data for installed products in accordance with Section 017000 – Contract Closeout. Include methods for maintaining installed products, and precautions against cleaning materials and methods detrimental to finishes and performance.

2. Warranty: Warranty documents specified herein.

F. Replacement Material:

1. Furnish extra materials from same production run as products installed. Packaged with protective covering for storage and identified with appropriate labels.

2. Submit to Owner at project site one box of each type and color of tile for each 50 boxes (or fraction thereof) of each type and color installed.

1.06 QUALITY ASSURANCE

A. Select an installer who is experienced and competent in the installation of Armstrong resilient vinyl composition tile flooring and the use of Armstrong Flooring subfloor preparation products.

1. Engage installers certified as Armstrong Commercial Flooring Certified Installers.
2. Confirm installer's certification by requesting their credentials.

B. Fire Performance Characteristics: Provide resilient vinyl composition tile flooring with the following fire performance characteristics as determined by testing material in accordance with ASTM test methods indicated below by a certified testing laboratory or other testing agency acceptable to authorities having jurisdiction:

1. ASTM E 648 Critical Radiant Flux of 0.45 watts per sq. cm. or greater, Class I
2. ASTM E 662 (Smoke Generation) Maximum Specific Optical Density of 450 or less

C. Flooring products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

1.07 PRODUCT DELIVERY AND STORAGE

A. Deliver materials to project site in manufacturer's original, unopened containers with labels indicating brand names, colors, patterns, and quality designations legible and intact.

B. Do not open containers or remove markings until materials are inspected and accepted by installation contractor.

C. Store materials in a clean, dry, enclosed space off the ground, protected from harmful weather conditions and at temperature and humidity conditions recommended by the manufacturer. Protect adhesives from freezing. Store flooring, adhesives, and accessories in the spaces where they will be installed for at least 48 hours before beginning installation.

D. Unless otherwise indicated, store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by Armstrong, but not less than 55 deg F or more than 85 deg F.

E. All products should be inspected for dye lot, style, color, size, quality and shipping damage prior to installation and should not be installed if any irregularities are observed. Inspect the cartons to be

sure all colors are the same shade.

1.08 ENVIRONMENTAL REQUIREMENTS

A. Install resilient products after other finishing operations, including painting, have been completed.

B. Temperatures provided for installation and initial finishing shall be maintained at levels in accordance with manufacturer's requirements.

C. Maintain ambient temperatures within range recommended by Armstrong, but not less than 65 deg F or more than 85 deg F in spaces to receive resilient products during the following time periods:

1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

D. Maintain the ambient relative humidity between 40% and 60% during installation.

E. Until Substantial Completion, maintain ambient temperatures within range recommended by Armstrong, but not less than 55 deg F or more than 85 deg F.

1.09 PROJECT CONDITIONS

A. Maintain a minimum temperature in the spaces to receive the flooring and accessories of 65º F and a maximum temperature of 100º F for at least 48 hours before, during, and for not less than 48 hours after installation. Thereafter, maintain a minimum temperature of 55º F in areas where work is completed. Protect all materials from the direct flow of heat from hot-air registers, radiators, or other heating fixtures and appliances. Refer to product installation recommendations for a complete guide on project conditions.

1.10 LIMITED WARRANTY

A. Resilient Flooring: Submit a written warranty executed by the manufacturer, agreeing to repair or replace resilient flooring that fails within the warranty period.

B. Limited Warranty Period: 5 years for VCT, 20 years for LVT Flooring.

C. Limited 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.

D. For the Limited Warranty to be valid, this product is required to be installed using the appropriate Armstrong Flooring Guaranteed Installation System. Product installed not using the specific instructions from the Guaranteed Installation System will void the warranty.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. Resilient tile flooring, wall base, adhesives and subfloor preparation products and accessories.

1. Armstrong Flooring Inc.,
   1770 Hempstead Road, Lancaster, PA 17605
   www.armstrongflooring.com/commercial, or equivalent.

2.02 RESILIENT TILE FLOORING MATERIALS

A. Provide Vinyl Composition Tile: Standard Excelon® Imperial® Texture Tile Flooring or Premium Excelon® Crown Texture™ manufactured by Armstrong Flooring, Inc or equivalent.

1. Description: Tile composed of polyvinyl chloride resin, plasticizers, fillers, stabilizers and pigments with colors and texture dispersed uniformly throughout its entire thickness.

2. Vinyl composition tile shall conform to the requirements of ASTM F 1066, “Standard Specification Vinyl Composition Floor Tile", Class 2, through-pattern.

3. Pattern and Color: Unless otherwise specified, color shall be as selected by the Architect from manufacturer’s full range of standard VCT patterns and colors. Pattern to match existing where appropriate or as shown on finish floor plans. In the event that the finish floor plans in part or in their entirety are not provided herein, the bid shall include a minimum of two and/or three colors in a full tile basic pattern as determined by the Architect.

4. Size: 12 in. x 12 in. unless otherwise shown

5. Thickness: 1/8 in.

6. Interior Floor Finish Requirements: Interior floor finish shall meet or exceed the requirements of The Building Code of New York State.

   a. The flooring specified is classified in accordance with NFPA 253 as: Class 1, Critical Radiant Flux 0.45 watts/cm2 or greater.
   b. Flame spread rating less than 25 and smoked developed not to exceed 450, in accordance with by ASTM E-84.

7. Slip resistance: ADA compliant with a static coefficient of friction of 0.6 for level surfaces and 0.8 for ramps.

8. Test data:

   a. Heat Stability - (ASTM F1514): $\Delta E < 8$
   b. Size/Squareness - (ASTM F2055): Passes
   c. Deflection - (ASTM F1304): Passes
   d. Chemical Resistance - (ASTM F925): Passes
   e. Static Load Resistance - (ASTM F970): 2000 psi, < 0.005 inches
   f. Residual Indentation - (ASTM F1914): Passes
   g. Slip Resistance - (ASTM D2047): ≥ 0.5 SCOF
   h. Dimensional Stability - (ASTM F2199): Passes
   i. Impact Resistance - (ASTM F1265): Passes
   j. Flammability - (ASTM E648 Critical Radiant Flux): Class 1 (≥ 0.45 W/cm2)
   k. Smoke Density - (ASTM E662): ≤ 450
   l. Limited Commercial Warranty: 5 years

9. Other Manufacturers offering products complying with these requirements include:

   a. Mannington Commercial; Calhoun, GA.

B. Provide Duo™, Exchange™ or Natural Creations™ Luxury Vinyl Tile (LVT) Flooring manufactured by Armstrong Flooring Inc., or equivalent.

1. Description: A layered construction consisting of a tough, clear, rigid vinyl wear layer protecting a high-fidelity print layer on a solid vinyl backing. Protected by a diamond-infused UV-cured

polyurethane finish, the wear surface is embossed with different textures to enhance each of the printed visuals. Colors are insoluble in water and resistant to cleaning agents and light.

2. Reference specification - ASTM F 1700, “Standard Specification for Solid Vinyl Tile", Class III, Type B – Embossed Surface. Meets requirements for size, squareness, thickness, thickness of wear layer, residual indentation, resistance to chemicals, resistance to light and resistance to heat.

3. Pattern and Color: Unless otherwise specified, color shall be as selected by the Architect from manufacturer’s current full range of industry colors. Pattern to match existing where appropriate or as shown on finish floor plans. In the event that the finish floor plans in part or in their entirety are not provided within. Include a minimum of two and/or three colors in a full tile basic pattern as determined by the Architect.

4. Size: 6” x 36”, unless otherwise shown

5. Wear layer thickness: 0.020 in. (0.5 mm)

6. Thickness: 0.100 in. (2.5 mm)

7. Interior Floor Finish Requirements: Interior floor finish shall meet or exceed the requirements of The Building Code of New York State.

    a. The flooring specified is classified in accordance with NFPA 253 as: Class 1, Critical Radiant Flux 0.45 watts/cm2 or greater.
    b. Flame spread rating less than 25 and smoked developed not to exceed 450, in accordance with by ASTM E-84.

8. Slip resistance: ADA compliant with a static coefficient of friction of 0.6 for level surfaces and 0.8 for ramps.

9. Test data:

    a. Heat Stability - (ASTM F1514): ΔE < 8avg.,max
    b. Chemical Resistance - (ASTM F925): Passes
    c. Static Load Resistance - (ASTM F970): 2000 psi, < 0.005 inches
    d. Residual Indentation - (ASTM F1914): Passes
    e. Slip Resistance - (ASTM D2047): ≥ 0.5 SCOF
    f. Flammability - (ASTM E648 Critical Radiant Flux): Class 1 (≥ 0.45 W/cm2)
    g. Smoke Density - (ASTM E662): ≤ 450
    h. Limited Commercial Warranty: 20 years

10. Other Manufacturers offering products complying with these requirements include:

    a. American Biltrite Flooring, Sherbrooke, QC.
    b. Polyflor Ltd., Manchester, UK.

2.03 ACCESSORIES

A. Manufacturer: Roppe Corporation, 1602 N Union St., Fostoria, OH 44830. P: (800) 537 – 9527, or equivalent.

B. Rubber Wall Base:

1. Product Name: Pinnacle

2. Material Specification: ASTM F1861, Type TS – rubber, vulcanized thermoset; Group 1 – solid, (homogenous); Style B – Cove except as may be detailed in finish floor plans or as selected by the Architect.

3. Material Height: 4” high unless otherwise noted on Drawings.

4. Material Thickness: ASTM F386, 1/8” (3.2 mm)

5. Material Length: 120’ length.

6. Limited Warranty: 1 Year, Manufacturing only. Manufacturer’s disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

7. Material & Composition: 100% vulcanized homogenous rubber compound comprised of a premium blend & SBR rubber materials.

8. Color: As may be detailed in the finish floor plans or as selected by Architect from the manufacturer’s full range of colors including premium colors. In the event that the finish floor plans in part or in their entirety are not provided herein, for bidding purposes, the Contractor shall utilize and, therefore, for inclusion in the scope of work and contract, that 100 percent of all rubber cove base shown to be provided shall be of Premium Colors or equal.

9. Interior Floor Finish Requirements: Interior floor finish shall meet or exceed the requirements of The Building Code of New York State.

    a. The flooring specified is classified in accordance with NFPA 253 as: Class 1, Critical Radiant Flux 0.45 watts/cm2 or greater.
    b. Flame spread rating less than 25 and smoked developed not to exceed 450, in accordance with by ASTM E-84.

10. Corners: Provide inside and outside corners where noted.

11. Test data:

    a. Surface Burning: ASTM E84/NFPA 255 - Class B
    b. Flammability/Critical Radiant Flux: ASTM E648 / NFPA 253 - Class 1 (>0.45 Watts per sq. cm.), .082 W/cm^2
    c. Smoke Density: ASTM E662/NFPA 258 - Passes (<450), 157 (flaming) - 197 (non-flaming)
    d. Substrate Preparation: Per ASTM F710 and Roppe Technical Data Sheet

B. Accessories:

1. The Contractor shall utilize for bidding purposes and, therefore, for inclusion in the scope of work, all transitional reducers, reducer strips, cove caps, thresholds, edging, fillet strips and/or joiners as may need to be required by the project and/or Architect to provide a complete and acceptable project. All accessories shall be rubber and as manufactured by Johnsonite by Armstrong, ColorMatch colors or equal or luxury vinyl tile moldings to match specified pattern by moldingsonline.com.

C. Adhesives (Cements):

1. Waterproof, stabilized type as recommended by flooring manufacturer for the type of tile to be installed. Asphalt emulsions and other non-waterproof types are not acceptable.

D. Concrete Slab Primer:

1. Non-staining type as recommended by flooring manufacturer.

E. Leveling and Patching Compounds

1. Trowel Grade, featherable, latex modified Portland cement or blended hydraulic cement-based formulation acceptable to the flooring manufacturer.

2. Gypsum based compounds shall not be used in slab on grade construction and will only be considered where specifically approved by the flooring manufacturer.

PART 3 - EXECUTION

3.01 MANUFACTURER'S INSTRUCTIONS

A. Compliance: Comply with manufacturer's product data, including technical bulletins, product catalog, installation instructions, and product carton instructions for installation and maintenance procedures as needed.

B. Ensure substrate meets the requirements of ASTM F710, Roppe Technical Data Sheets and Excelsior Technical Data Sheets.

3.02 EXAMINATION

A. Site Verification of Conditions: Verify substrate conditions (which have been previously installed under other sections) are acceptable for product installation in accordance with manufacturer's instructions (i.e., moisture tests, bond test, pH test, etc.).

B. Visually inspect flooring materials, adhesives, and accessories prior to installation. Flooring material with visual defects shall not be installed and shall not be considered as a legitimate claim.

C. Examine subfloors prior to installation to determine that surfaces are smooth and free from cracks, holes, ridges, and other defects that might prevent adhesive bond or impair durability or appearance of the flooring material.

D. Inspect subfloors prior to installation to determine that surfaces are free from curing, sealing, parting and hardening compounds; residual adhesives; adhesive removers; and other foreign materials that might prevent adhesive bond. Visually inspect for evidence of moisture, alkaline salts, carbonation, dusting, mold, or mildew.

E. Report conditions contrary to contract requirements that would prevent a proper installation. Do not proceed with the installation until unsatisfactory conditions have been corrected.

F. Failure to call attention to defects or imperfections will be construed as acceptance and approval of the subfloor. Installation indicates acceptance of substrates regarding conditions existing at the time of installation.

G. Proceed with installation only after unsatisfactory conditions have been corrected.

1. Defects or conditions that would adversely affect quality and execution of installation.
2. Deviations beyond allowable tolerances of surfaces to receive resilient flooring:

a. Maximum variation in sub-floor surfaces: 1/8 inch in 10 feet.

3.03 PREPARATION

A. Prepare substrates according to Armstrong written instructions to ensure proper adhesion of Resilient Flooring.

1. Prepare concrete substrates in accordance with ASTM F 710.

a. Concrete floors must be free of dust, solvent, paint, wax, oil, grease, residual adhesive, adhesive removers, film-forming curing compounds, silicate penetrating curing compounds, sealing, hardening or parting compounds, alkaline salts, excessive carbonation or laitence, mold, mildew, and other foreign materials that may affect dissipation rate of moisture from the concrete, discoloration or adhesive bonding.

b. Mechanically remove contamination on the substrate that may cause damage to the resilient flooring material. Permanent and non-permanent markers, pens, crayons, paint, etc., must not be used to write on the back of the flooring material or used to mark the substrate as they could bleed through and stain the flooring material.

2. Moisture Testing: Perform moisture testing as recommended by manufacturer. Proceed with installation only after substrates have been tested and meet the minimum requirements from the manufacturer in accordance with ASTM F1869 Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride or ASTM F2170 Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes.

a. When slab moisture content is in excess of manufacturer's requirements and if further drying is not possible, it may be necessary to install a moisture vapor barrier. If such a barrier product is determined to be required the product shall be deemed acceptable by the flooring and adhesive manufacturer'. The cost for application for such a barrier if not otherwise specified is considered an additional cost to the project. Added cost shall be agreed prior to proceeding.

b. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. A pH test for alkalinity must be conducted on the concrete floor prior to installation with results conforming to manufacturer requirements. If the test results are not within the acceptable range, then installation must not proceed until the problem has been corrected

c. VCT

1) Perform anhydrous calcium chloride test, ASTM F 1869. Results must not exceed 5 lbs. Moisture Vapor Emission Rate per 1,000 sq. ft. in 24 hours.
2) Special Note: If MVER is greater than 5 lbs. but less than 8 lbs. consult manufacturer for special adhesive recommendations.
3) Perform relative humidity test using in situ probes, ASTM F 2170. Results must not exceed 80%.
4) Special Note: If MVER is greater than 80% but less than 90% consult manufacturer for special adhesive recommendations.

d. LVT

1) ASTM F1869 and ASTM F2170 and pH testing is required when installing LVT. Testing should be performed in several areas including the perimeter of the room, at columns and wherever else moisture might occur. The maximum allowable moisture vapor emission rate (MVER) from the subfloor is 6.0 lbs. The maximum pH range is 9 or less. The In-Situ/RH requirement is not to exceed 75%. Three test results for the first 1,000 sq. ft. are required, with 1 test result for every 1,000 sq. ft. thereafter. The installer may alternate every 1,000 sq. ft. between RH and Calcium Chloride test sites after the first

1,000 sq. ft.

B. Wood subfloors must have a minimum of 18” of cross-ventilated space beneath the bottom of the joist.

1. The floor must be rigid, free of movement.

2. Single wood and tongue and groove subfloors should be covered with ¼” or ½” APA approved underlayment plywood.

a. Use ¼” thick underlayment panels for boards with a face width of 3” or less.
b. Use ½" thick underlayment panels for boards with a face width wider than 3".

3. Do not install over OSB (Oriented Strand Board), particle board, chipboard, lauan or composite type underlayments.

C. Fill cracks, holes, depressions and irregularities in the substrate with good quality Portland cement based underlayment leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.

D. Fill all minor cracks in substrates using approved crack filler in accordance with manufacturer's printed instructions.

E. Flash patch with products acceptable to the resilient flooring manufacturer. If condition requires self-levelling underlayment, refer to that specification in Division 03.

F. Clean substrates of all dirt and loose particles before application of flooring materials.

G. Provide additional underlayment and build up to abutting dissimilar flooring materials.

H. Floor covering shall not be installed over expansion joints.

I. Do not install resilient products until they are same temperature as the space where they are to be installed.

1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

J. Store and use adhesives in accordance with the manufacturer's printed instructions.

K. Proceeding with installation constitutes acceptance of the substrate conditions.

L. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

3.04 INSTALLATION

A. Install flooring in strict accordance with the latest edition of Armstrong Flooring Guaranteed Installation Systems. Failure to comply may result in voiding the manufacturer’s warranty listed in Section 1.10. Strictly adhere to manufacturer's written instructions and the following:

1. Install flooring wall to wall before the installation of floor-set cabinets, casework, furniture, equipment, movable partitions, etc. Extend flooring into toe spaces, door recesses, closets, and similar openings as shown on the drawings.

2. If required, install flooring on pan-type floor access covers. Maintain continuity of color and

pattern within pieces of flooring installed on these covers. Adhere flooring to the subfloor around covers and to covers.

3. Scribe, cut, and fit to permanent fixtures, columns, walls, partitions, pipes, outlets, and built-in furniture and cabinets.

4. Install flooring with adhesives, tools, and procedures in strict accordance with the manufacturer's written instructions. Observe the recommended adhesive trowel notching, open times, and working times.

5. Lay resilient tile so as to ensure full uniform contact with substrate and to produce finished surfaces, which are smooth, even, and in true plane, free of buckles, waves, or other imperfections.

6. Cut and scribe tile neatly into breaks and recesses, walls, door frames, casework, and around pipes, columns, and other projections where flashed base is not required.

7. Lay tile square with room axis. Do not install border tiles that are less than 1/2 the width of a field tile. Tile against walls shall be the same width on each side of room.

8. Tile pattern when laid shall lie in an alternating direction as determined by the Architect.

9. Install with Armstrong adhesive specified for the site conditions and follow adhesive label for proper use.

10. Open enough cartons of floor tiles to cover each area, and mix tile to ensure shade variations do not occur within any one area.

11. Roll the flooring in both directions using a 100 pound three-section roller.

12. Vinyl Tile flooring must be welded. Note: It is recommended to heat weld seams to provide a more sterile and water tight seam.

13. Armstrong Resilient Sheet Flooring may be flash coved.

    a. Use Johnsonite CFS-00-A Cove Filler Strip.
    b. Net fit flooring material into the appropriate Johnsonite cove cap.

B. Rubber Base:

1. Apply top set wall base to walls, columns, casework, and other permanent fixtures in areas where top-set base is required. Install base in lengths if practical, with inside corners fabricated from base materials that are mitered or coped. Tightly bond base to vertical substrate with continuous contact at horizontal and vertical surfaces.

2. Fill voids with plastic filler along the top edge of the resilient wall base or integral cove cap on masonry surfaces or other similar irregular substrates.

3. Place resilient edge strips tightly butted to flooring, and secure with adhesive recommended by the edge strip manufacturer. Install edge strips at edges of flooring that would otherwise be exposed.

4. Comply with Roppe's written instructions for installing rubber base.

5. Use approved cove base adhesive and apply in accordance with manufacturer's printed instructions. Adhesive shall hold base tightly in contact.

6. Where necessary, patch and fill back-up material with underlayment material to provide continuous, uniform surface.

7. Scribe base accurately; use specified preformed corners; butt joints between sections tightly.

8. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is either indicated or required.

9. Install resilient base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.

10. Tightly adhere resilient wall base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

11. Do not stretch resilient base during installation.

C. Reducing Strips: Install at points of transition from new resilient flooring to dissimilar flooring material. Whenever possible, locate strips between door jambs centered under doors.

3.05 ADJUSTMENTS

A. Reset any tiles which have not seated in a level plane with surrounding tiles.

B. Carefully remove and replace any tiles with broken corners with surrounding tiles.

3.06 CLEANING AND PROTECTION

A. Perform initial and on-going maintenance according to the latest edition of the Maintenance Instructions for Vinyl Composition & Bio-Based Tile.

B. Protect floors from rolling loads for 72 hours after installation by covering with hardboard or plywood. Protect the floor with un-dyed, untreated building paper until final inspection.

C. Initial cleaning and maintenance is the responsibility of the installing contractor and must be performed as soon as possible after installation. Initial cleaning may be not be performed until 3 days (72 hours) after installation or as otherwise specified by the manufacturer. The intent is to allow the tile become well seated in the adhesive and to prevent excess moisture and cleaning agents from interfering with the adhesive bond. Sweep and protect the floor until initial cleaning and maintenance can begin.

D. Initial Cleaning and Maintenance after Installation:

1. Sweep or vacuum floor thoroughly.

2. Clean flooring utilizing a pH neutral cleaner such as Super Shine All by Hillyard. Allow to stand for 5-15 minutes, but do not allow to dry. Scrub with a single disc rotary machine (175-350 rpm) with a blue or green pad. Remove solution and rinse with clean water. Allow flooring to dry completely before applying finish.

   a. Heavily soiled floor may require a stripping procedure as the initial cleaning.

3. Floor finish:

   a. For VCT, Apply four coats of a manufacturer approved high quality commercial floor finish such as Super Hil-Brite by Hillyard, allowing to dry completely between coats.

3.07 CLEAN UP

A. Remove from the site and legally dispose of all cartons, rubbish, and debris resulting from the work of this Section.

END OF SECTION

DIVISION 09 – FINISHES

SECTION 099000 – PAINTING

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General Supplementary Conditions and Division 01 Specification Sections, apply to this section.

1.02 DESCRIPTION

A. Work included: Paint and finish all new and existing interior and exterior surfaces related to the proposed work area including surface preparations.

1. Examine the specifications and drawings of all trades and thoroughly be familiar with all provisions regarding painted work included therein. Surfaces shown, noted, scheduled, or specified to receive painters' finish as part of the work of this section.

2. The painting subcontractor shall furnish, maintain, and remove when no longer required, all scaffolding, staging, and riggings required for this work.

1.03 RELATED WORK DESCRIBED ELSEWHERE

A. Shop Coats: Refer to specific project manual sections for shop coats on items such as structural steel, miscellaneous metal, custom hollow metal work, and similar items.

B. Pre-Finished Items: Refer to specific project manual sections for factory-finished, or installer finishes.

C. Related Sections:

1. Section 033000 – Cast-in-Place Concrete
2. Section 042000 – Unit Masonry
3. Section 051200 – Structural Steel Framing
4. Section 052100 – Steel Joist Framing
5. Section 053000 – Metal Decking
6. Section 055000 – Metal Fabrications
7. Section 055200 – Metal Railings
8. Section 062000 – Finish Carpentry
9. Section 081113 – Hollow Metal Doors and Frames
10. Section 092900 – Gypsum Wall Board
11. Section 260500 – Common Work Results for Electrical

1.04 REFERENCES

A. Steel Structures Painting Council (SSPC):

1. SSPC-SP 1 - Solvent Cleaning.
2. SSPC-SP 2 - Hand Tool Cleaning.
3. SSPC-SP 3 - Power Tool Cleaning.
4. SSPC-SP5/NACE No. 1, White Metal Blast Cleaning.
5. SSPC-SP6/NACE No. 3, Commercial Blast Cleaning.
6. SSPC-SP7/NACE No. 4, Brush-Off Blast Cleaning.

7. SSPC-SP10/NACE No. 2, Near-White Blast Cleaning.
8. SSPC-SP11, Power Tool Cleaning to Bare Metal.
9. SSPC-SP12/NACE No. 5, Surface Preparation and Cleaning of Metals by Waterjetting Prior to Recoating.
10. SSPC-SP 13 / NACE No. 6 Surface Preparation for Concrete.

B. Material Safety Data Sheets / Environmental Data Sheets: Per manufacturer's MSDS/EDS for specific VOCs (calculated per 40 CFR 59.406). VOCs may vary by base and sheen.

C. California Department of Public Health (CDPH):

1. CDPH v1.1-2010 and V1.2-2017

D. LEEDv4 EQ Credit: Indoor Environmental Quality-Low Emitting Materials.

1.05 SUBMISSIONS

A. General: Comply with requirements of Section 013300 – Submittal Procedures and as modified below.

B. Product Data:

1. Submit to the Architect a complete schedule of paint materials proposed to be furnished and installed under this section, including name of manufacturer and type of paint.

2. Submit Product Data for each paint product type as required to demonstrate compliance with the specified requirements including the following:

a. Product characteristics.
b. Surface preparation instructions and recommendations.
c. Primer requirements and finish specification.
d. Storage and handling requirements and recommendations.
e. Application methods.
f. Cautions for storage, handling and installation.

3. For information only, submit two copies of manufacturer’s specifications, including paint analysis and application instructions for each material. Indicate by transmittal that a copy of each manufacturer’s instructions has been distributed to the applicator.

C. Verification Samples: Submit three (3) 8 ½” x 11” paint strike offs of each paint color and paint type specified for color match verification. Identify each sample as to finish/ sheen, formula, color name, and color number.

D. Stain Samples: Submit three (3) 8 ½” x 10” wood samples of stain matching specified wood species and color for architect’s approval.

E. Certification by the manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOC’s).

F. Only submit complying products based on project requirements (i.e. LEED). Paint application must also comply with the regulations regarding VOCs (CARB, OTC, SCAQMD, LADCO).

G. USGBC LEED V4 Submittals (when applicable):

1. MRc2 Environmental Product Declaration Product Language: Products shall be selected with a preference to products that have product-specific environmental product declaration

documentation.

2. EQc2 Low Emitting Materials: The VOC content of all adhesives, sealants, paints and coatings in this Section shall not exceed the VOC limits established in Division 01 Sustainable Design sections.

1.06 WORK NOT INCLUDED

A. Do not include painting, which is specified under other sections.

B. Unless otherwise indicated, painting is not required on surfaces in concealed areas and inaccessible areas such as furred spaces, foundation spaces, utility tunnels, pipe spaces, and duct shafts.

C. Metal surfaces of anodized aluminum, stainless steel, chromium plate, copper, bronze, and similar finished materials will not require painting under this section except as may be specified herein.

D. Do not paint any moving parts of operating units, mechanical or electrical parts such as valve operators, linkages, sinkages, sensing devices, and motor shafts, unless otherwise indicated.

E. Do not paint over any required labels or equipment identification, performance rating, name or nomenclature plates.

F. Do not paint prefinished items, concealed surfaces, and finished metal surfaces unless indicated.

1.07 DEFINITIONS

A. The term “paint,” as used herein, means all coating systems materials including primers, emulsions, epoxy, enamels, stains, sealers, fillers, and other applied materials where used as prime, intermediate, or finish coats.

1.08 QUALITY ASSURANCE

A. Standards: Comply with standards specified in the section and as listed in Section 014219.

B. Qualifications of Manufacturers: Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the Architect.

C. Qualifications of Applicators:

1. A firm or individual experienced in applying paints and coatings similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.
2. Provide at least one person who shall be present at all times during execution of the work of this section, who shall be thoroughly familiar with the specified requirements and the materials and methods needed for their execution, and who shall direct all work performed under this section.
3. Provide adequate numbers of workman skilled in the necessary crafts and properly informed of the methods and materials to be used.
4. Minimum three years of experience in applying commercial coating systems similar to the materials specified.

D. Paint Coordination:

1. Provide finish coats, which are compatible with the prime coats used.

2. Review other sections of this specification as required, verifying the prime coats to be used and assuring compatibility of the total coating system for the various substrata.
3. Upon request, furnish information on the characteristics of the specific finish materials to ensure that compatible prime coats are used.
4. Provide barrier coats over non-compatible primers, or remove the primer and re-prime as require
5. Notify the Architect in writing of anticipated problems in using the specified coating systems over prime coating supplied under other sections.
6. Paint exposed surfaces. If a color of finish, or a surface is not specifically mentioned, Architect will select from standard products, colors and sheens available and as specified herein.

E. Field Samples:

1. Before proceeding with paint application provide a mock-up for evaluation of surface preparation techniques and application workmanship, finish one complete surface of each color scheme required, clearly indicating selected colors, finish texture, materials, and workmanship.

    a. Finish surfaces for verification of products, colors and sheens.
    b. Finish area designated by Architect.
    c. Provide samples that designate primer and finish coats.
    d. Compatibility and Adhesion: Check after one week of drying and curing by testing in accordance with ASTM D3359; Adhesion by tape test. If coating system is incompatible, additional surface preparation up to and including complete removal may be required.
    e. Do not proceed with remaining work until the Architect approves the mock-up.

2. Sample areas, when accepted by the Architect, shall serve as a minimum standard for work throughout the entire project.

1.09 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to the job site in the manufacturer’s original unopened packages and containers bearing manufacturer’s name and label and the following information:

1. Product name or title.
2. Product description (generic classification or binder type).
3. Federal Specification Number, if applicable.
4. Manufacturer’s stock number and date of manufacture.
5. Contents by volume, for pigment and vehicle constituents.
6. Thinning instructions.
7. Application and use instructions.
8. Surface preparation.
9. VOC Content.
10. Environmental handling.
11. Color name and number.

B. Storage:

1. Provide proper storage to prevent damage to, and deterioration of, paint materials.
2. Store materials in an area that is within the acceptable temperature range, per manufacturer's instructions. Protect from freezing. Storage area is to be kept neat and clean. Any damage to the storage area or surrounding occurring during its use for storage shall be repaired to its original state (Architect’s acceptance required). Remove all soiled or used rags, waste, and trash from the building every night and take every precaution to avoid damage of fire.
3. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

C. Handling:

1. Maintain a clean, dry storage area, to prevent contamination or damage to the coatings.

D. Protection:

1. Use all means necessary to protect the materials of this section before, during, and after installation. Protect the work and materials of other trades. Remove, clean, restore to original condition any spatter, runs, drips, spillage, overspray on other materials not intended to be painted.

E. Replacement:

1. In the event of damage, immediately make all the repairs and replacements necessary to the approval of the Architect and at no additional cost to the Owner.

1.10 JOB CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results, as required to maintain surface and ambient temperatures above 50ºF for at least 24 hours before, during and for at least 48 hours after paint application. Do not install products under environmental conditions outside manufacturer's recommended limits.

B. Do not apply paint in snow, rain, fog, or mist, or when relative humidity exceeds paint manufacturer’s recommended limits. Avoid painting surfaces while they are exposed to hot sun.

C. Lighting: Provide minimum 80 foot candle light level at mid-height of substrate surface.

1.11 EXTRA STOCK

A. Furnish extra paint materials from the same production run as the materials applied and in the quantities described below. Package with protective covering for storage and identify with labels describing contents. Deliver extra materials to Owner.

B. Amount: Upon completion of the work of this section, deliver to the Owner an extra stock equaling 1% of each color, type, and gloss of paint used on the work but not less than 1 gal (3.8 l) or 1 case, as appropriate.

C. Packaging: Tightly seal each container and clearly label with the contents and location used.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design Manufacturer: Sherwin-Williams, which is located at: 101 Prospect Ave.; Cleveland, OH 44115; ASD Toll Free Tel: 800-524-5979; Tel: 216-566-2000; Email: request info specifications@sherwin.com; Web: www.swspecs.com. Local representative: Anthony Spanevello, Architectural Account Executive | Tel: (516) 406-0612 | Email: Anthony.M.Spanevello@sherwin.com; or Architect approved equal.

2.02 PAINT MATERIALS

A. Design is based on the use of paint products manufactured by Sherwin Williams. The materials of this manufacturer are named in the painting schedule. Equal products of other manufacturers

approved in advance by the Architect may be utilized.

B. General: Provide the best quality grade of the various types of coatings as regularly manufactured by paint materials manufacturers approved by the Architect. Materials not displaying the manufacturer's identification as a standard best-grade product will not be acceptable.

C. Durability: Provide paints of durable and washable quality. Do not use paint materials, which will not withstand normal washing, as required to remove pencil marks, ink, ordinary soil, and similar material without showing discoloration, loss of gloss, staining or other damage.

D. Colors and Glosses: Provide colors and glosses as specified or to match existing from manufacturer's full range of colors for each product indicated.

E. Paints and Coatings:

1. Unless otherwise indicated, provide factory-mixed coatings. When required, mix coatings to correct consistency in accordance with manufacturer's instructions before application. Do not reduce, thin, or dilute coatings or add materials to coatings unless such procedure is specifically described in manufacturer's product instructions.
2. For opaque finishes, follow manufactures product instructions for optimal color conformance.

F. Primers: Where the manufacturer offers options on primers for a particular substrate, use primer categorized as "best" by the manufacturer.

G. Coating Application Accessories: Provide all primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials required, per manufacturer's specifications.

H. Undercoats and Thinners: Provide undercoat paint produced by the same manufacturer as the finish coat. Use only the thinners recommended by the paint manufacturer and use only the recommended limits. Insofar as practicable, use undercoat, finish coat, and thinner material as parts of a unified system of paint finish.

I. Standards: Provide paint materials which meet or exceed the standards listed for each application in the Painting Schedule in Part 3 of this section.

1. All paint to be V.O.C. compliant. The VOC concentrations (in grams per liter) of the product shall comply with the U.S. EPA 40 CFR 59 Subpart D National Volatile Organic Compound Emission Standards for Architectural Coatings.
2. OTC as used in this Section refers to the Ozone Transmission Commission. OTC II has established the following VOC levels for Maryland, New York and Connecticut, United States. Products shall meet the following OTC II limits for VOC's when jobs are in these states.

a. Interior flat paints: 50 grams per liter or less, per gallon.
b. Interior enamels: 100 grams per liter or less, per gallon.
c. Interior stains: 250 grams per liter or less, per gallon.
d. Interior primers: 100 grams per liter or less, per gallon.
e. Rust preventive coatings: 250 grams per liter or less, per gallon.
f. Dry fog coatings: 150 grams per liter or less, per gallon.
g. Floor coatings: 100 grams per liter or less, per gallon.
h. Flats50 g/L
i. Non-Flats100 g/L
j. Primers Sealers and Undercoats100 g/L
k. Floor Coatings100 g/L
l. Concrete/masonry Sealer100 g/L
m. Rust Preventative Coatings250 g/L
n. Industrial Maintenance Coatings250 g/L

o. Stains, Exterior250 g/L
p. Wood Coating/Varnish/stain275 g/L
q. Zinc Rich Primers340

J. Application Equipment: For application of the approved paint, use only such equipment as is recommended for application of the particular paint by the manufacturer of the particular paint and as approved by the Architect.

K. Other Materials: All other materials, not specifically described but required for a complete and proper installation of the work of this section, shall be new, first-quality of their respective kinds, and as selected by the Contractor subject to the approval of the Architect.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Prior to installation of the work of this section, carefully inspect the installed work of all other trades and verify that such work is complete to the point where this installation may properly commence. Verify that painting may be completed in strict accordance with the original design and with the manufacturer's recommendations as approved by the Architect.

B. Do not begin installation until substrates have been properly prepared; notify Architect of unsatisfactory conditions before proceeding. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

C. Proceed with work only after conditions have been corrected and approved by all parties, otherwise application of coatings will be considered as an acceptance of surface conditions.

3.02 SURFACE PREPARATION

A. General: Surfaces shall be dry and in sound condition. Remove oil, dust, dirt, loose rust, peeling paint or other contamination to ensure good adhesion.

1. Perform all preparation and cleaning procedures in strict accordance with the paint manufacturer's requirements and application instructions as approved by the Architect. Clean each surface to be painted prior to applying paint or surface treatment.
2. Prior to attempting to remove mildew, it is recommended to test any cleaner on a small, inconspicuous area prior to use. Bleach and bleaching type cleaners may damage or discolor existing paint films. Bleach alternative cleaning solutions are advised.
3. Remove mildew before painting by washing with a solution of 1 part liquid household bleach and 3 parts of warm water. Apply solution and scrub the mildewed area. Allow solution to remain on the surface for 10 minutes. Rinse thoroughly with clean water and allow surface to dry before painting. Wear protective glasses or goggles, waterproof gloves, and protective clothing. Quickly wash off any of the mixture that comes in contact with your skin. Do not add detergents or ammonia to the bleach/water solution.
4. Remove oil and great with clean cloths and cleaning solvents of low toxicity and a flash point in excess of 38ºC (100ºF), prior to start of mechanical cleaning.
5. Remove all removable items, which are in place and are not scheduled to receive paint finish or provide surface-applied protection prior to surface preparation and painting operations.
6. Remove items including but not limited to thermostats, electrical outlets, switch covers and similar items prior to painting. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.
7. No exterior painting should be done immediately after a rain, during foggy weather, when rain is predicted, or when the temperature is below 50 degrees F (10 degrees C), unless products are designed specifically for these conditions. On large expanses of metal siding, the air,

surface and material temperatures must be 50 degrees F (10 degrees F) or higher to use low temperature products.

8. Schedule the cleaning and painting in coordination with the Owner.

B. Aluminum: Remove all oil, grease, dirt, oxide and other foreign material by cleaning per SSPC-SP1, Solvent Cleaning.

C. Block (Cinder and Concrete): Remove all loose mortar and foreign material. Surface must be free of laitance, concrete dust, dirt, form release agents, moisture curing membranes, loose cement, and hardeners. Concrete and mortar must be cured at least 30 days at 75 degrees F (24 degrees C). The pH of the surface should be between 6 and 9 unless the products are designed to be used in high pH environments. On tilt-up and poured-in-place concrete, commercial detergents and abrasive blasting may be necessary to prepare the surface. Fill bug holes, air pockets, and other voids with a cement patching compound.

D. Concrete, SSPC-SP13 or NACE 6: This standard gives requirements for surface preparation of concrete by mechanical, chemical, or thermal methods prior to the application of bonded protective coating or lining systems. The requirements of this standard are applicable to all types of cementitious surfaces including cast-in-place concrete floors and walls, precast slabs, masonry walls, and shotcrete surfaces. An acceptable prepared concrete surface should be free of contaminants, laitance, loosely adhering concrete, and dust, and should provide a sound, uniform substrate suitable for the application of protective coating or lining systems.

E. Cement Composition Siding/Panels: Remove all surface contamination by washing with an appropriate cleaner, rinse thoroughly and allow to dry. Existing peeled or checked paint should be scraped and sanded to a sound surface. Pressure clean, if needed, with a minimum of 2100 psi pressure to remove all dirt, dust, grease, oil, loose particles, laitance, foreign material, and peeling or defective coatings. Allow the surface to dry thoroughly. The pH of the surface should be between 6 and 9 unless the products are designed to be used in high pH environments.

F. Copper and Stainless Steel: Remove all oil, grease, dirt, oxide and other foreign material by cleaning per SSPC-SP 2, Hand Tool Cleaning.

G. Exterior Composition Board (Hardboard): Some composition boards may exude a waxy material that must be removed with a solvent prior to coating. Whether factory primed or unprimed, exterior composition board siding (hardboard) must be cleaned thoroughly and primed with an alkyd primer.

H. Drywall - Exterior: Must be clean and dry. All nail heads must be set and spackled. Joints must be taped and covered with a joint compound. Spackled nail heads and tape joints must be sanded smooth and all dust removed prior to painting. Exterior surfaces must be spackled with exterior grade compounds.

I. Drywall - Interior: Must be clean and dry. All nail heads must be set and spackled. Joints must be taped and covered with a joint compound. Spackled nail heads and tape joints must be sanded smooth and all dust removed prior to painting.

J. Galvanized Metal: Clean per SSPC-SP1 using detergent and water or a degreasing cleaner to remove greases and oils. Apply a test area, priming as required. Allow the coating to dry at least one week before testing. If adhesion is poor, Brush Blast per SSPC-SP16 is necessary to remove these treatments.

K. Plaster: Must be allowed to dry thoroughly for at least 30 days before painting unless the products are designed to be used in high pH environments. Room must be ventilated while drying; in cold, damp weather, rooms must be heated. Damaged areas must be repaired with an appropriate patching material. Bare plaster must be cured and hard. Textured, soft, porous, or powdery plaster should be treated with a solution of 1 pint household vinegar to 1 gallon of water. Repeat until the

surface is hard, rinse with clear water and allow to dry.

L. Steel: Structural, Plate, And Similar Items: Should be cleaned by one or more of the surface preparations described below. These methods are used throughout the world for describing methods for cleaning structural steel. Visual standards are available through the Society of Protective Coatings. A brief description of these standards together with numbers by which they can be specified follow. Coordinate with paint specified and manufacturers requirements for appropriate preparation to receive paint specified.

1. Solvent Cleaning, SSPC-SP1: Solvent cleaning is a method for removing all visible oil, grease, soil, drawing and cutting compounds, and other soluble contaminants. Solvent cleaning does not remove rust or mill scale. Change rags and cleaning solution frequently so that deposits of oil and grease are not spread over additional areas in the cleaning process. Be sure to allow adequate ventilation.
2. Hand Tool Cleaning, SSPC-SP2: Hand Tool Cleaning removes all loose mill scale, loose rust, and other detrimental foreign matter. It is not intended that adherent mill scale, rust, and paint be removed by this process. Before hand tool cleaning, remove visible oil, grease, soluble welding residues, and salts by the methods outlined in SSPC-SP1.
3. Power Tool Cleaning, SSPC-SP3: Power Tool Cleaning removes all loose mill scale, loose rust, and other detrimental foreign matter. It is not intended that adherent mill scale, rust, and paint be removed by this process. Before power tool cleaning, remove visible oil, grease, soluble welding residues, and salts by the methods outlined in SSPC-SP1.
4. White Metal Blast Cleaning, SSPC-SP5 or NACE 1: A White Metal Blast Cleaned surface, when viewed without magnification, shall be free of all visible oil, grease, dirt, dust, mill scale, rust, paint, oxides, corrosion products, and other foreign matter. Before blast cleaning, visible deposits of oil or grease shall be removed by any of the methods specified in SSPC-SP1 or other agreed upon methods.
5. Commercial Blast Cleaning, SSPC-SP6 or NACE 3: A Commercial Blast Cleaned surface, when viewed without magnification, shall be free of all visible oil, grease, dirt, dust, mill scale, rust, paint, oxides, corrosion products, and other foreign matter, except for staining. Staining shall be limited to no more than 33 percent of each square inch of surface area and may consist of light shadows, slight streaks, or minor discoloration caused by stains of rust, stains of mill scale, or stains of previously applied paint. Before blast cleaning, visible deposits of oil or grease shall be removed by any of the methods specified in SSPC-SP1 or other agreed upon methods.
6. Brush-Off Blast Cleaning, SSPC-SP7 or NACE 4: A Brush-Off Blast Cleaned surface, when viewed without magnification, shall be free of all visible oil, grease, dirt, dust, loose mill scale, loose rust, and loose paint. Tightly adherent mill scale, rust, and paint may remain on the surface. Before blast cleaning, visible deposits of oil or grease shall be removed by any of the methods specified in SSPC-SP 1 or other agreed upon methods.
7. Power Tool Cleaning to Bare Metal, SSPC-SP11: Metallic surfaces that are prepared according to this specification, when viewed without magnification, shall be free of all visible oil, grease, dirt, dust, mill scale, rust, paint, oxide corrosion products, and other foreign matter. Slight residues of rust and paint may be left in the lower portions of pits if the original surface is pitted. Prior to power tool surface preparation, remove visible deposits of oil or grease by any of the methods specified in SSPC-SP1, Solvent Cleaning, or other agreed upon methods.
8. Near-White Blast Cleaning, SSPC-SP10 or NACE 2: A Near White Blast Cleaned surface, when viewed without magnification, shall be free of all visible oil, grease, dirt, dust, mill scale, rust, paint, oxides, corrosion products, and other foreign matter, except for staining. Staining shall be limited to no more than 5 percent of each square inch of surface area and may consist of light shadows, slight streaks, or minor discoloration caused by stains of rust, stains of mill scale, or stains of previously applied paint. Before blast cleaning, visible deposits of oil or grease shall be removed by any of the methods specified in SSPC-SP1 or other agreed upon methods.
9. High- and Ultra-High Pressure Water Jetting for Steel and Other Hard Materials: SSPC-SP12 or NACE 5: This standard provides requirements for the use of high- and ultra-high pressure

water jetting to achieve various degrees of surface cleanliness. This standard is limited in scope to the use of water only without the addition of solid particles in the stream.

10. Water Blasting, SSPC-SP12/NACE No. 5: Removal of oil grease dirt, loose rust, loose mill scale, and loose paint by water at pressures of 2,000 to 2,500 psi at a flow of 4 to 14 gallons per minute.

M. Vinyl Siding, Architectural Plastics, EIFS and Fiberglass: Clean vinyl siding thoroughly by scrubbing with a warm, soapy water solution. Rinse thoroughly. Do not paint vinyl siding with any color darker than the original color unless the paint system features Sherwin-Williams VinylSafe technology. Painting with darker colors that are not Sherwin-Williams VinylSafe may cause siding to warp. Follow all painting guidelines of the vinyl manufacturer when painting. Only paint properly installed vinyl siding. Deviating from the manufacturer's painting guidelines may cause the warranty to be voided.

N. Stucco: Must be clean and free of any loose stucco. If recommended procedures for applying stucco are followed, and normal drying conditions prevail, the surface may be painted in 30 days. The pH of the surface should be between 6 and 9 unless the products are designed to be used in high pH environments such as Loxon.

O. Wood: Must be clean and dry. Prime and paint as soon as possible. Knots and pitch streaks must be scraped, sanded, and spot primed before a full priming coat is applied. Patch all nail holes and imperfections with a wood filler or putty and sand smooth.

3.03 INSTALLATION

A. General

1. Apply products in accordance with manufacturer’s instructions.
2. Secure color schedules before applying paint or finish. Tint primer and undercoat to the approximate shade of the finish coat.
3. Apply all materials under adequate illumination and as follows:

    a. Brush Application: Brush out and work all brush coats onto the surfaces in an even film. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, and other surface imperfections will not be acceptable.
    b. Spray Application:

        1) Confine spray application to metal framework and similar surfaces where hand brushwork would be inferior.
        2) Wherever spray application is used, apply each coat to provide the equivalent hiding of brush-applied coats. Do not double back with spray equipment for the purpose of building of film thickness of two coats in one pass.

4. Allow sufficient drying time between coats. Modify the period as recommended by the material manufacturer to suit adverse weather conditions.
5. Apply materials in sufficient quantity to insure complete coverage and hide. Provide and apply additional coats until paint film is uniform in finish, color, appearance, and coverage.

B. Apply all coatings and materials with the manufacturer's specifications in mind. Mix and thin coatings according to manufacturer's recommendations.

C. Do not apply to wet or damp surfaces. Wait at least 30 days before applying to new concrete or masonry. Or follow manufacturer's procedures to apply appropriate coatings prior to 30 days. Test new concrete for moisture content. Wait until wood is fully dry after rain or morning fog or dew.

D. Apply coatings using methods recommended by manufacturer.

E. Uniformly apply coatings without runs, drips, or sags, without brush marks, and with consistent sheen.

F. Apply coatings at spreading rate required to achieve the manufacturers recommended dry film thickness.

G. Regardless of number of coats specified, apply as many coats as necessary for complete hide, and uniform appearance.

H. Completed work shall match the approved samples for color, texture, and coverage. Remove, refinish, or repaint all work not in compliance with specified requirements.

3.04 STAIN APPLICATION

A. Clean wood surfaces to be painted of dirt, oil, or other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sandpaper smooth those finished surfaces exposed to view and dust off. Scrape and clean small, dry seasoned knots and apply a thin coat of white shellac or other recommended knot sealer before application of priming coat. After priming fill holes and imperfections in finished surfaces with putty or plastic wood filler. Sandpaper smooth when dried.

B. Stain or seal wood required to be painted immediately upon delivery to job. Prime edges, ends, faces, undersides, and backsides of such wood, including cabinets, counters, cases and paneling.

C. When transparent finish is required, use spar varnish for back priming.

D. Back-prime paneling on interior partitions only where masonry, plaster, or other wet wall construction occurs on backside.

E. Seal tops, bottoms, and cut-outs of unprimed wood doors with a heavy coat of varnish or equivalent sealer immediately upon delivery to job.

3.05 CLEANING AND PROTECTION

A. Cleaning:

1. Promptly remove spilled, splashed, or splattered paint on finish as work proceeds and upon completion.
2. Keep premises free from any unnecessary accumulation of tools, equipment, surplus materials, and debris during progress of work.
3. Upon completion of work, leave premises in neat and clean condition.

B. Protect finished coatings from damage until completion of project.

C. Touch-up damaged coatings after substantial completion, following manufacturer's recommendation for touch up or repair of damaged coatings. Repair any defects that will hinder the performance of the coatings.

D. Completed work shall match the approved samples for color, texture, and coverage. Remove, refinish, or repaint all work not in compliance with specified requirements.

3.06 PAINTING SCHEDULE

A. General: Painting required under this section is called for on the drawings. Paint types for specific surfaces, exterior and interior are as defined below:

Exterior Work			
Surface	**1st Coat**	**2nd Coat**	**3rd Coat**
Hollow Metal Doors & Frames (Note 3 & 4)	B or *	A	A
Exposed Miscellaneous Metal or Structural Steel (Note 3 & 4)	T or *	I	I
Steel Handrails & Steel Lintels (Note 3 &4)	T	I	I
Traffic Bearing Exterior Metals (Steel Ladders – Foot Traffic) (Note 3 & 4)	N	R	R
Aluminum (Note 4)	B	A	A
Wood, Visible Blocking, Plywood	C	D	D
Visible Metal Plaster accessories adjoining stucco	T	I	I
Concrete Block	E	F	F
Galvanized Metal (Note 4)	B	I	I
Concrete Walls	O	F	F
Visual Contrasting Stripe at Stair Tread Nosings, concrete, bluestone, masonry or steel (Note 1)	H	-	-
Interior Work			
Surface	**1st Coat**	**2nd Coat**	**3rd Coat**
Concrete Block	E	G	G
Plaster	M	G	G
Gypsum Drywall	M	G	G
Concrete Walls	O	G	G
Concrete Floors, light to moderate duty, (Note 1) 1st coat is a thin coat to prime	P	P	P
Concrete Floors, moderate to Heavy duty, no vehicular traffic (Note 1)	N	Q	Q
Concrete Floors (High Vehicle Traffic, Wet Environments) (Note 1)	N	U	R
Wood-Painted (Note 2 & 5)	C	G	G
Wood-Natural Finish (Note 5)	J	J	J
Wood-Stained Finish (Note 5)	V	S – 2 coats	J – 2 coats
Hollow Metal, Steel Handrails & Steel Stair Components (Note 3 & 4)	B or *	A	A
Exposed Structural Steel & Steel Joists (Note 3 & 4)	B or *	K or L	K or L
Galvanized Steel Floor or Roof Deck (Note 4)	B or *	K or L	K or L
Miscellaneous Metal (Note 3 & 4)	B or *	L	L
Steel Floor Deck (Diamond Plate etc.) (Note 3 & 4)	N	R	R
Galvanized Metal (Note 3 & 4)	B	A	A
Exposed Ductwork (Note 4)	B	K or L	K or L

*Shop Coat – See other sections of Project Manual

Note 1: Where non-skid properties are required, a non-skid additive shall be used. Apply per manufacturer's instructions. Confirm if required via Architect.

Note 2: This is for large exposed surfaces. Where paint is indicated on narrow recesses, or on visible surface of back-up supports or blocking, use flat enamel.

Note 3: Inspect shop coat and touch up prior to finish coat application to prevent finish coat contacting bare steel. All exposed structural steel is to be painted in finished areas as per schedule unless

noted otherwise on the Contract Documents.

Note 4: Prior to priming and painting of exposed ductwork, galvanized steel, aluminum and other non-ferrous metals the Contractor shall clean bare metal with an oil and grease emulsifier (SIMPLE GREEN Heavy-Duty & All-Purpose Degreaser or equal). This product shall be ready to apply from the container. Careful surface preparation and cleaning is required. All surfaces shall be thoroughly clean and free from all grease, wax, oil, polish, loose paint, dirt or rust. Do not use mineral spirits, turpentine solvent or cleaners which will leave an oily residue. Apply clean and remove/rinse in accordance with manufacturer's instructions.

Note 5: For Wood Flooring finishes see Wood Flooring Specification Section included elsewhere in Division 09 of the Project Manual.

3.07 KEY TO PAINTS

* Shop coat: See other section of Project Manual.

A	S-W Pro Industrial DTM Acrylic Semi-Gloss, B66W01151 or S-W Pro Industrial™ Waterbased Alkyd Urethane Enamel Semi-Gloss, B53-1150/2150 Series
B	S-W Pro Industrial Pro Industrial Pro-Cryl Universal Primer, B66-1300 Series
C	S-W PrepRite® ProBlock® Interior-Exterior Latex Primer-Sealer, B51-600 Series
D	S-W A-100 Exterior Latex Low Sheen, A12W00151 or S-W SuperPaint Exterior Latex Low Lustre, A78-Series
E	S-W Pro Industrial Heavy Duty Block Filler (B42 Series)
F	S-W A-100 Exterior Latex Gloss, A08 Series or S-W SuperPaint Exterior Latex Gloss, A84-Series
G	S-W ProMar 200 Zero VOC Interior Latex Eg-Shel (B20-2600 Series) or Semi-Gloss (B31-2600 Series)
H	S-W Pro-Park™ Waterborne Traffic Marking Paint (B97 Series) with H&C® Sharkgrip® Slip Resistant Additive
I	S-W Pro Industrial Waterbased Alkyd Urethane Enamel Gloss (B53 Series)
J	Minwax Water-Based Polycrylic [for vertical applications only, no floors] or Minwax Oil-Modified Polyurethane (furniture, woodwork, cabinets, doors, hardwood floors)
K	S-W Pro Industrial™ Waterborne Acrylic Dryfall Flat (B42 Series)
L	S-W ProMar 200 Zero VOC Interior Latex Flat (B30-2600 Series)
M	S-W ProMar® 200 Zero V.O.C. Interior Latex Primer (B28 Series)
N	S-W Macropoxy 920 Pre-Prime (B58 Series)
O	S-W Loxon Concrete & Masonry Primer/Sealer (LX02 Series)
P	S-W Armorseal® Tread-Plex™ 100% Acrylic Water Based Floor Coating (B90 Series)
Q	S-W Armorseal® 8100 Water Based Epoxy Floor Coating Satin (B70-8160 Series)
R	S-W Hi-Solids Polyurethane 250 Aliphatic Polyurethane Semi-Gloss or Gloss (B65 Series)
S	Minwax Wood Finish, Water Based, Semi-Transparent, Color Stain
T	S-W Pro Industrial Pro Industrial Pro-Cryl Universal Primer, B66-1300 Series
U	S-W Armorseal 650 SL/RC Self-Leveling/Recoatable Epoxy (B58 Series) or S-W High Performance Flooring System TBD (architect to confirm).
V	Minwax Water-Based Pre-Stain Wood Conditioner

END OF SECTION

DIVISION 10 - SPECIALTIES

SECTION 107300 - PREFABRICATED ALUMINUM WALKWAY CANOPY

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Furnish and install pre-engineered, prefabricated aluminum canopy system(s), either fully free-standing or partially free-standing and partially supported on other construction, as shown on the drawings and specified herein.

1.02 RELATED SECTIONS

A. Division 03 Concrete specification sections.

B. Division 31 Earthwork specification sections.

C. Division 32 Exterior Improvement specification sections.

1.03 REFERENCES

A. Reference Standards:

1. BCNYS – Building Code of NYS for snow and wind load requirements.

2. ASTM - American Society for Testing and Materials.

3. ANSI – American National Standards Institute.

3. AWS - American Welding Society.

1.04 SUBMITTALS

A. General:

1. Submittals shall be in accordance with section 001300.

2. Submit shop drawings and structural calculations, both signed and sealed by a Professional Engineer licensed in the State of New York.

B. Product Design Requirements:

1. Meet design load requirements as shown on the drawings or contained in the BCNYS.

C. Submittal Requirements:

1. Shop drawings and structural calculations shall include, at a minimum:

a. Calculations:

1. References to building codes and design manuals used for calculations.

2. Identification of lateral force-resisting system.

3. Formulas used for determining snow, wind, and seismic loads to specific project location.

4. Connection design for structural bolts, welds, plate thicknesses, and anchorage to the foundation.

5. Required combinations of gravity and lateral loads shall be provided by the manufacturer to the Architect of Record for back-checking foundation design.

b. Shop Drawings

1. Anchor bolt layout.

2. Three-dimensional views of frame.

3. Member sizes and locations.

4. Structural connection details, including bolt sizes and plate thicknesses.

5. Roof trim and connection details.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications:

1. Minimum of 10 years in the industry.

2. Licensed structural engineer.

3. Certified AWS Welding Inspector.

4. AWS certified welders.

5. Controlled finishing system to include, pretreatment, primer, and powder coat.

1.06 MANUFACTURER WARRANTY

A. 5-year limited warranty on canopy and finish.

PART 2 – PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. For purpose of determining quality and performance requirements, this specification is based on products manufactured by Upside Innovations, LLC, 5470 Spellmire Drive, West Chester, OH 45246.

2.02 MATERIALS

A. Aluminum decking constructed of 3004-H36 aluminum alloy or 6036-T6 mill finish with powder coating, extruded flat pan.

1. Extruded flat plan 3”x6”x.065”.

2. Deck panels attached to inner flange of gutters with (2) #12 Tek screws each end.

3. Decking cut to length up to 12 feet.

B. Posts and gutters constructed of 6061-T6 extruded aluminum.

1. Internal drainage system directed from canopy decking into gutter system.

2. 6” gutter fascia, 4” wide. 0.100” thickness.

3. Gutter sections connected with 12” splices.

4. Gutter corners 18” x 18”, prefabricated.

5. 4”x4”x0.125” aluminum posts function as downspouts with drainage holes and deflector plates.

6. 8”x8”x0.5” base plate provided on each post.

7. Posts/base plates anchored to concrete footings or other foundation. Anchorage engineered by the manufacturer. Foundation engineered by the architect.

C. All accessories and fasteners shall be color-matched.

PART 3 – EXECUTION

3.01 STORAGE AND HANDLING

A. Store product elevated from soils to allow air circulation and to prevent introduction mold, fungi, decay or insects to the product.

C. Product must be handled with protective straps or padded forks if lifting with mechanical equipment. Use of chain or cable to lift product into place will not be accepted.

3.02 ERECTION

A. Conditions:

1. Inspect foundation and existing and constructed conditions to ensure satisfactory for erection of canopy.

2. Report any discrepancies or issues. Proceeding with installation is acceptance of all surrounding conditions.

B. Installation:

1. Install plumb and level according to manufacturer's installation instructions, these specifications, and details indicated on the Construction Drawings.

C. Tolerances:

1. Tolerances on prefabricated structural members cannot be increased. No field slotting or opening of holes will be allowed. It is therefore essential that contractors conform to the tolerances specified on the installation drawings for anchor bolt or post layout details.

END OF SECTION

DIVISION 14 – CONVEYING EQUIPMENT

SECTION 144216 – WHEELCHAIR LIFTS

PART 1 - GENERAL

1.01 SCOPE

A. System Description:

1. The product described herein is a permanently installed wheelchair lift within a shaftway intended for the exclusive use of individuals with disabilities. The lift shall be used only by individuals who are unable to negotiate stairs.

2. Lift must be in accordance with ICC/ANSI A117.1, A.D.A. compliant in the USA, including local codes and regulations except where specified otherwise.

1.02 NOT USED

1.03 RELATED SECTIONS

A. Section 033000 – Cast-in-Place Concrete Work.
B. Section 054000 – Cold Formed Metal Framing.
C. Section 061000 – Rough Carpentry.
D. Section 092900 – Gypsum Wall Board.
E. Division 26 – Electrical: power service and wiring connections.

1.04 REFERENCES

A. ADA Accessibility Guidelines for Buildings and Facilities (ADAAG).

B. ASME A17.5 - Elevator and Escalator Electrical Equipment.

C. ASME A18.1 - Safety Standard for Platform Lifts and Stairway Chairlifts.

D. ANSI A117.1 - Accessible and Usable Buildings and Facilities.

E. NFPA 70 (NEC) - National Electrical Code.

1.05 SUBMITTALS

A. Submissions shall be in accordance with Section 013300 – Submittal Procedures and as modified below.

B. Product Data: Manufacturer's data sheets on each product to be used, including:

1. Preparation instructions and recommendations.
2. Storage and handling requirements and recommendations.
3. Installation methods.

C. Shop Drawings: Drawings shall show dimensional and wiring requirements.

D. Verification Samples: For each finish product specified, two samples, 2 x 3 inches representing actual product, color, and patterns.

1.06 QUALITY ASSURANCE

A. Manufacturer shall have not less than twenty years of experience in the design and manufacture of vertical wheelchair lifts.

B. Installer Qualifications: Minimum 2 years' experience installing similar products.

1.07 PRE-INSTALLATION MEETINGS

A. Convene a conference approximately two weeks before scheduled commencement of the Work. Attendees shall include Architect, Contractor and trades involved. Agenda shall include schedule, responsibilities, critical path items and approvals.

1.08 DELIVERY, STORAGE AND HANDLING

A. Deliver and store products in manufacturer's unopened packaging bearing the brand name and manufacturer's identification until ready for installation.

B. Handle materials to avoid damage.

1.09 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

B. Do not use lift for hoisting materials or personnel during construction.

1.10 SEQUENCING

A. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

1.11 WARRANTY

A. Manufacturer shall provide an extended warranty for a period of an initial two years, with an additive five years, starting from the date of functional commissioning.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. Acceptable Manufacturer: Garaventa Lift; PO Box 1769, Baline, WA 98231-1769; Tel: 800-663-6556.

B. Acceptance of other products is subject to compliance with specified requirements and owner to architect approval.

2.02 VERTICAL PERMANENTLY-INSTALLED WHEELCHAIR LIFTS

A. Lift Product: GVL SW, with mast height per project conditions, installed in a shaftway.

B. Nominal Clear Platform Dimensions

1. Standard: 39 inches (992 mm) by 54 inches (1370 mm).

C. Platform Configuration

1. Straight Through Entry/Exit: Front and rear openings.

D. Landing Openings

1. Lower Landing: Door.

2. Upper Landing: Door.

E. Door Construction:

1. Fire Rated Doors: 1-1/2 hour B label rating. Pre-hung, constructed of 16 gauge (1.5 mm) steel, with a vision panel, delayed action door closer, pull handle and integrated interlock. Doors mount flush to the inside wall of the shaftway.

2. Doors, frames, and door hardware are all to be provided by the lift manufacturer as an integrated, turn-key system. Free egress must be provided when platform is at a landing.

3. Door vision panel glazing shall be Fire-Lite Plus ceramic laminated wireless glazing, complying with testing requirements of CPSC 16 CFR 1201, and passing positive pressure tests standards: UL 10C, UBC 7-2 and UBC 7-4.

a. Door Width:

1) Lower Landing: 35-5/8 inches (905 mm).

2) Intermediate Landing: 35-5/8 inches (905 mm).

3) Upper landing: 35-5/8 inches (905 mm).

F. Power Door Operator: Automatically opens the door/gate when platform arrives at a landing. Will also open at landing by pressing call button.

1. ADA Compliant and obstruction sensitive.

2. Low voltage, 24 VDC with all wiring concealed.

3. Provide power operators at upper and lower landing doors.

G. Lift Components:

1. Machine Tower: Extruded aluminum.

2. Base Frame: Structural steel tubing.

3. Platform Side Wall Panels: 16 gauge (1.5 mm) galvanized steel sheet. Aluminum extrusion tube frame.

H. Base Mounting and Access to Lift at Lower Landing

1. As shown on the drawings, either:

a. Floor Mount: Base of lift shall be mounted on the floor surface of the lower landing. For access onto the platform provide a ramp of 16 gauge (1.5 mm) galvanized steel sheet with a slip resistant surface.

b. Pit Mount: Lift to be mounted in pit with dimensions to meet manufacturer's requirements for the platform size specified. Pit construction shall be in accordance to Section 03300.

I. Drive Mast Side Wall Panels: Provide 16 gauge (1.5 mm) galvanized panels and mounting hardware to cover the void between both sides of the mast and the side of the shaftway. Panels to cover the front and top of the void area to the height of the top surface of the drive mast.

J. Leadscrew Drive:

1. Drive Type: Self-lubricating acme screw drive.

2. Emergency Operation:

1) Battery Powered Emergency Lowering: Battery powered platform lowering device that automatically activates in the event of power failure. Allows passenger to drive platform downward to lower landing. Does not operate lift in up direction.

3. Safety Devices:

a. Integral safety nut assembly with safety switch

b. Shoring device.

4. Travel Speed: 10 fpm (3.0 m/minute).

a. Motor: 2.0 hp (560 W).

b. Power Supply: 120 VAC single phase; 60 Hz on a dedicated 20-amp circuit.

K. Hydraulic Drive:

a. Drive Type: Chain hydraulic.

b. Emergency Operation: Manual device to lower platform and auxiliary battery power to raise or lower platform.

c. Safety Devices:

1) Slack chain safety device.

2) Shoring device.

d. Travel Speed: 17 fpm (5.2 m/minute).

e. Motor: 3.0 hp (2.2 kW); 24 volts DC.

f. Power Supply:

1) 120 VAC single phase; 60 Hz on a dedicated 15-amp circuit.

2) 208/240 VAC, single phase; 50 Hz on a dedicated 16-amp circuit.

3) Powered by continuous building mains converted to 24 VDC equipped with auxiliary battery power system capable of running lift up and down for a minimum of 5 trips with rated load. Required for high usage lifts.

g. Platform Controls: 24 VDC control circuit with the following features.

1) Direction Control: Illuminated tactile and continuous pressure buttons with dual platform courtesy lights and safety light.

2) Illuminated and audible emergency stop switch shuts off power to lift and activates audio alarm equipped with battery backup.

3) Keyless operation.

4) Emergency Telephone: Platform shall be equipped with ADA compliant autodialer telephone with a stainless-steel faceplate. Telephone shall operate in the event of power failure. A telephone line shall be supplied to the lift site as specified under Division 16.

5) Arrival Gong and Digital Floor Display.

h. Call Station Controls: 24 VDC control circuit with the following features.

1) Direction Control: Continuous pressure switches.

2) Direction Control: Illuminated and tactile continuous pressure buttons with illuminated "in-use" indicator.

3) Safety indicator lamp.

4) Keyless operation.

5) Call Station Mounting:

a) Lower: Wall mounted surface.

b) Upper: Wall mounted surface.

i. Safety Devices and Features:

1) Grounded electrical system with upper, lower, and final limit switches.

2) At all landings a solenoid activated interlock shall electrically monitor that the door is in the closed position and the lock is engaged before lift can move from landing.

3) Pit stop switch mounted on mast wall.

4) Electrical disconnect shall shut off power to the lift.

j. Finishes

1) Extruded aluminum electrostatically applied baked powder finish semi matte Silver Moon.

2) Ferrous Components: Electrostatically applied baked powder finish, semi matte.

a) Color: Silver Moon.

3) Lift Finish: Baked powder coat finish as selected by the Architect from manufacturer's optional RAL color chart.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify suitability of substrate preparation in accordance with approved manufacturer's drawings.

B. Verify correct space requirements in accordance with approved manufacturer's drawings. Verify electrical service is of correct type and at correct location.

C. Do not begin installation until substrates have been properly prepared. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

A. Install lift in accordance with approved submittals, manufacturer's instructions, and ASME A18.1 requirements.

B. Installation space and substrate shall be of sufficient strength to support the loads imposed on it during operation of the lift. Refer to structural loading diagrams provided by manufacturer to ensure proper provision is made.

   a. General Contractor to provide all blocking and framing, engineered by cold-formed metal framing manufacturer to the loads provided by lift manufacturer.

   b. General Contractor to construct shaft in accordance with all clearances provided by lift manufacturer.

3.04 FIELD QUALITY CONTROL

A. Perform acceptance tests as required by code and the authority having jurisdiction. Place rated load on platform and operate for several cycles to verify correct installation and operation. No mechanical failures shall occur and no wear that would affect the reliability of the lift shall be detected.

3.05 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

DIVISION 22 – PLUMBING

SECTION 220000 – PLUMBING GENERAL PROVISIONS

PART 1 – GENERAL

1.01 SUMMARY OF ITEMS INCLUDED

A. This Section contains General Provisions related specifically to the Plumbing Work.

1. Quality Assurance
2. Protection
3. Coordination and Sequencing
4. General Completion
5. Painting and Finishing
6. Excavation for Plumbing Work
7. Concrete for Plumbing Work

B. Drawings and General Provision of Contract, including General Conditions, Supplementary Conditions (if applicable), and Division 01 - Specification Sections, apply to work of this Section.

1.02 GENERAL

A. This Contractor, as well as sub-contractors for his work, must carefully read the “Instructions to Bidders” and study the plans and specifications.

1. It is the intention of these specifications to provide for the furnishing and installing of the plumbing equipment complete as shown and specified. Any work or changes which may be evidently necessary to complete the installation shall be furnished by the Contractor as being included in this Contract.

2. During the course of the work, should any ambiguities or discrepancies be found in the specifications to which the Contractor has failed to call attention to before submission of his bid, then the Engineer shall interpret the intent of the specifications, and the Contractor hereby agrees to abide by the Engineer’s interpretation and agrees to carry out the work in accordance with the decision of the Engineer. It is expressly stipulated that neither the instructions nor the specifications shall take precedence, one over the other, and it is further stipulated that the Engineer may interpret or construe the specifications of the work, and of that question the Engineer shall be the sole judge.

3. Where no specified kind of quality of material is given, a first class standard article as approved by the Engineer shall be furnished. The specifications do not undertake to illustrate or set forth every item necessary for the work.

4. Small details not usually shown or specified but necessary for its proper installation and finishing shall be included in the Contractor’s estimate, the same as if hereby specified or shown.

1.03 QUALITY ASSURANCE

A. Laws, Permits, Inspections.

1. Comply with the latest revisions of New York State Uniform Fire Protection and Construction Code, International Plumbing Code, any Local Codes or Regulations that apply.

2. Underwriters Laboratories label required for all electrical materials carrying 50 volts or more.

3. Comply with New York State Energy Conservation Construction Code, as referenced in NYCRR.

4. Comply with N.Y. State Education Department Manual of Planning Standards.

5. Comply to requirements of drawings and specifications that are in excess of governing codes.

6. Comply with the most current version of ASCE 7 for seismic requirements.

7. Do not install work as specified or shown if in conflict with governing code. Notify Engineer and request direction.

8. Pay all Inspection and Permit fees.

9. Provide Certificate of Inspection from all governing authorities.

B. Reference to technical society, organization, body or section made in accordance with the following abbreviations:

1. AGA – American Gas Association
2. AIA – American Institute of Architects
3. AMCA – American Moving and Conditioning Association, Inc.
4. ANSI – American National Standards Institute.
5. ASCE – American Society of Civil Engineers.
6. ASHRAE – American Society of Heating, Refrigeration and Air Conditioning Engineers
7. ASME – American Society of Mechanical Engineers
8. ASTM – American Society of Testing Materials
9. AWSC – American Welding Society Code
10. AWWA – American Water Works Association
11. CS – Commercial Standard
12. FS – Federal Specification
13. IEEE – Institute of Electric and Electronics Engineers
14. NEC – National Electric Code
15. NEMA – National Electrical Manufacturer's Association
16. NFPA – National Fire Protection Association
17. NYBFU – New York Board of Fire Underwriters
18. NYCRR – Codes, Rule and Regulations of the State of New York.
19. NSF – National Sanitation Foundation
20. PDI – Plumbing and Drainage Institute.
21. SMACNA – Sheet Metal and Air Conditioning Contractors National Association
22. USASI – United States of America Standards
23. UL – Underwriters' Laboratories, Inc.

C. Contractor submission of equivalent or substitute items other than those specified is at Contractor convenience only. If a substitution or equivalent is accepted, the Contractor shall coordinate the installation of the substitute or equivalent and make all associated changes required. The Contractor also waives any claim for additional costs associated with the substitute / equivalent which becomes apparent before, during or after installation. The Contractor agrees to bear any and all additional costs to all other contractors or subcontractors which are caused by the incorporation of the substitution / equivalent.

1.04 PROTECTION

A. Protect equipment from damage, including water, chemical, mechanical injury and theft.

B. Replace damaged equipment or components.

C. Close and waterproof between sleeves, openings, pipes and voids in walls, floors and foundations to prevent entrance of water or moisture.

D. Holes made in firewalls, partitions, fire stops, shall be patched to maintain fire rating integrity.

E. Deliver pipes and tubes with factory-applied end-caps. Maintain end-caps through shipping, storage and handling to prevent pipe-end damage and prevent entrance of dirt, debris and moisture.

F. Protect stored pipes and tubes from moisture and dirt. Elevate above grade. When stored inside, do not exceed structural capacity of the floor.

G. Protect flanges, fittings, and piping specialties from moisture and dirt.

H. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.05 COORDINATION AND SEQUENCING

A. Coordinate plumbing equipment installation with other building components.

B. Arrange for chases, slots and openings in building structure during progress of construction, to allow for plumbing installations.

C. Coordinate the installation of required supporting devices set sleeves in poured-in-place concrete and other structural components, as they are constructed.

D. Sequence, coordinate, and integrate installations of mechanical materials and equipment for efficient flow of the Work. Coordinate installation of large equipment requiring positioning prior to closing in the building.

E. Coordinate connection of plumbing systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies.

F. Coordinate requirements for access panels and doors where mechanical items requiring access are concealed behind finished surfaces. Access panels and doors are specified in Section 220555 “Access to Plumbing Work.”

G. Coordinate installation of identifying devices after completion of covering and painting, where devices are applied to surfaces. Install identifying devices prior to installation of acoustical ceilings and similar concealment.

H. Coordination with other trades: Right-of-Way as follows:

1. Light Fixtures.
2. Fire Suppression.
3. Steam and condensate piping.
4. Hot water supply and hot water return piping.
5. Drain Pipes and Vents
6. Ductwork
7. HVAC Piping
8. Domestic Water Piping
9. Electrical Conduit

1.06 GENERAL COMPLETION

A. Oiling Equipment.

1. Lubricate equipment and motors in accordance with manufacturer's requirements. Provide lubrication chart in frame mount where directed by Owner.

B. Instructions to Owner's Representative.

1. Give notice to Engineer when all systems are installed and operating.

2. Obtain name of Owner's Representative to receive instructions.

3. Schedule instructions of Owner's Representative by manufacturer's representative and instruct Owner in system installation and operation for all equipment installed under this contract.

C. Provide Operation and Maintenance manuals in accordance with the Requirements of Division 01 "Contract Closeout" Section.

1.07 PAINTING AND FINISHING

A. Refer to Division 09, Section "Painting" for field painting Requirements.

B. Damage and Touch-up: Repair marred and damaged factory painted finishes with materials and procedures to match original factory finish.

1.08 CUTTING AND PATCHING – SEE SPECIFICATION SECTION 220020

1.09 EXCAVATION FOR PLUMBING WORK

A. Description of Work: Types of excavation for plumbing related work specified in this section include:

1. Underground plumbing utilities and services.
2. Underground tanks and equipment enclosures.
3. Interior and Exterior water distribution systems to 5 feet outside of the building or where indicated on the plans.
4. Interior and Exterior sanitary and storm drainage systems to 5 feet outside of the building or where indicated on the plans.

B. Project Conditions.

1. Locate and protect existing utilities and other underground work in manner which will ensure that no damage or service interruption will result from excavating and backfilling. Liabilities arising out of performance of work is responsibility of Contractor doing excavation.

2. Protect persons from injury at excavations by barricades, warnings, and illumination.

3. Provide temporary covering or enclosure and temporary heat as necessary to protect bottoms of excavations from freezing and frost action. Do not install plumbing work on frozen excavation bases or sub bases.

1.10 CONCRETE FOR PLUMBING WORK

A. Types of concrete for plumbing related work specified in this section include:

1. Lean concrete backfill to support plumbing work.

2. Encasement of mechanical work.
3. Plumbing equipment foundations and housekeeping pads.
4. Inertia bases for isolation of plumbing work.
5. Rough grouting in and around plumbing work.
6. Patching concrete cuts to accommodate plumbing work.
7. Thrust block.

1.11 REBATES

A. The Plumbing Contractor shall assist the Owner in applying for any available rebates from manufacturer's, utility companies, etc. on equipment or materials installed under the contract. Provide all required documentation and assist in the completion of applications as required to complete the rebate process. All proceeds from rebates remain the property of the Owner.

PART 2 – PRODUCTS

2.01 BACKFILL MATERIALS

A. Sub base Material (Bedding): Graded mixture of gravel, sand crushed stone or crushed slag.

B. Backfill Material: Soil material free of large stones, shale, wood and similar material.

2.02 CONCRETE

A. Concrete installed by this division shall comply with Division 3 Specifications for Concrete.

PART 3 – EXECUTION

3.01 EXCAVATION - GENERAL

A. Do not excavate for plumbing work until work is ready to proceed without delay, so that total time lapse from excavation to completion of backfilling will be minimum.

B. Excavate with vertical sided excavations to greatest extent possible, except where otherwise indicated. Where necessary, provide sheeting and cross bracing to sustain sides of excavation. Remove sheeting and cross bracing during backfilling wherever such removal would not endanger work or other property. Where not removed, cut sheeting off at sufficient distance below finished grade to not interfere with other work.

C. Width: Excavate for piping with 6" to 9" clearance on both sides of pipe, except where otherwise shown or required for proper installation of pipe joints, fittings, valves and other work. Excavate for other mechanical work to provide minimum practical but adequate working clearance.

D. Depth for direct support: For work to be supported directly on undisturbed soil, do not excavate beyond indicated depths, and hand excavate bottom cut to accurate elevations, undercut at pipe hubs.

E. Depth for sub base support: For large piping (6" pipe size and larger), tanks, and where indicated for other plumbing work, excavate for installation of sub base material in depth indicated or, if not otherwise indicated, 6" below bottom of work to be supported.

F. Depth for unsatisfactory soil or rock conditions: Where directed, (because of unsatisfactory conditions at bottom of indicated excavation), excavate additional depth as directed to reach

satisfactory conditions. Backfill with sub base material compacted as directed, to indicate excavation depth.

G. Store excavated material (temporarily) near excavation, in manner, which will not interfere with or damage excavation or other work. Do not store under trees (within drip line).

1. Dispose of excavated material, which is either in excess of quantity needed for backfilling, or does not comply with requirements for backfill material.

2. Remove unused material from project site, and dispose of it in lawful manner.

3.02 WATER CONTROL

A. Maintain dry excavations for plumbing work, by removing water. Protect excavations from inflow of surface water. Pump minor inflow of ground water from excavations, protect excavations from major inflow of ground water, by installing temporary sheeting and waterproofing. Provide adequate barriers which will protect other excavations and below grade property from being damage by water, sediment or erosion from or through plumbing work excavations.

3.03 BACKFILLING

A. Do not backfill until installed plumbing work has been tested and accepted.

B. Install drainage fill where indicated, and tamp to uniform firm density.

C. Backfill with finely graded sub base material to 6” above wrapped, coated and plastic piping and tanks, or as shown on drawngsand to centerline of other tanks.

D. Condition backfill material by either drying or adding water uniformly, to whatever extent may be necessary to facilitate compaction to required densities. Do not backfill with frozen soil materials.

E. Backfill simultaneously on opposite side of plumbing work, and compact simultaneously, do not dislocate work from installed positions.

F. Backfill excavations in 8” high courses of backfill material uniformly compacted to the following densities (% of maximum density, ASTM D1557), using power-driven hand operated compaction equipment.

1. Lawn and landscaped areas: 85% for cohesive soils, 90% for cohesion less soil.

2. Paved areas and roadways: 90% for cohesive soils, 95% for cohesion less soils.

G. Backfill to elevations matching adjacent grades, at time of backfilling excavations for mechanical work. Return surfaces to original condition.

H. After covering piping with 6” layer of approved fill backfill and compact excavations beneath:

1. New foundations.
2. Slabs on grade.
3. Areas to be paved by General Contractor.

3.04 CONCRETE BASES

A. Construct concrete equipment bases of minimum 4 inches higher or as shown on drawings, and not less than 4 inches larger in both directions than supported unit. Follow supported equipment manufacturer’s setting templates for anchor bolt and tie locations.

3.05 CONCRETE GENERAL

A. Concrete installed by this division shall comply with Division 03 Specifications for Concrete.

END OF SECTION

DIVISION 22 – PLUMBING

SECTION 220010 – CODES, STANDARDS, AND PERMITS

PART 1 – GENERAL

1.01 GENERAL

A. The entire installation shall be made in accordance with State rules and regulations and shall also conform with the standards of the National Board of Fire Underwriters for this installation and the local Board of Fire Underwriters having jurisdiction. The installation shall also comply with air pollution requirements of the State of New York and Industrial Code Rule 4 of the State of New York Department of Labor, Board of Standards and Appeals, dated March 31, 1965, and all other ordinances having jurisdiction.

B. The Contractor shall submit to all authorities having jurisdiction all required applications and shall secure all necessary permits, tests, and inspections required for final approval.

C. Certain standard and staple materials are described by reference to standard specifications. These standards are as follows:

AGA	American Gas Association
ASA-B9	Safety Code for Mechanical Refrigeration
ASHRAE	American Society of Heating, Refrigerating, and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society of Testing Materials
CGA	Compressed Gas Association
AWWA	American Water Works Association
CS	Commercial Standard
FS	Federal Specification
NEMA	National Electrical Manufacturer's Association
NFPA	National Fire Protection Association
NSF	National Sanitation Foundation
PDI	Plumbing and Drainage Institute
SMACNA	Sheet Metal and Air Conditioning Contractors National Association
USASI	United States of America Standards Institute
UL	Underwriters' Laboratories
	New York State Uniformed Fire Prevention and Building Code
IPC	International Plumbing Code

D. All electric facilities shall receive the Underwriters label and be installed in accordance with the latest issue of the National Electric Code requirements.

END OF SECTION

DIVISION 22 – PLUMBING

SECTION 220020 – CUTTING AND PATCHING

PART 1 – GENERAL

1.01 GENERAL

A. Each Contractor shall be responsible for his cutting and patching. The Contractor shall also be responsible for all finish patching and painting.

B. Each Contractor shall replace and patch any surfaces of any structure disturbed by his operations and his work, even if such operations and work are outside the contract limit. Such replacement, repair, and patching shall be with similar material and shall restore surfaces as they exist, or better.

C. Cut and alter existing materials as required to perform the work. Limit cutting to the smallest amount necessary for proper installation of the work.

D. Where the removal of existing building components necessitates the addition of patching in new materials, such work shall be executed to insure the fire resistance rating of the system and visual continuity with adjacent surfaces, whether or not the remedial work is specifically detailed on the drawings.

E. Perform the removal work with such care as may be required to prevent damage to adjoining construction which is to remain.

F. Do not disturb any existing structure, piping, apparatus, or other construction which must remain unless expressly required by the contract. Where cutting or removals are required in existing construction, do the work in a manner that will safeguard and not endanger the structure and as approved by the Engineer.

G. If unforeseen obstructions are encountered, take all precautions necessary to prevent damage and obtain full instructions from the Engineer before proceeding with the work.

H. Remove from the site all debris and other materials resulting from the alterations and removals, subject to the General Requirements.

I. Fill all voids and patch existing construction and finishes damaged within area of alteration work unless otherwise indicated. Provide new materials to match existing corresponding items as closely as practicable.

J. Any pipe penetrations through fire rated areas shall be accomplished using Hilti fire barrier products in sheets, strips, or caulk using ASTM, UL, and FM standards.

END OF SECTION

DIVISION 22 – PLUMBING

SECTION 220030 – SCHEDULE OF EQUIVALENCY

PART 1 – GENERAL

1.01 GENERAL

A. Wherever a brand name or manufacturer is named in this specification, it indicates the standard of quality or purpose desired. Where one certain kind, type, brand, or manufacturer of materials is named, it shall be regarded as the standard quality. Where two or more are named, these are presumed to be equal, and the Contractor may select one of those items; if the Contractor desires to use any other kind, type, brand, or manufacturer of material other than named in the specifications, he shall submit a list, with his bid, stating what material, equipment, or method is offered as equal and how it affects the contract price.

B. The equivalency of such items is to be judged by the Engineer whenever offered by bidders as equivalent to the Base Bid items and so reported to the Owner for his ultimate decision.

C. The following manufacturers are approved equivalents for those listed in the specifications:

1. Insulation:

   Johns-Mansville Corporation
   Owens-Corning Fiberglass Corporation
   Knauf
   Certainteed

2. Drains, Cleanouts, Flashing Sleeves, Wall Hydrants, Water Hammer Arrestors, Interceptors, and Fixture Supports

   Zurn Manufacturing Company
   Josam Manufacturing Company
   Jay R. Smith Company

3. Plumbing Fixtures

   Zurn
   American Standard
   Crane Company

4. Fixture Trim

   American Standard
   Chicago Faucet Company
   T & S Brass and Bronze Works

5. Flush Valves

   Zurn
   Sloan Valve Company
   American Standard

6. Toilet Seats

   American Standard
   Olsonite
   C.F. Church Company

7. Access Doors

   Karp Associates, Inc.
   Zurn Manufacturing Company
   Wilcox Steel Company

8. Valves

   Jenkins Brothers
   Lukenheimer Company
   Walworth Company

END OF SECTION

DIVISION 22 – PLUMBING

SECTION 220100 – MAINTENANCE INSTRUCTIONS

PART 1 – GENERAL

1.01 GENERAL

A. In addition to the requirements outlined in the "Plumbing General Provisions", the following information shall be incorporated:

1. Manufacturer's plumbing equipment parts list of all functional components including control diagrams and wiring diagrams of controllers.

2. Step by step instructions for each system including preparation for starting, operation, and shutdown. Provide full maintenance manual describing procedures for each new piece of equipment. In addition, provide a video showing / describing step by step instructions for maintenance of each new piece of equipment.

3. Twelve-month maintenance schedule for each type of equipment.

4. Possible breakdowns and repairs for each type of equipment.

5. List of nearest local suppliers for all equipment.

END OF SECTION

DIVISION 22 – PLUMBING

SECTION 220300 – PLUMBING BASIC MATERIALS AND METHODS

PART 1 – GENERAL

1.01 SUMMARY OF ITEMS INCLUDED

A. This Section includes the following basic plumbing materials and methods to complement other Division 22 Sections.

1. Submittals.
2. Pipe joining materials and installation instructions common to piping systems.
3. Piping specialties: Escutcheons, dielectric fittings, sleeves and seals.
4. Non-shrink grout for equipment installations.
5. Drip pans.
6. Pipe supports: Hangers, clamps, support spacing, building attachments, shields and saddles, flashing, miscellaneous materials, and anchors.
7. Field fabricated metal and wood equipment supports.
8. Firestopping.

B. Pipe and pipe fitting materials are specified in piping system sections.

1.02 RELATED DOCUMENTS

A. Drawings and General Provision of Contract, including General Conditions, Supplementary Conditions (if applicable), and Division 01 - Specification Sections, apply to work of this Section.

B. NSF 372 and ANSI 61

1.03 SUBMITTALS

A. Comply with requirements of Section 013300 – Submittal Procedures and as modified below.

B. Product data for following piping specialties:

1. Mechanical sleeve seals.
2. Identification materials and devices.

C. Reflected ceiling plans to coordinate and integrate installations, air outlets and inlets, light fixtures, communication systems components, sprinklers, and other ceiling-mounted items.

1.04 STANDARDS FOR MATERIALS AND WORKMANSHIP

A. All materials and workmanship shall, at a minimum be in accordance with (in no order of precedence):

1. New York State Codes – latest edition as adopted by the Authority Having Jurisdiction, unless otherwise noted.

2. State and municipal Building Codes and related subcodes.

3. Occupational and Safety Act (OSHA) Requirements.

4. Rules and Regulations of the Authority Having Jurisdiction applicable to the work.

5. National Electrical Standards Association Standard for Good Workmanship in Electrical Construction (NECA-1).

6. Serving utility's rules and regulations for providing service.

7. Contract Drawings and Specifications.

8. Manufacturer recommended installation instructions, practices and procedures for the products being utilized or installed.

9. Where conflicts arise between the above, the more stringent requirement shall be adhered to.

PART 2 - PRODUCTS

2.01 PIPE AND PIPE FITTINGS

A. Refer to individual piping system specification Sections for pipe and fitting materials and joining methods.

B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

C. All fittings NSF 372 ANSI 61.

2.02 PIPE JOINING MATERIALS

A. Refer to individual piping system specification Sections in Division 22 for special joining materials not listed below.

B. Pipe Flange Gasket Materials: Suitable for the chemical and thermal conditions of the piping system contents.

1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness, except where 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-thick, except where other thickness is indicated; and full-face or ring type, except where type is indicated.

C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, except where other material is indicated.

2.03 PIPING SPECIALTIES

A. Escutcheons: Manufactured wall, ceiling and floor plates; deep-pattern type, where required to conceal protruding fittings and sleeves.

1. Inside Diameter: Closely fit around pipe, tube and insulation of insulated piping.

2. Outside Diameter: Completely cover opening.

3. Cast Brass: One-piece, with set-screw.

    a. Finish: Rough brass.

b. Finish: Polished chrome plate.

4. Cast Brass: Split casting, with concealed hinge and set-screw.

a. Finish: Rough brass.
b. Finish: Polished chrome plate.

5. Stamped Steel: One-piece, with set screw and chrome plated finish.

6. Stamped Steel: One-piece with spring clips and chrome plated finish.

7. Stamped Steel: Split plate with concealed hinge, set-screw, and chrome plated finish.

8. Stamped Steel: Split plate with concealed hinge, spring clips and chrome plated finish.

9. Cast-Iron Floor Plate: One-piece casting.

B. Dielectric Fittings: Assembly or fitting having insulating material isolating joined dissimilar metals, to prevent galvanic action and stop corrosion.

1. Description: Combination of copper alloy and ferrous; threaded, solder, plain, and weld neck end types and matching piping system materials.

2. Insulating Material: Suitable for system fluid, pressure and temperature.

3. Dielectric Unions: Factory-fabricated, union assembly, for 250 psig minimum working pressure at 180 deg F temperature.

4. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150 or 300 psig minimum pressure to suit system pressures.

5. Dielectric-Flange Insulation Kits: Field-assembled, companion-flange assembly, full face or ring type. Components include neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers and steel backing washers.

a. Provide separate companion flanges and steel bolts and nuts for 150 or 300 psig minimum working pressure to suit system pressures.

6. Dielectric Couplings: Galvanized steel coupling, having inert and non-corrosive, thermoplastic lining, with threaded ends and 300 psig minimum working pressure at 225 deg F temperature.

7. Dielectric Nipples: Electroplated steel nipple, having inert and non-corrosive, thermoplastic lining, with combination of plain, threaded or grooved end types and 300 psig working pressure at 225 deg F temperature.

C. Mechanical Sleeve Seals: Modular, watertight, mechanical type. Components include interlocking synthetic rubber links shaped to continuously fill annular space between pipe and sleeve. Connecting bolts and pressure plates cause rubber sealing elements to expand when tightened.

D. Sleeves: The following materials are for wall, floor, slab and roof penetrations.

1. Steel Sheet-Metal: 24 gage or heavier, galvanized sheet metal, round tube closed with welded longitudinal joint.

2. Steel Pipe: ASTM A53, Type E, Grade A, Schedule 40, galvanized, plain ends.
3. Cast-Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, having plain

ends and integral water stop, except where other features are specified.

4. Wall Penetration Systems: Wall sleeve assembly, consisting of housing, gaskets and pipe sleeve, with 1 mechanical-joint end conforming to AWWA C110 and 1 plain pipe-sleeve end.

    a. Penetrating Pipe Deflection: 5 percent without leakage.
    b. Housing: Ductile-iron casting having waterstop and anchor ring, with ductile-iron gland, steel studs and nuts, and rubber gasket conforming to AWWA C111 of housing and gasket size as required to fit penetrating pipe.
    c. Pipe Sleeve: AWWA C151, ductile-iron pipe.
    d. Housing-to-Sleeve Gasket: Rubber or neoprene, push-on type, of manufacturer's design.

5. Cast-Iron Sleeve Fittings: Commercially-made, sleeve having integral clamping flange, with clamping ring, bolts and nuts for membrane flashing.

    a. Underdeck Clamp: Clamping ring with set screws.

2.04 VALVES

A. Refer to individual piping system specifications section in Division 22 for special valves not listed below.

B. General

1. Valves shall be installed only in upright vertical or horizontal positions unless specifically otherwise required by the drawings.

2. All valves shall be installed in accessible locations to facilitate easy removal for repair or replacement. Where not possible provide access doors. Refer to 220555.

3. All gate and globe valves shall be designed for repacking when wide open under pressure.

4. Domestic water system valves 3/4" and smaller and all balancing valves shall be globe type.

5. All valves of the same type shall be the products of a single manufacturer and shall comply with ANSI B31.1.

6. All valves for domestic water use shall be no lead type in accordance with NSF-372 ANSI 61.

C. Gate Valves

1. Cold, hot, and hot water return, 2" and smaller: Ball type solder end connections. Jenkins, Nibco, or equal Type B. 3" and larger gate valve: Jenkins, Nibco, or equal Type 1, Class "A", Style 3.

D. Globe Valves

1. 3" or smaller: Jenkins, Nibco, or equal. Over 3": Jenkins, Nibco, or equal, Type 1 with cast iron body and bronze trim.

E. Check Valves

1. 3" and smaller: Jenkins, Nibco, or equal, Type IV, Class "A".

2.05 GROUT

A. Nonshrink, Nonmetallic Grout: ASTM C1107, Grade B.

1. Characteristics: Post-hardening, volume-adjusting, dry, hydraulic-cement grout, 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.

2.06 DRIP PANS

A. Provide drip pans fabricated from corrosion resistant sheet metal with watertight joints, and with edges turned up 2-1/2 inches. Reinforce top, either by structural angles or by folding over according to size. Provide hole, gasket, and flange at low point for watertight joint and 1-inch drain line connection.

2.07 HORIZONTAL PIPING HANGERS AND SUPPORTS

A. General: Except as otherwise indicated, provide factory fabricated horizontal piping hangers and supports. Hangers and supports shall be in complete conformance with Chapter 3 of the New York State Plumbing Code. Use only one type by one manufacturer for each piping service. Select size of hangers and supports to exactly fit pipe size for bare piping, and to exactly fit around piping insulation with saddle or shield for insulated piping. Provide copper plated hangers and supports for copper piping systems.

B. Adjustable steel clevises.

1. Material: Carbon steel, copper plated for copper piping.
2. Finish: Black or copper plated.
3. Adjustment: Hanger to be adjustable for vertical height of pipe without removing the pipe.

2.08 VERTICAL PIPING CLAMPS

A. Two bolt riser clamp.

1. Material: Carbon steel copper plated for copper piping.
2. Finish: Black or copper plated.

2.09 HANGER ROD AND SPACING

ROD SIZE AND SPACING SCHEDULE

Pipe Size		Maximum Spacing			Rod Size
		Steel	Copper		
1/2 to 1	6 ft.	6 ft.		3/8"	
1-1/4 to 1-1/2		6 ft.	6 ft.		3/8"
2		12 ft.	10 ft.		3/8"
2-1/2 - 3-1/2		12 ft.	10 ft.		1/2"
4 - 5		12 ft.	10 ft.		5/8"
6		12 ft.	10 ft.		3/4"
8 - 12		12 ft.			7/8"
14 - 16		12 ft.			1"

Note: Cast Iron - support at every hub or coupling 5 ft. maximum spacing.

2.10 BUILDING ATTACHMENTS

A. General: Except as otherwise indicated provide factory fabricated building attachments of one of the following types listed, selected by Installer to suit building substrate conditions. Select size of building attachments to suit hanger rods. Provide copper plated building attachments for copper piping systems.

B. On Structural Steel:

1. For pipes 2" and smaller: C clamps with lock nuts similar to Anvil figure 86.
2. For pipes 5" and larger: Use beam clamps similar to Anvil figure 228 or 292.

C. On New Masonry:

1. Use concrete inserts similar to Anvil figure 281.

D. On Existing Concrete:

1. Use expansion case similar to Anvil figure 117.

E. On Wood:

1. Use coach screw rods Anvil figure 142. Ceiling flanges Anvil figure 153, or fabricated angle clips. Use wood drive screws or lag bolts as fasteners.

2.11 SHIELDS AND SADDLES

A. General: For insulated piping.

B. Shields: 16-gauge galvanized metal.

C. Protection saddles:

1. Hardwood block
2. Steel saddle Anvil 160 series

2.12 FLASHING MATERIALS

A. General: Provide flashings for each penetration of plumbing systems through roofs or waterproof membranes.

B. Molded Pipe Flashing: Compatible with single ply membranes with which it is used and manufactured by membrane manufacturer.

C. Coated copper flashing: Provide cold-rolled sheet copper (ANSI/ASTM B 370), of proper temper for applications shown and required forming, coated on one side with not less than 0.06 lbs. per sq. ft. of antimony (ANSI/ASTM B 101, Type I, Class A), weighing 1.06 lbs. per sq. ft., except as otherwise indicated.

D. Bituminous coating: FS TT-C-494, or MIL-C-18480, or SSPC-Paint 12, cold applied solvent type bituminous mastic coating for application in dry film thickness of 15 mils per coat.

2.13 MISCELLANEOUS MATERIALS

A. Metal framing: Provide products complying with NEMA.

B. Steel plates, shapes and bars: Provide products complying with ANSI/ASTM A 36.

C. Heavy duty steel trapezes: Fabricate from steel shapes selected for loads required, weld steel in accordance with American Welding Society (AWS) standards.

D. Pipe guides: Provide factory fabricated guides, of cast semi-steel or heavy fabricated steel, consisting of a bolted two section outer cylinder and base with a two section guiding spider bolted tight to pipe. Size guide and spiders to clear pipe and insulation (if any), and cylinder. Provide guides of length recommended by manufacturer to allow indicated travel.

2.14 ANCHORS

A. Fabricate pipe anchors from 3 x 3 x 1/2" angle.

B. Use pipe protection saddles one size larger than piping.

PART 3 – EXECUTION

3.01 PIPING SYSTEMS - COMMON REQUIREMENTS

A. General: Install piping as described below, except where system Sections specify otherwise. Individual piping system specification Sections in Division 15A specify piping installation requirements unique to the piping system.

B. General Locations and Arrangements: Drawings (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, except where deviations to layout are approved on coordinate drawings.

C. Pitch piping at low points. Provide Manual Blowdown for maintenance.

D. Install piping at indicated slope.

E. Install components having pressure rating equal to or greater than system operating pressure.

F. Install piping in concealed interior and exterior locations, except in equipment rooms and service areas.

G. Install piping free of sags and bends.

H. Install exposed interior and exterior piping at right angles or parallel to building walls. Diagonal runs are prohibited, except where indicated.

I. Install piping tight to slabs, beams, joists, columns, walls and other building elements. Allow sufficient space above removable ceiling panels to allow for ceiling panel removal.

J. Install piping to allow application of insulation plus 1-inch clearance around insulation.

K. Locate groups of pipes parallel to each other, spaced to permit valve servicing.

L. Install fittings for changes in direction and branch connections.

M. Install couplings according to manufacturer's printed instructions.

N. Install pipe escutcheons for pipe penetrations of concrete and masonry walls, wallboard partitions and suspended ceilings according to the following:

1. Chrome-Plated Piping: Cast-brass, one-piece, with set-screw and polished chrome-plated finish. Use split-casting escutcheons where required, for existing piping.
2. Uninsulated Piping Wall Escutcheons: Cast-brass or stamped-steel, with set-screw.
3. Uninsulated Piping Floor Plates in Utility Areas: Cast-iron floor plates.
4. Insulated Piping: Cast-brass or stamped-steel, with concealed hinge, spring clips and chrome-plated finish.
5. Piping in Utility Areas: Cast-brass or stamped-steel with set-screw or spring clips.

O. Sleeves are not required for core drilled holes.

P. Permanent sleeves are not required for holes formed by PE plastic (removable) sleeves.

Q. Install sleeves for pipes passing through concrete and masonry walls, concrete floor and roof slabs, and where indicated.

R. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, concrete floor and roof slabs and where indicated.

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. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring where specified.

2. Build sleeves into new walls and slabs as work progresses.

3. Install large enough sleeves to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:

    a. CPVC Pipe Sleeves: For pipes smaller than 6 inches.
    b. Steel Pipe Sleeves: For pipes smaller than 6 inches.
    c. Steel Sheet-Metal Sleeves: For pipes 6 inches and larger, penetrating gypsum-board partitions.
    d. Cast-Iron Sleeve Fittings: For floors having membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level.
    e. Seal space outside of sleeve fittings with nonshrink, nonmetallic grout.

4. Except for below-grade wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using elastomeric joint sealants.

S. Above Grade, Exterior Wall, Pipe Penetrations: Seal penetrations using sleeve and mechanical sleeve seals. Size sleeve for 1 inch annular clear space between pipe and sleeve for installation of mechanical seals.

1. Install steel pipe for sleeves smaller than 6 inches.
2. Install cast-iron "wall pipes" for sleeves 6 inches and larger.
3. Assemble and install mechanical seals according to manufacturer's printed instructions.

T. Below Grade, Exterior Wall, Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Size sleeve for 1-inch annular clear space between pipe and sleeve for installation of mechanical seals.

U. Below Grade, Exterior Wall, Pipe Penetrations: Install ductile-iron wall penetration system sleeves according to manufacturer's printed installation instructions.

V. Verify final equipment locations for roughing-in.

W. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

X. Piping Joint Construction: Joint pipe and fittings as follows and as specifically required in individual piping system specification Sections.

1. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
2. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
3. Soldered Joints: Construct joints according to AWS "Soldering Manual", "The Soldering of Pipe and Tube".
4. Brazed Joints: Construct joints according to AWS "Brazing Manual", "Pipe and Tube".
5. 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 inside diameter. Join pipe fittings and valves as follows:

    a. Note the internal length of threads in fittings or valve ends and proximity of internal seat or wall, to determine how far pipe should be threaded into joint.
    b. Apply appropriate tape or thread compound to external pipe threads (except where dry seal threading is specified).
    c. Align threads at point of assembly.
    d. Tighten joint with wrench. Apply wrench to valve end into which pipe is being threaded.
    e. Damaged Threads: Do not use pipe or pipe fittings having threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

Y. Welded Joints: Construct joints according to AWS "Recommended Practices and Procedures for Welding Low Carbon Steel Pipe" using qualified processes and welding operators according to "Quality Assurance" article.

Z. Flanged Joints: Align flange surfaces parallel. Select appropriate gasket concentrically positioned. Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly using torque wrench.

AA. Piping Connections: Except as otherwise indicated, make piping connections as specified below.

1. Install unions, in piping 2 inches and smaller, adjacent to each valve and at final connection to each piece of equipment having 2 inches or smaller threaded pipe connection.
2. Install flanges, in piping 2 1/2 inches and larger, adjacent to flanged valves and at final connection to each piece of equipment having flanged pipe connection.
3. Dry Piping Systems (Gas, Compressed Air, and Vacuum): Install dielectric unions and flanges to connect piping materials or dissimilar metals.
4. Wet Piping Systems (Water): Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.02 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to provide the maximum possible headroom, where mounting heights are not indicated.

B. Install equipment according to approved submittal data. Portions of the Work are shown only in diagrammatic form. Refer conflicts to the Architect.

C. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, except where otherwise indicated.

D. Install mechanical equipment to facilitate servicing, maintenance and repair or replacement of equipment components. Connect equipment for ease of disconnecting, with minimum of interference with other installations. Extend grease fittings to an accessible location.

E. Install equipment giving right-of-way to piping systems installed at a required slope.

3.03 ERECTION OF METAL SUPPORTS AND ANCHORAGE

A. Cut, fit and place miscellaneous metal supports accurately in location, alignment and elevation to support and anchor mechanical materials and equipment.

B. Field Welding: Comply with AWS D1.1 "Structural Welding Code - Steel".

3.04 ERECTION OF WOOD SUPPORTS AND ANCHORAGE

A. Cut, fit and place wood grounds, nailers, blocking, and anchorage to support and anchor mechanical materials and equipment.

B. Select fastener sizes that will not penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood members.

C. Attach to substrates as required to support applied loads.

3.05 GROUTING

A. Install nonmetallic, nonshrink, grout for mechanical equipment base bearing surfaces, pump and other equipment base plates, and anchors. Mix grout according to manufacturer's printed instructions.

B. Clean surfaces that will come into contact with grout.

C. Provide forms for placement of grout, as required.

D. Avoid air entrapment when placing grout.

E. Place grout, completely filling equipment bases.

F. Place grout on concrete bases to provide a smooth bearing surface for equipment.

G. Place grout around anchors.

H. Cure placed grout according to manufacturer's printed instructions.

3.06 DRIP PANS

A. Locate drip pans under piping passing over or within 3 feet horizontally of electrical equipment, and elsewhere as indicated. Hang from structure with rods and building attachments, and weld rods to sides of drip pan. Brace to prevent sagging or swaying. Connect 1-inch drain line to drain connection and run to nearest plumbing drain or elsewhere as indicated. Provide Leak Detection

Alarm Floodmaster RS097. Provide power to unit.

3.07 INSTALLATION OF BUILDING ATTACHMENTS

A. Install building attachments at required locations in concrete, in wood or on structural steel for proper piping support. Space attachments within maximum piping span length indicated. Install additional building attachments where support is required for additional concentrated loads, including valves, flanges, guides, strainers, expansion joints, and at changes in direction of piping. Install concrete inserts before concrete is placed, fasten insert securely to forms. Where concrete with compressive strength less than 2500 psi is indicated, install reinforcing bars through openings at top of inserts.

3.08 INSTALLATION OF HANGERS AND SUPPORTS

A. General: Install hangers, supports, clamps and attachments to support piping properly from building structure. Arrange for grouping of parallel runs of horizontal piping to be supported together on trapeze type hangers where possible. Where piping of various sizes is to be supported together by trapeze hangers, space hangers for smallest pipe size or install intermediate supports for smaller diameter pipe. Do not use wire or perforated metal to support piping, and do not support piping from other piping.

B. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers and other accessories. Install hangers and supports of same type and style for grouped piping runs.

C. Support fire water piping independently of other piping.

D. Prevent electrolysis in support of copper tubing by use of hangers and supports which are copper plated.

E. Provisions for movement:

1. Install hangers and supports to allow controlled movement of piping systems and to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends and similar units.
2. Load distribution: Install hangers and supports so that piping live and dead loading and stresses from movement will not be transmitted to connected equipment.
3. Pipe slopes: Install hangers and supports to provide indicated pipe slopes.

F. Adjust hangers and supports and place grout as required under supports to bring piping to proper levels and elevations.

3.09 SHIELDS AND SADDLES FOR INSULATED PIPING

A. 4" and below use 16 gauge x 12 inch long shield with oversized hanger outside insulation.

B. 6" and above use hardwood protection saddle with 16 gauge x 18 inch long shield with oversized hanger outside insulation.

C. 6" and above use steel protection saddle. Fill void between shield and pipe with insulation. Cover with vapor barrier. Protect barrier with 16 gauge x 18 inch long shield with oversized hanger outside assembly.

3.10 INSTALLATION OF ANCHORS

A. Install anchors at proper locations to prevent stresses and to prevent transfer of loading and stresses to connected equipment.

B. Fabricate and install anchor by welding steel shapes, plates and bars to piping and to structure.

C. Where expansion compensators are indicated, install anchors in accordance with expansion unit manufacturer's written instructions, to limit movement of piping and forces to maximums recommended by manufacturer for each unit.

D. Anchor spacings: Where not otherwise indicated, install anchors at ends of principal pipe-runs, at intermediate points in pipe-runs between expansion loops and bends. Make provisions for preset of anchors as required to accommodate both expansion and contraction of piping.

3.11 FLASHINGS

A. Manufacturer's recommendations: Except as otherwise shown or specified, comply with recommendations and instructions of manufacturer of sheet metal being installed.

B. Coat back side of metal flashings where in contact with concrete and other cementitious substrates, by painting surface in area of contact with heavy application of bituminous coating, or by other permanent separation as recommended by manufacturer of metal.

C. On vertical surfaces, lap flashings minimum of 3".

D. On sloping surfaces, for slopes of not less than 6" in 12", lap unsealed flashings minimum of 6".

E. For embedment of metal flashing flanges in roofing or composition flashing or stripping, extend flanges minimum of 6" for embedment.

3.12 FIRE STOPPING

A. Provide UL listed and tested firestopping material, silicone elastomer specifically formulated for use in horizontal and vertical applications. The material shall possess intumescent characteristics, and upon exposure to heat above 250 degrees F. shall expand to not less than five times its original volume to form a fireproof envelope UL rated for 2- and 3-hours protection, when applied in accordance with the manufacturer's recommendation.

B. See section 220680 for additional fire stopping requirements.

END OF SECTION

DIVISION 22 – PLUMBING

SECTION 220553 – PLUMBING IDENTIFICATION SYSTEMS

PART 1 – GENERAL

1.01 GENERAL

A. Provide labels for all new pipes including hot water, hot water return, cold water, sanitary drain, storm drain, vent, gas and acid waste piping. Install identifying tags on all valves.

PART 2 – PRODUCTS

2.01 EQUIPMENT LABELS

A. Small: Labels shall be adhesive backed plastic tape with embossed letters in contrasting color. Tape shall be 3/8” wide.

B. Large: Labels shall be adhesive backed plastic tape with embossed letters in contrasting color.

C. Make: Seton Name Plate Corporation.

2.02 PIPING MARKERS

A. Pipe markers shall be snap-on type indicating pipe contents and direction of flow on a color coded background conforming to American National Standards Institute (ANSI) Standard A13.1. Pipe diameter less than 2” and smaller shall be snap-on type. Pipe diameter greater than 2” shall be stick-on type.

1. Hot water – green with white lettering.
2. Cold water – green with white lettering.
3. Sanitary Drain and Vent – green with white lettering.
4. Storm Drain – green with white lettering.
5. Gas – yellow with black lettering.
6. Acid Waste – black with orange lettering.

B. Make: Seton Name Plate Corporation – Setmark, or equal by Dover, Brady.

2.03 VALVE TAGS

A. Tags: Tags shall be 1 3/4” x 3 1/2” laminated with two 0.020” thick plastic sheets with matte finish and with a brass eyelet in the corner. Typed information shall include appropriate alphanumeric code (prefixed with the letter “P”), system designation, the fluid in the pipe, and size and function of the valve.

B. Make: Dover Enterprises, Syracuse, New York or approved equal by Seton Name Plate Company.

PART 3 – EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS

A. Coordination: Where identification is to be applied to surfaces which require insulation, painting or other covering or finish; including valve tags in finished mechanical spaces, install identification

after completion of covering and painting.

3.02 EQUIPMENT

A. General: Install engraved plastic laminate sign or plastic equipment marker on or near each major item of mechanical equipment and each operational device, as specified herein if not otherwise specified for each item or device. Provide signs for the following general categories of equipment and operational devices:

1. Meters, gauges, thermometers and similar units.
2. Fuel-burning units including water heaters.
3. Pumps and similar motor-driven units.
4. Storage tanks and pressure vessels.
5. Strainers, filters, humidifiers, water treatment systems and similar equipment.

B. Lettering Size: Minimum 1/4" high lettering for name of unit where viewing distance is less than 2'–0", 1/2" high for distances up to 6'-0", and proportionately larger lettering for greater distances. Provide secondary lettering 2/3 to 3/4 size of principal lettering.

C. Text of Signs: In addition to name of identified unit, provide lettering to distinguish between multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations.

3.03 PIPING

A. After piping has been painted or insulated, apply pipe labels as specified above.

B. Space labels on 15' centers in mechanical rooms, space at 25' centers elsewhere and at each side of partitions and interior walls. Also, at each branch and riser take off and adjacent to each valve (except at fixtures and equipment).

3.04 VALVES IDENTIFICATION

A. General: Provide valve tag on every valve, cock and control device in each piping system; exclude check valves, valves within factory-fabricated equipment units, plumbing fixture faucets, convenience hose bibs, and shut-off valves at plumbing fixtures, and similar rough-in connections of end-use fixtures and units. List each tagged valve in valve schedule for each piping system.

B. Provide valve tag chart, framed and securely fastened to the wall, using anchors and fasteners, where directed by owner.

C. Submit list of valve tags, including wording, for approval **BEFORE** ordering.

3.05 ADDITIONAL INFORMATION

A. For additional information see Specification Section 220300 – Plumbing Basic Materials & Methods.

END OF SECTION

DIVISION 22 – PLUMBING

SECTION 220555 – ACCESS TO PLUMBING WORK

PART 1 – GENERAL

1.01 SUMMARY OF ITEMS INCLUDED

A. Access doors in walls and ceilings.

1.02 SUBMITTALS

A. Product data: Submit manufacturer's technical data and installation instructions for each type of access door assembly, including setting drawings, templates, instructions and directions for installation of anchorage devices.

1.03 QUALITY ASSURANCE

A. Fire resistance ratings: Where fire resistance rating is required for construction penetrated by access units, provide UL listed and labeled units, except for units which are smaller than minimum requirements.

PART 2 - PRODUCTS

2.01 ACCESS DOORS

A. Where walls and ceilings must be penetrated for access to mechanical work, provide types of access doors indicated. Furnish sizes indicated or, where not otherwise indicated, furnish adequate size for intended and necessary access. Furnish manufacturer's complete units, of type recommended for application in indicated substrate construction, in each case, complete with anchorages and hardware.

B. Construction: Except as otherwise indicated, fabricate wall/ceiling door units of welded steel construction with welds ground smooth, 16-gauge frames and 14-gauge flush panel doors, 175 degree swing with concealed spring hinges, flush screwdriver-operated cam locks, factory applied rust-inhibitive prime coat paint finish.

C. Available manufacturers:

1. Milcor Div., Inryco Inc.
2. Smith (Jay R.) Mfg. Co.
3. Zurn Industries, Inc.

PART 3 - EXECUTION

3.01 GENERAL

A. Comply with manufacturer's instructions for installation of access doors.

B. Set frames accurately in position and securely attach to supports with face panels plumb or level in relation to adjacent finish surfaces.

C. Adjust hardware and panels after installation for proper operation.

D. Remove or replace panels or frames which are warped, bowed, or otherwise damaged.

E. Paint access doors to match surrounding surfaces.

F. In wet and damp locations provide stainless steel doors.

END OF SECTION

DIVISION 22 – PLUMBING

SECTION 220680 – FIRE STOPPING

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provision of Contract, including General Conditions, Supplementary Conditions (if applicable), and Division 01 - Specification Sections, apply to work of this Section.

1.02 DEFINITIONS

A. Firestopping: Material or combination of materials used to retain integrity of fire-rated construction by maintaining an effective barrier against the spread of flame, smoke, and hot gases through penetrations in/ joints between fire rated wall and floor assemblies.

1.03 GENERAL DESCRIPTION OF THE WORK OF THIS SECTION

A. Only tested fire stop systems shall be used in specific locations as follows:

1. Penetrations for the passage of cable, conduit, piping, through fire-rated vertical barriers (walls and partitions), horizontal barriers (floor/ceiling assemblies), and vertical service shaft walls and partitions.

B. Openings and penetrations in fire-rated partitions or walls.

1.04 RELATED WORK OF OTHER SECTIONS

A. Coordinate work of this section with work of other sections as required to properly execute the work and as necessary to maintain satisfactory progress of the work of other sections, including the following sections, when included in the Project Manual, are related to the work of this section:

1. Section 220300 – Plumbing Basic Materials and Methods
2. Section 220719 – Plumbing Insulation

1.05 REFERENCES

A. Test Requirements: ASTM E-814-02, "Standard Method of Fire Tests of Through Penetration Fire Stops"

B. Underwriters Laboratories (UL) of Northbrook, IL runs ASTM E-814 under their designation of UL 1479 and publishes the results in their "FIRE RESISTANCE DIRECTORY" that is updated annually.

1. UL Fire Resistance Directory:

a. Fire stop Devices (XHJI)
b. Fire Resistance Ratings (BXUV)
c. Through-Penetration Fire stop Systems (XHEZ)
d. Fill, Voids, or Cavity Material (XHHW)
e. Forming Materials (XHKU)

2. Alternate “Omega Point Laboratories Directory” (updated annually)

C. Test Requirements: UL 2079, “Tests for Fire Resistance of Building Joint Systems” (July 1998.)

D. Test Requirements: ASTM E 1966-01, “Standard test method for Fire Resistive Joint Systems”

E. Inspection Requirements: ASTM E 2174 – 01, “Standard Practice for On-site Inspection of Installed Fire Stops.”

F. International Firestop Council Guidelines for Evaluating Firestop Systems Engineering Judgments

G. ASTM E-84-01, Standard Test Method for Surface Burning Characteristics of Building Materials.

H. All major building codes: ICBO, SBCCI, BOCA, and IBC.

I. NFPA 101 - Life Safety Code

J. NFPA 70 - National Electric Code

1.06 QUALITY ASSURANCE

A. A manufacturer's direct representative (not distributor or agent) to be on-site during initial installation of firestop systems to train appropriate contractor personnel in proper selection and installation procedures. This will be done per manufacturer's written recommendations published in their literature and drawing details.

B. Firestop System installation must meet requirements of ASTM E-814, UL 1479 or UL 2079 tested assemblies that provide a fire rating equal to that of construction being penetrated.

C. Proposed firestop materials and methods shall conform to applicable governing codes having local jurisdiction.

D. Firestop Systems do not reestablish the structural integrity of load bearing partitions/assemblies, or support live loads and traffic. Installer shall consult the structural engineer prior to penetrating any load bearing assembly.

E. For those firestop applications that exist for which no UL tested system is available through a manufacturer, an engineering judgment derived from similar UL system designs or other tests will be submitted to local authorities having jurisdiction for their review and approval prior to installation. Engineer judgment drawings must follow requirements set forth by the International Firestop Council (Latest Edition, as may be amended from time to time).

1.07 SUBMITTALS

A. Submit Product Data: Manufacturer's specifications and technical data for each material including the composition and limitations, documentation of UL firestop systems to be used and manufacturer's installation instructions.

B. Manufacturer's engineering judgment identification number and drawing details when no UL system is available for an application. Engineer judgment must include both project name and contractor’s name who will install firestop system as described in drawing.

C. Submit material safety data sheets provided with product delivered to job-site.

1.08 INSTALLER QUALIFICATIONS

A. Engage an experienced Installer who is certified, licensed, or otherwise qualified by the firestopping manufacturer as having been provided the necessary training to install manufacturer’s products per specified requirements. A supplier’s willingness to sell its firestopping products to the Contractor or to an Installer engaged by the Contractor does not in itself confer qualification on the buyer.

1.09 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials undamaged in manufacturer's clearly labeled, unopened containers, identified with brand, type, and UL label where applicable.

B. Coordinate delivery of materials with scheduled installation date to allow minimum storage time at job-site.

C. Store materials under cover and protect from weather and damage in compliance with manufacturer's requirements, including temperature restrictions.

D. Comply with recommended procedures, precautions or remedies described in material safety data sheets as applicable.

E. Do not use damaged or expired materials.

1.10 PROJECT CONDITIONS

A. Do not use materials that contain flammable solvents.

B. Schedule installation of firestopping after completion of penetrating item installation but prior to covering or concealing of openings.

C. Verify existing conditions and substrates before starting work. Correct unsatisfactory conditions before proceeding.

D. Weather conditions: Do not proceed with installation of firestop materials when temperatures exceed the manufacturer's recommended limitations for installation printed on product label and product data sheet.

E. During installation, provide masking and drop cloths to prevent firestopping materials from contaminating any adjacent surfaces.

PART 2 - PRODUCTS

2.01 FIRESTOPPING GENERAL

A. Provide firestopping composed of components that are compatible with each other, the substrates forming openings, and the items, if any, penetrating the firestopping under conditions of service and application, as demonstrated by the firestopping manufacturer based on testing and field experience.

B. Provide components for each firestopping system that are needed to install fill material. Use only components specified by the firestopping manufacturer and approved by the qualified testing agency for the designated fire-resistance-rated systems.

C. Firestopping Materials are either “cast-in-place” (integral with concrete placement) or “post installed.” Provide cast-in-place firestop devices prior to concrete placement.

2.02 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with through penetration firestop systems (XHEZ) and joint systems (XHBN) listed in Volume 2A of the UL Fire Resistance Directory, provide products of the following manufacturers as identified below:

1. Hilti, Inc., Tulsa, Oklahoma (or equal) 800-879-8000

2.03 MATERIALS

A. Use only firestop products that have been UL 1479, ASTM E-814, or UL 2079 tested for specific fire-rated construction conditions conforming to construction assembly type, penetrating item type, annular space requirements, and fire-rating involved for each separate instance.

B. Cast-in place firestop devices for use with non-combustible and combustible plastic pipe (closed and open piping systems) penetrating concrete floors, the following products are acceptable:

1. Hilti CP 680 Cast-In Place Firestop Device
   a. Add Aerator adaptor when used in conjunction with aerator (“sovent”) system.

2. Hilti CP 681 Tub Box Kit for use with tub installations.

C. Sealants, caulking materials, or foams for use with non-combustible items including steel pipe, copper pipe, rigid steel conduit and electrical metallic tubing (EMT), the following products are acceptable:

1. Hilti FS-ONE Intumescent Firestop Sealant
2. Hilti CP 604 Self-leveling Firestop Sealant
3. Hilti CP 620 Fire Foam
4. Hilti CP 606 Flexible Firestop Sealant
5. Hilti CP 601s Elastomeric Firestop Sealant

D. Sealants or caulking materials for use with sheet metal ducts, the following products are acceptable:

1. Hilti CP 601s Elastomeric Firestop Sealant
2. Hilti CP 606 Flexible Firestop Sealant
3. Hilti FS-ONE Intumescent Firestop Sealant

E. Sealants, caulking or spray materials for use with fire-rated construction joints and other gaps, the following products are acceptable:

1. Hilti CP 672 Speed Spray
2. Hilti CP 601s Elastomeric Firestop Sealant
3. Hilti CP 606 Flexible Firestop Sealant
4. Hilti CP 604 Self-leveling Firestop Sealant

F. Pre-formed mineral wool designed to fit flutes of metal profile deck and gap between top of wall and metal profile deck; as a backer for spray material.

1. Hilti CP 677 Speed Plugs
2. Hilti CP 767 Speed Strips

G. Intumescent sealants, caulking materials for use with combustible items (penetrants consumed by high heat and flame) including insulated metal pipe, PVC jacketed, flexible cable or cable bundles and plastic pipe, the following products are acceptable:

1. Hilti FS-ONE Intumescent Firestop Sealant

H. Foams, intumescent sealants, caulking or putty materials for use with flexible cable or cable bundles, the following products are acceptable:

1. Hilti FS-ONE Intumescent Fire stop Sealant
2. Hilti CP 618 Fire stop Putty Stick
3. Hilti CP 620 Fire Foam
4. Hilti CP 601s Elastomeric Fire stop Sealant
5. Hilti CP 606 Flexible Fire stop Sealant

I. Non curing, re-penetrable intumescent sealants, caulking or putty materials for use with flexible cable or cable bundles, the following products are acceptable:

1. Hilti CP 618 Fire stop Putty Stick

J. Wall opening protective materials for use with U.L. listed metallic and specified nonmetallic outlet boxes, the following products are acceptable:

1. Hilti CP 617 Fire stop Putty Pad

K. Fire stop collar or wrap devices attached to assembly around combustible plastic pipe (closed and open piping systems), the following products are acceptable:

1. Hilti CP 642 Fire stop Collar
2. Hilti CP 643 Fire stop Collar
3. Hilti CP 645 Wrap Strips

L. Materials used for complex penetrations made to accommodate multiple steel and copper pipes, the following products are acceptable:

1. Hilti CP 637 Trowelable Fire stop Compound
2. Hilti FS 657 FIRE BLOCK
3. Hilti CP 620 Fire Foam

M. Non curing, re-penetrable materials used for large size/complex penetrations made to accommodate multiple steel and copper pipes, the following products are acceptable:

1. Hilti FS 657 FIRE BLOCK

N. Provide a fire stop system with a "F" Rating as determined by UL 1479 or ASTM E814 which is equal to the time rating of construction being penetrated.

O. Provide a fire stop system with an Assembly Rating as determined by UL 2079 which is equal to the time rating of construction being penetrated.

PART 3 - EXECUTION

3.01 PREPARATION

A. Verification of Conditions: Examine areas and conditions under which work is to be performed and identify conditions detrimental to proper or timely completion.

1. Verify penetrations are properly sized and in suitable condition for application of materials.

2. Surfaces to which fire stop materials will be applied shall be free of dirt, grease, oil, rust, laitance, release agents, water repellents, and any other substances that may affect proper adhesion.

3. Provide masking and temporary covering to prevent soiling of adjacent surfaces by firestopping materials.

4. Comply with manufacturer's recommendations for temperature and humidity conditions before, during and after installation of firestopping.

5. Do not proceed until unsatisfactory conditions have been corrected.

3.02 COORDINATION

A. Coordinate location and proper selection of cast-in-place fire- stop devices with trade responsible for the work. Ensure device is installed before placement of concrete.

B. Responsible trade to provide adequate spacing of field run pipes to allow for installation of cast-in-place firestop devices without interferences.

3.03 INSTALLATION

A. Regulatory Requirements: Install fire stop materials in accordance with UL Fire Resistance Directory or Omega Point Laboratories Directory.

B. Manufacturer's Instructions: Comply with manufacturer's instructions for installation of through-penetration and construction joint materials.

1. Seal all holes or voids made by penetrations to ensure an air and water resistant seal.

2. Protect materials from damage on surfaces subjected to traffic.

3.04 FIELD QUALITY CONTROL

A. Examine sealed penetration areas to ensure proper installation before concealing or enclosing areas.

B. Keep areas of work accessible until inspection by applicable code authorities, and engineer.

C. Inspection of through-penetration firestopping shall be performed in accordance with ASTM E 2174, “Standard Practice for On-Site Inspection of Installed Fire Stops” or other recognized standard.

D. Perform under this section patching and repairing of firestopping caused by cutting or penetrating of existing fire stop systems already installed by other trades.

3.05 ADJUSTING AND CLEANING

A. Remove equipment, materials and debris, leaving area in undamaged, clean condition.

B. Clean all surfaces adjacent to sealed holes and joints to be free of excess fire stop materials and soiling as work progresses.

END OF SECTION

DIVISION 22 – PLUMBING

SECTION 220719 – PLUMBING INSULATION

PART 1 – GENERAL

1.01 SUMMARY OF ITEMS INCLUDED

A. Extent of plumbing insulation work required by this section is indicated on Drawings and by requirements of this section.

B. Work includes thermal insulation for the following:

1. Domestic cold water piping.

2. Domestic hot water and hot water circulating piping.

3. Domestic tempered water piping.

4. Storm water drainage piping.

5. Roof drain bodies.

1.02 QUALITY ASSURANCE

A. Fire Hazard Classification: In accordance with ASTM E-84, NFPA 255 and UL 723, for insulation systems, including insulation, adhesives and coverings, not to exceed the following:

1. Flame spread 25.

2. Fuel contributed 50.

3. Smoke developed 50.

1.03 SUBMITTALS

A. Product Data: Submit manufacturers specification sheets, installation instructions, fire and smoke ratings. Submit schedule matching insulation type to mechanical systems and equipment.

1.04 INSULATION THICKNESS

A. Insulate domestic hot water supply, tempered water, and hot water recirculating piping with insulation thickness of fiberglass piping insulation as shown below, ASTM C 547 Class 1, with All Service Jacket.

B. Insulate domestic cold water Branches and Mains with insulation thickness as shown below of fiberglass piping insulation, ASTM C 547 Class 1.

C. Insulate storm water piping and roof drains with 1” insulation thickness of fiberglass insulation, ASTM C 547 Class 1.

D. Insulate condensate drain to HVAC units with 1” fiberglass insulation.

To Meet or Exceed Energy Conservation Construction Code of the State of New York

THICKNESS TABLE

	IPS 1-1/4" & Below	IPS 1-1/2" to 4"	IPS Above 4"
Hot Water	1"	1-1/2"	1-1/2"
Hot Water Ret.	1"	1-1/2"	N/A
Cold Water	1"	1"	1"
Storm	1"	1"	1"

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver insulation, coverings, cements, adhesives and coatings to site in containers with manufacturer's stamp or label affixed showing fire hazard indexes of products.

B. Protect insulation against dirt, water and chemical and mechanical damage. Do not install damaged or wet installation, remove from project site.

PART 2 - PRODUCTS

2.01 DOMESTIC COLD WATER, HOT WATER, TEMPERED, AND HOT WATER CIRCULATING PIPING

A. Scope: Insulate all mains, branches, fittings, flanges and valves including those in ceiling spaces, pipe chases or spaces. Terminate insulation at the fixture supply stops. Insulate equipment connections to the equipment stop.

B. Type:

1. Pre-formed sectional type nominal 3# density glass fiber in standard 3' long sections tightly butted together. K factor (Thermal conductivity) of 0.23 at 75 mean. Make: Mansville, Owens-Corning, or Knauf.

C. Finish:

1. Main mechanical room piping and exposed risers and runouts in finished rooms: Factory-applied All Service Jacket with self-sealing laps.

2. Valves, fittings and flanges: Equal thickness of fiberglass insulation with Zeston fittings covers or equal by Ham-Fab, Mansville.

2.02 STORM WATER PIPING – ABOVE GROUND

A. Scope: Insulate all horizontal piping above ground including underside of roof drain bodies and all fittings.

B. Type: Pipe insulation shall be preformed sectional type nominal 3 pound density glass fiber in standard 3 foot long sections with a K factor of 0.23 at 75 mean and factory applied All Service Jackets. Seal joints with 3" All Service Jacket.

C. Fittings & Drain Bodies: Insulate all fittings, hubs, flange and Drain bodies with fiberglass pre-moulded fitting insulation or with 1" resilient fiberglass blanket. (3/4) pcf density minimum) wrapped around the fitting or drain body, tied down with wire or jute. Compress blanket 50% in installation.

Coat each fitting or drain body with two 1/8” coats of vapor barrier mastic reinforced with glass fabric extending 2” onto adjacent pipes.

2.03 METAL JACKETED PIPE INSULATION

A. Scope: Pipe exposed to weather or physical abuse shall be insulated with .016” aluminum jacket over fiberglass insulation of the specified thickness. Sections shall be made in 36” lengths.

B. Fire and smoke Hazard Classification shall not exceed flame spread index of 25 or less and smoke developed index of 50 or less as tested by ASTM E-84, NFPA 255 or UL 723.

C. Manville Micro-Lok 650ML.

2.04 EQUIPMENT INSULATION MATERIALS

A. Rigid Fiberglass Equipment Insulation: ASTM C 612, Class 2.

B. Flexible Fiberglass Equipment Insulation: ASTM C 553, Type I, Class B-4.

C. Jacketing Material for Equipment Insulation: Provide pre-sized glass cloth jacketing material, not less than 7.8 ounces per square yard, or metal jacket at Installer’s option, except as otherwise indicated.

D. Equipment Insulation Compounds: Provide adhesives, cements, sealers, mastics and protective finishes as recommended by insulation manufacturer for applications indicated.

E. Equipment Insulation Accessories: Provide staples, bands, wire, wire netting, tape, corner angles, anchors and stud pins as recommended by insulation manufacturer for applications indicated.

PART 3 - EXECUTION

3.01 INSTALLATION - GENERAL

A. Apply insulation in accordance with the Schedule of Insulation on the Contract Specifications.

B. Use only insulation and finish materials including adhesives, cements, and mastics which conform to the requirements of all local codes and ordinances.

C. Fire resistant adhesive is highly flammable in liquid form. Eliminate welding, smoking, or other sources of ignition during application.

D. Apply insulation after all piping pressure tests, as described in Piping Installation Procedure, have been completed.

E. Clean surfaces of loose scale, dirt, oil, and other foreign matter and dry prior to insulating.

1. Detail for space @ blowdown
2. Detail for pipe @ insulation penetrating wall.

F. Apply insulation to completely cover piping surface. Do not insulate over weld certification stamps.

G. "Exposed" as used in this section means exposed to view. "Concealed" means concealed to view such as in furred chases or above suspended ceiling. Penthouse and equipment rooms are considered exposed locations.

H. Fill surface imperfections in the insulation such as chipped edges, small joints or cracks, and small voids or holes with appropriate insulation material and smooth with skim coat of hydraulic-setting insulating cement. Vapor barriers shall be continuous and unbroken at hanger installations.

I. Fit inside diameter of insulation sections or segments to outside curvature of pipe or previous insulation layer.

J. Where standard insulation shapes are not available, cut, score, or miter segments of appropriate block to fit contour of pipe. Stagger joints of adjoining segments. Fit insulation carefully and secure with No. 20 gage galvanized annealed steel wire. Finish with a smoothing coat of hydraulic-setting insulating cement.

K. Insulate valves, strainer, fittings, and flanges with identical material, density, thickness, and surface finish as the piping insulation. All edges shall be filled with filler and finished with a smoothing coat of hydraulic-setting insulating cement.

L. Insulate the entire surface of fittings and strainers. Insulate valves up to and including bonnets, unless authorized otherwise by Project Engineer. Do not cover removable valve bonnets.

M. Insulate strainers to permit removal of the basket without disturbing the insulation of the strainer body. Strainer covers shall be molded and taped to upper section of insulation.

N. Bevel the ends of pipe insulation adjacent to flanges to permit bolt removal. Provide a collar of sectional block insulation over the flanges and extend a minimum of 2 inches over the adjacent pipe insulation. Fasten with staples to permit easy removal. Prior to applying collar fill annular spaces with loose insulation.

O. Insulate all piping through sleeves.

P. Where pipelines pass through masonry walls or floors, completely fill the space between outside of pipe or insulation and the inside of the sleeve or framed opening with fibrous mineral wool or fiberglass pipe insulation.

Q. When it is unavoidable and hangers for cold lines must be installed directly on the pipe, insulate and finish the entire hanger and the rod for a length of not less than 12 inches above the pipe.

R. Apply insulation to completely cover metal surfaces.

S. Cut, score, or miter insulation to fit shape and contour of equipment. Where surfaces are flat, cylindrical, or regularly curved, use premolded blocks or segments.

T. Where required, provide permanently fastened angles or plates to support insulation.

U. Apply insulation on cover plates, heads and access openings as separate sections, with insulation cut back for access to boltheads and other fasteners.

V. Do not insulate over nameplates. Cut back insulation and line the insulation edges with 24 gage galvanized steel.

W. Surface Finish.

1. Apply surface finish to present a tight, smooth appearance.
2. Do not apply sealant or cement until all previous applications of cement and adhesives have thoroughly dried.
3. Extend surface finish to protect all insulation surfaces. Prevent raw edges or ends of insulation from being exposed.

3.02 INSTALLATION OF PIPING INSULATION

A. Apply to pipes with side and end joints butted tightly per manufacturer's directions.

B. Where joints in insulation occur, and at hangers, take extra precautions to seal the vapor barrier with adhesive BF 95-44 so that no moisture penetration will occur. Notify Engineer when insulation is complete so he may make inspection before walls are closed in or ceilings applied.

C. Where fiberglass insulation is exposed in an occupied room, apply pre-sized glass cloth vapor barrier jacket in same manner using same type of adhesive (or use ASI/SSL).

D. Repair all breaks in the jacket with 4" wide strip of vapor barrier jackets (FRGC or SSL as required) applied smoothly and securely. When applying adhesive at temperature below 750F, use staples with an additional brush coat of adhesive over the exterior of the staples.

E. Adhere 4" wide strips of jacket material smoothly and securely over all end joints with vapor barrier adhesive as above to insure a continuous vapor barrier.

F. Apply insulation on all cold surfaces where vapor barrier jackets are used with a continuous, unbroken vapor seal. Insulate and vapor seal hangers, supports, anchors, etc., that are securely directed to cold surfaces to prevent condensation.

3.03 EQUIPMENT INSULATION

A. Cold Equipment (Below Ambient Temperature)

1. Application Requirements: Insulate the following cold equipment:

   a. Domestic Hot water expansion tanks

2. Insulate each item of equipment specified above with fiberglass: 2" thick.

B. Hot Equipment (Above Ambient Temperature)

1. Application Requirements: Insulate the following hot equipment.

   a. Hot water storage tanks
   b. Water heaters (not insulated by manufacturer)

2. Insulate each item of equipment specified above with fiberglass: 2" thick.

3.04 SUPPORT OF INSULATED PIPE LINES

A. Scope: Install inserts at each hanger or support for all water lines for sizes 1-1/2" and up, or 16-gauge electro-galvanized carbon steel shields may be used in lieu of inserts. Install supporting devices on insulated lines with hangers with insulation shields.

B. Inserts:

1. Inserts between the pipe and pipe hangers shall consist rigid pipe insulation of equal thickness to the adjoining fiberglass insulation and shall be provided with vapor barrier where required.

2. Insulation inserts shall not be less than the following lengths:

   1-1/2" to 2-1/2" pipe size, use 6" length
   3" to 6" pipe size, use 9" length

C. Supporting Devices: Use cork stoppers, short lengths of wood dowels or wood blocks of the same thickness as insulation. Curve the support device surfaces to match the curve of the metal shield. Metal shields are provided with the hanger.

3.05 ADHESIVES, MASTIC, AND COATINGS

A. Apply adhesives, mastic and coatings specified at the manufacturer's recommended coverage per gallon.

3.06 EXPOSED RISERS AND RUNOUTS

A. Finish exposed risers and runouts in occupied rooms with ALL SERVICE JACKET.

B. Occupied areas mean all areas except ceiling spaces, crawl spaces and closed off pipe spaces or chases.

3.07 EXISTING INSULATION REPAIR

A. Repair damaged sections of existing mechanical insulation damaged during this construction period. Use insulation of the same thickness as existing insulation. Install new jacket lapping and seal over existing.

3.08 PROTECTION AND REPLACEMENT

A. Replace damaged insulation which cannot be repaired satisfactorily, including units with vapor barrier damage and moisture saturated units.

B. Protection: Insulation installer shall advise Contractor of required protection for insulation work during remainder of construction period, to avoid damage and deterioration.

C. Surface Finish: No surface finish required.

END OF SECTION

DIVISION 22 – PLUMBING

SECTION 220801 – PLUMBING TESTING, ADJUSTING AND BALANCING

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provision of Contract, including General Conditions, Supplementary Conditions (if applicable), and Division 01 - Specification Sections, apply to work of this Section.

1.02 DESCRIPTION OF WORK

A. Extent of testing, adjusting and balancing work is indicated by requirements of this section, and also by drawings and schedules.

B. Component types of testing, adjusting and balancing specified in this section includes the following when included in the Project Manual:

1. Rough sanitary and storm piping.
2. Water supply system.
3. Gas system – Refer to Specification Section 226310.

1.03 QUALITY ASSURANCE

A. Installer - a firm with at least 3 years of successful testing, adjusting and balancing experience on projects with testing and balancing requirements similar to those required for this project.

1.04 REQUIREMENTS

A. No system shall be covered or concealed until tested, approved.

B. Pay for Permit and Inspection Fees required by Authority having jurisdiction.

C. Test in presence of Owner's Representative and Plumbing Inspector.

D. Prove tight for period stated or longer if required.

E. Tests may be made in sections.

1.05 CODES AND REQUIREMENTS

A. Comply with latest editions and applicable portions of International Plumbing Code, Local Plumbing Standards, New York State Building Code, especially Article 9, Plumbing Requirements and Plumbing Code.

B. Comply with applicable portions of Standards for Waste Treatment Works, New York State.

PART 2 – PRODUCTS

2.01 GENERAL

A. Provide test equipment and materials necessary for tests.

PART 3 – EXECUTION

3.01 GENERAL

A. Examine installed work and conditions under which testing is to be done to ensure that work has been completed, cleaned and is operable.

B. Test, adjust and balance systems and components as indicated, in accordance with procedures outlined below and in applicable standards. Test which follows shall be considered minimum standards.

3.02 TESTS & INSPECTIONS

A. Rough Sanitary and Storm Piping.

1. Stop openings, fill with water to top of highest vent. Water shall hold constant for two (2) hours.
2. May be tested in sections using water pressure test.
3. Test pressure shall be equal to at least 10 ft. water column at all points.
4. Retest at least upper 10 ft. of next lower section.
5. Compliance with the Department of Health Lead in Water Regulation is located on Drawings.

B. Water Supply System.

1. Fill, subject to 125 psig hydrostatic pressure at lowest level for two (2) hours.
2. Fixtures shall not be connected into system during test.
3. After fixtures are connected, test system for two (2) hours, at 75 PSIG or prevailing water pressure, whichever is higher.
4. Regulate flow of water to each fixture.
5. Adjust balancing valves on hot water system.
6. Faucets, flush valves shall operate satisfactorily without waste of water, without objectionable noise.

END OF SECTION

DIVISION 22 – PLUMBING

SECTION 221000 – PLUMBING PIPING SYSTEMS

PART 1 – GENERAL

1.01 SUMMARY OF ITEMS INCLUDED

A. Extent of domestic water piping systems work is indicated on drawings and schedules, and by requirements of this section.

B. Applications for domestic water piping systems include the following:

1. Domestic cold water piping.
2. Domestic hot water piping.
3. Domestic recirculating water piping.
4. Water hammer arresters.
5. Valves.
6. Pumps

C. All domestic water piping systems must comply with the “Lead-Free” Division 22 Specifications. The contractor shall provide the required submittals for all equipment that will be part of the system prior to the equipment installation, and confirm on the jobsite that the equipment adheres to “Lead-Free” regulations.

1.02 SUBMITTALS

A. Product Data: Submit manufacturer's data for domestic water piping systems, materials and products.

B. Submittals shall include but not be limited to the following:

1. Valves
2. Water hammer arresters
3. Piping
4. Pumps

1.03 QUALITY ASSURANCE

A. Plumbing Code: Comply with applicable portions of New York State Uniform Fire Protection and Building Code, Article 9, Plumbing Requirements, State sanitary code, Department of Health, Division Sanitary Engineering, Bureau of Public Water Supply, any local codes or regulations, and the International Plumbing Code and the International Energy Conservation Code.

B. All piping valves, hydrants, etc. shall comply with all ASME, ANSI, ASTM, AWWA and NFPA regulations that apply to the work.

C. Meters, backflow preventers, hydrants, etc. shall conform to local utility company regulations, ordinances and laws, and the International Plumbing Code (IPC).

D. Obtain all necessary approvals, certificates and arrange for all inspections required by local authorities having jurisdictions. Pay all fees.

E. Perform water sampling upon completion of all piping systems. Samples to be analyzed by a NYS Dept. of Health approved lab for bacteria as well as all other code required chemical / organic

analyses. The plumbing contractor will bear all costs associated with the testing procedures / reports. Test reports shall be included as part of the project closeout documents.

PART 2 – PRODUCTS
(All to comply with the 2020 IPC)

2.01 DOMESTIC WATER PIPING

A. Underground Water

1. 3" or larger: Class 52 ductile iron pipe per AWWA C151, with C104 cement lining, and asphaltic coating inside and out. Fittings shall be cast or ductile iron per AWWA C110, with push-on joints with four serrated silicon bronze wedges at each joint for electrical continuity. Underground type plastic line marker: Provide standard permanent bright colored, continuous-printed plastic tape, intended for direct burial service, not less than 6"wide X 4 mils thick, with lettering "WATER SERVICE".

2. 2" and smaller: Type 'K' copper soldered or brazed.

B. Domestic hot water, cold water and tempered water.

1. Type "L" copper, ASTM B88.
2. Make: Anaconda, or equal by Muller, Revere.
3. Fittings shall be wrought or cast solder type pressure fittings.
4. Chrome plated sponge cleanable brass, sch. 40 for exposed piping.

2.02 BALL VALVES

A. Description: Bronze body, ball valve with 600 PSI W.O.G. min. rating, teflon seats, stainless ball, blow-out proof stem, viton-o-ring sealed union, removable operating handle and solder ends. Bronze materials to be "no lead" type, in conformance with the latest edition of NSF 61. ANSI372.

2.03 INTERIOR HOSE BIBBS

A. 'No-Lead', Anti-siphon vacuum breaker wall faucet enclosed in a flush mounting wall box, ¾" male hose outlet, loose key opens box and faucet operator, chrome plated casting.

B. Manufacturer:

1. Josam or equivalent. Where indicated, install on cold water piping.

2.04 EXTERIOR WALL HYDRANTS

A. 'No lead', Automatic draining, freezeless wall hydrant with an anti-siphon vacuum breaker enclosed in a flush mounting wall box. Cast bronze, ¾" male hose outlet, non-freeze, "water" on cover, key handle, proper length galvanized wall sleeve, vacuum breaker, wall clamp, chrome finish.

B. Where indicated, install on cold water piping.

2.05 SWING CHECK VALVES

A. General: Construct pressure-containing parts as follows:

1. Bronze valves, 125 or 150 psi: ANSI/ASTM B 62. Bronze materials to be "no lead" type, in conformance with the latest edition of NSF 61. ANSI 372.

B. Construct valves with disk seating angle 40° to 45° unless composition disc is specified. Provide stop plug as renewable stop for disc hanger. Construct disc and hanger as separate parts, with disc free to rotate. Support hanger pins on both ends by removable side plugs.

C. Soldered ends 2" and smaller: Class 125, bronze body, screwed cap, horizontal swing, bronze disc.

D. Flanged ends 2 1/2" and larger: Class 125, iron body bronze mounted, bolted cap, horizontal swing, cast iron disc.

E. Manufacturers:

1. Jenkins Bros., A Corp.
2. Kennedy Valve.
3. Lunkenheimer.
4. Stockham Valves and Fittings, Inc.

2.06 SPECIAL VALVES

A. Balance valve:

1. Bronze/Brass Ball valve with pressure readout ports, calibarated nameplate and memory stop. Bronze materials to be "no lead" type, in conformance with the latest edition of NSF 61.

2. Manufacturer: Bell & Gossett model CB, Watts

B. Trap Primer Valve:

1. 'No lead', Automatic, large port openings, activates on 10 psig pressure drop at 30-250 psig. Water release is factory set. Chrome plated finish.

2.07 THERMOMETERS AND GAGES

A. Water Pressure Gages: 0-150 psi range, aluminum or brass 4-1/2" case, 1/4" NPT connection. Glass enclosed dial with ¼" ball valve. 1 percent accuracy, ANSI B40.1, Grade A.

B. Glass Thermometers

1. General: Die cast aluminum, baked epoxy enamel finish, glass front, 9" long, adjustable joint, locking device. 1 percent accuracy, shock mounted. Copper plated steel or brass stem. Alcohol based thermometers to be used.

2. Range:
   a. Hot water: 30 to 240°F, 2°F divisions.
   b. Cold water: 30 to 180°F, 2°F divisions.

3. Thermometer wells: No Lead, Brass or stainless steel, 2" extension for insulated piping. Cap nut with chain fastened to thermometer well.

2.08 PLUMBING INSULATION

A. General: Comply with Division 22 Section "220719 – Plumbing Insulation".

2.09 UNIONS

A. Description: "No lead" Cast Brass with Solder Ends. Working pressure: 200 PSI W.O.G.

B. Manufacturer: Nibco, or equal by Mueller, Revere.

2.10 SOLDER AND FLUX

A. Solder shall be in solid wire form of Type II 95-5 tin antimony solder conforming to ASTM B-32, Grade 5A. Flux shall conform to ASTM B813. Solders containing lead shall not be used. 96.5 – 3.5 and 95-5 tin/silver solders may be used.

2.11 SHOCK ARRESTER

A. Construction:

1. Type 1: Stainless steel body with stainless steel bellows, an air or argon gas cushion and with or without hydraulic displacement fluid.

2. Type 2: “No lead” Hard drawn copper body, polypropylene piston with EPDM O ring seal and brass NPT threaded connection.

3. Contractor may use either Type 1 or Type 2.

B. Code Compliance: Shock absorbers shall comply with the following codes:

1. P.D.I. – WH201 latest issue.
2. ASSE 1010 latest issue.

C. Manufacturer:
1. Type 1: J.R.Smith 5000 Series.
2. Type 2: Watts LF15M2 -DR Series

PART 3 – EXECUTION

3.01 INSTALLATION OF DOMESTIC WATER PIPING MATERIALS AND PRODUCTS

A. General: Install the following in accordance with Division 22 Section 220300 – “Basic Materials and Methods".

1. Identification.
2. Piping specialties.
3. Supports, anchors and seals.

3.02 INSTALLATION OF PIPE, TUBE AND FITTINGS

A. General: Install in accordance with Division 22 Section 220300 – “Basic Materials and Methods".

B. Install in accordance with recognized industry practices, which will achieve permanently leak proof piping systems. Install each run with minimum joints and couplings. Reduce sizes (where indicated) by use of reducing fittings. Align piping accurately at connections, within 1/16" misalignment tolerance. Comply with ANSI B31 Code for pressure piping.

C. Hose faucets at low points. Cap with hose caps.

D. Carry headers for groups of fixtures full size through their length.

E. Swing joints as follows:

1. From water mains to risers.
2. From riser to branch connections to fixtures.
3. From riser to mains.

3.03 INSTALLATION OF SHOCK ARRESTORS

A. General: Upright position, locations and sizes indicated in accordance with PDI Standard WH-201.

3.04 INSTALLATION OF STRAINERS

A. General: Install full size of pipeline, in accordance with manufacturers installation instructions. Install pipe nipple and shutoff valve in strainer blow down connection, full size of connection, except for strainers 2" and smaller installed ahead of control valves feeding individual terminals. Where indicated, provide drain line from shutoff valve to plumbing drain, full size of blow down connection.

B. Locate plate-type strainer in supply line ahead of the water meter.

3.05 INSTALLATION OF VALVES

A. General: Install where required for proper operation of piping and equipment, including all branch lines to isolate sections of piping. Locate to be accessible and separate support can be provided.

B. Install valves with stems pointed up, in vertical position where possible, but in no case with stems pointed downward for horizontal plane unless unavoidable.

C. Insulation: Where insulation is indicated, install extended stem valves, arranged in proper manner to receive insulation.

D. Drain Valves: Each plumbing equipment item. Located to completely drain equipment for service or repair. Base of each riser, base of each rise or drop in piping system, at all low points, and where indicated or required to completely drain system. Provide hose caps on hose bibbs.

E. Check Valves: Horizontal position with hinge pin horizontally perpendicular to center line of pipe. Install for proper direction of flow.

3.06 INSTALLATION OF SPECIAL VALVES

A. Balance Valves: Each hot water recirculating loop, and where indicated.

B. Trap Primer Valves: Install in upright, vertical position in a convenient cold water line where indicated for floor drain primer supply.

3.07 INSTALLATION OF THERMOMETERS AND GAGES

A. General: Install in accordance with manufacturer's instructions.

B. Locations: Where indicated on Drawings.

3.08 INSTALLATION OF PLUMBING INSULATION

A. Install in accordance with Division 22 Section "220719 – Plumbing Insulation ".

3.09 EQUIPMENT CONNECTIONS

A. Piping Runouts to Fixtures: Hot and cold water runouts of sizes indicated, no smaller than required by the Plumbing Code.

B. Mechanical Equipment Connections:

1. Connect hot and cold water piping system to plumbing equipment as indicated.
2. Comply with equipment manufacturer's installation instructions.
3. Provide shutoff valve and union for each connection.
4. Provide drain valve on drain connection.
5. Exposed piping shall be sch. 40 chrome plated brass, sponge cleanable surface.

3.10 WALL HYDRANT AND HOSE BIBB INSTALLATION

A. Wall hydrant: Install approximately 24” above finished grade or as noted on the plans. Install a stop and drain valve on each wall hydrant branch.

B. Hose Bibbs for toilet and finished rooms: In rooms where shown with lavatories, install approximately 18” above finished floor under lavatory where indicated. Elsewhere, install 36” above the finished floor where shown. Install stop on branch. Hose bibbs to be furnished with loose key handles.

3.11 WATER SYSTEM DISINFECTION

A. Scope: All newly installed lines carrying potable water and parts of existing systems which have been altered, extended or repaired prior to use.

B. Before any use of system is made for domestic purposes, disinfect by one of the following methods as specified in the New York State Uniform Fire Prevention and Building Code. All water samples are to be sent to / tested by a New York State Department of Health approved lab for bacteria analysis. All test results shall be sent to the engineer for review prior to placing the systems in service.

1. The system shall be filled with a water solution containing 50 parts per million of available chlorine and allowed to stand for 24 hours before flushing and returning to service.

2. The system shall be filled with a water solution containing 200 parts per million of available chlorine and allowed to stand one hour before flushing and returning to service.

3. For a potable water storage tank, where it is not practicable to disinfect by the foregoing methods, the entire interior of the tank shall be swabbed with a water solution containing 200 parts per million of available chlorine and allowed to stand for two hours before flushing and returning to service.

C. Contractor shall provide test kit for residual chlorine.

D. After contact period flush system with clear water until system tests no more than 0.2 PPM residual chlorine.

3.12 DOMESTIC WATER SYSTEM TEST

A. Test in accordance with the requirements of Section 220801 – “Plumbing, Testing, Adjusting and Balancing.”

3.13 SPARE PARTS

A. Furnish to Owner, with receipt, one valve key for each key operated hydrant, bib, or faucet installed.

3.14 LEAD TESTING REQUIREMENTS

A. Following the completion of the P.C. work scope, the owner shall have the water conditions tested for lead containments by a third-party testing firm to regulation 67.4 of the Department of Health regulations as part of Section 1417 of the Federal Safe Water Act to determine “Lead-Free” compliance and SED guidelines of less then 15 parts per billion.

B. If the system does not comply with Sub-Part Regulation 67.4 of the DOH Section 1417 of the Federal Safe Water Act, the P.C. shall provide replacements at no additional cost, to then repeat the installation and testing requirements. The P.C. shall absorb the fee for the first lead testing procedure as well as the following confirmation procedures at no additional cost to the owner.

END OF SECTION

DIVISION 22 – PLUMBING

SECTION 221316 – SANITARY WASTE AND VENT PIPING

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provision of Contract, including General Conditions, Supplementary Conditions (if applicable), and Division 01 - Specification Sections, apply to work of this Section.

1.02 DESCRIPTION OF WORK

A. Extent of soil, waste and vent piping system work, is indicated on drawings and schedules, and by requirements of this section.

B. Applications for soil, waste and vent piping systems include the following:

1. Above ground soil, waste and vent piping within buildings including soil stacks, vent stacks, horizontal branches, traps, and connections to fixtures and drains.

2. Underground building drain piping including mains, branches, traps, connections to fixtures and drains, and connections to stacks, terminating at connection to sanitary sewer, 5’-0” from building wall, or where shown on drawing. Coordinate with site contractor.

C. Trenching and backfilling is required in conjunction with underground and building drain piping is specified in applicable Division 22 sections, and is included as work of this section.

1.03 QUALITY ASSURANCE

A. Plumbing code compliance - comply with applicable portions of New York State Uniform Fire Protection and Building Code, especially Article 9, Plumbing Requirements, State Sanitary Code, Department of Health, Division Sanitary Engineering, Bureau of Public Water Supply, any local codes or regulations that apply pertaining to plumbing materials, and the 2020 IPC especially Chapter 7.

B. ANSI compliance - comply with applicable American National Standards pertaining to products and installation of soil and waste piping systems.

C. PDI compliance - comply with applicable Plumbing and Drainage Institute Standards pertaining to products and installation of soil and waste piping systems.

1.04 SUBMITTALS

A. Product data - submit manufacturer's data for soil and waste piping systems materials and products on the following:

1. Pipe and Couplings
2. Clean outs
3. Floor drains

B. Acceptable Manufacturers

1. Floor Drains
   a. Jay R. Smith

b. Josam
c. Zurn
d. Watts

2. Couplings for no-hub pipe
   a. Anaco
   b. Tyler

3. Soil Pipe
   a. Eastern Foundry
   b. Tyler Pipe
   c. Charlotte Pipe

PART 2 – PRODUCTS
(All to comply with the 2020 IPC)

2.01 SOIL AND WASTE PIPING MATERIALS AND PRODUCTS

A. General - provide piping materials and factory fabricated piping products of sizes, types, pressure ratings and capacities as indicated. Where not indicated, provide proper selection as determined by Installer to comply with installation requirements. Provide sizes and types matching piping and equipment connections, provide fittings of materials which match pipe materials used in soil and waste piping systems. Where more than one type of materials or products are indicated, selection is Installer's option.

2.02 BASIC IDENTIFICATION

A. General - provide identification complying with Specification Section 220553, in accordance with the following listing:

1. Above ground soil, waste and vent piping - pipe markers.
2. Underground building drain piping - underground type plastic line markers.

2.03 PIPE

A. Below Ground:
   1. Service weight cast iron with push-on gaskets, hub and spigot. Compression Gaskets shall conform to the requirements of ASTM Standard C564-14 and CISPI310.

B. Above Ground:
   1. Service weight C.I. soil pipe and fittings with no-hub joints. Make: Tyler pipe or equal by Eastern Foundry Co. Anaheim Foundry Co.
   2. Copper drainage tubing, type DWV, shall not be used on site.
   3. Exposed: Sch. 40 chrome plated brass, threaded, sponge cleanable.

2.04 COUPLINGS FOR NO-HUB PIPE

A. Description: Type 304 stainless steel shield and 3/8” slot head 304 stainless steel screws. All other component metal parts shall be 304 stainless steel. The coupling sealing gasket shall be made of Neoprene as the sole elastomer. A cast iron coupling may be used. Do not use under ground. Coupling shall meet or exceed CISPE Standard 310.

B. Manufacturer: Anaheim Co., Tyler Pipe.

2.05 BASIC PIPING SPECIALTIES

A. General - provide piping specialties complying with Division 22 – Section 220300 Basic Materials and Methods section, in accordance with the following listing:

1. Pipe escutcheons.
2. Mechanical sleeve seals.
3. Pipe sleeves.

2.06 BASIC SUPPORTS AND ANCHORS

A. General - provide supports, anchors and seals complying with Division 22 – Section 220300 Basic Materials and Methods section "Supports and Anchors".

2.07 CLEANOUTS

A. General

1. Units shall meet all design parameters shown on the drawings.
2. Units shall be complete with all design features and accessories necessary to provide a coordinated installation (such as carpet markers, tile recesses, etc.).
3. Units shall be of the following sizes:

    a. Line size for piping to 4”.
    b. 4” for piping from 5” to 8”.
    c. 6” for piping 10” and larger.

4. Location:

    a. At each bend of more than 45 degrees.
    b. At bottom of soil or waste stacks and rainwater leaders.
    c. At 50’ intervals or less on horizontal pipe lines 4” or smaller.
    d. At 50’intervals or less horizontal pipe lines 5” or larger.
    e. At exit of sanitary and storm drains from building.
    f. Wherever shown on the drawings.
    g. At the end of each branch line serving more than two fixtures.

5. Placement: must be located where they will be accessible. Check general construction drawings for location of lockers or other equipment which may prevent access.

B. Cleanout Types

1. Deck Plate Cleanout:

    a. Adjustable cast iron floor cleanout with inside caulk outlet, adjustable ABS housing, clamp device, internal tapered bronze cleanout plug, secured round scoriated nickel alloy cover plate. Jay R. Smith Figure 4020.

2. Wall Plate Cleanout:

    a. Exposed installation: Cast iron ‘T’ branch cleanout tee with bronze tapered plug. Jay R. Smith Fig. 4510
    b. Concealed installation behind plaster, dry or masonry walls: Provide cleanout tee with bronze plug tapped for center screw similar to exposed installation with polished vandalproof stainless steel access plate.

C. Cleanout:

1. Cast iron cleanout with straight body for caulking into soil pipe hub and fitted with bronze plug countersunk or raised head as required.

D. Exterior Cleanout:

1. Round coated cast iron access frame, heavy duty scoriated (vandalproof), secured cover. Coated cast iron cleanout ferrule with inside caulk connection and recessed tapered thread bronze plug.

2.08 FLOOR DRAINS

A. Drains and traps shall be same size as waste pipes. Provide clamping devices for drain flashing. Provide P-trap in outlet from each drain, or as shown on drawings.

B. Drain bodies to be cast iron.

C. Floor drains shall be by Jay R. Smith, Zurn, Watts or approved equal.

PART 3 – EXECUTION

3.01 INSTALLATION OF BASIC IDENTIFICATION

A. General - install plumbing identification in accordance with Specification Section 220553.

3.02 INSTALLATION OF SOIL WASTE AND VENT PIPING

A. General - install soil and waste piping in accordance with Division 22 – Section 220300 Basic Materials and Methods section "Pipe, Tube and Fittings" and with Plumbing Code having jurisdiction.

B. Solder joints use Type 1 solder.

C. Insulate vent piping within three feet of passage through roof.

3.03 INSTALLATION DRAINAGE PIPING - SANITARY

A. Changes in direction long sweep bends or 1/8 and/or 1/16 bends.

B. Connections of branches to mains with "Y" fittings and 1/8 and/or 1/16 bends.

C. All connections of horizontal into vertical piping with long turn sanitary "T-Y's".

D. Grade the "horizontal" piping 1/4" per foot, minimum for 2 1/2” or less, 1/8” per foot minimum for 3” and larger.

3.04 TURNS AND OFFSETS

A. Turns:

1. From vertical to horizontal:
   a. Less than 3”: Use long sweep or extra-long turn elbow.
   b. 3” and larger: Use short sweep or 90° short turn fittings.
   c. Horizontal piping: Use 45° wyes, long sweeps: 1/4, 1/6, 1/8 and 1/16 bends or any

combination of same.
d. For vents in any direction; Use quarter bends or 90° short turn fittings.

B. Offsets:

1. Make offsets at no less than 45° angle to the horizontal in the following cases:

a. Offsets in stack vent portion of soil and waste stacks (above the highest fixture drainage connection).
b. Offset in vent stacks.
c. Grade the “horizontal” piping 1/4" per foot.
d. Connect all plumbing fixtures into sanitary house drain. No case shall soil or waste pass through more than one trap before entering house drain.

3.05 INSTALLATION OF VENT PIPING

A. Provide vents shown and required by Plumbing Code.

B. Grade vents to discharge water of condensation.

C. Make offsets at 45 degree angle.

D. Connect upper ends of drainage lines to vent system or extend through roof without decreasing size.

E. Arrange vents and connections except wet vents, so not to carry drainage.

F. Connect bottom to drains so drainage will wash out rust and scale.

G. Extend vents above floor line to not less than 6" above flood rim of highest fixture before running horizontally.

H. Terminate vents 24 inches minimum above roof line.

I. Increase pipes smaller than 3" to 4" through roof with vent cap from 18 inches below roof to terminus, using standard length tapered increasers.

3.06 INSTALLATION OF PIPING SPECIALTIES

A. Install piping specialties in accordance with Division 22 – Section 220300 Basic Materials and Methods section.

3.07 INSTALLATION OF SUPPORTS AND ANCHORS

A. Install supports, anchors and seals in accordance with Division 22 – Section 220300 Basic Materials and Methods section.

3.08 INSTALLATION OF DRAINAGE PIPING PRODUCTS

A. Cleanouts - install in sanitary above ground piping and sanitary building drain piping as indicated, as required by Plumbing Code, and at each change in direction of piping greater than 45 degrees, at minimum intervals of 50' for piping 4" and smaller and 50' for larger piping, and at base of each vertical soil or waste stack. Install floor and wall cleanout covers for concealed piping.

B. Flashing flanges - install flashing flange and clamping device with each stack and cleanout passing through waterproof membranes.

3.09 INSTALLATION OF FLOOR DRAINS

A. General - install floor drains in accordance with manufacturer's written instructions and in locations indicated.

B. Coordinate with soil and waste piping as necessary to interface floor drains with drainage piping systems.

C. Install floor drains at low points of surface areas to be drained, or as indicated. Set tops of drains flush with finished floor.

D. Install drain flashing collar or flange so that no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes, where penetrated.

E. Position drains so that they are accessible and easy to maintain.

3.10 FLASHING

A. General

1. Flash openings with 6 lb. copper flashing.
2. Make watertight, allow for expansion and contraction.

B. Vent pipes

1. Extend not less than 12" from base of pipe.
2. Turn flashing over edge on cast iron; extend into same one (1) inch.
3. Ream coupling screw down over flashing at least one (1) inch screwed pipe.
4. Copper flashing assembly acceptable.

C. Waterproof pipes through waterproof walls or floors: See details on drawings.

3.11 EQUIPMENT CONNECTIONS

A. Piping runouts to fixtures - provide soil and waste piping runouts to plumbing fixtures and drains, with approved trap, of sizes indicated, but in no case smaller than required by Plumbing Code. Traps and tailpieces shall be chrome plated brass. Waste stubs out of wall (exposed) shall be sch. 40 threaded chrome plated brass. All exposed surfaces shall be sponge cleanable.

3.12 INSPECTION AND TEST

A. New drainage piping shall be subjected to hydrostatic pressure test, see requirements in Section 220801, “Plumbing Testing, Adjusting and Balancing”.

3.13 PROTECTION

A. Protect drains during remainder of construction period, to avoid clogging with construction materials and debris and to prevent damage from traffic and construction work.

END OF SECTION

DIVISION 23 – HEATING, VENTILATING AND AIR CONDITIONING (HVAC)

SECTION 230000 – GENERAL PROVISIONS

PART 1 – GENERAL

1.01 SUMMARY OF ITEMS INCLUDED

A. This Section contains General Provisions related specifically to the Mechanical Work.

1. Quality Assurance.
2. Terminology.
3. Protection.
4. Coordination and Sequencing.
5. General Completion.
6. Demolition.
7. Cutting and Patching.
8. Excavation for Mechanical Work.
9. Concrete for Mechanical Work.

B. Drawings and General Provisions of Contract, including General and Supplementary Conditions, apply to this section.

1.02 QUALITY ASSURANCE

A. Laws, Permits, Inspections.

1. Comply with latest revisions of New York State Uniform Fire Protection and Construction Code, NYSED Manual of Planning Standards, any Local Codes or Regulations that apply.
2. Underwriters Laboratories label required for all electrical materials carrying 50 volts or more.
3. Comply with New York State Energy Conservation Construction Code.
4. Comply to requirements of drawings and specifications that are in excess of governing codes.
5. Comply with Section 1613 of the New York State Building Code for seismic requirements.
6. Do not install work as specified or shown if in conflict with governing code. Notify Engineer and request direction.
7. Pay all Inspection and Permit fees.
8. Provide Certificate of Inspection from all governing authorities.

B. Reference to technical society, organization, body or section made in accordance with the following abbreviations:

1. AIA American Institute of Architects
2. AMCA Air Moving and Conditioning Association, Inc.
3. ANSI American National Standards Institute.
4. ASHRAE American Society of Heating, Refrigerating and Air Conditioning Engineers
5. ASME American Society of Mechanical Engineers
6. ASTM American Society of Testing Materials
7. AWSC American Welding Society Code
8. AWWA American Water Works Association
9. IEEE Institute of Electric and Electronics Engineers
10. NEC National Electric Code
11. NEMA National Electrical Manufacturer's Association
12. NFPA National Fire Protection Association
13. NYBFU New York Board of Fire Underwriters
14. NYCRR - Codes, Rules and Regulations of the State of New York.

15. NSF - National Sanitation Foundation
16. PDI - Plumbing and Drainage Institute.
17. SMACNA Sheet Metal and Air Conditioning Contractors National Association
18. UL Underwriters' Laboratories, Inc.

C. Contractor submission of equivalent or substitute items other than those specified is at Contractor convenience only. If a substitution or equivalent is accepted, the Contractor shall coordinate the installation of the substitute or equivalent and make all associated changes required. The Contractor also waives any claim for additional costs associated with the substitute / equivalent which becomes apparent before, during or after installation. The Contractor agrees to bear any and all additional costs to all other contractors or subcontractors which are caused by the incorporation of the substitution / equivalent.

D. The Contractor shall, as part of his contract, furnish and install all equipment, materials, wiring accessories, and on-site installation of equipment as required by current standards of good practice.

E. All materials and equipment to be furnished and installed shall be new and of first quality and be free from all defects.

1.03 TERMINOLOGY

A. The following terminology and definitions are used on this project as related to the Mechanical Work.

1. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below the roof, spaces above ceilings, unexcavated spaces, crawl spaces and tunnels.
2. Exposed Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
3. Exposed Exterior Installations: Exposed to view outdoors, or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
4. Concealed Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.
5. 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.
6. Sewers: Refer to underground connections from building to street mains. Sewers begin at points 5 feet outside building wall.
7. Service Connections: Refer to underground connections from 5 feet outside building wall to street mains.
8. Underground Lines: Refer to piping buried in earth inside and within 5 feet outside building.
9. Building Lines: Refer to all other lines.
10. For other definitions refer to latest issue of New York State Plumbing Code, and all revisions.

1.04 PROTECTION

A. Protect equipment from damage, including water, chemical, mechanical injury and theft.

B. Replace damaged equipment or components.

C. Close and waterproof between sleeves, openings, pipes and voids in walls, floors and foundations to prevent entrance of water or moisture.

D. Holes made in fire walls, partitions, fire stops, shall be patched to maintain fire rating integrity.

E. Deliver pipes and tubes with factory-applied end-caps. Maintain end-caps through shipping, storage and handling to prevent pipe-end damage and prevent entrance of dirt, debris and moisture.

F. Protect stored pipes and tubes from moisture and dirt. Elevate above grade. When stored inside, do not exceed structural capacity of the floor.

G. Protect flanges, fittings, and piping specialties from moisture and dirt.

H. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

I. If permanently installed air handler equipment/systems are used during construction, filtration media with a Minimum Efficiency Reporting Value (MERV) of 8 shall be used in each unit and at each return air grille/opening, as determined by ASHRAE 52.2 Replace all unit filtration media with a Minimum Efficiency Reporting Value (MERV) of 13 immediately prior to occupancy and verify ductwork cleanliness; if ductwork is found contaminated, clean ductwork and associated air handling equipment and replace filtration media.

1.05 COORDINATION AND SEQUENCING

A. Coordinate mechanical equipment installation with other building components.

B. Arrange for chases, slots and openings in building structure during progress of construction, to allow for mechanical installations.

C. Coordinate the installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components, as they are constructed.

D. Sequence, coordinate, and integrate installations of mechanical materials and equipment for efficient flow of the Work. Coordinate installation of large equipment requiring positioning prior to closing in the building.

E. Coordinate connection of mechanical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies.

F. Coordinate requirements for access panels and doors where mechanical items requiring access are concealed behind finished surfaces. Access panels and doors shall be submitted and approved by the engineer.

G. Coordinate installation of identifying devices after completion of covering and painting, where devices are applied to surfaces. Install identifying devices prior to installation of acoustical ceilings and similar concealment.

H. Coordination with other trades: Right-of-Way as follows:

1. Light Fixtures.
2. Drain Pipes and Vents.
3. Ductwork.
4. HVAC Piping.
5. Domestic Water Piping.
6. Electrical Conduit.

I. Work in existing building.

1. Verify existing locations of pipe, ductwork equipment and conduit in field.

2. Extend existing systems as required for proper tie-in to new systems.
3. Leave existing equipment to be reused in satisfactory working order.
4. Remove from building all existing piping, ductwork, equipment and similar items which do not conform to new layout. Before disposing of these items, determine if Owner wishes to retain them.

J. Changeovers and continuity of services.

1. Make changeovers, tie-ins, removal, and perform similar work that affect operation of present building at times approved by Owner.
2. Make temporary connections required to keep present building systems and equipment in operation.
3. Prior to any shutdown of present building, have necessary materials at site.

1.06 GENERAL COMPLETION

A. Oiling Equipment.

1. Lubricate equipment and motors in accordance with manufacturer's requirements.

B. Instructions to Owner's Representative.

1. Give notice to Engineer when all systems are installed and operating.
2. Obtain name of Owner's Representative to receive instructions.
3. Schedule instructions of Owner's Representative by manufacturer's representative and instruct Owner in system installation and operation for:

a. Heating, Ventilating & Air Conditioning Equipment.
b. Fan equipment.
c. Pumps.
d. Temperature control.
e. Equipment lubrication.
f. Packaged systems.

C. Provide Operation and Maintenance manuals in accordance with the requirements of Division 01 "Project Closeout" Section. Provide an instructional video to the owner of the training / maintenance instruction sessions with the owner.

1.07 PAINTING AND FINISHING

A. Refer to "Painting" Section 099000 for field painting requirements.

B. Damage and Touch-up: Repair marred and damaged factory painted finishes with materials and procedures to match original factory finish.

1.08 DEMOLITION

A. Disconnect, demolish, and remove work specified under Division 23 and as indicated.

B. Where pipe, ductwork, insulation or equipment to remain is damaged or disturbed, remove damaged portions and install new products of equal capacity and quality.

C. Accessible Work: Remove indicated exposed pipe and ductwork in its entirety.

D. Abandoned Work: Cut and remove buried pipe abandoned in place, 2 inches beyond the face of adjacent construction. Cap and patch surface to match existing finish.

E. Removal: Remove indicated equipment from the project site.

F. Temporary Disconnection: Remove, store, clean, reinstall, reconnect, and make operational equipment indicated for relocation. Add cap off and pressure test prior to putting back in service.

1.09 CUTTING AND PATCHING

A. All cutting required to facilitate the proper installation of all work to be installed under Division 23, shall be done by the Mechanical Contractor.

B. Cut, channel, chase and drill floors, walls, partitions, ceilings and other surfaces necessary for mechanical installations in the maner specified and approved by the architect. Perform cutting by skilled mechanics of the trades involved.

C. Repair cut surfaces to match adjacent surfaces.

1.10 EXCAVATION FOR MECHANICAL WORK

A. Description of Work: Types of excavation for mechanical related work specified in this section include:

1. Underground mechanical utilities and services.
2. Underground tanks, casings and equipment enclosures.
3. Exterior water circulation and distribution systems.

B. Project Conditions.

1. Locate and protect existing utilities and other underground work in manner which will ensure that no damage or service interruption will result from excavating and backfilling. Liabilities arising out of performance of work is responsibility of Contractor doing excavation.
2. Protect persons from injury at excavations by barricades, warnings, and illumination.
3. Provide temporary covering or enclosure and temporary heat as necessary to protect bottoms of excavations from freezing and frost action. Do not install mechanical work on frozen excavation bases or subbases.

1.11 CONCRETE FOR MECHANICAL WORK.

A. Types of concrete for mechanical related work specified in this section include:

1. Lean concrete backfill to support mechanical work.
2. Encasement of mechanical work.
3. Mechanical equipment foundations and housekeeping pads.
4. Inertia bases for isolation of mechanical work.
5. Rough grouting in and around mechanical work.
6. Patching concrete cuts to accommodate mechanical work.
7. Thrust block.

1.12 REBATES

A. The Mechanical Contractor shall assist the Owner in applying for any available rebates from manufacturer’s, utility companies, etc. on equipment or materials installed under the contract. Provide all required documentation and assist in the completion of applications as required to complete the rebate process. All proceeds from rebates remain the property of the Owner.

PART 2 – PRODUCTS

Reference Section 033000.

PART 3 - EXECUTION

3.01 EXCAVATION - GENERAL

A. Do not excavate for mechanical work until work is ready to proceed without delay, so that total time lapse from excavation to completion of backfilling will be minimum.

B. Excavate with vertical sided excavations to greatest extent possible, except where otherwise indicated. Where necessary, provide sheeting and cross bracing to sustain sides of excavation. Remove sheeting and cross bracing during backfilling wherever such removal would not endanger work or other property. Where not removed, cut sheeting off at sufficient distance below finished grade to not interfere with other work.

C. Width: Excavate for piping with 6" to 9" clearance on both sides of pipe, except where otherwise shown or required for proper installation of pipe joints, fittings, valves and other work. Excavate for other mechanical work to provide minimum practical but adequate working clearances.

D. Depth for direct support: For work to be supported directly on undisturbed soil, do not excavate beyond indicated depths, and hand excavate bottom cut to accurate elevations, undercut at pipe hubs.

E. Depth for subbase support: For large piping (6" pipe size and larger), tanks, and where indicated for other mechanical work, excavate for installation of subbase material in depth indicated or, if not otherwise indicated, 6" below bottom of work to be supported.

F. Depth for unsatisfactory soil or rock conditions: Where directed, (because of unsatisfactory conditions at bottom of indicated excavation), excavate additional depth as directed to reach satisfactory conditions. Backfill with subbase material, compacted as directed, to indicated excavation depth.

G. Store excavated material (temporarily) near excavation, in manner which will not interfere with or damage excavation or other work. Do not store under trees (within drip line).

1. Dispose of excavated material which is either in excess of quantity needed for backfilling, or does not comply with requirements for backfill material.

    a. Remove unused material from project site, and dispose of in lawful manner.

3.02 WATER CONTROL

A. Maintain dry excavations for mechanical work, by removing water. Protect excavations from inflow of surface water. Pump inflow of ground water from excavations, protect excavations from inflow of ground water, by installing temporary sheeting and waterproofing as well as dewatering as required. Provide adequate barriers which will protect other excavations and below grade property from being damaged by water, sediment or erosion from or through mechanical work excavations. Need permit for dewatering – contractor to obtain and pay for.

3.03 BACKFILLING (REFERENCE 310000)

A. Do not backfill until installed mechanical work has been tested and accepted, wherever testing is indicated.

B. Install drainage fill where indicated, and tamp to uniform firm density.

C. Backfill with finely graded subbase material to 6" above wrapped, coated and plastic piping and tanks, and to centerline of other tanks.

D. Condition backfill material by either drying or adding water uniformly, to whatever extent may be necessary to facilitate compaction to required densities. Do not backfill with frozen soil materials.

E. Backfill simultaneously on opposite sides of mechanical work, and compact simultaneously, do not dislocate work from installed positions.

F. Backfill excavations in 8" high courses of backfill material, uniformly compacted to the following densities (% of maximum density, ASTM D1557), using power-driven hand operated compaction equipment.

1. Lawn and landscaped areas: 85% for cohesive soils, 90% for cohesionless soil.
2. Paved areas and roadways: 90% for cohesive soils, 95% for cohesionless soils.

G. Backfill to elevations matching adjacent grades, at time of backfilling excavations for mechanical work. Return surfaces to original condition.

H. After covering piping with 6" layer of approved fill, employ General Contractor to backfill, compact excavations beneath:

1. New foundations.
2. Slabs on grade.
3. Areas to be paved by General Contractor.

3.04 CONCRETE BASES

A. Construct concrete equipment bases of dimensions required, but not less than 4 inches larger in both directions than supported unit. Follow supported equipment manufacturer's setting templates for anchor bolt and tie locations.

3.05 CONCRETE GENERAL

Reference Section 033000.

3.06 CONCRETE CURING AND PROTECTION

Reference Section 033000.

3.07 MISCELLANEOUS CONCRETE ITEMS

A. Fill in holes and openings left in concrete structures for passage of work by trade unless otherwise shown or directed, after work of other trades is in place. Mix, place and cure concrete as herein specified, to blend with in-place construction. Provide other miscellaneous concrete filling shown or required to complete work.

3.08 CONCRETE SURFACE REPAIRS (REFERENCE 030130)

A. Repair and patch areas with epoxy or non-shrink grout immediately after removal of forms, when acceptable to Architect/Engineer.

B. Repair areas, except single holes not exceeding 1" diameter, by cutting out and replacing with fresh concrete. Remove areas to sound concrete with clean, square cuts and expose reinforcing steel with at least 3/4" clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding compound. Mix patching concrete of same materials to provide concrete of same type or class as original concrete. Place, compact and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

C. Use epoxy-based mortar for structural repairs, where directed by Architect/Engineer.

D. Repair methods not specified above may be used, subject to acceptance of Engineer.

3.09 QUALITY CONTROL TESTING DURING CONSTRUCTION

A. Quality Control: Owner's acceptable testing laboratory will perform sampling and testing during concrete placement, which may include the following, as directed by Engineer. This testing does not relieve Contractor of responsibility of providing concrete in compliance with specifications. Contractor shall perform additional testing as necessary, at no expense to Owner, to ensure quality of concrete.

1. Sampling Fresh Concrete: ASTM.
2. Slump: ASTM, one test for each load at point of discharge.
3. Air Content: ASTM C 173, one for each set of compressive strength (specimens of freshly mixed concrete).
4. Compressive Strength: ASTM, one set for each 50 cu. yds. or fraction thereof of each class and type of concrete; 2 specimens tested at 7 days, 3 specimens tested at 28 days, and one retained for later testing if required.
5. Laboratory Cured Test Cylinders: ASTM.

END OF SECTION

DIVISION 23 – HEATING, VENTILATING AND AIR CONDITIONING (HVAC)

SECTION 230000 – GENERAL PROVISIONS

PART 1 – GENERAL

1.01 SUMMARY OF ITEMS INCLUDED

A. This Section contains General Provisions related specifically to the Mechanical Work.

1. Quality Assurance.
2. Terminology.
3. Protection.
4. Coordination and Sequencing.
5. General Completion.
6. Demolition.
7. Cutting and Patching.
8. Excavation for Mechanical Work.
9. Concrete for Mechanical Work.

B. Drawings and General Provisions of Contract, including General and Supplementary Conditions, apply to this section.

1.02 QUALITY ASSURANCE

A. Laws, Permits, Inspections.

1. Comply with latest revisions of New York State Uniform Fire Protection and Construction Code, NYSED Manual of Planning Standards, any Local Codes or Regulations that apply.
2. Underwriters Laboratories label required for all electrical materials carrying 50 volts or more.
3. Comply with New York State Energy Conservation Construction Code.
4. Comply to requirements of drawings and specifications that are in excess of governing codes.
5. Comply with Section 1613 of the New York State Building Code for seismic requirements.
6. Do not install work as specified or shown if in conflict with governing code. Notify Engineer and request direction.
7. Pay all Inspection and Permit fees.
8. Provide Certificate of Inspection from all governing authorities.

B. Reference to technical society, organization, body or section made in accordance with the following abbreviations:

1. AIA American Institute of Architects
2. AMCA Air Moving and Conditioning Association, Inc.
3. ANSI American National Standards Institute.
4. ASHRAE American Society of Heating, Refrigerating and Air Conditioning Engineers
5. ASME American Society of Mechanical Engineers
6. ASTM American Society of Testing Materials
7. AWSC American Welding Society Code
8. AWWA American Water Works Association
9. IEEE Institute of Electric and Electronics Engineers
10. NEC National Electric Code
11. NEMA National Electrical Manufacturer's Association
12. NFPA National Fire Protection Association
13. NYBFU New York Board of Fire Underwriters
14. NYCRR - Codes, Rules and Regulations of the State of New York.

15. NSF - National Sanitation Foundation
16. PDI - Plumbing and Drainage Institute.
17. SMACNA Sheet Metal and Air Conditioning Contractors National Association
18. UL Underwriters' Laboratories, Inc.

C. Contractor submission of equivalent or substitute items other than those specified is at Contractor convenience only. If a substitution or equivalent is accepted, the Contractor shall coordinate the installation of the substitute or equivalent and make all associated changes required. The Contractor also waives any claim for additional costs associated with the substitute / equivalent which becomes apparent before, during or after installation. The Contractor agrees to bear any and all additional costs to all other contractors or subcontractors which are caused by the incorporation of the substitution / equivalent.

D. The Contractor shall, as part of his contract, furnish and install all equipment, materials, wiring accessories, and on-site installation of equipment as required by current standards of good practice.

E. All materials and equipment to be furnished and installed shall be new and of first quality and be free from all defects.

1.03 TERMINOLOGY

A. The following terminology and definitions are used on this project as related to the Mechanical Work.

1. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below the roof, spaces above ceilings, unexcavated spaces, crawl spaces and tunnels.
2. Exposed Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
3. Exposed Exterior Installations: Exposed to view outdoors, or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
4. Concealed Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.
5. 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.
6. Sewers: Refer to underground connections from building to street mains. Sewers begin at points 5 feet outside building wall.
7. Service Connections: Refer to underground connections from 5 feet outside building wall to street mains.
8. Underground Lines: Refer to piping buried in earth inside and within 5 feet outside building.
9. Building Lines: Refer to all other lines.
10. For other definitions refer to latest issue of New York State Plumbing Code, and all revisions.

1.04 PROTECTION

A. Protect equipment from damage, including water, chemical, mechanical injury and theft.

B. Replace damaged equipment or components.

C. Close and waterproof between sleeves, openings, pipes and voids in walls, floors and foundations to prevent entrance of water or moisture.

D. Holes made in fire walls, partitions, fire stops, shall be patched to maintain fire rating integrity.

E. Deliver pipes and tubes with factory-applied end-caps. Maintain end-caps through shipping, storage and handling to prevent pipe-end damage and prevent entrance of dirt, debris and moisture.

F. Protect stored pipes and tubes from moisture and dirt. Elevate above grade. When stored inside, do not exceed structural capacity of the floor.

G. Protect flanges, fittings, and piping specialties from moisture and dirt.

H. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

I. If permanently installed air handler equipment/systems are used during construction, filtration media with a Minimum Efficiency Reporting Value (MERV) of 8 shall be used in each unit and at each return air grille/opening, as determined by ASHRAE 52.2 Replace all unit filtration media with a Minimum Efficiency Reporting Value (MERV) of 13 immediately prior to occupancy and verify ductwork cleanliness; if ductwork is found contaminated, clean ductwork and associated air handling equipment and replace filtration media.

1.05 COORDINATION AND SEQUENCING

A. Coordinate mechanical equipment installation with other building components.

B. Arrange for chases, slots and openings in building structure during progress of construction, to allow for mechanical installations.

C. Coordinate the installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components, as they are constructed.

D. Sequence, coordinate, and integrate installations of mechanical materials and equipment for efficient flow of the Work. Coordinate installation of large equipment requiring positioning prior to closing in the building.

E. Coordinate connection of mechanical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies.

F. Coordinate requirements for access panels and doors where mechanical items requiring access are concealed behind finished surfaces. Access panels and doors shall be submitted and approved by the engineer.

G. Coordinate installation of identifying devices after completion of covering and painting, where devices are applied to surfaces. Install identifying devices prior to installation of acoustical ceilings and similar concealment.

H. Coordination with other trades: Right-of-Way as follows:

1. Light Fixtures.
2. Drain Pipes and Vents.
3. Ductwork.
4. HVAC Piping.
5. Domestic Water Piping.
6. Electrical Conduit.

I. Work in existing building.

1. Verify existing locations of pipe, ductwork equipment and conduit in field.

2. Extend existing systems as required for proper tie-in to new systems.
3. Leave existing equipment to be reused in satisfactory working order.
4. Remove from building all existing piping, ductwork, equipment and similar items which do not conform to new layout. Before disposing of these items, determine if Owner wishes to retain them.

J. Changeovers and continuity of services.

1. Make changeovers, tie-ins, removal, and perform similar work that affect operation of present building at times approved by Owner.
2. Make temporary connections required to keep present building systems and equipment in operation.
3. Prior to any shutdown of present building, have necessary materials at site.

1.06 GENERAL COMPLETION

A. Oiling Equipment.

1. Lubricate equipment and motors in accordance with manufacturer's requirements.

B. Instructions to Owner's Representative.

1. Give notice to Engineer when all systems are installed and operating.
2. Obtain name of Owner's Representative to receive instructions.
3. Schedule instructions of Owner's Representative by manufacturer's representative and instruct Owner in system installation and operation for:

a. Heating, Ventilating & Air Conditioning Equipment.
b. Fan equipment.
c. Pumps.
d. Temperature control.
e. Equipment lubrication.
f. Packaged systems.

C. Provide Operation and Maintenance manuals in accordance with the requirements of Division 01 "Project Closeout" Section. Provide an instructional video to the owner of the training / maintenance instruction sessions with the owner.

1.07 PAINTING AND FINISHING

A. Refer to "Painting" Section 099000 for field painting requirements.

B. Damage and Touch-up: Repair marred and damaged factory painted finishes with materials and procedures to match original factory finish.

1.08 DEMOLITION

A. Disconnect, demolish, and remove work specified under Division 23 and as indicated.

B. Where pipe, ductwork, insulation or equipment to remain is damaged or disturbed, remove damaged portions and install new products of equal capacity and quality.

C. Accessible Work: Remove indicated exposed pipe and ductwork in its entirety.

D. Abandoned Work: Cut and remove buried pipe abandoned in place, 2 inches beyond the face of adjacent construction. Cap and patch surface to match existing finish.

E. Removal: Remove indicated equipment from the project site.

F. Temporary Disconnection: Remove, store, clean, reinstall, reconnect, and make operational equipment indicated for relocation. Add cap off and pressure test prior to putting back in service.

1.09 CUTTING AND PATCHING

A. All cutting required to facilitate the proper installation of all work to be installed under Division 23, shall be done by the Mechanical Contractor.

B. Cut, channel, chase and drill floors, walls, partitions, ceilings and other surfaces necessary for mechanical installations in the maner specified and approved by the architect. Perform cutting by skilled mechanics of the trades involved.

C. Repair cut surfaces to match adjacent surfaces.

1.10 EXCAVATION FOR MECHANICAL WORK

A. Description of Work: Types of excavation for mechanical related work specified in this section include:

1. Underground mechanical utilities and services.
2. Underground tanks, casings and equipment enclosures.
3. Exterior water circulation and distribution systems.

B. Project Conditions.

1. Locate and protect existing utilities and other underground work in manner which will ensure that no damage or service interruption will result from excavating and backfilling. Liabilities arising out of performance of work is responsibility of Contractor doing excavation.
2. Protect persons from injury at excavations by barricades, warnings, and illumination.
3. Provide temporary covering or enclosure and temporary heat as necessary to protect bottoms of excavations from freezing and frost action. Do not install mechanical work on frozen excavation bases or subbases.

1.11 CONCRETE FOR MECHANICAL WORK.

A. Types of concrete for mechanical related work specified in this section include:

1. Lean concrete backfill to support mechanical work.
2. Encasement of mechanical work.
3. Mechanical equipment foundations and housekeeping pads.
4. Inertia bases for isolation of mechanical work.
5. Rough grouting in and around mechanical work.
6. Patching concrete cuts to accommodate mechanical work.
7. Thrust block.

1.12 REBATES

A. The Mechanical Contractor shall assist the Owner in applying for any available rebates from manufacturer’s, utility companies, etc. on equipment or materials installed under the contract. Provide all required documentation and assist in the completion of applications as required to complete the rebate process. All proceeds from rebates remain the property of the Owner.

PART 2 – PRODUCTS

Reference Section 033000.

PART 3 - EXECUTION

3.01 EXCAVATION - GENERAL

A. Do not excavate for mechanical work until work is ready to proceed without delay, so that total time lapse from excavation to completion of backfilling will be minimum.

B. Excavate with vertical sided excavations to greatest extent possible, except where otherwise indicated. Where necessary, provide sheeting and cross bracing to sustain sides of excavation. Remove sheeting and cross bracing during backfilling wherever such removal would not endanger work or other property. Where not removed, cut sheeting off at sufficient distance below finished grade to not interfere with other work.

C. Width: Excavate for piping with 6" to 9" clearance on both sides of pipe, except where otherwise shown or required for proper installation of pipe joints, fittings, valves and other work. Excavate for other mechanical work to provide minimum practical but adequate working clearances.

D. Depth for direct support: For work to be supported directly on undisturbed soil, do not excavate beyond indicated depths, and hand excavate bottom cut to accurate elevations, undercut at pipe hubs.

E. Depth for subbase support: For large piping (6" pipe size and larger), tanks, and where indicated for other mechanical work, excavate for installation of subbase material in depth indicated or, if not otherwise indicated, 6" below bottom of work to be supported.

F. Depth for unsatisfactory soil or rock conditions: Where directed, (because of unsatisfactory conditions at bottom of indicated excavation), excavate additional depth as directed to reach satisfactory conditions. Backfill with subbase material, compacted as directed, to indicated excavation depth.

G. Store excavated material (temporarily) near excavation, in manner which will not interfere with or damage excavation or other work. Do not store under trees (within drip line).

1. Dispose of excavated material which is either in excess of quantity needed for backfilling, or does not comply with requirements for backfill material.

    a. Remove unused material from project site, and dispose of in lawful manner.

3.02 WATER CONTROL

A. Maintain dry excavations for mechanical work, by removing water. Protect excavations from inflow of surface water. Pump inflow of ground water from excavations, protect excavations from inflow of ground water, by installing temporary sheeting and waterproofing as well as dewatering as required. Provide adequate barriers which will protect other excavations and below grade property from being damaged by water, sediment or erosion from or through mechanical work excavations. Need permit for dewatering – contractor to obtain and pay for.

3.03 BACKFILLING (REFERENCE 310000)

A. Do not backfill until installed mechanical work has been tested and accepted, wherever testing is indicated.

B. Install drainage fill where indicated, and tamp to uniform firm density.

C. Backfill with finely graded subbase material to 6" above wrapped, coated and plastic piping and tanks, and to centerline of other tanks.

D. Condition backfill material by either drying or adding water uniformly, to whatever extent may be necessary to facilitate compaction to required densities. Do not backfill with frozen soil materials.

E. Backfill simultaneously on opposite sides of mechanical work, and compact simultaneously, do not dislocate work from installed positions.

F. Backfill excavations in 8" high courses of backfill material, uniformly compacted to the following densities (% of maximum density, ASTM D1557), using power-driven hand operated compaction equipment.

1. Lawn and landscaped areas: 85% for cohesive soils, 90% for cohesionless soil.
2. Paved areas and roadways: 90% for cohesive soils, 95% for cohesionless soils.

G. Backfill to elevations matching adjacent grades, at time of backfilling excavations for mechanical work. Return surfaces to original condition.

H. After covering piping with 6" layer of approved fill, employ General Contractor to backfill, compact excavations beneath:

1. New foundations.
2. Slabs on grade.
3. Areas to be paved by General Contractor.

3.04 CONCRETE BASES

A. Construct concrete equipment bases of dimensions required, but not less than 4 inches larger in both directions than supported unit. Follow supported equipment manufacturer's setting templates for anchor bolt and tie locations.

3.05 CONCRETE GENERAL

Reference Section 033000.

3.06 CONCRETE CURING AND PROTECTION

Reference Section 033000.

3.07 MISCELLANEOUS CONCRETE ITEMS

A. Fill in holes and openings left in concrete structures for passage of work by trade unless otherwise shown or directed, after work of other trades is in place. Mix, place and cure concrete as herein specified, to blend with in-place construction. Provide other miscellaneous concrete filling shown or required to complete work.

3.08 CONCRETE SURFACE REPAIRS (REFERENCE 030130)

A. Repair and patch areas with epoxy or non-shrink grout immediately after removal of forms, when acceptable to Architect/Engineer.

B. Repair areas, except single holes not exceeding 1" diameter, by cutting out and replacing with fresh concrete. Remove areas to sound concrete with clean, square cuts and expose reinforcing steel with at least 3/4" clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding compound. Mix patching concrete of same materials to provide concrete of same type or class as original concrete. Place, compact and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

C. Use epoxy-based mortar for structural repairs, where directed by Architect/Engineer.

D. Repair methods not specified above may be used, subject to acceptance of Engineer.

3.09 QUALITY CONTROL TESTING DURING CONSTRUCTION

A. Quality Control: Owner's acceptable testing laboratory will perform sampling and testing during concrete placement, which may include the following, as directed by Engineer. This testing does not relieve Contractor of responsibility of providing concrete in compliance with specifications. Contractor shall perform additional testing as necessary, at no expense to Owner, to ensure quality of concrete.

1. Sampling Fresh Concrete: ASTM.
2. Slump: ASTM, one test for each load at point of discharge.
3. Air Content: ASTM C 173, one for each set of compressive strength (specimens of freshly mixed concrete).
4. Compressive Strength: ASTM, one set for each 50 cu. yds. or fraction thereof of each class and type of concrete; 2 specimens tested at 7 days, 3 specimens tested at 28 days, and one retained for later testing if required.
5. Laboratory Cured Test Cylinders: ASTM.

END OF SECTION

DIVISION 23 – HEATING, VENTILATING AND AIR CONDITIONING (HVAC)

SECTION 230010 – CODES, STANDARDS, AND PERMITS

PART 1 – GENERAL

1.01 GENERAL

The entire installation shall be made in accordance with State rules and regulations and shall also conform with the Standards of the National Board of Fire Underwriters for this installation and the local Board of Fire Underwriters having jurisdiction. The installation shall also comply with air pollution requirements of the State of New York and Industrial Code Rule 4 of the State of New York Department of Labor, Board of Standards and Appeals, dated March 31, 1965, and all other ordinances having jurisdiction.

The Contractor shall submit to all authorities having jurisdiction all required applications and shall secure all necessary permits, tests, and inspections required for final approval.

Certain standard and staple materials are described by reference to standard specifications. These standards are as follows:

ASA-B9	Safety Code for Mechanical Refrigeration
ASHRAE	American Society of Heating, Refrigerating, and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society of Testing Materials
AWWA	American Water Works Association
CS	Commercial Standard
FS	Federal Specification
NEMA	National Electrical Manufacturer's Association
NFPA	National Fire Protection Association
NSF	National Sanitation Foundation
PDI	Plumbing and Drainage Institute
SMACNA	Sheet Metal and Air Conditioning Contractors Association
USASI	United States of America Standards Institute
UL	Underwriters' Laboratories
	New York State Uniform Fire Prevention and Building Code
A.A.B.C.	Associated Air Balance Council
N.E.B.B.	National Environmental Balancing Bureau
NYSED	Manual of Planning Standards (Latest Edition)

All new equipment shall bear U.L. label and conform to the latest edition of the National Electric code.

END OF SECTION

DIVISION 23 – HEATING, VENTILATING AND AIR CONDITIONING (HVAC)

SECTION 230300 – BASIC MECHANICAL MATERIALS AND METHODS

PART 1 – GENERAL

1.01 SUMMARY OF ITEMS INCLUDED

A. This Section includes the following basic mechanical materials and methods to complement other Division 23 Sections.

1. Submittals.
2. Welder certification.
3. Pipe joining materials and installation instructions common to piping systems.
4. Piping specialties: Escutcheons, dielectric fittings, sleeves and seals.
5. Identifying devices and labels.
6. Nonshrink grout for equipment installations.
7. Drip pans.
8. Fire stopping.
9. Pipe supports: Hangers, clamps, support spacing, building attachments, shields and saddles, flashing, miscellaneous materials, anchors.
10. Field fabricated metal and wood equipment supports.

B. Pipe and pipe fitting materials are specified in piping system sections.

1.02 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.03 SUBMITTALS

A. General - Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections.

B. Product data for following piping specialties:

1. Mechanical sleeve seals.
2. Identification materials and devices.

C. Samples of color, lettering style and other graphic representation required for each identification material and device.

D. Shop drawings detailing fabrication and installation for metal and wood supports and anchorage for mechanical materials and equipment.

E. Coordination drawings for access panel and door locations.

F. Prepare coordination drawings to a 1/4 inch equals 1 foot scale or larger. Detail major elements, components and systems of mechanical equipment and materials in relationship with other systems, installations, and building components. Show space requirements for installation and access. Show where sequence and coordination of installations are important to the efficient flow of the Work. Include the following:

1. Proposed locations of piping, ductwork, equipment and materials. Include the following:

a. Planned piping layout, including valve and specialty locations and valve stem movement.
b. Planned duct systems layout, including elbows radii and duct accessories.
c. Clearances for installing and maintaining insulation.
d. Clearances for servicing and maintaining equipment, including space for equipment disassembly required for periodic maintenance.
e. Equipment service connections and support details.
f. Exterior wall and foundation penetrations.
g. Fire-rated wall and floor penetrations.
h. Sizes and location of required concrete pads and bases.

G. Floor plans, elevations and details to indicate penetrations in floors, walls and ceilings and their relationship to other penetrations and installations.

H. Reflected ceiling plans to coordinate and integrate installations, air outlets and inlets, light fixtures, communication systems components, sprinklers, and other ceiling-mounted items.

I. Submit weld procedure specifications.

1.04 WELD AND WELDER CERTIFICATION

A. Welder certificates signed by Contractor certifying that welders comply with requirements of this Section.

B. Qualify welding processes and operators for structural steel according to AWS D1.1 "Structural Welding Code - Steel".

1. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

C. Qualify welding processes and operators for piping according to ASME "Boiler and Pressure Vessel Code", Section IX, "Welding and Brazing Qualifications".

1. Comply with provisions of ASME B31 Series "Code for Pressure Piping".

1.05 STANDARDS FOR MATERIALS AND WORKMANSHIP

A. All materials and workmanship shall, at a minimum be in accordance with (in no order of precedence):

1. New York State Codes – latest edition as adopted by the Authority Having Jurisdiction, unless otherwise noted.

2. State and municipal Building Codes and related subcodes.

3. Occupational and Safety Act (OSHA) Requirements.

4. Rules and Regulations of the Authority Having Jurisdiction applicable to the work.

5. National Electrical Standards Association Standard for Good Workmanship in Electrical Construction (NECA-1)

6. Serving utility’s rules and regulations for providing service.

7. Contract Drawings and Specifications.

8. Manufacturer recommended installation instructions, practices and procedures for the products being utilized or installed.

9. Where conflicts arise between the above, the more stringent requirement shall be adhered to.

PART 2 - PRODUCTS

2.01 PIPE AND PIPE FITTINGS

A. Refer to individual piping system specification Sections for pipe and fitting materials and joining methods. Joining methods and pipe installation shall be performed in complete accordance with section 1613 of the Building Code of New York State for building seismic type II, zone C.

B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.02 PIPE JOINING MATERIALS

A. Refer to individual piping system specification Sections in Division 23 for special joining materials not listed below.

B. Pipe Flange Gasket Materials: Suitable for the chemical and thermal conditions of the piping system contents.

1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8 inch maximum thickness, except where 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. ASME B16.20 for grooved, ring-joint, steel flanges. Note that grooved, ring joint piping / accessories may be used for sprinkler or condenser water piping systems only.

3. AWWA C110, rubber, flat face, 1/8 inch thick, except where other thickness is indicated; and full-face or ring type, except where type is indicated.

C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, except where other material is indicated.

D. Solder Filler Metal: ASTM B 32.

1. Alloy Sn95 or Alloy Sn94: Tin (approximately 95 percent) and silver (approximately 5 percent).
2. Alloy E: Tin (approximately 95 percent) and copper (approximately 5 percent).
3. Allow HA: Tin-antimony-silver-copper-zinc.
4. Alloy HB: Tin-antimony-silver-copper-nickel.
5. Alloy Sb5: Tin (95 percent) and antimony (5 percent).

E. Brazing Filler Metals: AWS A5.8.

1. BCuP Series: Copper-phosphorus alloys.
2. BAg1: Silver alloy.

F. Welding Fill Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

G. Flanged, Ductile-Iron Pipe Gasket, Bolts and Nuts: AWWA C110, rubber gasket, carbon steel bolts and nuts.

H. Couplings: Iron body sleeve assembly, fabricated to match outside diameters of plain-end, pressure pipes.

1. Sleeve: ASTM A 126, Class B, gray iron.
2. Followers: ASTM A 47, Grade 32510 or ASTM A 536 ductile iron.
3. Gaskets: Rubber.
4. Bolts and Nuts: AWWA C111.
5. Finish: Enamel paint.

2.03 PIPING SPECIALTIES

A. Escutcheons: Manufactured wall, ceiling and floor plates; deep-pattern type, where required to conceal protruding fittings and sleeves.

1. Inside Diameter: Closely fit around pipe, tube and insulation of insulated piping.
2. Outside Diameter: Completely cover opening.
3. Cast Brass: One-piece, with set-screw.

    a. Finish: Rough brass.
    b. Finish: Polished chrome plate.

4. Cast Brass: Split casting, with concealed hinge and set-screw.

    a. Finish: Rough brass.
    b. Finish: Polished chrome plate.

5. Stamped Steel: One-piece, with set screw and chrome plated finish.
6. Stamped Steel: One-piece with spring clips and chrome plated finish.
7. Stamped Steel: Split plate with concealed hinge, set-screw, and chrome plated finish.
8. Stamped Steel: Split plate with concealed hinge, spring clips and chrome plated finish.
9. Cast-Iron Floor Plate: One piece casting.

B. Dielectric Fittings: Assembly or fitting having insulating material isolating joined dissimilar metals, to prevent galvanic action and stop corrosion.

1. Description: Combination of copper alloy and ferrous; threaded, solder, plain, and weld neck end types and matching piping system materials.
2. Insulating Material: Suitable for system fluid, pressure and temperature.
3. Dielectric Unions: Factory-fabricated, union assembly, for 250 psig minimum working pressure at 180 deg F temperature.
4. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150 or 300 psig minimum pressure to suit system pressures.
5. Dielectric-Flange Insulation Kits: Field-assembled, companion-flange assembly, full face or ring type. Components include neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers and steel backing washers.

    a. Provide separate companion flanges and steel bolts and nuts for 150- or 300-psig minimum working pressure to suit system pressures.

6. Dielectric Couplings: Galvanized steel coupling, having inert and non-corrosive, thermoplastic lining, with threaded ends and 300 psig minimum working pressure at 225 deg F temperature.

7. Dielectric Nipples: Electroplated steel nipple, having inert and non-corrosive, thermoplastic lining, with combination of plain or threaded end types and 300 psig working pressure at 225 deg F temperature.

C. Mechanical Sleeve Seals: Modular, watertight, mechanical type. Components include interlocking synthetic rubber links shaped to continuously fill annular space between pipe and sleeve. Connecting bolts and pressure plates cause rubber sealing elements to expand when tightened.

D. Sleeves: The following materials are for wall, floor, slab and roof penetrations.

1. Steel Sheet-Metal: 24 gage or heavier, galvanized sheet metal, round tube closed with welded longitudinal joint.
2. Steel Pipe: ASTM A53, Type E, Grade A, Schedule 40, galvanized, plain ends.
3. Cast-Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, having plain ends and integral water stop, except where other features are specified.
4. Wall Penetration Systems: Wall sleeve assembly, consisting of housing, gaskets and pipe sleeve, with 1 mechanical-joint end conforming to AWWA C110 and 1 plain pipe-sleeve end.

    a. Penetrating Pipe Deflection: In accordance with the Building Code of New York State (latest edition), Chapter 16: seismic requirements, without leakage.
    b. Housing: Ductile-iron casting having waterstop and anchor ring, with ductile-iron gland, steel studs and nuts, and rubber gasket conforming to AWWA C111 of housing and gasket size as required to fit penetrating pipe.
    c. Pipe Sleeve: AWWA C151, ductile-iron pipe.
    d. Housing-to-Sleeve Gasket: Rubber or neoprene, push-on type, of manufacturer's design.

5. Cast-Iron Sleeve Fittings: Commercially-made, sleeve having integral clamping flange, with clamping ring, bolts and nuts for membrane flashing.

    a. Underdeck Clamp: Clamping ring with set screws.

2.04 IDENTIFYING DEVICES AND LABELS

A. General: Manufacturer's standard products of categories and types required for each application as referenced in other Division 23 Sections. Where more than single type is specified for listed application, selection is Installer's option, but provide single selection for each product category.

B. Equipment Nameplates: Metal nameplate with operational data engraved or stamped; permanently fastened to equipment.

1. Data: Manufacturer, product name, model number, serial number, capacity, operating and power characteristics, labels of tested compliances, and similar essential data.
2. Location: An accessible and visible location.

C. Snap-On Plastic Pipe Markers: Manufacturer's standard pre-printed, semi-rigid snap-on, color-coded pipe markers, conforming to ASME A13.1.

D. Pressure-Sensitive Pipe Markers: Manufacturer's standard pre-printed, permanent adhesive, color-coded, pressure-sensitive vinyl pipe markers, conforming to ASME A13.1.

E. Plastic Duct Markers: Manufacturer's standard laminated plastic, color coded duct markers. Conform to following color code:

1. Green: Cold air.
2. Yellow: Hot air.
3. Yellow/Green: Supply air.
4. Blue: Exhaust, outside, return and mixed air.
5. For hazardous exhausts, use colors and designs recommended by ASME A13.1.
6. Nomenclature: Include following:

a. Direction of air flow.
b. Duct service (supply, return, exhaust, etc.).
c. Duct origin (from).
d. Duct destination (to).
e. Design cfm.

F. Engraved Plastic-Laminate Signs: ASTM D 709, Type I, cellulose, paper-base, phenolic-resin-laminate engraving stock: Grade ES-2, black surface, black phenolic core, with white (letter color) melamine subcore, except when other colors are indicated.

1. Fabricate in sizes required for message.
2. Engraved with engraver's standard letter style, of sizes and with wording to match equipment identification.
3. Punch for mechanical fastening.
4. Thickness: 1/16 inch, except as otherwise indicated.
5. Thickness: 1/8 inch, except as otherwise indicated.
6. Thickness: 1/16 inch, for units up to 20 square inches or 8-inches long; 1/8 inch for larger units.
7. Fasteners: Self-tapping stainless-steel screws or contact-type permanent adhesive.

G. Plastic Equipment Markers: Laminated-plastic, color-coded equipment markers. Conform to following color code:

1. Green: Cooling equipment and components.
2. Yellow: Heating equipment and components.
3. Yellow/Green: Combination cooling and heating equipment and components.
4. Brown: Energy reclamation equipment and components.
5. Blue: Equipment and components that do not meet any of above criteria.
6. For hazardous equipment, use colors and designs recommended by ASME A13.1.
7. Nomenclature: Include following, matching terminology on schedules as closely as possible:

a. Name and plan number.
b. Equipment service.
c. Design capacity.
d. Other design parameters such as pressure drop, entering and leaving conditions, and rpm.

8. Size: Approximately 2-1/2 by 4 inches for control devices, dampers, and valves; and 4-1/2 by 6 inches for equipment.

H. Underground Type Plastic Line Marker.

1. Manufacturer's standard permanent, bright colored, continuous printed plastic tape, intended for direct burial service, not less than 6" wide x 4 mils thick. Provide tape with printing which most accurately indicates type of service of buried pipe.

I. Lettering and Graphics: Coordinate names, abbreviations and other designations used in mechanical identification, with corresponding designations indicated. Use numbers, lettering and wording indicated for proper identification and operation/maintenance of mechanical systems and equipment.

1. Multiple Systems: Where multiple systems of same generic name are indicated, provide identification that indicates individual system number as well as service such as "Boiler No. 3", "Air Supply No. 1H", or "Standpipe F12".

2.05 GROUT

A. Nonshrink, Nonmetallic Grout: ASTM C1107, Grade B.

1. Characteristics: Post-hardening, volume-adjusting, dry, hydraulic-cement grout, 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.

2.06 DRIP PANS

A. Provide drip pans fabricated from corrosion resistant sheet metal with watertight joints, and with edges turned up 2-1/2 inches. Reinforce top, either by structural angles or by folding over according to size. Provide hole, gasket, and flange at low point for watertight joint and 1-inch drain line connection.

2.07 FIRE STOPPING

A. Refer to Specification Section 230680 for details.

2.08 HORIZONTAL PIPING HANGERS AND SUPPORTS

A. General: Except as otherwise indicated, provide factory fabricated horizontal piping hangers and supports. Supports and hangers in conformance with the Building Code of New York State (latest edition), Chapter 16: seismic requirements shall be used. Use only one type by one manufacturer for each piping service. Select size of hangers and supports to exactly fit pipe size for bare piping, and to exactly fit around piping insulation with saddle or shield for insulated piping. Provide copper plated hangers and supports for copper piping systems. Provide spring hangers where piping is subject to vibration movement.

B. Adjustable steel clevises.

1. Material: Carbon steel, copper plated for copper piping.
2. Finish: Black or copper plated.
3. Adjustment: Hanger to be adjustable for vertical height of pipe without removing the pipe.

2.09 VERTICAL PIPING CLAMPS

A. Two bolt riser clamp.

1. Material: Carbon steel copper plated for copper piping.
2. Finish: Black or copper plated.

2.10 HANGER ROD AND SPACING

ROD SIZE AND SPACING SCHEDULE (In accordance with NYSBC 1621)

PIPE SIZE	ROD DIAMETER
2" and smaller	3/8"
2-1/2" thru 3-1/2"	1/2"
4" thru 5"	5/8"
6" and over	3/4"

TYPE	MAXIMUM SPACING
Steel	10’ -0"
Copper	6’- 0"

Note: Cast Iron - support at every hub or coupling 5 ft. maximum spacing.

2.11 BUILDING ATTACHMENTS

A. General: Except as otherwise indicated provide factory fabricated building attachments of one of the following types listed, selected by Installer to suit building substrate conditions. Select size of building attachments to suit hanger rods. Provide copper plated building attachments for copper piping systems. Provide the following where approved by Building Code of New York State (latest edition), Chapter 16:

B. On Structural Steel:

1. For pipes 2" and smaller: C clamps with lock nuts similar to Grinnell figure 86.
2. For pipes 5" and larger: Use beam clamps similar to Grinnell figure 228 or 292.

C. On New Masonry:

1. Use concrete inserts similar to Grinnell figure 281.

D. On Existing Concrete:

1. Use expansion case similar to Grinnell figure 117.

E. On Wood:

1. Use coach screw rods Grinnell figure 111. Ceiling flanges Grinnell figure 153, or fabricated angle clips. Use wood drive screws or lag bolts as fasteners.

2.12 SHIELDS AND SADDLES (Where approved by the Building Code of New York State (latest edition), Chapter 16:)

A. General: For insulated piping.

B. Shields: 16 gauge galvanized metal.

Unsul Coustic Corp. "Insul-Shield"

C. Protection saddles:

1. Hardwood block
2. Steel saddle Grinnell 160 series

2.13 FLASHING MATERIALS

A. General: Provide flashings for each penetration of mechanical systems through roofs or waterproof membranes.

B. Molded Pipe Flashing: Compatible with single ply membranes with which it is used and manufactured by membrane manufacturer.

C. Copper flashing: Provide cold-rolled sheet copper (ANSI/ASTM B 370), of proper temper for applications shown and required forming, coated on one side with not less than 0.06 lbs. per sq. ft. of antimony (ANSI/ASTM B 101, Type I, Class A), weighing 1.06 lbs. per sq. ft., except as otherwise indicated.

D. Bituminous coating: FS TT-C-494, or MIL-C-18480, or SSPC-Paint 12, cold applied solvent type bituminous mastic coating for application in dry film thickness of 15 mils per coat.

2.14 MISCELLANEOUS MATERIALS

A. Metal framing: Provide products complying with NEMA STD ML 1.

B. Steel plates, shapes and bars: Provide products complying with ANSI/ASTM A 36.

C. Heavy duty steel trapezes: Fabricate from steel shapes selected for loads required, weld steel in accordance with AWS standards.

D. Pipe guides: Provide factory fabricated guides, of cast semi-steel or heavy fabricated steel, consisting of a bolted two section outer cylinder and base with a two section guiding spider bolted tight to pipe. Size guide and spiders to clear pipe and insulation (if any), and cylinder. Provide guides of length recommended by manufacturer to allow indicated travel.

2.15 ANCHORS

A. Fabricate pipe anchors from 3 x 3 x 1/2" angle.

B. Use pipe protection saddles one size larger than piping.

PART 3 - EXECUTION

3.01 PIPING SYSTEMS - COMMON REQUIREMENTS

A. General: All piping systems, components and their installation shall be in conformance with the Building Code of New York State (latest edition), Chapter 16: for seismic requirements. Install piping as described below, except where system Sections specify otherwise. Individual piping system specification Sections in Division 23 specify piping installation requirements unique to the piping system.

B. General Locations and Arrangements: Drawings (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, except where deviations to layout are approved on coordinate drawings.

C. Install piping at indicated slope.

D. Install components having pressure rating equal to or greater than system operating pressure.

E. Install piping in concealed interior and exterior locations, except in equipment rooms and service areas.

F. Install piping free of sags and bends.

G. Install exposed interior and exterior piping at right angles or parallel to building walls. Diagonal runs are prohibited, except where indicated.

H. Install piping tight to slabs, beams, joists, columns, walls and other building elements. Allow sufficient space above removable ceiling panels to allow for ceiling panel removal.

I. Install piping to allow application of insulation plus 1-inch clearance around insulation.

J. Locate groups of pipes parallel to each other, spaced to permit valve servicing.

K. Install fittings for changes in direction and branch connections.

L. Install couplings according to manufacturer's printed instructions.

M. Install pipe escutcheons for pipe penetrations of concrete and masonry walls, wallboard partitions and suspended ceilings according to the following:

1. Chrome-Plated Piping: Cast-brass, one-piece, with set-screw and polished chrome-plated finish. Use split-casting escutcheons where required, for existing piping.
2. Uninsulated Piping Wall Escutcheons: Cast-brass or stamped-steel, with set-screw.
3. Uninsulated Piping Floor Plates in Utility Areas: Cast-iron floor plates.
4. Insulated Piping: Cast-brass or stamped-steel, with concealed hinge, spring clips and chrome-plated finish.
5. Piping in Utility Areas: Cast-brass or stamped-steel with set-screw or spring clips.

N. Sleeves are required for core drilled holes.

O. Permanent sleeves are not required for holes formed by PE plastic (removable) sleeves.

P. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, concrete floor and roof slabs and where indicated.

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. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring where specified.

2. Build sleeves into new walls and slabs as work progresses.

3. Install large enough sleeves to provide 1/4 inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:

    a. Steel Sheet-Metal Sleeves: For pipes 6 inches and larger, penetrating gypsum-board partitions.
    b. Cast-Iron Sleeve Fittings: For floors having membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level. Flashing is specified in Division 7 Section "Flashing and Sheet Metal".
    c. Seal space outside of sleeve fittings with nonshrink, nonmetallic grout.

4. Except for below-grade wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using elastomeric joint sealants specified in Division 7 Section "Joint Sealants".

Q. Above Grade, Exterior Wall, Pipe Penetrations: Seal penetrations using sleeve and mechanical sleeve seals. Size sleeve for 1 inch annular clear space between pipe and sleeve for installation of mechanical seals.

1. Install steel pipe for sleeves smaller than 6 inches.
2. Install cast-iron "wall pipes" for sleeves 6 inches and larger.
3. Assemble and install mechanical seals according to manufacturer's printed instructions.

R. Below Grade, Exterior Wall, Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Size sleeve for 1-inch annular clear space between pipe and sleeve for installation of mechanical seals.

S. Below Grade, Exterior Wall, Pipe Penetrations: Install ductile-iron wall penetration system sleeves according to manufacturer's printed installation instructions.

T. Verify final equipment locations for roughing-in.

U. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

V. Piping Joint Construction: Joint pipe and fittings as follows and as specifically required in individual piping system specification Sections.

1. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
2. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
3. Soldered Joints: Construct joints according to AWS "Soldering Manual", Chapter 22 "The Soldering of Pipe and Tube".
4. Brazed Joints: Construct joints according to AWS "Brazing Manual", Chapter 28 "Pipe and Tube".
5. 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 inside diameter. Join pipe fittings and valves as follows:

    a. Note the internal length of threads in fittings or valve ends and proximity of internal seat or wall, to determine how far pipe should be threaded into joint.
    b. Apply appropriate tape or thread compound to external pipe threads (except where dry seal threading is specified).
    c. Align threads at point of assembly.
    d. Tighten joint with wrench. Apply wrench to valve end into which pipe is being threaded.
    e. Damaged Threads: Do not use pipe or pipe fittings having threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

W. Welded Joints: Construct joints according to AWS D10.12 "Recommended Practices and Procedures for Welding Low Carbon Steel Pipe" using qualified processes and welding operators according to "Quality Assurance" article.

X. Flanged Joints: Align flange surfaces parallel. Select appropriate gasket concentrically positioned. Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly using torque wrench.

1. Fitting Heat-Fusion Joints: Prepare pipe and fittings and join with heat-fusion equipment, according to manufacturer's printed instructions.

    a. Plain-End Pipe and Socket-Type Fittings: Socket-joining.

Y. Piping Connections: Except as otherwise indicated, make piping connections as specified below.

1. Install unions, in piping 2 inches and smaller, adjacent to each valve and at final connection to each piece of equipment having 2 inches or smaller threaded pipe connection.
2. Install flanges, in piping 2 1/2 inches and larger, adjacent to flanged valves and at final connection to each piece of equipment having flanged pipe connection.
3. Dry Piping Systems (Gas, Compressed Air, and Vacuum): Install dielectric unions and flanges to connect piping materials or dissimilar metals.
4. Wet Piping Systems (Water and Steam): Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.02 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to provide the maximum possible headroom, where mounting heights are not indicated. Equipment platforms, vibration isolation and restraints shall be provided and installed where described and shall be in conformance with Building Code of New York State (latest edition), Chapter 16:

B. Install equipment according to approved submittal data. Portions of the Work are shown only in diagrammatic form. Refer conflicts to the Architect.

C. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, except where otherwise indicated.

D. Install mechanical equipment to facilitate servicing, maintenance and repair or replacement of equipment components. Connect equipment for ease of disconnecting, with minimum of interference with other installations. Extend grease fittings to an accessible location.

E. Install equipment giving right-of-way to piping systems installed at a required slope.

3.03 LABELING AND IDENTIFYING

A. Piping Systems: Install pipe markers on each system. Include arrows showing normal direction of flow.

1. Plastic markers, with application systems. Install on pipe insulation segment where required for hot non-insulated pipes.

2. Locate pipe markers as follows wherever piping is exposed in finished spaces, machine rooms, accessible maintenance spaces (shafts, tunnels, plenums) and exterior non-concealed locations.

    a. Near each valve and control device.
    b. Near each branch, excluding short take-offs for fixtures and terminal units. Mark each pipe at branch, where flow pattern is not obvious.
    c. Near locations where pipes pass through walls, floors, ceilings, or enter non-accessible enclosures.
    d. At access doors, manholes and similar access points that permit view of concealed piping.
    e. Near major equipment items and other points of origination and termination.
    f. Spaced at a maximum of 50 feet intervals along each run. Reduce intervals to 25 feet in congested areas of piping and equipment.
    g. On piping above removable acoustical ceilings, except omit intermediately spaces markers.

3. During back-filling/top-soiling of each exterior underground piping systems, install continuous underground type plastic line marker, located directly over buried line at 6-inches to 8-inches below finished grade. Where multiple small lines are buried in common trench and do not exceed overall width of 16-inches, install single line marker. For tile fields and similar installations, mark only edge pipe lines of field.

B. Equipment: Install engraved plastic laminate sign or equipment marker on or near each major item of mechanical equipment.

1. Lettering Size: Minimum 1/4 inch high lettering for name of unit where viewing distance is less than 2 feet, 1/2 inch high for distance up to 6 feet, and proportionately larger lettering for greater distances. Provide secondary lettering 2/3 to 3/4 of size of principal lettering.

2. Text of Signs: Provide text to distinguish between multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to name of identified unit.

C. Duct Systems: Identify air supply, return, exhaust, intake and relief ducts with duct markers, or provide stenciled signs and arrows, showing duct system service and direction of flow.

1. Location: In each space where ducts are exposed or concealed by removable ceiling system, locate signs near points where ducts enter into space and at maximum intervals of 50 feet.

D. Adjusting: Relocate identifying devices which become visually blocked by work of this Division or other Divisions.

3.04 ERECTION OF METAL SUPPORTS AND ANCHORAGE

A. Provide and install in conformance with the Building Code of New York State (latest edition), Chapter 16: Cut, fit and place miscellaneous metal supports accurately in location, alignment and elevation to support and anchor mechanical materials and equipment.

B. Field Welding: Comply with AWS D1.1 "Structural Welding Code - Steel".

3.05 ERECTION OF WOOD SUPPORTS AND ANCHORAGE

A. Cut, fit and place wood grounds, nailers, blocking, and anchorage to support and anchor mechanical materials and equipment.

B. Select fastener sizes that will not penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood members.

C. Attach to substrates as required to support applied loads.

3.06 GROUTING

A. Install nonmetallic, nonshrink, grout for mechanical equipment base bearing surfaces, pump and other equipment base plates, and anchors. Mix grout according to manufacturer's printed instructions.

B. Clean surfaces that will come into contact with grout.

C. Provide forms for placement of grout, as required.

D. Avoid air entrapment when placing grout.

E. Place grout, completely filling equipment bases.

F. Place grout on concrete bases to provide a smooth bearing surface for equipment.

G. Place grout around anchors.

H. Cure placed grout according to manufacturer's printed instructions

3.07 DRIP PANS

A. Locate drip pans under piping passing over or within 3 ft. horizontally of electrical equipment, and elsewhere as indicated. Hang from structure with rods and building attachments, and weld rods to

sides of drip pan. Brace to prevent sagging or swaying. Connect 1-inch drain line to drain connection, and run to nearest plumbing drain or elsewhere as indicated.

3.08 FIRESTOPPING

A. See section 230680 for additional fire stopping requirements.

3.09 INSTALLATION OF BUILDING ATTACHMENTS

A. Install building attachments at required locations in concrete, in wood or on structural steel for proper piping support. Space attachments within maximum piping span length indicated. Install additional building attachments where support is required for additional concentrated loads, including valves, flanges, guides, strainers, expansion joints, and at changes in direction of piping. Install concrete inserts before concrete is placed, fasten insert securely to forms. Where concrete with compressive strength less than 2500 psi is indicated, install reinforcing bars through openings at top of inserts.

3.10 INSTALLATION OF HANGERS AND SUPPORTS

A. General: Install hangers, supports, clamps and attachments to support piping properly from building structure. Supports / hangers shall conform to the requirements of the Building Code of New York State (latest edition), Chapter 16: Arrange for grouping of parallel runs of horizontal piping to be supported together on trapeze type hangers where possible. Where piping of various sizes is to be supported together by trapeze hangers, space hangers for smallest pipe size or install intermediate supports for smaller diameter pipe. Do not use wire or perforated metal to support piping, and do not support piping from other piping.

B. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers and other accessories. Install hangers and supports of same type and style for grouped piping runs.

C. Support fire water piping independently of other piping.

D. Prevent electrolysis in support of copper tubing by use of hangers and supports which are copper plated.

E. Provisions for movement: Building Code of New York State (latest edition), Chapter 16:

1. Install hangers and supports to allow controlled movement of piping systems and to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends and similar units.
2. Load distribution: Install hangers and supports so that piping live and dead loading and stresses from movement will not be transmitted to connected equipment.
3. Pipe slopes: Install hangers and supports to provide indicated pipe slopes.

F. Adjust hangers and supports and place grout as required under supports to bring piping to proper levels and elevations.

3.11 SHIELDS AND SADDLES FOR INSULATED PIPING

A. 4" and below use 16 gauge x 12 inch long shield with oversized hanger outside insulation.

B. 6" and above use hardwood protection saddle with 16 gauge x 18 inch long shield with oversized hanger outside insulation.

C. 6" and above use steel protection saddle. Fill void between shield and pipe with insulation. Cover with vapor barrier. Protect barrier with 16 gauge x 18 inch long shield with oversized hanger outside assembly.

3.12 INSTALLATION OF ANCHORS

A. Install anchors at proper locations to prevent stresses and to prevent transfer of loading and stresses to connected equipment.

B. Fabricate and install anchor by welding steel shapes, plates and bars to piping and to structure.

C. Where expansion compensators are indicated, install anchors in accordance with expansion unit manufacturer's written instructions, to limit movement of piping and forces to maximums recommended by manufacturer for each unit.

D. Anchor spacings: Where not otherwise indicated, install anchors at ends of principal pipe-runs, at intermediate points in pipe-runs between expansion loops and bends. Make provisions for preset of anchors as required to accommodate both expansion and contraction of piping.

3.13 FLASHINGS

A. Manufacturer's recommendations: Except as otherwise shown or specified, comply with recommendations and instructions of manufacturer of sheet metal being installed.

B. Coat back side of flashings where in contact with concrete and other cementitious substrates, by painting surface in area of contact with heavy application of bituminous coating, or by other permanent separation as recommended by manufacturer of metal.

C. On vertical surfaces, lap flashings minimum of 3".

D. On sloping surfaces, for slopes of not less than 6" in 12", lap unsealed flashings minimum of 6".

E. For embedment of metal flashing flanges in roofing or composition flashing or stripping, extend flanges minimum of 6" for embedment.

END OF SECTION

DIVISION 23 – HEATING, VENTILATING AND AIR CONDITIONING (HVAC)

SECTION 230400 – PAINTING OF MECHANICAL WORK

PART 1 – GENERAL

1.01 SUMMARY OF ITEMS INCLUDED

A. Types of painting of mechanical related work specified in this section include the following:

1. Exposed piping systems.
2. Exposed ductwork systems.
3. Steel supports, hangers and rods.

B. The scope of painting to be applied as part of the work under Division 23 shall consist of the following:

1. Paint exposed mechanical work throughout entire project including piping, ductwork, and terminal HVAC equipment.
2. Paint uninsulated ductwork and equipment.
3. Paint exposed NON insulated pipe, black steel such as pipe hangers, supporting steel, tanks, and equipment having no prime or only a prime coat finish.

1.02 SUBMITTALS

A. Submit manufacturer's technical information, including analysis of ingredients and application instructions for products used in painting work.

B. Certification by the manufacturer that products supplied comply with State VOC Regulations

1.03 DELIVERY, STORAGE AND HANDLING

A. Deliver painting materials to job site in original, new and unopened containers bearing manufacturer's name and label showing the following information:

1. Name and title of material.
2. Manufacturer's stock number and date of manufacture.
3. Contents by volume, for major pigments and vehicles.
4. Thinning instructions.
5. Application instructions.
6. Color name and number.

B. Store materials in approved fire-safe location with adequate ventilation. Area must be kept clean.

1.04 PROJECT CONDITIONS

A. Comply with governing regulations concerning use of and conditions for application of paint. Comply with manufacturer's recommendations and instructions. Do not apply paint in unfavorable conditions of temperature, moisture (including humidity) or ambient contamination (dust and other pollutants).

PART 2 - PRODUCTS

2.01 GENERAL PAINTING PRODUCT REQUIREMENTS

A. Painting products based on a system by Rust-Oleum. Equivalent systems by Devoe and Pratt and Lambert are acceptable.

B. Steel surfaces - normal temperatures:

1. First Coat - Rust-Oleum or equal Red Primer.
2. Second Coat - Rust-Oleum or equal Zinc Chromate Rust-Inhibitive Primer.
3. Third Coat - Rust-Oleum industrial enamels, finish color as directed.

C. Steel surfaces - elevated temperatures above 150 deg. F.

1. First Coat - Rust-Oleum or equal heat resistant primer.
2. Second Coat - Rust-Oleum or equal heat resistant aluminum.
3. Machinery, equipment and apparatus having factory applied prime coat shall be painted as specified above except omit first coat.

D. Exposed canvas on pipe and equipment insulation:

1. First Coat - Primer, Rust-Oleum primer-sealer.
2. Second and third coats - Rust-Oleum Acrylic Series.
3. Colors as directed.

E. Vehicles and thinners: Comply with governing regulations and recognized safe practices in handling, use and drying of paint vehicles and thinners. Compatibility of paint products is the Contractor's exclusive responsibility. Select paint products to ensure freedom from problems relating to vehicles and thinners of type and within limits recommended by paint manufacturer.

PART 3 - EXECUTION

3.01 GENERAL

A. Clean surfaces before applying paint products. Remove oil and grease prior to mechanical cleaning. Comply with paint products manufacturer's instructions for surface cleaning and preparation.

B. Remove surface applied accessories which are not to be painted, and reinstall after completion of painting. Protect non-removable items not to be painted, by covering with paper or plastic film.

C. Ferrous metal surfaces: Remove mill scale and loose rust on surfaces which are not zinc coated or shop/factory prime coated.

1. Clean shop applied prime coats on metal surfaces, and repair (touch-up) prime coats wherever abraded or otherwise damaged, prior to application of paint system.

D. Zinc coated surfaces: Clean with non-petroleum based solvent. Wash with copper sulfate solution and flush with water, unless surface has been pre-treated, or unless treatment is not recommended by manufacturer of prime coat.

3.02 PAINT SYSTEM APPLICATION

A. Comply with manufacturer's recommendations for mixing or stirring paint products immediately before application.

B. Application limitations: Paint every accessible surface of each unit of work indicated to be painted, regardless of whether in location recognized as "concealed" or "exposed" except as otherwise indicated.

1. Omit painting of ductwork and insulated piping above removable ceilings, but apply paint system to pipe hangers, duct hangers and similar unprotected ferrous materials.
2. Omit painting on machined sliding surfaces and rotating shafts of equipment, and on nonferrous finished metals including chrome plate, stainless steel, special anodized aluminum, brass/bronze and copper, and on plastics and similar finished materials, except where specifically indicated to be color-coded by painting.
3. Omit painting on required name plates, labels, identification tags, signs, markers, printed instructions, performance ratings, flow diagrams and similar text and graphics, located within the scope of work indicated to receive paint application.
4. Omit specified prime coat of paint system for metal surfaces where surface has shop applied prime coat of equivalent quality. Apply prime coat on other surfaces to be painted, comply with paint manufacturer's instructions for prime coating where not otherwise indicated. Apply additional prime coats where suction spots or unsealed areas appear.

C. Apply paint in accordance with manufacturer's directions. Apply additional coats when undercoats, stains or other conditions show through final coat of paint, until paint film is of uniform finish, color and appearance.

D. Apply paint at edges, corners, joints, welds and exposed fasteners in manner which will ensure dry-film thickness equal to that of flat surfaces. Allow sufficient time between successive coats for proper drying (comply with manufacturer's drying instructions).

1. Number of coats: Number indicated is minimum number, apply as many coats as are necessary to cover.
2. Coating thickness: Apply paint in uniform coats without thinning in application thickness recommended by manufacturer for each coat.
3. Apply paint in smooth finish without noticeable texture, cloudiness, spotting, holidays, laps, brush marks, runs, sags, ripples, ropiness and other surface imperfections.

3.03 CLEAN UP AND PROTECTION, PAINTING

A. During progress of work, remove from site discarded paint materials, rubbish, cans and rags at end of each work day. Do not leave in paint storage area.

B. Spattered surfaces: Upon completion of painting work, clean paint spattered surfaces. Remove spattered paint by proper methods of washing and scraping, using care not to scratch or otherwise damage finished surfaces.

C. Protection: Protect work of other trades, whether to be painted or not, against damage by painting work. Correct damage by cleaning, repairing or replacing and repainting as directed. Provide "Wet Paint" signs as required to protect newly painted finishes. Remove temporary protective wrappings installed for protection of work not to be painted, after completion of painting operations. At completion of work by other trades, touch up and restore damaged or defaced painted surfaces.

END OF SECTION

DIVISION 23 – HEATING, VENTILATING AND AIR CONDITIONING (HVAC)

SECTION 230513 – COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

A. Internal electrical control devices that operate starters, controllers, etc. shall be furnished, installed, and wired under Division 23. Such devices shall be included but not necessarily limited to, devices connected to ducts, damper switches, float switches, electric thermostats, safety devices, limit switches, relays, push button controllers, selector switches, pilot lights, extra interlock contacts, etc.

B. Equipment starters and disconnects shall be provided by the mechanical contractor completely mounted and wired to internal controls and shall be wired to incoming and outgoing control connections. Should integral equipment starters, disconnects or control panels be shipped separately, the mechanical contractor shall be responsible for the proper installation and connections from equipment to same. Incoming and outgoing (line and load) power wiring to starters / disconnect switches shall be performed by the electrical contractor.

C. The integration of the existing temperature control system wiring and controls shall be the responsibility of the Contractor under Division 15. The Contractor shall be fully responsible for the satisfactory operation of new equipment with the temperature control system.

D. All control transformers, control devices, starters, and control wiring furnished shall be properly protected with fuse cutouts and fuses or circuit breakers to conform to the National Electric Code, latest edition. All work shall be performed by a licensed electrician.

E. Each piece of equipment shall be provided with permanent type laminated, black finish, white core, phenolic nameplate. Nameplates should indicate the name and number of the unit, voltage, and any interlock reference. Each starter furnished by the Contractor shall be provided with a permanent type laminated, black finish, white core phenolic nameplate. Nameplate shall indicate the name of the unit controlled and the voltage rating. Nameplate shall be secured with adhesives. Plastic tape type labels will not be accepted.

F. All equipment shall be provided with disconnect means (by Mechanical Contractor).

G. All wiring furnished and installed by the mechanical contractor shall be in strict accordance with the latest edition of the National Electrical Code and all State and Municipal Agencies having jurisdiction. Except as specified otherwise, minimum size wire shall be #14 AWG (control) and #12 AWG (power) and shall be run in rigid galvanized steel conduit except as noted hereinafter. All wire shall be Type THHN or as required by code. All conduit connections to motors shall be made with short lengths of neoprene jacketed galvanized flexible metallic conduit (liquitite).

H. All wire and cable shall be new, manufactured of soft drawn copper of not less than 98% conductivity, conforming to ASTM Specifications and the latest requirements of N.E.C. Wire, and cable shall have 600 volt insulation (unless otherwise noted or specified) of the type specified and shall be of the standard AWG sizes as called for on Drawings or specified.

I. The Contractor shall furnish all labor and material required for the installation of the systems. A brief description of the work is as follows:

   1. Furnish all electrical control wiring for the new equipment and controls.

   2. Contractor shall apply final finish to insure uniformity.

   3. All cutting, patching, and painting as required.

   4. All controls for units as hereinbefore specified and disconnect switches.

5. Testing of all mechanical contractor installed wiring as directed.

6. Contractor shall perform all work as stated on the documents for fire alarm fan shutdown for all new applicable equipment, unless noted otherwise.

7. Contractor shall obtain an approved independent electrical inspection certificate, covering all work performed by an electrical inspection agency serving the locality of the project.

END OF SECTION

DIVISION 23 – HEATING, VENTILATING AND AIR CONDITIONING (HVAC)

SECTION 230516 – EXPANSION COMPENSATION

PART 1 – GENERAL

1.01 SUMMARY OF ITEMS INCLUDED

A. Expansion compensation products required for this project shall be provided and installed in accordance with section 1621 of the New York State Building Code.

B. Expansion compensation products specified in this section include:

1. Fabricated Expansion Loops.

2. Flexible Ball Pipe Joints.

3. Expansion Compensators.

1.02 QUALITY ASSURANCE

A. Refer to Division 01, for requirements pertaining to substitute materials and equipment.

B. Comply with standards of the Expansion Joint Manufacturer's Association (EJMA).

1.03 SUBMITTALS

A. Product Data: Submit catalog cuts, specifications, installation instructions, and dimensioned drawings for each type of expansion compensation product. Submit schedule showing manufacturer's figure number, size, and location on project.

B. Shop Drawings: Submit shop drawings for fabricated expansion loops indicating location, dimensions, pipe sizes and location and method of attachment of anchors.

C. Maintenance Data: Submit maintenance data and spare parts list for each type of expansion compensation product. Include this data in Maintenance Manual.

PART 2 - PRODUCTS

2.01 EXPANSION LOOPS

A. General: Fabricate expansion loops as dimensioned and located on the Drawings and elsewhere as determined by installer to provide for adequate control of expansion of the installed piping system. Cold spring the loop prior to connecting to the anchored piping.

2.02 FLEXIBLE BALL PIPE JOINTS

A. General: Provide flexible ball pipe joints where indicated for piping systems, with materials and pressure/temperature ratings selected by Installer to suit intended service. Design joints for 360 degree rotation and with minimum of 30 degree angular flexing movement for sizes 1/4" to 6", 15 degrees for sizes 8" to 30". Provide 2 composition gaskets for each joint.

B. Certify carbon steel joints for environmental shock testing in accordance with MIL-S-4456 or MIL-S-901C.

C. Comply with Section II of ASME Boiler and Pressure Vessel Code and ANSI B31.1 Power Piping for materials and design of pressure containing parts and bolting.

D. Test each assembly with steam at working pressure of piping system for zero leaks before shipment.

E. Manufacturer: Subject to compliance with requirements, provide flexible ball pipe joints of the following:

1. Gustin-Bacon Div., Aeroquip Corp.

2.03 EXPANSION COMPENSATORS

A. Low Pressure: 70 psi, 3/4 inch to 3 inch copper pipe, 2 ply phosphor bronze bellows, brass shroud, male copper tube end.

B. High Pressure: 150 psi, 3/4 inch to 3/ inch steel pipe, 2 ply seamless stainless steel bellows, steel shroud and male thread end or psi, 3/4 inch to 3 inch copper pipe all bronze construction male thread or sweat ends.

C. Manufacturer: Subject to compliance with requirements, provide expansion compensators of one of the following:

1. Flexonics Div., UOP, Inc.
2. Keflex, Mfg. Div.
3. Metraflex Co.
4. Vibration Mountings and Controls, Inc.

2.04 PIPE ALIGNMENT GUIDES

A. General: Provide pipe alignment guides on both sides of expansion joints and elsewhere as indicated. Construct with 3 or 4 finger spider traveling inside a guiding sleeve, with provision for anchoring to building substrate.

B. Manufacturer: Subject to compliance with requirements, provide pipe alignment guides of the following:

1. Flexonics Div., UOP, Inc.
2. Keflex Mfg. Div.
3. Metraflex Co.

2.05 PIPE ANCHORS

A. General: Fabricated anchor, coupling with steel angle clips, teflon lined clamp sleeve, or shaped anchor for welding to pipe.

B. Manufacturer: Subject to compliance with requirements, provide anchors of the following:

1. Flexonics Div., UOP, Inc.
2. Keflex Mfg. Div.

PART 3 - EXECUTION

3.01 EXPANSION LOOPS

A. General: Fabricate expansion loops as indicated, in locations indicated, and elsewhere as determined by Installer for adequate expansion of installed piping system. Subject loop to cold spring which will absorb 50 percent of total expansion between hot and cold conditions. Provide pipe anchors and pipe alignment guides as indicated, and elsewhere as determined by Installer to properly anchor piping in relationship to expansion loops.

3.02 EXPANSION COMPENSATION FOR RISERS AND TERMINALS

A. General: Install connection between piping mains and risers with at least 5 pipe fittings including tee in main. Install connections between piping risers and terminal units with at least 4 pipe fittings including tee in riser.

3.03 PIPE ALIGNMENT GUIDES AND ANCHORS

A. General: Install alignment guides on both sides of each expansion joint or loop. Provide anchors secured to building structure as required.

END OF SECTION

DIVISION 23 – HEATING, VENTILATING AND AIR CONDITIONING (HVAC)

SECTION 230519 – METERS AND GAUGES FOR HVAC PIPING

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

A. Thermometers and gages specified in this section include the following:

1. Thermometers and fittings:
2. Pressure gages and fittings:

PART 2 - PRODUCTS

2.01 THERMOMETERS

A. Thermometers:

1. General: Provide and install adjustable, variable angle type thermometers of materials, capacities and ranges indicated.
2. Case: Die cast aluminum finished in baked epoxy enamel, glass front, 9 inches long.
3. Adjustable joint: 180 degree adjustment in vertical plane, 360 degree adjustment in horizontal plane, with locking device.
4. Tube and capillary: Blue liquid filled, magnifying lens, 1-percent scale range accuracy, shock mounted. (Mercury filled not acceptable).
5. Scale: Satin faced, non-reflective aluminum, permanently etched markings.
6. Stem: Copper plated steel, or brass, for separable socket.
7. Range: Conform to the following:

    a. Hot water: 30 to 240 degrees F with 2 degree F scale divisions.
    b. Chilled water: 30 to 180 degrees F with 2 degrees F scale divisions.

8. Manufacturer:

9. Wika
10. Trerice
11. Weiss
12. Or approved equal

B. Dial Thermometers:

1. General – Provide dial bimetal type adjustable angle thermometers of materials, capacities and ranges indicated, designed and constructed for use in service indicted.
2. Case – Type 300 series stainless steel hermetically sealed.
3. Dial – White finished aluminum with black and blue marking.
4. Pointer – balanced aluminum with black finish.
5. Stem – type 300 series stainless steel 1/4"o.d.internal bimetal coil silicone dampened.
6. Range – conform to the following:

    a. Hot water 20° to 240° F. scale divisions.

7. Manufacturer – subject to compliance with requirements, provide glass thermometers of one of the following:

a. Tel-Tru Mfg. Co.
b. Trerice (H.O.) Co.
c. Weiss Instrument Inc.

C. Thermometer wells:

1. General: Provide thermometer wells of brass or stainless steel, pressure rated to match piping system design pressure. Provide 2 inch extension for insulated piping. Provide cap nut with chain fastened permanently to thermometer well.

2. Manufacturer: Same as thermometers.

2.02 PRESSURE GAGES AND FITTINGS

A. Pressure gages:

1. General: Provide "AA" industrial rated liquid filled pressure gages of capacities and ranges indicated, designed and constructed for use in service indicated. All pressure gauges shall be liquid filled unless otherwise specified. Provide gauge cocks for all pressure gauges.
2. Type: General use, 1/2 percent accuracy, ANSI B 40.1 grade A, phosphor bronze bourdon type, bottom connection.
3. Case: Aluminum or brass, glass lens, 4 1/2 inch diameter.
4. Connector: Brass with 1/4 inch male NPT. Provide protective syphon when used for steam service.
5. Scale: White coated aluminum, with permanently etched markings.
6. Range: Conform to the following:

a. Water - 0 - 100 psi.

7. Manufacturer - subject to compliance with requirements, provide pressure gages of one of the following:

a. Ametek, U.S. Gage Div.
b. Trerice
c. Weiss

B. Pressure gage accessories:

1. Gage cocks: Brass cock with 1/4 inch female NPT on each end, and "T" handle brass plug.
2. Syphon: 1/4 inch straight coil constructed of brass tubing with 1/4 inch male NPT on each end.
3. Snubber: 1/4 inch brass bushing with corrosion resistant porous metal disc, through which pressure fluid is filtered. Select disc material for fluid served and pressure rating.
4. Manufacturer: Same as gages.

PART 3 - EXECUTION

3.01 INSTALLATION OF THERMOMETERS

A. General: Install temperature gages in vertical upright position, and tilted so as to be easily read by observer standing on floor.

B. Locations: Install in the following locations and elsewhere as indicated:

1. At inlet and outlet of each hydronic zone 3-way valve.
2. At inlet and outlet of each hydronic boiler and chiller.

3. At inlet and outlet of each hydronic coil in air handling units, and built-up central systems.
4. At inlet and outlet of each hydronic heat exchanger.
5. At inlet and outlet of each hydronic heat recovery unit.
6. At inlet and outlet of each thermal storage tank.
7. At outlet of domestic hot water heater.
8. Common boiler supply and return header.

C. Thermometer wells: Install in piping tee where indicated, in vertical upright position. Fill well with Thermal grease.

3.02 INSTALLATION OF PRESSURE GAGES

A. General: Install pressure gages in piping tee with pressure gage cock, located on pipe at most readable position.

B. Locations: Install in the following locations, and elsewhere as indicated:

1. At suction and discharge of each hydronic pump.
2. At discharge of each pressure reducing valve.
3. At water service outlet.
4. At inlet and outlet of water side for condensers, chillers, and cooling towers.
5. System makeup water line.
6. Accessible hihg point of hydronic piping systems.

C. Pressure gage cocks: Install in piping tee with snubber or syphon if steam.

END OF SECTION

DIVISION 23 – HEATING, VENTILATING AND AIR CONDITIONING (HVAC)

SECTION 230523 – GENERAL DUTY VALVES FOR HVAC PIPING

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and Division 01 Specification sections, apply to work of this section.

1.02 DESCRIPTION OF WORK

A. Extent of valves required by this section is indicated on drawings and/or specified in other Division 23 sections.

B. Types of valves specified in this section include the following:

1. Gate valves.
2. Globe valves
3. Drain valves.
4. Ball valves.
5. Butterfly valves (where specifically approved by engineer only).
6. Check valves.

    a. Wafer Check (where specifically approved by engineer only).

1.03 QUALITY ASSURANCE

A. Marking of valves - comply with MSS SP-25.

B. Valve dimensions - for face-to-face and end-to-end dimensions of flanged or welding end valve bodies, comply with ANSI B16.10.

C. ASME Compliance: ASME 1331.9 for Building Services Piping.

D. Valve types. Provide valves of same type by same manufacturer.

1.04 SUBMITTALS

A. Product data - submit catalog cuts, specifications, installation instructions, and dimensioned drawings for each type of valve. Include pressure drop curve or chart for each type and size of valve. Submit valve schedule showing manufacturer's figure number, size, location and valve features for each required valve.

B. Maintenance data - submit maintenance data and spare parts lists for each type of valve. Include this data in Maintenance Manual.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Handle valves and components carefully to prevent damage, breaking, denting and scoring. Do not install damaged valves or components, replace with new.

B. Store valves and components in clean dry place. Protect from weather, dirt, fumes, water, construction debris, and physical damage.

PART 2 - PRODUCTS

2.01 GENERAL

A. Provide factory fabricated valves recommended by manufacturer for use in service indicated. Provide valves of types and pressure ratings indicated, provide proper selection as determined by installer to comply with installation requirements. Provide sizes as indicated, and connections which properly mate with pipe, tube and equipment connections. Where more than one type is indicated, selection is engineer's option.

B. Valve Features

1. Bypass- when shown provide manufacturer's standard bypass piping and valving.
2. Drain - when shown provide threaded pipe plugs complying with Division 15 "Hot & Chilled water piping" section.
3. Flanged - valve flanged complying with ANSI B16.1 (cast iron), ANSI B16.5, (steel), or ANSI B16.24 (bronze).
4. Threaded - valve ends complying with ANSI B2.1
5. Solder joint - valve ends complying with ANSI B16.18.
6. Trim - fabricate pressure containing components of valve, including stems (shafts) and seats from brass or bronze materials, of standard alloy recognized in valve manufacturing industry.
7. Renewable seat - design seat of valve with removable disc, and assemble valve so disc can be replaced when worn.
8. Extended stem - increase stem length 2" minimum, to accommodate insulation applied over valve.

C. Valve Definitions

1. Mechanical actuator - factory fabricated gears, gear enclosure, external chain attachment and chain designed to provide mechanical advantage in operating valve.
2. Bonnet - part of gate or globe valve through which stem passes to valve body, and attached to valve body by screws, bolts union, or welding.
3. Solid wedge - one piece tapered disc in gate valve, designed for contact on both sides.
4. Outside screw and yoke (OS&Y) - stem and handwheel designed to rise out of bonnet or yoke as valve is operated from closed to open position.
5. Inside screw, non-rising stem - stem and handwheel designed to rotate without rising when valve is operated from closed to open position.
6. Tight shutoff - butterfly valve designed for flow regulation, and manufactured to be tight in closed position.

2.02 GLOBE VALVES

A. Packing - select valves designed for repacking under pressure when fully opened, equipped with packing suitable for intended service. Select valves designed so back seating protects packing and stem threads from fluid when valve is fully opened, and equipped with gland follower.

B. Composition discs - where required, provide suitable material for intended service. For stem throttling service, fit composition disc valve with throttling nut. For metal seated globe valves, provide hardened stainless steel disc and seat ring.

C. Comply with the following standards:

1. Cast iron valves - MSS SP-85.
2. Bronze valves - MSS SP-80.
3. Steel valves - ANSI B16.34.

D. For HVAC hot and chilled water service:

1. Threaded ends 2" and smaller - Class 150, bronze body, union bonnet, rising stem, composition disc.
2. Soldered ends 2" and smaller - Class 125, bronze body, screwed bonnet, rising stem, composition disc.
3. Flanged ends 2 1/2" and larger - Class 125, iron body, bolted bonnet, rising stem, OS&Y, renewable seat and disc.

E. Manufacturer - subject to compliance with requirements, provide globe valves of one of the following:

1. Jenkins Bros, A Corp.
2. Kennedy Valve
3. Stockham Valves and Fittings, Inc.

2.03 DRAIN VALVES

A. For low pressure drainage service:

1. Threaded ends 2" and smaller - Class 125, bronze body, screwed bonnet, rising stem, composition disc, 3/4" hose outlet connection.
2. Soldered ends 2" and smaller - Class 125, bronze body, screwed bonnet, rising stem, composition disc, 3/4" hose outlet connection.

B. Manufacturer - subject to compliance with requirements, provide drain valves of one of the following:

1. NIBCO, Inc.
2. Watts

2.04 BALL VALVES

A. Comply with the following standards:

1. Cast iron valves - MSS SP-72.
2. Steel valves - ANSI B16.34.

B. For HVAC hot and chilled water service:

1. Threaded ends 2" and smaller - Class 125, bronze 2 piece body, full port, bronze ball, bronze stem.
2. Soldered ends 2" and smaller - Class 125, bronze 2 piece body, full port, bronze ball, bronze stem.

C. Manufacturer - subject to compliance with requirements, provide ball valves of one of the following:

1. Jenkins Bros.
2. Stockham Valves & Fittings
3. Watts

2.05 BUTTERFLY VALVES (only where specifically approved by the engineer)

A. General - comply with MSS SP-67. Valves to be tight shutoff. Where butterfly valves are used as shutoffs for terminal or equipment removal or repair, select lug type valves. Select wafer type valves for other applications. Provide gear operators on butterfly valves 8" and larger.

B. For HVAC hot and chilled water service:

1. Lug type 3" and larger - Class 150, ductile iron body, lever operated, cadmium plated ductile iron disc, Type 316 stainless steel stem, EPT or EPDM seat.

C. Manufacturer - subject to compliance with requirements, provide butterfly valves of one of the following:

1. Demco Inc.
2. Jenkins Bros., A Corp.
3. Mark Controls Corp., MCC Centerline.
4. Stockham Valves and Fittings, Inc.
5. Crane Co., Valve Division

2.06 WAFER CHECK VALVES (only where specifically approved by the engineer)

A. General - provide wafer style, butterfly type, spring actuated check valves designed to be installed with gaskets between two standard Class 125 flanges. Construct iron body valves with pressure containing parts of materials conforming to ANSI/ASTM A-126, Grade B. Support hanger pins on both ends by removable side plugs.

B. For water service:

1. 2" and larger - Class 125, cast iron body, stainless steel trim, bronze disc, Buna-N seal.

C. Manufacturer - subject to compliance with requirements, provide wafer check valves of one of the following:

1. Bell & Gossett, ITT Fluid Handling Div.
2. Metraflex Co.
3. NIBCO, Inc.

PART 3 - EXECUTION

3.01 INSTALLATION

A. General - except as otherwise indicated, comply with the following requirements:

1. Install valves where required for proper operation of piping and equipment, including valves in branch lines where necessary to isolate sections of piping. Locate valves so as to be accessible and so that separate support can be provided when necessary.
2. Install valves with stems pointed up, in vertical position where possible, but in no case with stems pointed downward for horizontal plane unless unavoidable. Install valve drains with hose end adapter for each valve that must be installed with stem below horizontal plane.

B. Insulation - where insulation is indicated, install extended stem valves, arranged in proper manner to receive insulation.

C. Applications subject to shock - install valves with bodies of metal other than cast iron where thermal or mechanical shock is indicated or can be expected to occur.

D. Applications subject to corrosion - do not install bronze valves and valve components in direct contact with steel, unless bronze and steel are separated by dielectric insulator. Install bronze valves in steam and condensate service and in other services where corrosion is indicated or can be expected to occur.

E. Mechanical actuators - install mechanical actuators with chain operators where indicated, and where valves 4" and larger are mounted more than 7'-0" above floor in mechanical rooms, boiler rooms, and where recommended by valve manufacturer because of valve size, pressure differential or other operating condition making manual operation difficult.

F. Selection of valve ends (pipe connections) - except as otherwise indicated, select and install valves with the following ends or types of pipe/tube connections.

1. Copper tube size 2" and smaller - soldered joint valves except ball valves used in plumbing systems.
2. Steel pipe, size 2" and smaller - threaded valves.
3. Pipe size 2 1/2" and larger - flanged valves.

G. Valve system - select and install valves with outside screw and yoke stems, except provide inside screw non-rising stem valves where headroom prevents full opening of OS&Y valves.

H. Non-metallic disc - limit selection and installation of valves with non-metallic discs to locations indicated and where foreign material in piping system can be expected to prevent tight shutoff of metal seated valves.

I. Renewable seats - select and install valves with renewable seats, except where otherwise indicated.

J. Fluid control - except as otherwise indicated, install gate, ball, globe, and butterfly valves to comply with ANSI B31.1. Where throttling is indicated or recognized as principal reason for valve, install globe or butterfly valves.

K. Installation of Check valves: Wafer check valves – install between two flanges in horizontal or vertical position for proper direction of flow.

END OF SECTION

DIVISION 23 – HEATING, VENTILATING AND AIR CONDITIONING (HVAC)

SECTION 230548 – VIBRATION ISOLATION

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and Division 01 Specification sections, apply to work specified in this section.

B. This section is a Division 23 Basic Materials and Methods section, and is a part of each Division 23 section making reference to vibration isolation products specified herein. Vibration isolation devices shall conform to the seismic requirements of the New York State Building Code. Isolators shall allow the amount of movement required by this code and shall be equipped with limit stops as required by this code.

1.02 DESCRIPTION OF WORK

A. Types of vibration isolation products specified in this section include the following:

1. Fiberglass Pad and Shapes
2. Neoprene Pads
3. Cork/Neoprene Pads
4. Equipment Rails
5. Fabricated Equipment Bases
6. Roof Curb Isolators
7. Isolation Hangers
8. Riser Isolators
9. Riser Support Isolators
10. Flexible Duct Connectors
11. Flexible Pipe Connectors

B. Vibration isolation products furnished as part of factory-fabricated equipment, are specified as part of the equipment assembly in other Division 23 sections.

C. Refer to other sections of these specifications for equipment foundations, hangers, sealants, gaskets and other work related to vibration isolation work.

1.03 QUALITY ASSURANCE

A. Product qualification - provide each type of vibration isolation unit produced by specialized manufacturer, with not less than 5 years successful experience in production of units similar to those required for this project.

1.04 SUBMITTALS

A. Product data - submit manufacturer's specifications, detailed drawings, performance characteristics data and installation instructions for each type of unit required.

1. Include data for each type and size of unit, showing isolation efficiency, stiffness, natural frequency and transmissibility at lowest operating speed of equipment.
2. Where required, include independent test agencies certified report of test results for each type of unit.

3. For spring units, show wire size, spring diameter, free height, solid-compression height, operating height, fatigue characteristics and ratio of horizontal to vertical stiffness.
4. For spring and pad type units, show basis of spring rate selection for range of loading weights.
5. Include performance certifications where required.

B. Shop drawings - submit shop drawings showing structural design and details of inertia bases, steel beam bases and other custom fabricated work not covered by manufacturer's submitted data.

1. Furnish templates to fabricators of equipment bases, foundations and other support systems, as needed for coordination of vibration isolation units with other work.

C. Submit shop drawings indicating scope of vibration isolation work and locations of units and flexible connections. Include support isolation points for piping and ductwork including risers, air housings and inertia bases.

1. Include schedule of units, showing size or manufacturer's part number, and weight supported and resulting deflection of each unit.

PART 2 - PRODUCTS

2.01 ISOLATION MATERIALS AND SUPPORT UNITS

A. Fiberglass pads and shapes - glass fiber of not more than 0.18 mil diameter, produced by multiple-flame attenuation process, molded with manufacturer's standard fillers and binders through 10 compression cycles at 3 times rated load bearing capacity, to achieve natural frequency of not more than 12 Hertz, in thicknesses and shapes required for use in vibration isolation units.

B. Neoprene pads - oil resistant neoprene sheets, of manufacturer's standard hardness and cross ribbed pattern, designed for neoprene in shear type vibration isolation, and in thicknesses required.

C. Cork/Neoprene pads - close grained composition cork sheet, laminated between 2 sheets of ribbed oil resistant neoprene, in thicknesses required.

D. Vibration isolation products furnished as part of factory-fabricated equipment, are specified as part of the equipment assembly in other Division 23 sections.

E. Refer to other sections of these specifications for equipment foundations, hangers, sealants, gaskets and other work related to vibration isolation work.

F. Equipment rails - where rails or beams are indicated for use with isolator units to support equipment, provide steel beams complying with ANSI/ASTM A36, with minimum depth of 6" or 0.08 x span of beam between isolators (whichever is greater). Provide welded bracket at each end of beams, and anchor each end to spring isolator unit. Provide bolt holes in beams matching anchor bolt holes in equipment. Provide beams of section modulus indicated or, if not indicated, selected for normal-weight equipment loading to limit static load stress to 16,000 psi.

1. Except as otherwise indicated, position equipment on equipment rails so that load will be equally supported by isolator units.

G. Fabricated equipment bases - where supplementary bases are indicated for use with isolator units to support equipment (base not integral with equipment), provide welded unit, fabricated of structural steel shapes, plates and bars complying with ANSI/ASTM A36, as shown. Provide welded support brackets at points indicated, and anchor base to spring isolator units.

H. Except as otherwise indicated, arrange brackets to result in the lowest possible mounting height for equipment. Provide bolt holes in base matching anchor bolt holes in equipment.

1. Where indicated, provide auxiliary steel base for support of motor, mounted on equipment base with slotted anchor bolt holes for adjustment of motor position.
2. Where sizes of base framing members are not indicated, fabricate base with depth of structure not less than 0.10 x longest span of base, rigidly braced to support equipment without deflections or distortions which would be detrimental to equipment or equipment performances.

I. Roof-curb isolators - fabricated frame units sized to match roof curbs as shown, formed with isolation springs between extruded aluminum upper and lower sections, which are shaped and positioned to prevent metal-to-metal contact. Provide continuous airtight and waterproof seal between upper and lower extrusions. Include provisions for anchorage of frame unit to roof curb, and for anchorage of equipment to unit.

J. Isolation hangers - hanger units formed with brackets and including manufacturer's standard compression isolators of type indicated. Design brackets for 5 times rated loading of units. Fabricate units to accept misalignment of suspension members, and for use with either rod or strap type members and including acoustical washers to prevent metal-to-metal contacts.

1. Provide vibration isolation spring with cap and pad type isolator, securely retained in unit.
2. Provide neoprene pad, securely retained in unit.
3. Provide fiberglass pad or shape, securely retained in unit, with threaded metal top plate.
4. Provide removable spacer in each unit, to limit deflection during installation to rated-load deflection.

K. Riser isolators - manufacturer's standard pad type isolator bonded to steel plate, formed for welding to pipe sleeve extension.

L. Riser support isolators - manufacturer's standard pad type isolator laminated between two formed steel plate members, one for welding to pipe sleeve extension and other for welding to pipe riser.

M. Flexible duct connectors - laminated flexible sheet of cotton duct and sheet elastomer (butyl, neoprene or vinyl), reinforced with steel wire mesh where required for strength to withstand duct pressure indicated. Form connectors with full faced flanges and accordian bellows to perform as flexible isolation unit, and of manufacturer's standard length for each size unless otherwise indicated. Equip each unit with galvanized steel retaining rings for airtight connection with ductwork.

N. Flexible pipe connectors:

1. For non-ferrous piping, provide bronze hose covered with bronze wire braid with copper tube ends or bronze flanged ends, brase-welded to hose.
2. For ferrous piping, provide stainless steel hose covered with stainless steel wire braid with NPT steel nipples or 150 psi ANSI flanges, welded to hose.
3. Rubber flexible pipe connectors - provide of rubber and butyl construction with integral full faced duck and butyl flanges, internally steel wire reinforced, and furnished complete with steel retaining rings. Select with temperature and pressure ratings to suit intended service.
4. Manufacturer - subject to compliance with requirements, provide vibration isolation products of one of the following:

a. Korfund Dynamics Corp.
b. Mason Industries, Inc.
c. Vibration Eliminator Co., Inc.
d. Vibration Mountings and Controls, Inc.

PART 3 - EXECUTION

3.01 PERFORMANCE OF ISOLATORS

A. General - comply with minimum static deflections recommended by the American Society of Heating, Refrigerating and Air Conditioning Engineers, including definitions of critical and noncritical locations, for selection and application of vibration isolation materials and units as indicated.

B. Manufacturer's recommendations - except as otherwise indicated, comply with manufacturer's recommendations for selection and application of vibration isolation materials and units.

3.02 APPLICATIONS

A. General - except as otherwise indicated, apply the following types of vibration isolators at indicated locations or for indicated items of equipment. Selection is Installer's option where more than one type is indicated.

B. Neoprene pad type isolators - install where the following equipment is indicated:

1. Floor mounted air handling units, in noncritical locations.
2. Rooftop units mounted on dunnage. (as well as internal spring isolator).

C. Equipment rails and spring isolators - install where the following floor mounted equipment is indicated:

1. Air handling units, 7 1/2 H.P. and larger.
2. Centrifugal fans, 7 1/2 H.P. and larger.

D. Fabricated equipment base and spring isolators - install where the following equipment is indicated:

1. Centrifugal fans.
2. Reciprocating refrigeration compressor, in noncritical locations.

E. Roof curb isolators - install where the following equipment is located on roof curbs over critical locations:

1. Air handling units.
2. Rooftop air conditioning units.
3. Fan or blower units, of more than 1.5 H.P.

F. Isolation hangers - install where the following suspended equipment is indicated:

1. Package air handling units.
2. Pipe over 1" pipe size, located in mechanical equipment rooms and each run connected to vibration isolation mounted equipment for a distance of 100 diameters but not less than 50' - 0".
3. Ductwork (except flexible ductwork), located in mechanical equipment rooms, and each run connected to vibration isolation mounted equipment for a distance of 50' - 0".
4. Sound traps in ductwork.
5. Ductwork, where air velocity is 3000 fpm or greater.

G. Riser isolators - install where the following risers pass through floors and roofs, provide support type where riser support is required:

1. Pipe risers.

2. Pipe risers, within 50' - 0" of connection with vibration isolation mounted equipment.
3. Pipe risers, in critical locations.
4. Pipe risers, 2" pipe size and larger, in critical locations.
5. Ductwork risers, in critical locations.
6. Ductwork risers, where air velocity is 3000 fpm or greater.
7. Ductwork risers, within 50' - 0" of connection with vibration isolation mounted equipment.

H. Flexible duct connectors - install at the following ductwork connections:

1. Connections with vibration isolation mounted air handling equipment.
2. Connections with fixed wall louvers for air intake and exhausts.
3. Where ductwork, 1.0 square foot and greater, changes directions in critical locations.

I. Flexible pipe connectors - install in piping systems at the following location:

1. Connections, 3/4" pipe size and larger, with vibration isolation mounted equipment.

3.03 INSTALLATION

A. General - except as otherwise indicated, comply with manufacturer's instructions for installation and load application to vibration isolation materials and units. Adjust to ensure that units do not exceed rated operating deflections or bottom out under loading, and are not short circuited by other contacts or bearing points. Remove space blocks and similar devices (if any) intended for temporary protection against overloading during installation.

B. Anchor and attach units to substrate and equipment as required for secure operation and to prevent displacement by normal forces, and as indicated.

C. Adjust leveling devices as required to distribute loading uniformly onto isolators. Shim units as required where leveling devices cannot be used to distribute loading properly.

D. Locate isolation hangers as near overhead support structure as possible.

E. Weld riser isolator units in place as required to prevent displacement from loading and operations.

F. Bond flanges of flexible duct connectors to ducts and housings to provide airtight connections. Seal seams and penetrations to prevent air leakage.

G. Flexible pipe connectors - install on equipment side of shutoff valves, horizontally and parallel to equipment shafts wherever possible.

3.04 DEFLECTION MEASUREMENTS

A. Upon completion of vibration isolation work, prepare report showing measured equipment deflections for each major item of equipment as indicated.

END OF SECTION

DIVISION 23 – HEATING, VENTILATING AND AIR CONDITIONING (HVAC)

SECTION 230593 – HVAC TESTING, ADJUSTING AND BALANCING

PART 1 – GENERAL

1.01 SUMMARY OF ITEMS INCLUDED

A. Scope: Extent of HVAC testing, adjusting and balancing work required by this Section is indicated on the drawings, in schedules, and by the requirements of this Section.

B. Testing, Adjusting and Balancing (TAB) contractor to meet or exceed all uniform code testing requirements. (e.g. ASHRAE, ASME, IMC, Etc.)

C. Systems: Testing, adjusting and balancing specified in this Section includes the following systems:

1. Air systems including supply, return and exhaust.
2. Hydronic systems including heating, chilled water.

D. Related Sections: Refer to other Division 23 sections for:

1. Fans
2. Air Terminal Units
3. Pumps
4. Hydronic Piping Systems
5. Ductwork
6. Boilers
7. Chillers and Cooling Towers

1.02 QUALITY ASSURANCE

A. Agency Qualifications

1. The qualifications of the TAB contracting firms shall be submitted, within 30 days of notice to proceed. Recent projects shall be listed and described for the company. Names and telephone numbers of the project contractors and facility managers will be provided.

2. The Owner must approve in writing the qualifications of both the company and the lead technician.

3. Qualifications of TAB Firm Personnel:

a. A minimum of one professional engineer with current registration is required to be in the permanent employment of the firm for supervision and direction in the work performed. This engineer shall be totally responsible for developing job site data as required for test procedures.

b. All personnel used on job site shall be either professional engineer or technicians, who shall have been permanent, full-time employees of firm for a minimum of six (6) months prior to start of work for that specified project.

c. The qualifications of the TAB lead site technician who will remain on site during all TAB work, within 30 days of notice to proceed. Recent projects shall be listed and described for the company. Names and telephone numbers of the project contractors and facility managers will be provided.

d. The Owner must approve in writing the qualifications of both the company and the lead technician.

B. Tester's Qualifications: A specialist certified by the National Environmental Balancing Bureau (NEBB) or Associated Air Balance Council (AABC) with at least 3 years of experience in those testing, adjusting and balancing requirements similar to those required for this project, who is not the installer of the system to be tested and is otherwise independent of the project.

C. Codes and Standards: Provide testing, adjusting and balancing conforming to American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE), American National Standards Institute (ANSI), and either NEBB or AABC the following:

1. American National Standards Institute (ANSI): Comply with the following:

a. S1.4Specification For Sound Level Meters
b. S1.11Specification for Octave-Band and Fractional-Octave-Band Analog and Digital Filters

2. American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE): Comply with ASHRAE recommendations pertaining to measurements, instruments, and testing, adjusting, and balancing.

3. NEBB or AABC: Comply with NEBB'S "Procedural Standards for Testing, Adjusting, Balancing of Environmental Systems" or comply with AABC MN-1 "National Standards," as applicable to mechanical air and hydronic distribution systems, and associated equipment and apparatus.

D. Calibration of Testing Instruments: All measurement instruments used for testing, adjusting, balancing, and commissioning shall be calibrated. The time between the most recent calibration data and the final test report date shall not be over 1 year.

1.03 SUBMITTALS

A. Test Reports: Provide certified test reports, signed by the test and balance supervisor who performed the work. The final reports shall include identification and types of instruments used, and their most recent calibration date and calibration date.

B. Standards: Deliver a copy of either NEBB or AABC standards for testing and balancing work associated with the project. This document shall serve as specific guidance to balancers as to minimum requirements.

C. Maintenance Data: Include, in maintenance manuals, copies of balance test reports and identification of instruments.

D. Qualifications: Submit the individual qualifications of all persons responsible for supervising and performing the actual work.

1.04 AGENDA

A. Agenda: A preliminary report and agenda shall be submitted and approved prior to the start of testing and balancing work.

1. Review Drawings and Specifications prior to installation of any of the affected systems, and submit a report indicating any deficiencies in the systems that would preclude the proper adjusting, balancing, and testing of the systems.

2. The agenda shall include a general description of each air and water system with its associated equipment and operation cycles for heating, intermediate, and cooling.

3. The agenda shall include a list of all air and water flow and air terminal measurements to be performed.

4. The agenda shall incorporate the proposed selection points for sound measurements, including typical spaces as well as sound sensitive areas.

5. The agenda shall also include specific test procedures and parameters for determining specified quantities (e.g. flow, drafts, sound levels) from the actual field measurements to establish compliance with contract requirements. Samples of forms showing application of procedures and calculations to typical systems shall be submitted.

6. Specific test procedures for measuring air quantities at terminals shall specify type of instrument to be used, method of instrument application (by sketch) and factors for:

    a. Air terminal configuration.
    b. Flow direction (supply or exhaust).
    c. Velocity corrections.
    d. Effective area applicable to each size and type of air terminal.
    e. Density corrections.

7. The agenda shall include identification and types of measurement instruments to be used, and their most recent calibration date and calibration date.

1.05 JOB CONDITIONS

A. General: Do not proceed with testing, adjusting and balancing work until the following conditions have been met.

1. Work has been completed and is operable. Ensure that there is no latent residual work yet to be completed on the tested equipment.

2. Work scheduled for testing, adjusting and balancing is clean and free from debris, dirt and discarded building materials.

3. All architectural openings (doors, windows, and other openings) which may affect the operation of the system to be tested, adjusted, and balanced shall at their normal states.

4. All related mechanical systems which may affect the operation of the system to be tested, adjusted, and balanced shall be at their normal operating conditions. Coordinate tests with Controls Contractor.

5. Air handling unit filters are not "loaded"; Mechanical Contractor shall replace, if required, prior to balancing.

PART 2 - PRODUCTS

2.01 PATCHING MATERIALS

A. Material: Seal, patch and repair ductwork, piping and equipment drilled or cut for testing purposes.

1. Plastic plugs with retainers may be used to patch drilled holes in ductwork and housings.

2. Piping shall be capped with materials the same as the piping system.

3. Insulation shall be neatly hemmed with metal or plastic.

2.02 TEST INSTRUMENTS

A. Standards: Utilize instruments and equipment of type, precision, and capacity as recommended in the following standards:

1. NEBB "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems."

2. AABC Manual MN-1, "AABC National Standards".

B. Test Instruments: All instruments used for measurements shall be accurate and calibration histories for each instrument shall be available for examination. Each test instrument shall be calibrated by an approved laboratory or by the manufacturer. Owner's representative has the right to request instrument recalibration, or the use of other instruments and test methodology, where accuracy of readings is questionable.

C. Additional Instruments: Permanently installed measuring instruments, such as temperature and pressure gauges, shall be checked against transfer standard instruments. Any instrument which does not meet specification requirement shall be replaced or recalibrated.

D. Cone Instruments: Employ manufactured enclosure type cones, capable of air volume direct readings, for all diffuser air flow measurements. The readout meters shall meet calibration requirements.

PART 3 - EXECUTION

3.01 PROCEDURES AND INSTRUMENTS, GENERAL

A. Requirements: All systems and components thereof shall be adjusted to perform as required by drawings and specifications.

B. Test Duration: Operating tests of heating and cooling coils, fans, and other equipment shall be of not less than four hours duration after stabilized operating conditions have been established. Capacities shall be based on temperatures and air and water quantities measured during such tests.

C. Instrumentation: Method of application of instrumentation shall be in accordance with the approved agenda.

1. All instruments shall be applied in accordance with the manufacturer's certified instructions.

2. All labor, instruments, and appliances required shall be furnished by the balancer. Permanently installed instruments used for the tests (e.g., flow meters and Btu meters) shall not be installed until the entire system has been cleaned and ready for operation.

3.02 AIR SYSTEM PROCEDURES

A. Adjustments: Adjust all air handling systems to provide approximate design air quantity to or through, each component, and to maintain stable and comfortable interior temperatures, free of drafts or stagnant conditions. Adjusting and balancing of all systems shall be conducted during periods of the year approximating maximum seasonal operation. Verify operating parameters prior to start of balancing. Laboratory doors shall be closed and fume hood sashes full open, and all

other ancillary systems in simultaneous operation. Coordinate with automatic control system operation.

B. Balance: Flow adjusting (volume control) devices shall be used to balance air quantities (i.e., proportion flow between various terminals comprising system) to the extent that their adjustments do not create objectionable air motion or sound (i.e., in excess of specified limits).

1. Balancing between runs (submains, branch mains, and branches) generally shall be accomplished by flow regulating devices at, or in, the divided-flow fitting.

2. Restriction imposed by flow regulating devices in or at terminals shall be minimal. Final measurements of air quality shall be made after the air terminal has been adjusted to provide the optimum air patterns of diffusion.

C. Fan Adjustment: Total air system quantities, generally, shall be varied by adjustment of fan speeds or axial-flow fan wheel blade pitch. Damper restriction of a system's total flow may be used only for systems with direct-connected fans (without adjustable pitch blades), provided system pressure is less than 1/2-inch W.G. and sound level criteria is met.

D. Air Measurement: Where air quantity measuring devices are specified in other sections such systems shall be used as a cross-check of portable measuring equipment.

1. Except as specifically indicated herein, pitot tube traverses shall be made of each duct to measure air flow therein. Pitot tubes, associated instruments, traverses, and techniques shall conform to the ASHRAE "Handbook Fundamentals Inch Pound Edition."

2. For ducts serving modular office areas with movable partitions, which are subject to change, pitot tube traverses may be omitted provided the duct serves only a single room or space and its design volume is less than 2000 cfm. In lieu of pitot tube traverses, air flow in the duct shall be determined by totalling volume of individual terminals served, measured as described herein.

3. Where duct's design velocity and air quantity are both less than 1000 (fpm/cfm), air quantity may be determined by measurements at terminals served.

E. Test Holes: Test holes shall be in a straight duct, as far as possible downstream from elbows, bends, take-offs, and other turbulence generating devices, to optimize reliability of flow measurements.

F. Air Terminal Balancing: Generally, measurement of flow rates by means of velocity meters applied to individual terminals, with or without cones or other adapters, shall be used only for balancing. Measurement of air quantities at each type of air terminal (inlet and outlet) shall be determined by the method approved for the balancing agenda.

G. Air Motion: Air motion and distribution shall be as specified and indicated on Drawings.

3.03 WATER SYSTEM PROCEDURES

A. Adjustment: All heating, cooling and condensing water systems shall be adjusted to provide required quantity to or through each component. Verify operating parameters prior to start of balancing.

B. Metering: Water quantities and pressures shall be measured with calibrated meters.

1. Venturi tubes, orifices, or other metering fittings and pressure gauges shall be used to measure water flow rates and balance systems. Systems shall be adjusted to provide the approved

pressure drops through the heat transfer equipment (coils [except room units], converters, etc.) prior to the capacity testing.

2. Where flow metering fittings are not installed, in air/water type heat transfer equipment, flow balance shall be determined by measuring the air side energy differential across the heat transfer equipment. Measurement of water temperature differential shall be performed with the air system, adjusted as described herein, in operation.

C. Automatic Controls: Automatic control valves shall be positioned for full flow through the heat transfer equipment of the system during tests.

D. Flow: Flow through bypass circuits at three-way valves shall be adjusted to equal that through the supply circuit, when the valve is in the bypass position.

E. Distribution: Adjustment of distribution shall be effected by means of balancing devices (cocks, valves, and fittings) and automatic flow control valves as provided; service valves shall not be used.

1. Where automatic flow control valves are utilized in lieu of Venturi tubes, only pressure differential need be recorded, provided that the pressure is at least the minimum applicable to the tag rating.

F. Special Procedures: Where available pump capacity (as designed) is less than total flow requirements of individual heat transfer units of system served, full flow may be simulated by the temporary restriction of flow to portions of the system; specific procedures shall be delineated in the agenda.

3.04 HEAT EXCHANGER CAPACITY VERIFICATION

A. Air coil capacities shall be verified from air side measurement data. Capacities of coils shall be the difference of the energy carried by the air between the up stream and down stream of the coils.

B. The measured air flow rate for the fan may be used for air coil capacity calculations providing no ducted bypassing of coil is occurring.

C. Capacity verifications shall be performed after air and water systems have been balanced. Heat exchangers using steam as the exchange medium shall have the steam measured and adjusted to the specified pressure.

D. False load shall be applied if the upstream air or water does not meet the specified conditions at the time of test.

3.05 REPORTS

A. Submittals: Three copies of the reports described herein, covering air and water system performance, air motion (fpm), and sound pressure levels, shall be submitted prior to final tests and inspection.

B. Instrument Records: Types, serial numbers, and dates of calibration of all instruments shall be included.

C. Reports: Reports shall conspicuously identify items not conforming to contract requirements, or obvious malfunction and deficiencies.

3.06 AIR SYSTEM DATA

A. Report: The report shall include for each air handling system the data listed below.

1. Equipment (Fan or Factory Fabricated Station Unit):

    a. Installation data

        1) Manufacturer and model
        2) Size
        3) Arrangement, discharge and class
        4) Motor hp, voltage, phase, cycles, and full load amps
        5) Location and local identification data

    b. Design data

        1) Data listed in schedules on drawings and specifications.

    c. Fan recorded (test) data

        1) cfm
        2) Static pressure
        3) rpm
        4) Motor operating amps motor operating bhp

2. Duct Systems:

    a. Duct air quantities (maximum and minimum) - main, submains, branches, outdoor (outside) air, total air, and exhaust

        1) Duct size(s)
        2) Number of Pitot tube (pressure measurements)
        3) Sum of velocity measurements (Note: Do not add pressure measurements)
        4) Average velocity
        5) Recorded (test) cfm design cfm

    b. Individual air terminals

        1) Terminal identification supply or exhaust, location and number designation
        2) Type size, manufacturer and catalog identification applicable factor for application, velocity, area, etc., and designated area
        3) Design and recorded velocities- fpm (state "core," "inlet," etc., as applicable)
        4) Design and recorded quantities -cfm deflector vane or diffusion cone settings

3.07 WATER SYSTEM DATA

A. Report: The certified report for each water system shall include the data listed below.

1. Pumps:

    a. Installation data

        1) Manufacturer and model
        2) Size
        3) Type drive
        4) Motor hp, voltage, phase, and full load amps

    b. Design data

        1) gpm

2) Head
3) rpm, bhp, and amps

c. Recorded data

1) Discharge pressures (full-flow and no-flow)
2) Suction pressures (full-flow and no-flow) operating head
3) Operating gpm (from pump curves if metering is not provided) no-load amps (where possible)
4) Full-flow amps
5) No-flow amps

2. Air Heating and Cooling Equipment:

a. Design data

1) Load in Btu or MBh
2) gpm
3) Entering and leaving water temperature
4) Entering and leaving air conditions (DB and WB)

b. Recorded data

1) Type of equipment and identification (location or number designation)
2) Entering and leaving air conditions (DB and WB)
3) Entering and leaving water temperatures

3. Water Chilling Units:

a. Installation data

1) Manufacturer and model
2) Motor hp, voltage, cycles, phase, and full load amps
3) Part load amperes
4) gpm - chiller and condenser
5) Water pressure drop - chiller and condenser
6) Entering and leaving water temperature - chiller and condenser

b. Recorded data (chiller and condenser)

1) gpm
2) Water pressure drop
3) Entering and leaving water temperature
4) Amperes

3.08 FINAL COMMISSIONING TESTS, INSPECTIONS AND ACCEPTANCE

A. Scope: Test shall be made to demonstrate that capacities and performance of air and water systems comply with contract requirements.

1. At the time of final inspection, recheck random selection of data (water and air quantities, air motion, and sound levels) recorded in the balancing report. All laboratories shall be rechecked for satisfactory air flow and motion on vicinity of and through hoods.

2. Points and areas for recheck shall be selected by the Owner's Representative.

3. Measurement and test procedures shall be the same as approved for work forming basis of certified report.

4. Selections for recheck (specific plus random), in general, will not exceed 25 percent of the total number tabulated in the report, except that special air systems may require a complete recheck for safety reasons.

B. Retests: If random tests elicit a measured flow deviation of 10 percent or more from, or a sound level of 2 db or more greater than, that recorded in the report listings, as 10 percent or more of the rechecked selections, the report shall be automatically rejected. In the event the report is rejected, all systems shall be readjusted and tested, new data recorded, new certified reports submitted, and new inspection tests made, all at no additional cost.

C. Marking of Settings: Following final acceptance of balance reports, the settings of all valves, splitters, dampers, and other adjustment devices shall be permanently marked so that adjustment can be restored if disturbed at any time. Devices shall not be marked until after final acceptance.

END OF SECTION

DIVISION 23 – HEATING, VENTILATING AND AIR CONDITIONING (HVAC)

SECTION 230680 – FIRE STOPPING

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 Specification Section, apply to work specified in this section.

1.02 DEFINITIONS

A. Firestopping: Material or combination of materials used to retain integrity of fire-rated construction by maintaining an effective barrier against the spread of flame, smoke, and hot gases through penetrations in/ joints between fire rated wall and floor assemblies.

1.03 GENERAL DESCRIPTION OF THE WORK OF THIS SECTION

A. Only tested fire stop systems shall be used in specific locations as follows:

1. Penetrations for the passage of ductwork, cable, cable tray, conduit, piping, electrical bus ways and raceways through fire-rated vertical barriers (walls and partitions), horizontal barriers (floor/ceiling assemblies), and vertical service shaft walls and partitions.

B. Safing slot gaps between edge of floor slabs and curtain walls.

C. Openings between structurally separate sections of wall or floors.

D. Gaps between the top of walls and ceilings or roof assemblies.

E. Expansion joints in walls and floors.

F. Openings and penetrations in fire-rated partitions or walls containing fire doors.

G. Openings around structural members which penetrate floors or walls.

1.04 RELATED WORK OF OTHER SECTIONS

A. Coordinate work of this section with work of other sections as required to properly execute the work and as necessary to maintain satisfactory progress of the work of other sections, including:

1. Section 033000 – Cast-In-Place Concrete Work
2. Section 042000 – Unit Masonry
3. Section 079200 – Joint Sealants
4. Section 092300 – Gypsum Plaster
5. Section 092900 – Gypsum Wall Board
6. Section 230300 – Mechanical Basic Materials and Methods
7. Section 230700 – HVAC Insulation

1.05 REFERENCES

A. Test Requirements: ASTM E-814-02, "Standard Method of Fire Tests of Through Penetration Fire Stops"

B. Underwriters Laboratories (UL) of Northbrook, IL runs ASTM E-814 under their designation of UL 1479 and publishes the results in their "FIRE RESISTANCE DIRECTORY" that is updated annually.

1. UL Fire Resistance Directory:

a. Fire stop Devices (XHJI)
b. Fire Resistance Ratings (BXUV)
c. Through-Penetration Fire stop Systems (XHEZ)
d. Fill, Voids, or Cavity Material (XHHW)
e. Forming Materials (XHKU)

2. Alternate “Omega Point Laboratories Directory” (updated annually)

C. Test Requirements: UL 2079, “Tests for Fire Resistance of Building Joint Systems” (June 2024.)

D. Test Requirements: ASTM E 1966-01, “Standard test method for Fire Resistive Joint Systems”

E. Inspection Requirements: ASTM E 2174 – 01, “Standard Practice for On-site Inspection of Installed Fire Stops.”

F. International Firestop Council Guidelines for Evaluating Firestop Systems Engineering Judgments

G. ASTM E-84-01, Standard Test Method for Surface Burning Characteristics of Building Materials.

H. All major building codes: ICBO, SBCCI, BOCA, and the Building Code of New York State.

I. NFPA 101 - Life Safety Code

J. NFPA 70 - National Electric Code

1.06 QUALITY ASSURANCE

A. A manufacturer's direct representative (not distributor or agent) to be on-site during initial installation of firestop systems to train appropriate contractor personnel in proper selection and installation procedures. This will be done per manufacturer's written recommendations published in their literature and drawing details.

B. Firestop System installation must meet requirements of ASTM E-814, UL 1479 or UL 2079 tested assemblies that provide a fire rating equal to that of construction being penetrated.

C. Proposed firestop materials and methods shall conform to applicable governing codes having local jurisdiction.

D. Firestop Systems do not reestablish the structural integrity of load bearing partitions/assemblies, or support live loads and traffic. Installer shall consult the structural engineer prior to penetrating any load bearing assembly.

E. For those firestop applications that exist for which no UL tested system is available through a manufacturer, an engineering judgment derived from similar UL system designs or other tests will be submitted to local authorities having jurisdiction for their review and approval prior to installation. Engineer judgment drawings must follow requirements set forth by the International Firestop Council (Latest Edition varies (2009 – 2018), and may be amended from time to time).

1.07 SUBMITTALS

A. Submit Product Data: Manufacturer's specifications and technical data for each material including the composition and limitations, documentation of UL firestop systems to be used and manufacturer's installation instructions to comply with Section 13300.

B. Manufacturer's engineering judgment identification number and drawing details when no UL system is available for an application. Engineer judgment must include both project name and contractor's name who will install firestop system as described in drawing.

C. Submit material safety data sheets provided with product delivered to job-site.

1.08 INSTALLER QUALIFICATIONS

A. Engage an experienced Installer who is certified, licensed, or otherwise qualified by the firestopping manufacturer as having been provided the necessary training to install manufacturer's products per specified requirements. A supplier's willingness to sell its firestopping products to the Contractor or to an Installer engaged by the Contractor does not in itself confer qualification on the buyer.

1.09 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials undamaged in manufacturer's clearly labeled, unopened containers, identified with brand, type, and UL label where applicable.

B. Coordinate delivery of materials with scheduled installation date to allow minimum storage time at job-site.

C. Store materials under cover and protect from weather and damage in compliance with manufacturer's requirements, including temperature restrictions.

D. Comply with recommended procedures, precautions or remedies described in material safety data sheets as applicable.

E. Do not use damaged or expired materials.

1.10 PROJECT CONDITIONS

A. Do not use materials that contain flammable solvents.

B. Schedule installation of firestopping after completion of penetrating item installation but prior to covering or concealing of openings.

C. Verify existing conditions and substrates before starting work. Correct unsatisfactory conditions before proceeding.

D. Weather conditions: Do not proceed with installation of firestop materials when temperatures exceed the manufacturer's recommended limitations for installation printed on product label and product data sheet.

E. During installation, provide masking and drop cloths to prevent firestopping materials from contaminating any adjacent surfaces.

PART 2 - PRODUCTS

2.01 FIRESTOPPING GENERAL

A. Provide firestopping composed of components that are compatible with each other, the substrates forming openings, and the items, if any, penetrating the firestopping under conditions of service and application, as demonstrated by the firestopping manufacturer based on testing and field experience.

B. Provide components for each firestopping system that are needed to install fill material. Use only components specified by the firestopping manufacturer and approved by the qualified testing agency for the designated fire-resistance-rated systems.

C. Firestopping Materials are either “cast-in-place” (integral with concrete placement) or “post installed.” Provide cast-in-place firestop devices prior to concrete placement.

2.02 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with through penetration firestop systems (XHEZ) and joint systems (XHBN) listed in Volume 2 of the UL Fire Resistance Directory, provide products of the following manufacturers as identified below:

1. Hilti, Inc., Tulsa, Oklahoma (or equal) 800-879-8000

2.03 MATERIALS

A. Use only firestop products that have been UL 1479, ASTM E-814, or UL 2079 tested for specific fire-rated construction conditions conforming to construction assembly type, penetrating item type, annular space requirements, and fire-rating involved for each separate instance.

B. Cast-in place firestop devices for use with non-combustible and combustible plastic pipe (closed and open piping systems) penetrating concrete floors, the following products are acceptable:

1. Hilti CP 680 Cast-In Place Firestop Device
   a. Add Aerator adaptor when used in conjunction with aerator (“sovent”) system.

2. Hilti CP 681 Tub Box Kit for use with tub installations.

C. Sealants, caulking materials, or foams for use with non-combustible items including steel pipe, copper pipe, rigid steel conduit and electrical metallic tubing (EMT), the following products are acceptable:

1. Hilti FS-ONE Intumescent Firestop Sealant
2. Hilti CP 604 Self-leveling Firestop Sealant
3. Hilti CP 620 Fire Foam
4. Hilti CP 606 Flexible Firestop Sealant
5. Hilti CP 601s Elastomeric Firestop Sealant

D. Sealants or caulking materials for use with sheet metal ducts, the following products are acceptable:

1. Hilti CP 601s Elastomeric Firestop Sealant
2. Hilti CP 606 Flexible Firestop Sealant
3. Hilti FS-ONE Intumescent Firestop Sealant

E. Sealants, caulking or spray materials for use with fire-rated construction joints and other gaps, the following products are acceptable:

1. Hilti CP 672 Speed Spray
2. Hilti CP 601s Elastomeric Firestop Sealant
3. Hilti CP 606 Flexible Firestop Sealant
4. Hilti CP 604 Self-leveling Firestop Sealant

F. Pre-formed mineral wool designed to fit flutes of metal profile deck and gap between top of wall and metal profile deck; as a backer for spray material.

1. Hilti CP 677 Speed Plugs
2. Hilti CP 767 Speed Strips

G. Intumescent sealants, caulking materials for use with combustible items (penetrants consumed by high heat and flame) including insulated metal pipe, PVC jacketed, flexible cable or cable bundles and plastic pipe, the following products are acceptable:

1. Hilti FS-ONE Intumescent Firestop Sealant

H. Foams, intumescent sealants, caulking or putty materials for use with flexible cable or cable bundles, the following products are acceptable:

1. Hilti FS-ONE Intumescent Fire stop Sealant
2. Hilti CP 618 Fire stop Putty Stick
3. Hilti CP 620 Fire Foam
4. Hilti CP 601s Elastomeric Fire stop Sealant
5. Hilti CP 606 Flexible Fire stop Sealant

I. Non curing, re-penetrable intumescent sealants, caulking or putty materials for use with flexible cable or cable bundles, the following products are acceptable:

1. Hilti CP 618 Fire stop Putty Stick

J. Wall opening protective materials for use with U.L. listed metallic and specified nonmetallic outlet boxes, the following products are acceptable:

1. Hilti CP 617 Fire stop Putty Pad

K. Fire stop collar or wrap devices attached to assembly around combustible plastic pipe (closed and open piping systems), the following products are acceptable:

1. Hilti CP 642 Fire stop Collar
2. Hilti CP 643 Fire stop Collar
3. Hilti CP 645 Wrap Strips

L. Materials used for complex penetrations made to accommodate cable trays, multiple steel and copper pipes, electrical bus ways in raceways, the following products are acceptable:

1. Hilti CP 637 Trowelable Fire stop Compound
2. Hilti FS 657 FIRE BLOCK
3. Hilti CP 620 Fire Foam

M. Non curing, re-penetrable materials used for large size/complex penetrations made to accommodate cable trays, multiple steel and copper pipes, electrical bus ways in raceways, the following products are acceptable:

1. Hilti FS 657 FIRE BLOCK

N. Sealants or caulking materials used for openings between structurally separate sections of wall and floors, the following products are acceptable:

1. Hilti CP 672 Speed Spray
2. Hilti CP 601s Elastomeric Fire stop Sealant
3. Hilti CP 606 Flexible Fire stop Sealant
4. Hilti CP 604 Self-Leveling Fire stop Sealant

O. Provide a fire stop system with a "F" Rating as determined by UL 1479 or ASTM E814 which is equal to the time rating of construction being penetrated.

P. Provide a fire stop system with an Assembly Rating as determined by UL 2079 which is equal to the time rating of construction being penetrated.

PART 3 - EXECUTION

3.01 PREPARATION

A. Verification of Conditions: Examine areas and conditions under which work is to be performed and identify conditions detrimental to proper or timely completion.

1. Verify penetrations are properly sized and in suitable condition for application of materials.

2. Surfaces to which fire stop materials will be applied shall be free of dirt, grease, oil, rust, laitance, release agents, water repellents, and any other substances that may affect proper adhesion.

3. Provide masking and temporary covering to prevent soiling of adjacent surfaces by firestopping materials.

4. Comply with manufacturer's recommendations for temperature and humidity conditions before, during and after installation of firestopping.

5. Do not proceed until unsatisfactory conditions have been corrected.

3.02 COORDINATION

A. Coordinate location and proper selection of cast-in-place Fire stop Devices with trade responsible for the work. Ensure device is installed before placement of concrete.

B. Responsible trade to provide adequate spacing of field run pipes to allow for installation of cast-in-place fire stop devices without interferences.

3.03 INSTALLATION

A. Regulatory Requirements: Install fire stop materials in accordance with UL Fire Resistance Directory or Omega Point Laboratories Directory.

B. Manufacturer's Instructions: Comply with manufacturer's instructions for installation of through-penetration and construction joint materials.

1. Seal all holes or voids made by penetrations to ensure an air and water resistant seal.

2. Consult with mechanical engineer, project manager, and damper manufacturer prior to installation of UL fire stop systems that might hamper the performance of fire dampers as it pertains to duct work.

3. Protect materials from damage on surfaces subjected to traffic.

3.04 FIELD QUALITY CONTROL

A. Examine sealed penetration areas to ensure proper installation before concealing or enclosing areas.

B. Keep areas of work accessible until inspection by applicable code authorities.

C. Inspection of through-penetration firestopping shall be performed in accordance with ASTM E 2174, “Standard Practice for On-Site Inspection of Installed Fire Stops” or other recognized standard.

D. Perform under this section patching and repairing of firestopping caused by cutting or penetrating of existing fire stop systems already installed by other trades.

3.05 ADJUSTING AND CLEANING

A. Remove equipment, materials and debris, leaving area in undamaged, clean condition.

B. Clean all surfaces adjacent to sealed holes and joints to be free of excess fire stop materials and soiling as work progresses.

END OF SECTION

DIVISION 23 – HEATING, VENTILATING AND AIR CONDITIONING (HVAC)

SECTION 230700 – HVAC INSULATION

PART 1 – GENERAL

1.01 WORK INCLUDED

A. Duct Insulation.

B. Pipe Insulation.

C. Equipment and Specialties Insulation.

D. Acoustical Wrap.

1.02 RELATED WORK

A. Division 23 – Mechanical, General

B. Division 23 – Hangers and Supports

C. Division 23 – Sleeves and Seals

D. Division 23 – Pumps

E. Division 23 – Refrigerant Piping System

F. Division 23 – Ductwork

1.03 DEFINITIONS

A. R: Thermal resistance of insulation, in units of hr-sf-deg F/Btu.

B. Run-out: Piping not more than 12 feet long that runs to an individual unit.

C. Subject to Damage: Items installed exposed less than 8 feet above the walking surface (i.e., floor platform, roof, grade, etc.) adjacent to the item.

1.04 QUALITY ASSURANCE

A. All insulation and materials shall have a fire hazard rating not to exceed 25 for flame spread and 50 for smoke development, as tested by ASTM E 84, NFPA 255, and UL 723.

1.05 SUBMITTALS

A. All submittals shall comply with Section 230000.

B. Provide product data on all insulation materials to be used. Indicate thickness to be used.

1.06 GENERAL REQUIREMENTS

A. Code Compliance: Contractor shall insulate all systems with the materials and thicknesses as required by code, but in no case shall the insulation be less than that specified herein. In some cases the specified insulation exceeds code, and shall be provided as specified. Not all systems

requiring insulation by code are specified but shall be provided with insulation where required by code.

B. Insulation at Hangers: Insulation shall be continuous through hangers on all insulated systems (except ductwork). Inserts at hangers are specified in Section 230300 and are considered as part of the hanger and support system. Inserts are required to be installed at the time of pipe installation and are intended to be installed by the Contractor installing the pipe hanger/supports. See Section 230300.

C. All adhesives, sealants, mastics and similar materials shall be low-VOC type and comply with Section 230000 Low-VOC requirements.

1.07 REFERENCES

A. ASTM A 653: Standard Specification For Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot Dip Process.

B. ASTM B 209: Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

C. ASTM C 547: Standard Specification for Mineral Fiber Pipe Insulation.

D. ASTM C 1136: Standard Specifications for Flexible, Low Permeance Vapor Retarders for Thermal Insulation.

E. ASTM C 1290: Standard Specification for Flexible Fibrous Glass Blanket Insulation Used to Externally Insulate HVAC Ducts.

F. ASTM E 84: Standard Test Method for Surface Burning Characteristics of Building Materials.

G. NCIIS: National Commercial & Industrial Insulation Standards, published by Midwest Insulation Contractors Association, 5th Edition.

H. NFPA 255: Standard Method of Test of Surface Burning Characteristics of Building Materials.

I. UL 723: Tests For Surface Burning of Building Materials.

PART 2 – PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Products shall comply with Section 230000.

B. Insulation: Johns Manville, Armacell, Owens-Corning, Knauf, Pittsburgh Corning, GLT, Halstead, Thermal Pipe Systems.

C. Accessories: Johns Manville, Armacell, Owens-Corning, Knauf, Pittsburgh Corning, GLT, Halstead, Duro Dyne, Gustin Bacon, Childers, RPR, Tee Cee, JPS, Buckaroos.

D. Acoustical Wrap: Kinetics Noise Control.

E. Fire Protection Duct Wrap: 3M.

2.02 DUCT INSULATION

A. Flexible Glass Fiber:

B. Material: Inorganic glass fibers, bonded with a thermosetting resin.

C. Jacket: All-purpose, factory-applied, laminated glass-fiber- reinforced, flame-retardant kraft paper and aluminum foil having self-sealing lap.

D. Board: ASTM C 612, Class 2, semi-rigid jacketed board.

1. Thermal Conductivity: 0.23 Btu x inch/h x sq. ft. x deg F average maximum at 75 deg F mean temperature.

2. Density: 3 pcf average maximum.

E. Blanket: ASTM C 553, Type II, Class F-1, jacketed flexible blankets. (maximum 25% compression installed)

1. Thermal Conductivity: 0.23 Btu x inch/h x sq. ft. x deg F average maximum at 75 deg F mean temperature.

F. Adhesive: Produced under the UL Classification and follow-up service.

1. Type: Non-flammable, water-based.
2. Service Temperature Range: Minus 20 to 180 deg F (Minus 29 to 82 deg C).

G. Vapor Barrier Coating: Waterproof coating recommended by insulation manufacturer for outside service.

2.03 ACCESSORIES AND ATTACHMENTS

A. Glass Cloth and Tape: Woven glass fiber fabrics, plain weave, pre-sized a minimum of 8 ounces per sq. yd.

1. Tape Width: 4 inches
2. Cloth Standard: MIL-C-20079H, Type I.
3. Tape Standard: MIL-C-20079H, Type II.

B. Bands: 3/4 inch wide, in one of the following materials compatible with jacket:

1. Stainless Steel: Type 304, 0.020 inch thick.
2. Aluminum: 0.0070 inch thick.

C. Wire: 14-gauge nickel copper alloy, 16-gauge, soft-annealed stainless steel, or 16-gauge, soft annealed galvanized steel.

D. Corner Angles: 28-gauge (0.3 mm), 1 inch by 1 inch (25 mm by 25 mm) aluminum, adhered to 2 inches by 2 inches (51 mm by 51 mm) kraft paper.

E. Anchor Pins: Capable of supporting 20 pounds each. Provide anchor pins and speed washers of sizes and diameters as recommended by the manufacturer for insulation type and thickness.

2.04 SEALING COMPOUNDS

A. Vapor Barrier Compound: Water-based, fire-resistive composition.

1. Water Vapor Permeance: 0.08 perm maximum.
2. Temperature Range: Minus 20 to 180 deg F.

B. Weatherproof Sealant: Flexible-elastomer-based, vapor-barrier sealant designed to seal metal joints.

1. Water Vapor Permeance: 0.02 perm maximum.
2. Temperature Range: Minus 50 to 250 deg F.
3. Cooler: Aluminum.

C. Duct Insulation installed R values:

1. General: Provide insulation densities and thicknesses to achieve the following R values. R values are for the insulation only, in their installed thickness, considering installed duct wrap stretch and in accordance with code.

2. Lining: Where ducts have internal lining, the insulating properties of the lining may be credited toward meeting the required insulation R value.

3. Supply Air Ductwork:

   a. Inside Building and within conditioned space: No insulation required.

   b. Inside Building but not within conditioned space: R-6.

4. Return Air Ductwork:

   a. Inside Building and within conditioned space: No insulation required.

   b. Inside Building but not within conditioned space: R-6.

5. Outside Air Ductwork: Same insulation for ducts within conditioned space: R-8.

6. Exhaust and Relief Ductwork:

   a. Inside Building and within conditioned space: No insulation required except ductwork from the system's backdraft damper (or motorized damper) to outside the building shall be insulated with R-8 insulation.

   b. Inside Building but Not within conditioned space: R-6.

2.05 PIPE INSULATION

A. Glass Fiber:

1. Type: Rigid molded type, constructed of glass fibers bonded by a thermosetting resin, complying with ASTM C 1290, Type III. Insulation factory molded to match pipe size applied to. Johns Manville "Micro- Lok" (or approved).

2. Jacket: ASJ type, vapor proof, consisting of a white kraft paper cover reinforces with glass fiber and bonded to aluminum foil, with longitudinal self-sealing closure system. Provide with butt strips constructed of jacket material with adhesive to seal all joints. Water vapor permeance shall not exceed 0.02 perms.

3. Thermal Conductivity: Shall not exceed 0.24 Btu-in/hr-sq ft-deg F at 75° F.

4. Operating Temperature Limits: 0° F to 850° F.

B. Elastomeric Insulation:

1. Type: Flexible cellular elastomeric insulation, factory formed to match pipe sizes applied to, complying with ASTM C 534, Type 1. Armacell “AP/Armaflex SS”, Armaflex Shield (or approved equal).

2. Thermal Conductivity: Shall not exceed 0.27 Btu-in/hr-sq ft-deg F at 75° F.

3. Water Vapor Transmission: Water vapor permeance shall not exceed 0.08 perms.

4. Operating Temperature Limits: -20° F to 180° F.

5. Weather Protection: Where installed outdoors provide Zeston 2000 PVC cover.

C. Pipe Fittings:

1. Insulate with mitre cut or premolded fitting insulation of same material and thickness as pipe insulation.

D. Pipe Insulation Types:

1. Aboveground-Inside Building:

a. Hydronic Piping Systems: Glass fiber.

b. Cooling Coil Condensate: Glass fiber or elastomeric.

c. Refrigerant Piping: Elastomeric.

d. Other Systems: Glass fiber.

E. Pipe Insulation Thickness:

COLD SERVICE INSULATION MATERIAL SCHEDULE

TYPE	SERVICE AND TEMPERATURES	INSULATION MATERIAL	PIPE SIZES (INCHES)	MINIMUM (NOMINAL) INSULATION THICKNESS (INCHES)
A & B	Refrigerants, Brine, and Fluids below 40 F.	Flex. Elastomeric Foam	Less than 8 8 and Up	1 1-1/2
C	Chilled Water, domestic cold water, and other fluids 40 F to 80 F.	Flex. Elastomeric Foam or Fibrous Glass	All sizes	1

HOT SERVICE INSULATION MATERIAL SCHEDULE

	SERVICE AND TEMPERATURES	INSULATION MATERIAL	PIPE SIZES (INCHES)	MINIMUM (NOMINAL) INSULATION THICKNESS (INCHES)
D	Domestic Hot water, Domestic Hot Water recirculating, and other fluids 105 F to 140 F.	Flex. Elastomeric Foam or Fibrous Glass	Less than 1-1/2 1-1/2 &over	1 1-1/2
E	Heating hot water, and other fluids 141 F to 200 F.	Fibrous Glass	Less than 1-1/2 2 &over	1-1/2 2
F	Steam (LPS) to 15 psig 201 F-250 F	Fibrous Glass	Less than 4 4 & Up	2-1/2 3
G	Water and other fluids 251 F to 350 F.	Fibrous Glass	Less than 1 1 & Up	2 4-1/2
H	Water and other fluids Above 350 F.	Fibrous Glass	Less than 1 1 & Up	4-1/2 5

1. Provide minimum piping insulation thickness indicated, in inches.
2. Where a system operates over temperature ranges calling for different insulation thicknesses, the thicker insulation requirements shall be met.
3. Cooling system condensate piping (i.e., from a cooling coil) shall be considered to operate at 53° F.
4. Refrigerant piping (RG or RS piping) returning from an evaporator (i.e., cooling coil) to a compressor shall be considered to operate at 40° F.
5. Outdoor Piping: Piping exposed to outside air or located outside the building/thermal envelope, shall have insulation thickness increased by 0.5 inch from that indicated above.
6. Hydronic heat pump piping shall be considered to operate at 120° F (unless noted otherwise).
7. Cold water piping shall be considered to operate at 56° F (unless noted otherwise).

F. Underground piping:

1. Underground chilled water and hot water:

a. All underground pre-insulated pipe 1 1/2” – 12” shall be similar to thermal pipe systems, inc. heat-tite® piping with ring-tite joints.

b. Steel carrier pipe shall be black steel of the type, grade, and class specified by the design engineer. the pipe shall be suitable for use at maximum hydrostatic working pressure of 150 psi at 250ºf.

c. Each joint shall automatically provide for expansion and contraction through the ethylene propylene diene monomer (epdm) sealing rings in the grooves of the pre-insulated ductile iron coupling.

d. Casing pipe shall be [polyvinyl chloride (pvc) meeting the minimum classification requirements of astm d-1784] or [high density polyethylene (hdpe)]. the thickness shall be in accordance with the thermal pipe systems published data.

e. The insulation shall be polyurethane foam completely encapsulated on each end by a compression rubber end seal.

f. The rubber end seals shall be an ethylene propylene diene monomer (epdm) heat resistant compound.

g. Fittings may be uninsulated using welded steel or ductile iron class 150 fitting with a groove and rubber ring. fittings may also be pre-insulated by thermal pipe systems, inc. using the same carrier pipe, insulation thickness, and casing as the straight lengths of pipe.

h. After completion of hydrostatic testing, joints shall be closed using factory supplied 30 mil high temperature tape. it shall be applied circumferentially around the seam between the coupling and pipe casing.

2. Underground steam and steam condensate piping:

a. All underground pre-insulated steam and condensate pipe 3” – 12” shall be similar to thermal pipe systems, inc. super temp-tite® piping with ring-tite joints.

b. Steel carrier pipe shall meet the requirements of astm a-53 or a-106, grade b. each end of the carrier pipe shall be machined and metalized to provide a non-corrosive surface for the sealing rings. the metalizing shall be high nickel alloy applied to an excess thickness and then machined to the required outside diameter.

c. Each joint shall automatically provide for expansion and contraction through the sealing rings in the grooves of the bronze joining coupling. the sealing rings shall be stainless steel spring loaded molded and machined teflon. pipe must be assembled with the lubricant supplied by thermal pipe systems, inc.

d. Casing pipe shall be fiberglass reinforced thermosetting resin pipe (rtrp) manufactured by a filament winding process. the pipe shall be wound to meet astm d2310 classified rtrp-12e.

e. The composite insulation shall be a twocomponent system. the initial insulation shall be calcium silicate satisfactory for temperatures to 1200ºf and shall conform to astm c-533 and mil spec mil-1-2781. the secondary insulation shall be polyurethane foam completely filling the void between the calcium silicate and casing.

f. The rubber end seals shall be a highly saturated hitrile (hsn) or ethylene propylene diene monomer (epdm) heat resistant compound.

g. Fittings shall be pre-insulated by thermal pipe systems, inc. using the same carrier pipe, insulation thickness, and casing as the straight lengths of pipe.

2.06 EQUIPMENT AND SPECIALTIES INSULATION

A. Flexible Glass Fiber:

1. Type: Flexible blanket insulation, constructed of inorganic glass fibers bonded by a thermosetting resin, complying with ASTM C 553, Type III. Johns Manville “812 Spin-Glas” (or approved).

2. Jacket: FSK type, vapor proof, consisting of an aluminum foil cover reinforces with glass fiber mesh, and laminated to kraft. Water vapor permeance shall not exceed 0.05 perms. Provide with joint sealing tape constructed of jacket material with adhesive to seal all joints.

3. Thermal Conductivity: Shall not exceed 0.24 Btu-in/hr-sq ft-deg F at 75° F.

4. Operating Temperature Limits: 40° F to 450° F.

5. Density: 1.5 lb/cu ft.

B. Elastomeric:

1. Type: Flexible cellular elastomeric insulation, complying with ASTM C 534, Type II.

2. Thermal Conductivity: Shall not exceed 0.30 Btu-in/hr-sq ft-deg F at 75° F.

3. Water Vapor Transmission: Water vapor permeance shall not exceed 0.08 perms.

4. Operating Temperature Limits: -20° F to 220° F.

5. Weather Protection: Where installed outdoors provide with manufacturer’s weather proof coating to protect from UV and weather exposure.

C. Removable Insulation Blankets:

1. Type: Flexible blanket insulation pads, for insulating valves, unions, strainers, and similar items. Constructed of exterior fabric enclosure sewn around interior insulation, held in position with a closure system that allows for removal of the blanket. Contractor or factory fabricated.

2. Enclosure:

a. Hot Applications: Glass fiber mat, ¼ inch thick, noncombustible, service temperature up to 1200° F. JPS Glass Fabrics “Glastex 2025” (or approved).

b. Cold Application: Silicone impregnated glass fiber cloth, water resistant, ¼ inch thick. Claremont “Claretex SL” (or approved).

3. Insulation: Thermal insulating wool, 1-inch thick, complying with ASTM C 553. Maximum thermal conductivity 0.22 Btu-in/hr-sq ft-deg F at 75° F. Provide in layers to give equivalent R value to the adjacent insulated piping. Owens Corning “Fiberglass Brand TIW, Type II”.

4. Closure System: Steel lacing anchors with spindles and self-locking washers, fabricated of minimum 14 gauge stainless steel, with stainless steel wire ties. AGM Industries “Series NLA” (or approved).

D. Metal Jacket:

1. Steel: Minimum 24 gauge galvanized steel complying with ASTM A 653. Provide with longitudinal slip joints and 2-inch laps.

2. Aluminum: Minimum 0.020-inch thick aluminum, alloy 3003 or 5005, complying the ASTM B 209. Provide with longitudinal slip joints and 2- inch laps.

E. Equipment and Specialties Insulation Types and Thickness:

1. Unless a specific type of insulation is specified or noted, any of the insulation materials specified in this specification section may be used provided such application is in conformance with NCIIS.

2. Insulation Thickness: Insulation thickness shall be the same as that specified for the piping or ductwork connected to item, or as specified for the system the item is installed in (unless noted otherwise). Insulation thickness shall in no case be less than 1 inch thick.

3. Valves:

a. 2 inches and Smaller: Insulate with same material as piping system.

b. 2-1/2 inches and Larger: Removable blanket insulation.

4. Control Valves: Removable blanket insulation.

5. All equipment and specialties where access is required shall have removable insulation blankets; other removable insulation materials per NCIIS may be used where pre-approved by the Engineer. Items requiring such removable insulation include, but are not limited to, the following:

a. Strainers.

b. Pumps.

c. Balancing valves.

d. Pressure/temperature/flow measuring devices.

e. Pump suction diffusers.

f. Heat exchanger heads.

2.07 ACCESSORIES

A. Adhesive, Caulks, Mastics, and Coatings: As recommended by insulation material manufacturer and suited for the application.

B. Bands: ½ inch wide, of stainless steel, galvanized steel, or aluminum construction, to match with materials used with.

C. Weld-Attached Anchor Pins and Washers: Copper-coated steel pin for capacitor- discharge welding and galvanized speed washer. Pin length shall be as required for insulation thickness used with. Welded pin holding capacity 100 lb., for direct pull perpendicular to the attached surface. Style and type to suit application.

D. Adhesive-Attached Anchor Pins and Speed Washers: Galvanized steel plate, pin, and washer manufactured for attachment to duct and plenum with adhesive. Pin length sufficient for insulation thickness used with. Adhesive as recommended by the anchor pin manufacturer as appropriate for surface temperatures and materials used with, and to achieve a holding capacity of 100 lb for direct pull perpendicular to the adhered surface. Style and type to suit application.

2.08 ACOUSTICAL WRAP

A. Type: Composite material having an outer foil faced sound barrier wrap with an internal sound decoupling insulation. Kinetics Noise Control KNM-100ALQ (or equal).

B. Construction: Outer sound barrier material shall be flexible 1.10 inch think, 1 lb/sf (minimum) barium sulfate loaded limp vinyl sheet, bonded to an outside layer of aluminum foil. Interior sound decoupling insulation shall be 1-inch-thick fiberglass batting quilted to a non-woven porous scrim-coated glass cloth in a 4-inch diamond stitch pattern. Material shall be suitable for temperatures form 40 to 200 degrees F.

C. Acoustic Rating: STC (sound transmission coefficient) 28 (or better).

D. Vibration Damping Material: Kinetics Noise Control KDD or DKC-E-162.

PART 3 – EXECUTION

3.01 GENERAL

A. Pre-Insulation Review: No covering materials shall be applied until systems to be covered have had all tests satisfactorily completed, have had all required inspections, and have been satisfactorily reviewed by the Architect-Engineer. All systems shall be examined by the Contractor to confirm cleanliness and other conditions are appropriate to allow for insulation installation.

B. Insulation Work Review: No insulated items shall be concealed in the building structure or buried until the insulation work has been satisfactorily reviewed by the Architect-Engineer, and has had all required inspections.

C. Standards: Materials shall be installed in accordance with manufacturers' written instructions, NCIIS, and shall comply with materials and methods specified herein. The more stringent requirements govern.

D. Joints/Seams: Joints shall be staggered on multi layer insulation. Locate seams and joints in least visible location.

E. Insulation Protection: Insulation shall be kept clean and dry and shall be protected from dirt, damage, and moisture. Insulation that becomes dirty, damaged, or wet and cannot be restored to like new condition will be rejected, and shall immediately be removed from the jobsite.

F. Insulation Interruptions: Insulation shall be neatly finished at all supports, protrusions and interruptions. Provide adhesive and tape seal to maintain vapor barrier integrity.

G. Equipment and Floor Protection: Cover existing equipment and finished floors to protect such items from insulation fiber and dust. Keep all such existing areas in a "broom clean" condition at the end

of each day. Take precautions in these areas to prevent glass fiber and insulation dust from entering ventilation systems or areas adjacent to the work.

H. Glass Fiber Insulation – General:

1. Finish all insulation ends with joint sealing tape or vapor barrier mastic, no raw edges allowed.

2. Joints: Tightly butt adjacent insulation sections together without any voids. Provide overlap of jacket material over all joints.

I. Items To Be Insulated: Provide insulation on all ductwork, all piping, all items installed in these duct and piping systems, all air and liquid energy conveying systems and components, all air and liquid energy storage, all equipment, and all energy consuming devices specified as part of Division 15, except where such insulation has been specifically excluded.

J. Items Excluded From Being Insulated:

1. Fire Sprinkler piping (except where heat traced).

2. Sanitary sewer drain lines (except traps at handicap accessible fixtures).

3. Factory pre-insulated underground piping.

4. Stops and risers at plumbing fixtures (except at handicap accessible fixtures).

5. Factory insulated water heaters (except for base on electric water heaters).

6. Factory insulated tanks.

7. Electric motors.

8. Fans.

9. Factory insulated or factory lined air handler (heat pumps).

10. Overflow condensate drains.

11. Pumps.

12. Relief valves and associated drain piping.

13. Hose bibs (except where used as drains hot water systems).

14. Water meter.

15. Underground cold water piping and associated underground items.

16. Underground hydronic system piping, 5 feet beyond building foundation wall.

3.02 DUCT INSULATION INSTALLATION

A. Types and Thickness: Insulate all ducts with insulation type and thickness (to provide the required R value listed in this specification.

B. General: Insulation shall be firmly butted at all joints. All longitudinal seams for flexible insulation shall overlap a minimum of 2 inches. All joints and seams shall be finished with appropriate joint sealing tape.

C. Attachment: For rectangular ducts over 24 inches wide, duct insulation shall be additionally secured to the bottom of the ductwork with mechanical fasteners on 18 inch centers to reduce sagging. Washers shall be applied without compressing the insulation. Protruding ends of fasteners shall be cut off flush after washers are installed. All seams, joints, penetrations, and damage to the facing shall be sealed with joint sealing tape or vapor retardant mastic or appropriate joint sealing tape.

3.03 PIPE INSULATION INSTALLATION

A. Types and Thickness: Insulate all piping with insulation type and thickness as specified in “Part 2 – Products”. All piping shall be insulated except where specifically excluded.

B. General: All ends shall be firmly butted together and secured with joint sealing tape. All jacket laps and joint sealing tape shall be secured with outward clinch staples at 4 inch spacing, or by use of a suitable adhesive. Seal all jacket penetrations with vapor barrier mastic.

C. Elastomeric Pipe Insulation: Flexible elastomeric cellular insulation shall be installed with seams and joints sealed with rubberized contact adhesive. Insulation with pre-applied adhesive is not permitted. Insulation exposed to weather and not shown to have jacketing shall be protected with UV resistant PVC jacketing as recommended by the manufacturer after the adhesive is dry and cured. A brush coating of adhesive shall be applied to both butt ends to be joined and to both split surfaces to be sealed. The adhesive shall be allowed to set until dry to touch but tacky under slight pressure before joining the surfaces. Insulation seals at seams and joints shall not be capable of being pulled apart one (1) hour after application. Insulation that can be pulled apart one (1) hour after installation shall be replaced.

D. Pipe Hangers: Provide insulation tight up to pre-insulated pipe supports at pipe hangers; seal all joints with joint sealing tape.

E. Pipe Sleeves: Run insulation continuous full size through sleeve. Coordinate work with fire seal work and confirm fire sealant system is approved for use with insulated pipes; see Division 23.

3.04 EQUIPMENT AND SPECIALTIES INSTALLATION

A. Types and Thickness: All equipment and items installed in insulated duct and piping systems shall be insulated except where specifically noted not to be; reference paragraph 3.01. Insulation type and thickness shall be as specified in “Part 2 – Products”.

B. General: Apply insulation as close as possible to equipment by grooving, scoring, and beveling as necessary. As required, secure insulation to equipment with studs, pins, clips adhesive, wires or bands. Fill joints, cracks, seams, and depressions with bedding compound to form smooth surface. Comply with NCIIS.

C. Removable: All equipment and specialties where access is required for maintenance, repair, service, or cleaning shall have insulation installed so that it can be easily removed and reinstalled without being damaged and without requiring new insulation.

D. Handicap Lavatories: Insulate P-trap and HW supplies below lavatory where exposed.

E. Nameplates: Do not insulate over nameplate or ASME stamps; bevel and seal insulation around.

F. Jacketing: Provide all equipment with vapor retardant jackets.

3.05 ACOUSTIC WRAP

A. Install in accordance with manufacturers written instruction and NCIIS.

B. On ductwork less than 20 gauge, apply vibration damping material on outside of duct before applying thermal insulation or acoustic wrap.

C. Overlap all interior sound insulation joints with a minimum 2 inch overlap of the exterior sound barrier.

D. Acoustical insulation shall not be compressed.

E. Where installed on ducts requiring thermal insulation, install thermal insulation over acoustic wrap.

END OF SECTION

DIVISION 23 – HEATING, VENTILATING AND AIR CONDITIONING (HVAC)

SECTION 230713 – DUCT INSULATION - INTERIOR

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and provisions of contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this section.

1.02 SUMMARY

A. This section includes duct and plenum insulation.

B. Related Sections: The following sections contain requirements that relate to this section:

1. Division 23 Section “Ductwork” for duct lining.

1.03 DEFINITIONS

A. Hot Surfaces: Normal operating temperatures of 100 deg F or higher.

B. Dual-Temperature Surfaces: Normal Operating temperatures that vary from hot to cold.

C. Cold Surfaces: Normal operating temperatures less than 75 deg F.

D. Thermal Conductivity (k-value): Measure of heat flow through a material at a given temperature difference; conductivity is expressed in units of Btu x inch/h x sq. ft. x deg F.

E. Density: Is expressed in lb/cu. ft.

1.04 SUBMITTALS

A. General: Submit the following in accordance with General Conditions of the Contract and Division 01 specification sections.

B. Product and data for each type of duct insulation identifying k-value, thickness, and accessories.

C. Material certificates, signed by the manufacturer, certifying that materials comply with specified requirements where laboratory test reports cannot be obtained.

D. Material test reports prepared by a qualified independent testing laboratory. Certify insulation meets specified requirements.

1.05 QUALITY ASSURANCE

A. Fire Performance Characteristics: Conform to the following characteristics for insulation including facings, cements, and adhesives, when tested according to ASTM E 84, by UL or other testing or inspecting organization acceptable to the authority having jurisdiction. Label insulation with appropriate markings of testing laboratory.

1. Interior Insulation: Flame spread rating of 25 or less and a smoke developed rating of 50 or less.

1.06 SEQUENCING AND SCHEDULING

A. Schedule insulation application after testing of duct systems.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering 'GREENGUARD' certified products that may be incorporated in the Work include, but are not limited to the following:

1. Glass Fiber:

a. CertainTeed Corporation.
b. Knauf Fiberglass GmbH.
c. Manville.

2.02 GLASS FIBER

A. Material: Inorganic glass fibers, bonded with a thermosetting resin.

B. Jacket: All-purpose, factory-applied, laminated glass-fiber- reinforced, flame-retardant kraft paper and aluminum foil having self-sealing lap.

C. Board: ASTM C 612, Class 2, semi-rigid jacketed board.

1. Thermal Conductivity: 0.23 Btu x inch/h x sq. ft. x deg F average maximum at 75 deg F mean temperature.

2. Density: 3 pcf average maximum.

D. Blanket: ASTM C 553, Type II, Class F-1, jacketed flexible blankets. (maximum 25% compression installed)

1. Thermal Conductivity: 0.23 Btu x inch/h x sq. ft. x deg F average maximum at 75 deg F mean temperature.

E. Adhesive: Produced under the UL Classification and follow-up service.

1. Type: Non-flammable, water-based.
2. Service Temperature Range: Minus 20 to 180 deg F (Minus 29 to 82 deg C).

F. Vapor Barrier Coating: Waterproof coating recommended by insulation manufacturer for outside service.

2.03 ACCESSORIES AND ATTACHMENTS

A. Glass Cloth and Tape: Woven glass fiber fabrics, plain weave, pre-sized a minimum of 8 ounces per sq. yd.

1. Tape Width: 4 inches
2. Cloth Standard: MIL-C-20079H, Type I.
3. Tape Standard: MIL-C-20079H, Type II.

B. Bands: 3/4 inch wide, in one of the following materials compatible with jacket:

1. Stainless Steel: Type 304, 0.020 inch thick.
2. Aluminum: 0.0070 inch thick.

C. Wire: 14-gauge nickel copper alloy, 16-gauge, soft-annealed stainless steel, or 16-gauge, soft annealed galvanized steel.

D. Corner Angles: 28-gauge (0.3 mm), 1 inch by 1 inch (25 mm by 25 mm) aluminum, adhered to 2 inches by 2 inches (51 mm by 51 mm) kraft paper.

E. Anchor Pins: Capable of supporting 20 pounds each. Provide anchor pins and speed washers of sizes and diameters as recommended by the manufacturer for insulation type and thickness.

2.04 SEALING COMPOUNDS

A. Vapor Barrier Compound: Water-based, fire-resistive composition.

1. Water Vapor Permeance: 0.08 perm maximum.
2. Temperature Range: Minus 20 to 180 deg F.

B. Weatherproof Sealant: Flexible-elastomer-based, vapor-barrier sealant designed to seal metal joints.

1. Water Vapor Permeance: 0.02 perm maximum.
2. Temperature Range: Minus 50 to 250 deg F.
3. Cooler: Aluminum.

PART 3 – EXECUTION

3.01 PREPARATION

A. Surface Preparation: Clean, dry and remove foreign materials such as rust, scale, and dirt.

3.02 INSTALLATION

A. Refer to schedules at the end of this section for materials, forms, jackets, and thicknesses required for each duct system.

B. Select accessories compatible with materials suitable for the service. Select accessories that do not corrode, soften, or otherwise attack the insulation or jacket in either the wet or dry state.

C. Install vapor barriers on insulated ducts and plenums having surface operating temperatures below 60 deg.

D. Apply insulation material, accessories, and finishes according to the manufacturer’s printed instructions.

E. Install insulation with smooth, straight, and even surfaces.

F. Seal joints and seams to maintain vapor barrier on insulation requiring a vapor barrier.

G. Seal penetrations for hangers, supports, anchors, and other projections in insulation requiring a vapor barrier.

H. Seal Ends: Except for flexible elastomeric insulation, taper ends at 45 degree angle and seal with lagging adhesive. Cut ends of flexible elastomeric cellular insulation square and seal with adhesive.

I. Apply water based adhesives and coatings at the manufacturer's recommended coverage-per-gallon rate.

J. Keep insulation materials dry during application and finishing.

K. Install board insulation as follows:

1. Adhesive and Band Attachment: Secure board insulation tight and smooth with at least 50 percent coverage of water based adhesive. Install bands spaced 12 inches apart. Protect insulation under bands and at exterior corners with metal corner angles. Fill joints, seams, and chipped edges with vapor barrier compound.

2. Speed Washers Attachment: Secure insulation tight and smooth with speed washers and welded pins. Space anchor pins 18 inches apart each way and 3 inches from insulation joints. Apply vapor barrier coating compound to insulation in contact, open joints, breaks, punctures, and voids in insulation.

L. Blanket Insulation: Install tight and smooth. Secure to ducts having long sides or diameters as follows:

1. Smaller Than 24 Inches: Bonding water based adhesive applied in 6-inch (150-mm) wide transverse strips on 12-inch centers.

2. 24 inches and Larger: Anchor pins spaced 12 inches (300 mm) apart each way. Apply bonding adhesive to prevent sagging of the insulation.

3. Overlap joints 3 inches.

4. Seal joints, breaks, and punctures with vapor barrier compound.

3.03 JACKETS

A. Foil and Paper Jackets (FP): Install jackets drawn tight. Install lap or butt strips at joints with material same as jacket. Secure with adhesive. Install jackets with 1-1/2 inches (40 mm) laps at longitudinal joints and 3 inches (75 mm) wide butt strips at end joints.

1. Seal openings, punctures, and breaks in vapor barrier jackets, and exposed insulation with vapor barrier compound.

3.04 APPLICATIONS

A. General: Materials and thicknesses are specified in schedules at the end of this Section.

B. Duct Systems: Insulate all new interior ductwork.

3.05 DUCT SYSTEMS INSULATION SCHEDULE

A. All interior supply and return ducts:

Material	Type	Installed R-value	Vapor Barrier Req'd	Field-Applied Jacket
Glass Fiber	Blanket	6.0	Yes	None

B. All outdoor air intake ducts and outdoor air plenums:

Material	Type	Installed R-value	Vapor Barrier Req'd	Field-Applied Jacket
Glass Fiber	Blanket	8.0	Yes	None

END OF SECTION

DIVISION 23 – HEATING, VENTILATING AND AIR CONDITIONING (HVAC)

SECTION 230714 – DUCT INSULATION - EXTERIOR

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and provisions of contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this section.

1.02 SUMMARY

A. This section includes exterior supply and return ductwork and plenum insulation.

1.03 DEFINITIONS

A. Hot Surfaces: Normal operating temperatures of 100 deg F or higher.

B. Dual-Temperature Surfaces: Normal Operating temperatures that vary from hot to cold.

C. Cold Surfaces: Normal operating temperatures less than 75 deg F.

D. Thermal Conductivity (k-value): Measure of heat flow through a material at a given temperature difference; conductivity is expressed in units of Btu x inch/h x sq. ft. x deg F.

E. Density: Is expressed in lb/cu. ft.

1.04 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 specification sections.

B. Product and data for each type of duct insulation identifying k-value, thickness, and accessories.

C. Samples of each type of insulation. Identify each sample describing product and intended use. Submit 12 inches square sections of each sample materials.

D. Material certificates, signed by the manufacturer, certifying that materials comply with specified requirements where laboratory test reports cannot be obtained.

E. Material test reports prepared by a qualified independent testing laboratory. Certify insulation meets specified requirements.

1.05 QUALITY ASSURANCE

A. Fire Performance Characteristics: Conform to the following characteristics for insulation including facings, cements, and adhesives, when tested according to ASTM E 84, by UL or other testing or inspecting organization acceptable to the authority having jurisdiction. Label insulation with appropriate markings of testing laboratory.

1. Exterior Insulation: Flame spread value of 25 or less and a smoke developed value of 50 or less.

1.06 SEQUENCING AND SCHEDULING

A. Schedule insulation application after cleaning and sealing of the new ductwork and testing of duct systems sealing; ductwork to be air and water tight to prevent tempered air exfiltration and water infiltration to SMACNA seal class ‘A’.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering ‘GREENGUARD’/’ENERGY-STAR’ certified products that may be incorporated in the Work include, but are not limited to the following:

1. Rigid Foam Insulation:

    a. Owens Corning – Foamular 250.
    b. Dow – Styrofoam Highload 40.
    c. GreenGuard Type VI.

2. Protective Membrane:

    a. MFM Building Products Corp.–FlexClad 250 – 36”-52836 25mils
    b. Polyguard Products–Alumaguard / Alumaguard All Weather

2.02 RIGID FOAM – based on Owens Corning ‘Foamular 250’

A. Material: Extruded closed cell polystyrene (XPS).

B. Board: ASTM C 578, Type IV, rigid board.

1. Thermal Conductivity: 0.20 Btu x inch/h x sq. ft. x deg F average maximum at 75 deg F mean temperature.

2. Thermal Resistance(R):5.0 per inch at75 deg F mean temperature.

C. Adhesive: Produced under the UL Classification.

1. Type: Non-flammable, water-based.

2. Application Temperature Range: 40ºF to 90ºF.

2.03 PROTECTIVE MEMBRANE – based on MFM – FlexClad 250 – 36”-52836 25mils

A. Material: Outer layer – embossed UV-resistant white weathering surface, multiple layers of high-density cross linked polyethylene and rubberized asphalt adhesive layer. Total thickness = 25 mils.

B. Flame Spread: 0 (ASTM E 84-97a)

C. Smoke Density: 5 (ASTM E 84-97a)

D. Vapor Permeance = 0.01 perms (E-96-95)

E. Adhesive = Modified Asphalt

2.04 ACCESSORIES AND ATTACHMENTS

A. Membrane Tape: (based on MFM 'Peel & Seal')

1. Tape Width: minimum 4 inches white finish
2. Vapor Permeance: <0.01 (ASTM E96)
3. Thickness: 25 mil minimum.

B. Bands: 3/4 inch wide, in one of the following materials compatible with jacket:

1. Stainless Steel: Type 304, 0.020 inch thick.
2. Aluminum: 0.0070 inch thick.

C. Wire: 14-gauge nickel copper alloy, 16-gauge, soft-annealed stainless steel, or 16-gauge, soft annealed galvanized steel.

D. Edge/Corner/Close-off Angles: 28-gauge, 1 inch by 1 inch aluminum, adhered with membrane tape.

E. Anchor Pins **(for primary insulation attachment and for protective membrane covering on ductwork 24" wide and greater)**: Welded copper-coated steel pin for capacitor-discharge welding with a minimum 1 1/2" diameter galvanized speed washer capable of supporting/holding 100 pounds for direct pull perpendicular to the attached surface. Provide anchor pins and speed washers of sizes and diameters as may be otherwise recommended by the manufacturer for insulation type and thickness.

F. Spray Adhesives: based on MFM Spray Adhesive for protective membrane and Ductmate Protack/HV for insulation.

2.05 DUCT SEALING COMPOUNDS

A. Duct Sealant Compound: (based on 'Ductmate' Everseal) Water-based, non-flammable composition.

1. Water Resistant, No VOC's and UV Resistant.
2. Service Temperature Range: Minus 25 to 200 deg F.

B. Weatherproof Sealant: Flexible synthetic latex based, vapor/air barrier sealant designed to seal metal joints and seams.

PART 3 – EXECUTION

3.01 PREPARATION

A. Surface Preparation: Clean, dry and remove foreign materials such as rust, scale, and dirt including existing mastic coating on existing ductwork, existing fiberglass insulation, existing anchor pins, etc. Apply duct sealant compound to all joints and seams including all anchor pin holes, access plates, etc. (Reference SMACNA seal class 'A').

3.02 INSTALLATION

A. Refer to schedules at the end of this section for materials, forms, jackets, and thicknesses required for each duct system.

B. Select accessories compatible with materials suitable for the service. Select accessories that do not corrode, soften, or otherwise attack the insulation or jacket in either the wet or dry state; follow manufacturer's installation guidelines.

C. Install vapor barriers on insulated ducts and plenums having surface operating temperatures below 60 deg.

D. Apply insulation material, accessories, protective membrane and finishes according to the manufacturer's printed instructions.

E. Install insulation with smooth, straight, and even surfaces. **NOTE: after top of duct insulation is installed, additional top of duct insulation is to be installed and pitched at a minimum of 1/4" per foot to prevent puddling on the top of the ductwork**.

F. Seal joints and seams to maintain vapor barrier on insulation requiring a vapor barrier (i.e. exterior ductwork).

G. Seal penetrations for hangers, supports, anchors, and other projections in insulation requiring a vapor barrier.

H. Seal Ends: Taper ends at 45 degree angle and seal with membrane tape and or spray adhesive.

I. Apply water based adhesives and coatings at the manufacturer's recommended coverage-per-gallon rate.

J. Keep insulation materials dry during application and finishing.

K. Install rigid foam board insulation as follows:

1. Adhesive and Band Attachment: Secure board insulation tight and smooth with at least 50 percent coverage of water based adhesive. Install bands, where required, spaced 12 inches apart. Protect insulation under bands and at exterior corners and edges with metal corner angles. Cover joints, seams, gaps and chipped edges with membrane tape.

2. Speed Washers Attachment: Secure insulation tight and smooth with speed washers and welded pins. Space anchor pins 12 inches apart each way and 3 inches from insulation joints. Apply membrane tape to insulation in contact, open joints, breaks, punctures, and voids in insulation.

3. Apply protective membrane strickly adhering to the manufacturers installation instructions including 'pinning' on ductwork 24" wide and greater.

3.03 APPLICATIONS

A. General: Materials and thicknesses are specified in schedules at the end of this Section.

B. Duct Systems: Unless otherwise indicated, insulate the following duct systems:

1. Exterior exposed supply and return ductwork.

3.04 DUCT SYSTEMS INSULATION SCHEDULE

A. EXTERIOR EXPOSED HVAC SUPPLY/RETURN DUCTS AND PLENUMS

MATERIAL	FORM	THICKNESS IN INCHES	VAPOR BARRIER REQ'D	FIELD- APPLIED JACKET/ MEMBRANE
RIGID FOAM	BOARD	2	YES (JOINTS AND SEAMS)	YES

END OF SECTION

DIVISION 23 – HEATING, VENTILATING AND AIR CONDITIONING (HVAC)

SECTION 230800 – COMMISSIONING OF HVAC

PART 1 – GENERAL

1.01 DESCRIPTION

A. The purpose of this section is to specify Division 23 responsibilities in the commissioning process.

B. The systems to be commissioned are shown on the Drawings and noted in Section 230590 and Section 230593.

C. Commissioning requires the participation of Division 23 to ensure that all systems are operating in a manner consistent with the Contract Documents. Division 23 shall be familiar with all parts of Division 01 and the commissioning plan issued by the CA and shall execute all commissioning responsibilities assigned to them in the Contract Documents.

D. The commissioning process shall be performed in accordance with the latest Energy Code of New York State.

E. An approved agency or design professional shall perform the commissioning. The Commissioning Agent shall not be affiliated with the Contractor.

1.02 RESPONSIBILITIES

A. Mechanical, Controls and TAB Contractors. The commissioning responsibilities applicable to each of the mechanical, controls and TAB contractors of Division 23 are as follows (all references apply to commissioned equipment only):

1. Construction and Acceptance Phases

    a. Include and itemize the cost of commissioning in the contract price.

    b. In each purchase order or subcontract written, include requirements for submittal data, commissioning documentation, O&M data and training.

    c. Attend a commissioning scoping meeting and other meetings necessary to facilitate the Cx process.

    d. Contractors shall provide the CA with normal cut sheets and shop drawing submittals of commissioned equipment.

    e. Provide additional requested documentation, prior to normal O&M manual submittals, to the CA for development of start-up and functional testing procedures.

        1) Typically this will include detailed manufacturer installation and start-up, operating, troubleshooting and maintenance procedures, full details of any owner-contracted tests, fan and pump curves, full factory testing reports, if any, and full warranty information, including all responsibilities of the Owner to keep the warranty in force clearly identified. In addition, the installation, start-up 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 Commissioning Agent.

2) The Commissioning Agent may request further documentation necessary for the commissioning process.

3) This data request may be made prior to normal submittals.

f. Provide a copy of the O&M manuals and submittals of commissioned equipment, through normal channels, to the CA for review and approval.

g. Contractors shall assist (along with the design engineers) 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.

h. Provide limited assistance to the CA in preparing the specific functional performance test procedures. Subs shall review test procedures to ensure feasibility, safety and equipment protection and provide necessary written alarm limits to be used during the tests.

i. Develop a full start-up and initial checkout plan using manufacturer's start-up procedures and the construction checklists from the CA for all commissioned equipment. Submit to CA for review and approval prior to startup. Refer to Section 230590 and Section 230593 for further details on start-up plan preparation.

j. During the startup and initial checkout process, execute the mechanical-related portions of the construction checklists for all commissioned equipment.

k. Perform and clearly document all completed startup and system operational checkout procedures, providing a copy to the CA.

l. Address current A/E punch list items before functional testing. Air and water TAB shall be completed with discrepancies and problems remedied before functional testing of the respective air- or water-related systems.

m. Provide skilled technicians to execute starting of equipment and to execute the functional performance tests. Ensure that they are available and present during the agreed upon schedules and for sufficient duration to complete the necessary tests, adjustments and problem-solving.

n. Provide skilled technicians to perform functional performance testing under the direction of the CA for specified equipment specified to be commissioned. Assist the CA in interpreting the monitoring data, as necessary.

o. Correct deficiencies (differences between specified and observed performance) as interpreted by the CA, OR and A/E and retest the equipment.

p. Prepare O&M manuals according to the Contract Documents, including clarifying and updating the original sequences of operation to as-built conditions.

q. During construction, maintain as-built red-line drawings for all drawings and final CAD as-builts for contractor-generated coordination drawings. Update after completion of commissioning (excluding deferred testing).

r. Provide training of the Owner's operating staff using expert qualified personnel, as specified.

s. Coordinate with equipment manufacturers to determine specific requirements to maintain the validity of the warranty.

2. Warranty Period

    a. Execute seasonal or deferred functional performance testing, witnessed by the CA, according to the specifications.

    b. Correct deficiencies and make necessary adjustments to O&M manuals and as-built drawings for applicable issues identified in any seasonal testing.

B. Mechanical Contractor. The responsibilities of the HVAC mechanical contractor, during construction and acceptance phases in addition to those listed in (A) are:

1. Provide startup for all HVAC equipment, except for the building automation control system.

2. Assist and cooperate with the TAB contractor and CA by:

    a. Putting all HVAC equipment and systems into operation and continuing the operation during each working day of TAB and commissioning, as required.

    b. Including cost of sheaves and belts that may be required by TAB.

    c. Providing test holes in ducts and plenums where directed by TAB to allow air measurements and air balancing. Providing an approved plug.

    d. Providing temperature and pressure taps according to the Construction Documents for TAB and commissioning testing.

3. Install a P/T plug at each water sensor, which is an input point to the control system.

4. List and clearly identify on the as-built drawings the locations of all airflow stations.

5. Prepare a preliminary schedule for Division 23 pipe and duct system testing, flushing and cleaning, equipment start-up and TAB start and completion for use by the CA. Update the schedule as appropriate.

6. Notify the OR or CA depending on protocol, when pipe and duct system testing, flushing, cleaning, startup of each piece of equipment and TAB will occur. Be responsible to notify the OR or CA, ahead of time, when commissioning activities not yet performed or not yet scheduled will delay construction. Be proactive in seeing that commissioning processes are executed and that the CA has the scheduling information needed to efficiently execute the commissioning process.

C. Temperature Controls Contractor. The commissioning responsibilities of the Temperature Controls Contractor, during construction and acceptance phases in addition to those listed in (A) are:

1. Sequences of Operation Submittals. The Temperature Controls Contractor's submittals of control drawings shall include complete detailed sequences of operation for each piece of equipment, regardless of the completeness and clarity of the sequences in the specifications. They shall include:

    a. An overview narrative of the system (1 or 2 paragraphs) generally describing its purpose, components and function.

    b. All interactions and interlocks with other systems.

c. Detailed delineation of control between any packaged controls and the building automation system, listing what points the BAS monitors only and what BAS points are control points and are adjustable.

d. Written sequences of control for packaged controlled equipment. (Equipment manufacturers' stock sequences may be included, but will generally require additional narrative).

e. Start-up sequences.

f. Warm-up mode sequences.

g. Normal operating mode sequences.

h. Unoccupied mode sequences.

i. Shutdown sequences.

j. Capacity control sequences and equipment staging.

k. Temperature and pressure control: setbacks, setups, resets, etc.

l. Detailed sequences for all control strategies, e.g., economizer control, optimum start/stop, staging, optimization, demand limiting, etc.

m. Effects of power or equipment failure with all standby component functions.

n. Sequences for all alarms and emergency shut downs.

o. Seasonal operational differences and recommendations.

p. Initial and recommended values for all adjustable settings, setpoints and parameters that are typically set or adjusted by operating staff; and any other control settings or fixed values, delays, etc. that will be useful during testing and operating the equipment.

q. Schedules, if known.

r. To facilitate referencing in testing procedures, all sequences shall be written in small statements, each with a number for reference. For a given system, numbers will not repeat for different sequence sections, unless the sections are numbered.

2. Control Drawings Submittal

a. The control drawings shall have a key to all abbreviations.

b. The control drawings shall contain graphic schematic depictions of the systems and each component.

c. The schematics will include the system and component layout of any equipment that the control system monitors, enables or controls, even if the equipment is primarily controlled by packaged or integral controls.

d. Provide a full points list with at least the following included for each point:

1) Controlled system
2) Point abbreviation

3) Point description
4) Display unit
5) Control point or setpoint (Yes / No)
6) Monitoring point (Yes / No)
7) Intermediate point (Yes / No)
8) Calculated point (Yes / No)

a) Key:
b) Point Description: DB temp, airflow, etc.
c) Control or Setpoint: Point that control equipment and can have its setpoint changed (OSA, SAT, etc.)
d) Intermediate Point: Point whose value is used to make a calculation which then controls equipment (space temperatures that are averaged to a virtual point to control reset).
e) Monitoring Point: Point that does not control or contribute to the control of equipment, but is used for operation, maintenance, or performance verification.
f) Calculated Point: "Virtual" point generated from calculations of other point values.

The Temperature Controls Contractor shall keep the CA informed of all changes to this list during programming and setup.

3. An updated as-built version of the control drawings and sequences of operation shall be included in the final controls O&M manual submittal.

4. Assist and cooperate with the TAB contractor in the following manner:

   a. Meet with the TAB contractor prior to beginning TAB and review the TAB plan to determine the capabilities of the control system toward completing TAB. Provide the TAB any needed unique instruments for setting terminal unit boxes and instruct TAB in their use (handheld control system interface for use around the building during TAB, etc.).

   b. For a given area, have all required construction checklists, calibrations, startup and selected functional tests of the system completed and approved by the CA prior to TAB.

   c. Provide a qualified technician to operate the controls to assist the TAB contractor in performing TAB, or provide sufficient training for TAB to operate the system without assistance.

5. Assist and cooperate with the CA in the following manner:

   a. Using a skilled technician who is familiar with this building, execute the functional testing of the controls system. Assist in the functional testing of all equipment. Provide two-way radios during the testing.

   b. Execute all control system trend logs.

6. The Temperature Controls Contractor shall prepare a written plan indicating in a step-by-step manner, the procedures that will be followed to test, checkout and adjust the control system prior to functional performance. At minimum, the plan shall include for each type of equipment controlled by the automatic controls:

   a. System name.

   b. List of devices.

   c. Step-by-step procedures for testing each controller after installation, including:

1) Process of verifying proper hardware and wiring installation.

2) Process of downloading programs to local controllers and verifying that they are addressed correctly.

3) Process of performing operational checks of each controlled component.

4) Plan and process for calibrating valve and damper actuators and all sensors.

5) A description of the expected field adjustments for transmitters, controllers and control actuators should control responses fall outside of expected values.

d. A copy of the log and field checkout sheets that will document the process. This log must include a place for initial and final read values during calibration of each point and clearly indicate when a sensor or controller has "passed" and is operating within the contract parameters.

e. A description of the instrumentation required for testing.

f. Indicate what tests on what systems should be completed prior to TAB using the control system for TAB work. Coordinate with the CA and TAB contractor for this determination.

7. Provide a signed and dated certification to the CA and OR upon completion of the checkout of each controlled device, equipment and system prior to functional testing for each piece of equipment or system, that all system programming is complete as to all respects of the Contract Documents, except functional testing requirements.

8. Beyond the control points necessary to execute all documented control sequences, provide monitoring, control and virtual points as specified in Section 230900.

9. List and clearly identify on the as-built duct and piping drawings the locations of all static and differential pressure sensors (air, water and building pressure).

D. TAB Contractor. The duties of the TAB contractor, in addition to those listed in (A) are:

1. Six weeks prior to starting TAB, submit to the OR the qualifications of the site technician for the project, including the name of the contractors and facility managers of recent projects the technician on which was lead. The Owner will approve the site technician's qualifications for this project.

2. Submit the outline of the TAB plan and approach for each system and component to the CA, OR and the Temperature Controls Contractor six weeks prior to starting the TAB. This plan will be developed after the TAB has some familiarity with the control system.

3. The submitted plan will include:

a. Certification that the TAB contractor has reviewed the construction documents and the systems with the design engineers and contractors to sufficiently understand the design intent for each system.

b. An explanation of the intended use of the building control system. The Temperature Controls Contractor will comment on feasibility of the plan.

c. All field checkout sheets and logs to be used that list each piece of equipment to be tested, adjusted and balanced with the data cells to be gathered for each.

d. Discussion of what notations and markings will be made on the duct and piping drawings during the process.

e. Final test report forms to be used.

f. Detailed step-by-step procedures for TAB work for each system and issue: terminal flow calibration (for each terminal type), diffuser proportioning, branch / submain proportioning, total flow calculations, rechecking, diversity issues, expected problems and solutions, etc. Criteria for using air flow straighteners or relocating flow stations and sensors will be discussed. Provide the analogous explanations for the water side.

g. List of all air flow, water flow, sound level, system capacity and efficiency measurements to be performed and a description of specific test procedures, parameters, formulas to be used.

h. Details of how total flow will be determined (Air: sum of terminal flows via BAS calibrated readings or via hood readings of all terminals, supply (SA) and return air (RA) pitot traverse, SA or RA flow stations. Water: pump curves, circuit setter, flow station, ultrasonic, etc.).

i. The identification and types of measurement instruments to be used and their most recent calibration date.

j. Specific procedures that will ensure that both air and water side are operating at the lowest possible pressures and provide methods to verify this.

k. Confirmation that TAB understands the outside air ventilation criteria under all conditions.

l. Details of whether and how minimum outside air cfm will be verified and set, and for what level (total building, zone, etc.).

m. Details of how building static and exhaust fan / relief damper capacity will be checked.

n. Proposed selection points for sound measurements and sound measurement methods.

o. Details of methods for making any specified coil or other system plant capacity measurements.

p. Details of any TAB work to be done in phases (by floor, etc.), or of areas to be built out later.

q. Details regarding specified deferred or seasonal TAB work.

r. Details of any specified false loading of systems to complete TAB work.

s. Details of all exhaust fan balancing and capacity verifications, including any required room pressure differentials.

t. Details of any required interstitial cavity differential pressure measurements and calculations.

u. Plan for hand-written field technician logs of discrepancies, deficient or uncompleted work by others, contract interpretation requests and lists of completed tests (scope and frequency).

v. Plan for formal progress reports (scope and frequency).

w. Plan for formal deficiency reports (scope, frequency and distribution).

4. A running log of events and issues shall be kept by the TAB field technicians. Submit hand-written reports of discrepancies, deficient or uncompleted work by others, contract interpretation requests and lists of completed tests to the CA and OR at least twice a week.

5. Communicate in writing to the Temperature Controls Contractor all setpoint and parameter changes made or problems and discrepancies identified during TAB which affect the control system setup and operation.

6. Provide a draft TAB report within two weeks of completion. A copy will be provided to the CA. The report will contain a full explanation of the methodology, assumptions and the results in a clear format with designations of all uncommon abbreviations and column headings. The report should follow the latest and most rigorous reporting recommendations by AABC, NEBB or ASHRAE Standard 111.

7. Provide the CA with any requested data, gathered, but not shown on the draft reports.

8. Provide a final TAB report for the CA with details, as in the draft.

9. Conduct functional performance tests and checks on the original TAB.

E. Commissioning Team: The commissioning process will require cooperation of the Contractor, sub-contractors, vendors, Architect/ Engineer, Commissioning Agent, LEED Consultant (if applicable) and Owner.

1. The commissioning team shall be comprised of the following:

a. Contractor

1) Project Manager
2) Test Engineer

b. Subcontractors: As appropriate to product or system being commissioned.

c. Commissioning Agent

1) Project Manager
2) Project Engineers

d. Owner’s Representative(s)

e. LEED Consultant (if applicable)

f. Architect/ Engineer

1) Architect
2) MEP Engineers

PART 2 - PRODUCTS

2.01 TEST EQUIPMENT

A. Division 23 shall provide all test equipment necessary to fulfill the testing requirements of this Division.

PART 3 - EXECUTION

3.01 SUBMITTALS

A. Division 23 shall provide submittal documentation relative to commissioning as required in this Section Part 1, Section 013300.

3.02 STARTUP

A. The HVAC mechanical and Temperature Controls Contractors shall follow the start-up and initial checkout procedures listed in the Responsibilities list in this section and in Section 230590 and Section 230593. Division 23 has start-up responsibility and is required to complete systems and sub-systems so they are fully functional, meeting the design objectives of the Contract Documents. The commissioning procedures and functional testing do not relieve or lessen this responsibility or shift that responsibility partially to the commissioning agent or Owner.

B. Functional testing is intended to begin upon completion of a system. Functional testing may proceed prior to the completion of systems or sub-systems at the discretion of the CA and OR. Beginning system testing before full completion, does not relieve the Contractor from fully completing the system, including all construction checklists as soon as possible.

3.03 TAB

A. Refer to the TAB responsibilities in Part 1.02 above.

3.04 PRE-FUNCTIONAL CHECKLIST

A. A list of items to inspect and elementary component tests to conduct to verify proper installation of equipment, provided by the Commissioning Agent to the contractor. Pre-functional checklists are primarily static inspections and procedures to prepare the equipment or system for initial operation (e.g., belt tension, oil levels OK, labels affixed, gages in place, sensors calibrated, etc.). However, some pre-functional checklist items entail simple testing of the function of a component, a piece of equipment or system (such as measuring the voltage imbalance on a three-phase pump motor of a chiller system). The word “pre-functional” refers to before functional testing. Pre-functional checklists augment and are combined with the manufacturer’s start-up checklist.

3.05 FUNCTIONAL PERFORMANCE TESTS

A. Test 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, 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. Traditional air or water test and balancing (TAB) is not functional testing, in the commissioning sense of the word. TAB’s primary work is setting up the system flows and pressures as specified, while functional testing is verifying that which has already been set up. The Commissioning Agent develops the functional test procedures in a sequential written form, coordinates, oversees and documents the actual testing, which is usually performed by the installing contractor or vendor. Functional Performance Tests are performed after pre-functional checklists and startup are complete.

3.06 DEFICIENCY REPORT AND RESOLUTION RECORD

A. Deficiency Report and Resolution Record: Document items of non-compliance in materials, installation, or operation.

B. Non-Conformance. Non-conformance and deficiencies observed shall be addressed immediately, in terms of notification to responsible parties, and providing recommended actions to correct deficiencies.

1. Corrections of minor deficiencies identified may be made during the tests at the discretion of the Commissioning Agent. In such cases the deficiency and resolution shall be documented on the procedure form.

2. For identified deficiencies:

a. If there is no dispute on the deficiency and the responsibility to correct it:
   1) The Commissioning Agent documents the deficiency and the adjustments or alterations required to correct it. The contractor corrects the deficiency and notifies the Commissioning Agent that the equipment is ready to be retested.
   2) The Commissioning Agent reschedules the test and the test is repeated.

b. If there is a dispute about a deficiency or who is responsible:
   1) The deficiency is documented on the non-compliance form and a copy given to the Consultant.
   2) Resolutions are made at the lowest management level possible. Additional parties are brought into the discussions as needed. Contractor shall have responsibility for resolving construction deficiencies. If a design revision is deemed necessary and approved by Owner, Architect/Engineer shall have responsibility for providing design revision.
   3) The Commissioning Agent documents the resolution process.
   4) Once the interpretation and resolution have been decided, the appropriate party corrects the deficiency and notifies the Commissioning Agent that the equipment is ready to be retested. The Commissioning Agent reschedules the test and the test is repeated until satisfactory performance is achieved.

3. Cost of Retesting: Costs for retesting shall be charged to the Contractor.

3.07 FINAL COMMISSIONING REPORTS

A. Two copies of the final commissioning reports must be provided to the engineer of record and owner.

B. Division 23 shall compile and prepare documentation for all equipment and systems covered in the O&M manuals, according to this section prior to the training of owner personnel.

C. The components of the Commissioning Report shall include the following and are defined as follows:

1. Executive summary of process and results of commissioning – including observations, conclusions and outstanding items.
2. History of any system deficiencies and how resolved.
   a. Include outstanding deficiencies and plans for resolution.
   b. Include plans for seasonal testing scheduled for a later date.
3. System performance test results and evaluations.
4. Summary of training completed and scheduled.
5. Attach commissioning process documents.

a. Commissioning Plan
b. OPR – Owner's Project Goals
c. BOD – Basis of Design
d. Executed installation checklists
e. Executed functional performance test compliance documents.
f. Recommendations for end-of-warranty review activities.

3.08 OPERATION AND MAINTENANCE (O&M) MANUALS

A. The following O&M manual requirements do not replace O&M manual documentation requirements elsewhere in these specifications.

B. Division 23 shall compile and prepare documentation for all equipment and systems covered in Division 23 and deliver this documentation to the GC for inclusion in the O&M manuals, according to this section.

C. The CA shall receive a copy of the O&M manuals for review.

D. Special Control System O&M Manual Requirements. In addition to documentation that may be specified elsewhere, the Temperature Controls Contractor shall compile and organize at minimum the following data on the control system in labeled 3-ring binders with indexed tabs.

1. Four copies of the controls training manuals in a separate manual from the O&M manuals.

2. Operation and Maintenance Manuals containing:

a. Specific instructions on how to perform and apply all functions, features, modes, etc. mentioned in the controls training sections of this specification and other features of this system. These instructions shall be step-by-step. Indexes and clear tables of contents shall be included. The detailed technical manual for programming and customizing control loops and algorithms shall be included.

b. Full as-built set of control drawings (refer to Submittal section above for details).

c. Full as-built sequence of operations for each piece of equipment.

d. Full points list. In addition to the updated points list required in the original submittals (Part 1 of this section), a listing of all rooms shall be provided with the following information for each room:

1) Floor
2) Room number
3) Room name
4) Air handler unit ID
5) Reference drawing number
6) Air terminal unit tag ID
7) Heating and/or cooling valve tag ID
8) Minimum cfm
9) Maximum cfm

e. Full print out of all schedules and set points after testing and acceptance of the system.

f. Full as-built print out of software program.

g. Electronic copy on disk of the entire program for this facility.

h. Marking of all system sensors and thermostats on the as-built floor plan and mechanical drawings with their control system designations.

i. Maintenance instructions, including sensor calibration requirements and methods by sensor type, etc.

j. Control equipment component submittals, parts lists, etc.

k. Warranty requirements.

l. Copies of all checkout tests and calibrations performed by the Contractor (not commissioning tests).

3. The manual shall be organized and subdivided with permanently labeled tabs for each of the following data in the given order:

a. Sequences of operation
b. Control drawings
c. Points lists
d. Controller / module data
e. Thermostats and timers
f. Sensors and DP switches
g. Valves and valve actuators
h. Dampers and damper actuators
i. Program setups (software program printouts)

4. Field checkout sheets and trend logs should be provided to the CA for inclusion in the Commissioning Record Book.

E. Special TAB Documentation Requirements. The TAB will compile and submit the following with other documentation that may be specified elsewhere in the Specifications.

1. Final report containing an explanation of the methodology, assumptions, test conditions and the results in a clear format with designations of all uncommon abbreviations and column headings.

2. The TAB shall mark on the drawings where all traverse and other critical measurements were taken and cross reference the location in the TAB report.

F. Review and Approvals. Review of the commissioning related sections of the O&M manuals shall be made by the A/E and by the CA.

3.07 TRAINING OF OWNER PERSONNEL

A. Division 23 Contractor shall be responsible for training coordination and scheduling and ultimately to ensure that training is completed.

B. The CA shall be responsible for overseeing and approving the content and adequacy of the training of Owner personnel for commissioned equipment.

C. Mechanical Contractor. The mechanical contractor shall have the following training responsibilities:

1. Provide the CA with a training plan two weeks before the planned training.

2. Provide designated Owner personnel with comprehensive orientation and training in the understanding of the systems and the operation and maintenance of each piece of HVAC

equipment including, but not limited to, pumps, boilers, furnaces, chillers, heat rejection equipment, air conditioning units, air handling units, fans, terminal units, controls and water treatment systems, etc.

3. Training shall normally start with classroom sessions followed by hands-on training on each piece of equipment, which shall illustrate the various modes of operation, including startup, shutdown, fire/smoke alarm, power failure, etc.

4. During any demonstration, should the system fail to perform in accordance with the requirements of the O&M manual or sequence of operations, the system will be repaired or adjusted as necessary and the demonstration repeated.

5. The appropriate trade or manufacturer's representative shall provide the instructions on each major piece of equipment. This person may be the start-up technician for the piece of equipment, the installing contractor or manufacturer's representative. Practical building operating expertise as well as in-depth knowledge of all modes of operation of the specific piece of equipment are required. More than one party may be required to execute the training.

6. The Temperature Controls Contractor shall attend sessions other than the controls training, as requested, to discuss the interaction of the controls system as it relates to the equipment being discussed.

7. The training sessions shall follow the outline in the Table of Contents of the operation and maintenance manual and illustrate whenever possible the use of the O&M manuals for reference.

8. Training shall include:

    a. Use of the printed installation, operation and maintenance instruction material included in the O&M manuals.

    b. A review of the written O&M instructions emphasizing safe and proper operating requirements, preventative maintenance, special tools needed and spare parts inventory suggestions. The training shall include start-up, operation in all modes possible, shut-down, seasonal changeover and any emergency procedures.

    c. Discussion of relevant health and safety issues and concerns.

    d. Discussion of warranties and guarantees.

    e. Common troubleshooting problems and solutions.

    f. Explanatory information included in the O&M manuals and the location of all plans and manuals in the facility.

    g. Discussion of any peculiarities of equipment installation or operation.

    h. The format and training agenda in The HVAC Commissioning Process, ASHRAE latest Guideline is recommended.

    i. Classroom sessions shall include the use of overhead projections, slides, video/audio-taped material as might be appropriate.

9. Hands-on training shall include start-up, operation in all modes possible, including manual, shut-down and any emergency procedures and preventative maintenance for all pieces of equipment.

10. The mechanical contractor shall fully explain and demonstrate the operation, function and overrides of any local packaged controls, not controlled by the central control system.

11. Training shall occur after functional testing is complete, unless approved otherwise by the Project Manager.

12. Duration of Training. The mechanical contractor shall provide training on each piece of equipment according to the following schedule.

Hours	System
8	Chillers and System
8	Boilers and System
3	Piping Systems
4	Chemical Treatment
12	Air Handler Units
8	VRF Systems
12	Rooftop Units
4	Heat Exchangers
1	Spot Unit Heaters
2	Air Terminal Units
1	Central Exhaust Systems
2	Supplementary Fans
2	Pumps
16	Controls System
16	Control system Follow-up
4	Humidifiers

D. Temperature Controls Contractor. The Temperature Controls Contractor shall have the following training responsibilities:

1. Provide the Commissioning Agent, Architect/ Engineer and CM with a training plan four weeks before the planned training.

2. The Temperature Controls Contractor shall provide designated Owner personnel training on the control system in this facility. The intent is to clearly and completely instruct the Owner on all the capabilities of the control system.

3. Training manuals. The standard operating manual for the system and any special training manuals will be provided for each trainee, with three extra copies left for the O&M manuals. In addition, copies of the system technical manual will be demonstrated during training and three copies submitted with the O&M manuals. Manuals shall include detailed description of the subject matter for each session. The manuals will cover all control sequences and have a definitions section that fully describes all relevant words used in the manuals and in all software displays. Manuals will be approved by the CA. Copies of audiovisuals shall be delivered to the Owner.

4. The trainings will be tailored to the needs and skill-level of the trainees.

5. The trainers will be knowledgeable on the system and its use in buildings. For the on-site sessions, the most qualified trainer(s) will be used. The Owner shall approve the instructor prior to scheduling the training.

6. During any demonstration, should the system fail to perform in accordance with the requirements of the O&M manual or sequence of operations, the system will be repaired or adjusted as necessary and the demonstration repeated.

7. The Temperature Controls Contractor shall attend sessions other than the controls training, as requested, to discuss the interaction of the controls system as it relates to the equipment being discussed.

8. There shall be three training sessions:

   a. Training I. Control System. This training may be held on-site or in the supplier's facility. If held off-site, the training may occur prior to final completion of the system installation. Upon completion, each student, using appropriate documentation, should be able to perform elementary operations and describe general hardware architecture and functionality of the system.

   b. Training II. Building Systems. The second session shall be held on-site and will consist of actual hands-on training after the completion of system commissioning. The session shall include instruction on:

      1) Specific hardware configuration of installed systems in this building and specific instruction for operating the installed system, including HVAC systems, lighting controls and any interface with security and communication systems.

      2) Security levels, alarms, system start-up, shut-down, power outage and restart routines, changing set points and alarms and other typical changed parameters, overrides, freeze protection, manual operation of equipment, optional control strategies that can be considered, energy savings strategies and set points that if changed will adversely affect energy consumption, energy accounting, procedures for obtaining vendor assistance, etc.

      3) All trending and monitoring features (values, change of state, totalization, etc.), including setting up, executing, downloading, viewing both tabular and graphically and printing trends. Trainees will actually set-up trends in the presence of the trainer.

      4) Every screen shall be completely discussed, allowing time for questions.

      5) Use of keypad or plug-in laptop computer at the zone level.

      6) Use of remote access to the system via phone lines or networks.

         a) Setting up and changing an air terminal unit controller.
         b) Graphics generation
         c) Point database entry and modifications
         d) Understanding DDC field panel operating programming (when applicable)

   c. Training III. The third training (Follow-up Training) will be conducted on-site six months after occupancy. The session will be structured to address specific topics that trainees need to discuss and to answer questions concerning operation of the system.

E. TAB The TAB contractor shall have the following training responsibilities:

1. TAB shall meet for 2 hours with facility staff after completion of TAB and instruct them on the following:

   a. Go over the final TAB report, explaining the layout and meanings of each data type.

   b. Discuss any outstanding deficient items in control, ducting or design that may affect the proper delivery of air or water.

c. Identify and discuss any terminal units, duct runs, diffusers, coils, fans and pumps that are close to or are not meeting their design capacity.

d. Discuss any temporary settings and steps to finalize them for any areas that are not finished.

e. Other salient information that may be useful for facility operations, relative to TAB.

3.08 DEFERRED TESTING

A. Unforeseen Deferred Tests:

1. If a test cannot be completed due to the building structure, required occupancy condition, of other deficiency, the functional testing may be delayed upon recommendation of the Commissioning Agent and the approval of the Owner. These tests are conducted in the same manner as the seasonal tests as soon as possible.

B. Seasonal Testing:

1. Schedule, coordinate, observe and document additional testing for seasonal variation in operations and control strategies during the opposite season to verify performance of the HVAC system and controls. Complete testing during the warranty period to fully test all sequences of operation.

C. Update O&M manuals and Record Documents as necessary due to testing.

3.09 WRITTEN WORK PRODUCTS

A. Written work products of Contractors will consist of the start-up and initial checkout plan and the filled out start-up, initial checkout and construction checklists.

END OF SECTION

DIVISION 23 – HEATING, VENTILATING AND AIR CONDITIONING (HVAC)

SECTION 232113 – HYDRONIC PIPING

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and Division 01 Specification sections, apply to work of this section.

1.02 DESCRIPTION OF WORK

A. Extent of hot and / or chilled water piping systems work is indicated on drawings and schedules, and by requirements of this section.

B. Applications for hot/chilled water piping systems include the following:

1. Hot/chilled water piping systems for hot/chilled water heating/cooling terminal units.

2. Hot/chilled water piping systems for hot/chilled water coils in air handling units.

C. Refer to appropriate Division 23 sections for insulation required in connection with hot/chilled water piping systems.

1.03 QUALITY ASSURANCE

A. ANSI Compliance: Comply with applicable American National Standards pertaining to products and installation of hot/chilled water piping systems.

1.04 SUBMITTALS

A. Product Data: Submit manufacturer's data for hot/chilled water piping systems, materials and products.

B. Shop Drawings: Submit scaled layout drawings of installed hot/chilled water pipe and fittings including, but not necessarily limited to, pipe sizes, locations, elevations and slopes of horizontal runs, wall and floor penetrations, and connections. Show interface and spatial relationship between piping and proximate equipment.

PART 2 - PRODUCTS

2.01 HOT/CHILLED WATER PIPING MATERIALS AND PRODUCTS

A. General: Provide piping materials and factory-fabricated piping products of sizes, types, pressure ratings, temperature ratings and capacities as indicated. Where not indicated, provide proper selection as determined by engineer to comply with installation requirements.

B. Provide materials and products complying with ANSI B31.1 Code for Power Piping where applicable, base pressure rating on hot/chilled water piping systems maximum design pressures. Provide sizes and types matching piping and equipment materials used in hot/chilled water piping systems. Where more than one type of material or product is indicated, selection is engineer’s option.

2.02 BASIC IDENTIFICATION

A. General: Provide identification complying with Division 23 Basic Materials and Methods section "Mechanical Identification."

2.03 BASIC PIPE, TUBE AND FITTINGS

A. General: Provide pipe, tube and fittings complying with Division 15 Basic Materials and Methods section "Pipe, Tube and Fittings," in accordance with the following listing:

1. Hot/chilled water AND low pressure steam piping:

    a. Pipe size 2" and smaller: Black steel pipe.

        1) Pipe weight: Schedule 40.
        2) Fittings: Class 125 cast iron threaded.

2. Pipe size 2-1/2" and larger: Black steel pipe.

        1) Pipe weight: Schedule 40.
        2) Fittings: Wrought steel buttwelding.

2.04 BASIC PIPING SPECIALTIES

A. General: Provide piping specialties complying with Division 23 Basic Materials and Methods section "Piping Specialties."

2.05 BASIC SUPPORTS, ANCHORS AND SEALS

A. General: Provide supports, anchors and seals complying with Division 23 Basic Material and Methods section "Supports, Anchors, and Seals." Supports and anchors provided shall meet the requirements of section 1613 of the New York State Building Code; horizontal and vertical runs of pipe shall be securely supported in accordance with the New York State Building Code including seismic requirements.

2.06 BASIC VALVES

A. General: Provide valves complying with Division 23 Basic Materials and Methods section "Valves," in accordance with the following listings:

1. Sectional Valves:

    a. 2" and smaller: Ball valves (hot/chilled water only).
    b. 2-1/2” and larger: rising stem or O.S.&Y. type.
    c. 2-1/2: and larger: Butterfly valves

2. Shutoff Valves:

    a. 2" and smaller: Ball valves (hot/chilled water only)
    b. 2-1/2" and larger: Rising stem or O.S.&Y. valves. Butterfly valves may be used.

3. Heating/Cooling Terminal Outlet Valves:

    a. 2" and smaller: Balance valve (Globe type)(hot/chilled water only)
    b. 2-1/2" and larger: Rising Stem.(Globe type).

4. Drain Valves:

    a. 2" and smaller: Ball valves.

5. Check Valves:

    a. All sizes: Silent wafer type check valve, swing type check valve.

2.07 BASIC EXPANSION COMPENSATION

A. General: Provide expansion compensation products complying with Division 23 "Expansion Compensation," in accordance with the following listing:

1. Flexible ball pipe joints (hot/chilled water only) Use fabricated piping loops for low pressure steam or linear bellows type rated for steam service.
2. Pipe alignment guides and anchors.

2.08 BASIC THERMOMETERS AND GAUGES

A. General: Provide meters and gauges complying with Division 23 section "Thermometers and Gauges," in accordance with the following listing:

1. Temperature gauges and fittings.
2. Pressure gauges and fittings.
3. Flow measuring gauges.

2.09 HYDRONIC SPECIALTIES

A. General: Provide hydronic specialties complying with Division 23 section "Hydronic Specialties," in accordance with the following listing:

1. Balance valves.
2. Balance cocks.
3. Vent valves.
4. Flow control valves.
5. Diverting fittings.
6. Air separators.

2.10 UNDERGROUND PIPING

A. General:

1. All underground heating water lines shall be XTRU-THERM as manufactured by PERMA-PIPE. All straight sections shall be factory fabricated, insulated, and jacketed. The piping system design and manufacture shall be in strict conformance with ASME B31.1, latest edition. The piping manufacturer will be responsible for the design and thermal expansion of the system. Installation of the piping system shall be in accordance with the manufacturer’s instructions. Factory trained field technical assistance shall be provided for critical periods of installation, unloading, field joint instruction and testing.

B. Service Pipe:

1. The service pipe shall be ASTM A53 Schedule 40 Grade B Carbon Steel. Straight sections shall be supplied in 20 or 40-foot lengths with piping exposed at each end for field joint fabrication.

C. Insulation:

1. The service pipe insulation shall be polyurethane foam with 2 lb/ft^3 minimum density, 90% minimum closed cell content, minimum compressive strength of 40 psi and initial thermal conductivity of 0.18 Btu-in/hr/ft^2/^{O}F. The insulation shall completely fill the annular space between the service pipe and jacket and-shall be bonded to both. Systems using open cell insulation or a non- bonded design shall not be allowed. The polyurethane foam insulation shall be tested by the manufacturer for mechanical and thermal s to assure compliance with the above values. All test samples will be taken from production material, identified, tagged and tested in accordance with the table below. Test reports showing results will be furnished to the engineer for approval. Data supplied by the polyurethane foam chemical supplier is not acceptable.

Attribute	ASTM STD	Sample Frequency	Requirement
Insulation Density	D 1622	Once per shift	$\geq$ 2 lb/ft^3
Insulation Compression Strength	D 1621	Once per shift	$\geq$ 40 psi
Insulation Closed Cell Content	D 2856	Once per shift	$\geq$ 90%
Insulation Thermal Conductivity	C 518	Once per shift	< 0.18 Btu-in/hr/ft^2/°F

The insulation shall be provided to the minimum thickness specified below:

Pipe Size (in.)	Minimum Insulation Thickness (in.)	
	Chilled Water	Glycol Water
1 to 12	1.5	1.5

D. Insulation Jacket:

1. The outer protective insulation jacket shall be seamless high-density polyethylene (HDPE) in accordance with ASTM D3350, minimum cell classification PE345444C. PVC or tape materials are not allowed. The end of each straight section of pipe will have the jacket tapered down over the insulation and bonded to the service pipe. No mastic is allowed. The minimum thickness of the HDPE jacket shall be as follows:

Jacket OD (in.)	Minimum Jacket Thickness (in.)
OD < 12	0.120

E. Fittings:

1. All fittings shall be factory prefabricated and pre-insulated. Straight tangent lengths shall be added to all ends so that all field joints are at straight sections of pipe. Elbow jackets shall be molded HDPE. Tee jackets shall be extrusion welded or butt fusion welded HDPE. Gluing, taping or hot air welding shall not be allowed.

F. Field Joints:

1. The service pipe shall be hydrostatically tested to 150 psig or 1 1/2 times the design pressures whichever is greater. Insulation shall then be poured in place into the field joint area. All field-applied insulation shall be placed only in straight sections of pipe. The installer shall seal the field joint area with a heat shrinkable adhesive backed sleeve. Backfilling shall not begin until the heat shrink sleeve has cooled. All insulation and jacketing materials for the field joint shall be furnished by PERMA-PIPE.

G. Field Service:

1. The piping manufacturer will provide a factory field service technician to be present during critical periods of the installation. The factory field service technician will be employed by the piping manufacturer and will not be a sales representative.

H. Backfill:

1. A 4-inch layer of sand or fine gravel shall be placed and tamped in the trench to provide a uniform bedding for the pipe. The entire trench width shall be evenly backfilled with a similar material as the bedding in 6 inch compacted layers to a minimum height of 6 inches above the top of the insulated pipe. The remaining trench shall be evenly and continuously backfilled and compacted in uniform layers with suitable excavated soil.

PART 3 - EXECUTION

3.01 INSTALLATION OF BASIC IDENTIFICATION

A. General: Install mechanical identification in accordance with Division 23 Basic Materials and Methods section "Mechanical Identification."

3.02 INSTALLATION OF HOT/CHILLED WATER WATER DISTRIBUTION PIPING

A. General: Install water distribution piping in accordance with Division 23 Basic Materials and Methods section "Pipe, Tube and Fittings."

B. Install concentric reducers where pipe is reduced in size in direction of flow, with tops of both pipes and reducer flush.

C. Install piping with 1" minimum rise in 40' pipe run (0.2%) in direction of flow.

D. Connect branch feed piping to mains at horizontal center line of mains, connect run-out piping to branches at horizontal center line of branches.

E. Locate groups of pipes parallel to each other, spaced to permit applying full insulation and servicing of valves.

3.03 INSTALLATION OF PIPING SPECIALTIES

A. Install piping specialties in accordance with Division 23 section "Hydronic Specialties."

3.04 INSTALLATION OF SUPPORTS, ANCHORS AND SEALS

A. Install supports, anchors and seals in accordance with Division 15 Basic Materials and Methods and project drawings and details.

3.05 INSTALLATION OF VALVES

A. Install valves in accordance with Division 23 section "Valves."

B. Sectional valves: Install on each branch and riser, close to main, where branch or riser serves two or more heating terminals or equipment connections and elsewhere as indicated.

C. Shutoff valves: Install on inlet and outlet of each mechanical equipment item and on inlet of each heating/cooling terminal and elsewhere as indicated.

D. Heating/cooling terminal outlet valves: Install on outlet of each heating/cooling terminal and elsewhere as indicated.

E. Drain valves: Install on each mechanical equipment item located to completely drain equipment for service or repair. Install at base of each riser, at base of each rise or drop in piping system and elsewhere where indicated or required to completely drain hot/chilled water piping system.

F. Check valves: Install on discharge side of each pump and elsewhere as indicated.

3.06 INSTALLATION OF EXPANSION COMPENSATION PRODUCTS

A. Install expansion compensation products in accordance with Division 23 section "Expansion Compensation."

3.07 INSTALLATION OF THERMOMETERS AND GAUGES

A. Install thermometers and gauges in accordance with Division 23 section "Thermometers and Gauges."

3.08 INSTALLATION OF HYDRONIC SPECIALTIES

A. General: Install hydronic specialties in accordance with Division 23 "Hydronic Specialties" section.

3.09 EQUIPMENT CONNECTIONS

A. General: Connect hot/chilled water piping system to mechanical equipment as indicated and comply with equipment manufacturer's instructions where not otherwise indicated. Install shutoff valve and union on supply and return, drain valve on drain connection.

B. Hot/chilled water terminals: Install hot/chilled water terminals with heating/cooling terminal outlet valve and union on outlet, union, shutoff valve on inlet. Install automatic air vent valve on element in accordance with manufacturer's instructions. Locate valves and balancing cocks behind valve access doors for ease of maintenance. Where indicated, install automatic temperature control valve with unions between all ports of the control valve.

3.10 CLEANING, FLUSHING AND INSPECTING

A. General: Include coils, etc. See Division 23 Basic Materials & Methods.

3.11 TESTING AND BALANCING

A. General: See Division 23 "Testing, Adjusting and Balancing.

END OF SECTION

DIVISION 23 – HEATING, VENTILATING AND AIR CONDITIONING (HVAC)

SECTION 232116 – HYDRONIC SPECIALTIES

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 Specification sections, apply to work of this section.

1.02 DESCRIPTION OF WORK

A. Extent of hydronic specialties required by this section is indicated on drawings, and/or specified in other Division 23 hydronic piping system sections.

B. Types of hydronic specialties specified in this section include the following:

1. Balance valves.
2. Vent valves.
3. Flow control valves.
4. Diverting fittings.
5. Air separators.
6. Compression tanks.
7. Pump discharge valves.
8. Shot feeders.
9. Water relief valves.
10. Pressure reducing valves.
11. RPZ – Backflow Preventer

1.03 QUALITY ASSURANCE

A. Materials and equipment shall be provided by one of the manufactures listed in Part 2 - Products. Materials and equipment from other manufacturers may be accepted if proven equal to those specified. This contractor is liable for and shall pay for all architectural and engineering review and redesign costs for substitute materials and equipment. This contractor also is liable for all costs of changes in the work required by substitute equipment.

B. The length of time the manufacturer has been in business, the location and capability of complete repair facilities, availability of repair parts and annual maintenance contracts all will be considered in determining equality. Refer to requirements pertaining to substitute materials and equipment.

1.04 SUBMITTALS

A. Product data - submit catalog cuts, specifications, installation instructions and dimensioned drawings for each type of manufactured hydronic specialty. Include pressure drop curve or chart for each type and size of hydronic specialty.

B. Shop drawings - submit for fabricated specialties, indicating details of fabrication, materials and method of support.

C. Maintenance data - submit maintenance data and spare parts lists for each type of manufactured hydronic specialty. Include this data in maintenance manual.

D. Hydronic specialty types - provide hydronic specialties of same type by same manufacturer.

PART 2 - PRODUCTS

2.01 MANUFACTURED HYDRONIC SPECIALTIES

A. General - provide factory fabricated hydronic specialties recommended by manufacturer for use in service indicated. Provide hydronic specialties of types and pressure ratings indicated for each service, or if not indicated, provide proper selection as determined by the engineer to comply with installation requirements. Provide sizes as indicated and connections which properly mate with pipe, tube and equipment connections. Where more than one type is indicated, selection is the engineers' option, but more than one type cannot be used on project.

B. Balance valves:

1. General - provide balance valves as indicated, of one of the following types:

   a. Threaded ends 2" and smaller - Class 125, bronze body, ball valve with memory stop.
   b. Soldered ends 2" and smaller - Class 125, bronze body, ball valve with memory stop.
   c. Threaded, soldered, of flanged end globe style providing three (3) functions:

      1) Precise flow measurement
      2) Precision flow balancing
      3) Positive shut-off, no drip seat, Teflon disk, 1-1/2" to 2" size - drain connection with protective cap.
      4) Vernier-type setting with "hidden memory" feature to program valve for tamper-proof setting. Balance meter, valved connections. Manufacturer: Armstrong Pumps, Type CBV.

C. Vent valves:

1. Manual vent valves - provide manual vent valves designed to be operated manually with screwdriver or thumbscrew, 1/8" N.P.T. connection.

2. Automatic vent valves - provide automatic vent valves designed to vent automatically with float principle, stainless steel float and mechanisms, cast iron body, pressure rated for 125 psi, 1/2" N.P.T. inlet and outlet connections.

3. Manufacturer - subject to compliance with requirements, provide vent valves of one of the following:

   a. Bell & Gossett, ITT Fluid Handling Div.
   b. Taco, Inc.
   c. Armstrong Co.

D. Flow control valves:

1. General - provide flow control valves pressure rated for 125 psi, containing lift check assembly which will automatically open by means of pump flow pressure, and automatically close when pump is not operating. Provide with means to manually open in case of pump failure.

   a. Threaded ends 2" and smaller - cast iron body, bronze check mechanism, screw-in bonnet, straight or angle pattern.
   b. Soldered ends 1 1/4" and smaller - cast bronze body, bronze check mechanism, screw in bonnet, straight or angle pattern.
   c. Threaded ends 2 1/2" through 4" - cast iron body, bronze check mechanism, screw in bonnet, straight or angle pattern.

2. Manufacturer - subject to compliance with requirements, provide flow control valves of one of the following:

    a. Bell & Gossett, ITT Fluid Handling Div.
    b. Taco, Inc.
    c. Armstrong Pump Co.

E. Diverting fittings:

1. General - provide diverting fittings as indicated for one pipe hydronic piping systems. Construct fittings of cast iron with threaded ends or wrought copper with solder ends, pressure rated for 125 psi. Provide indication on fitting of direction of flow for supply or return applications. Furnish flow and pressure drop curves based on manufacturer's testing with submittal.

2. Manufacturer - subject to compliance with requirements, provide diverting fittings of one of the following:

    a. Armstrong Pumps, Inc.
    b. Bell & Gossett, ITT Fluid Handling Div.

F. Air Separators:

1. General – provide air separators pressure rated for 125 psi. Select capacity based on total system gpm.

2. Dip tube fittings – provide dip tube fittings in boilers as indicated to prevent free air collected in boiler from rising into system.

3. In-Line air separators – provide in-line air separators as indicated. Construct sizes 1 1/2” and smaller of cast iron, and sizes 2” and larger of steel complying with ASME Boiler and Pressure Vessel Code and stamped with” U” symbol. Furnish National board Form U-1 denoting compliance.

4. Combination separator/strainer – provide external combination air separators/strainers as indicated. Construct of steel complying with ASME Boiler and Pressure Vessel Code and stamped with “U” symbol. Furnish National Board Form U-1 denoting compliance. Provide galvanized steel integral strainer with 3/16” perforations and free area of not less than 5 times cross sectional area of connecting lines. Provide tangential inlet and outlet connections and internal stainless steel air collector tube designed to direct released air into compression tank. Provide blowdown connections.

5. Manufacturer – subject to compliance with requirements, provide air separators of one of the following:

    a. Armstrong Pumps, Inc.
    b. Bell & Gosett, ITT Fluid Handling Div.
    c. Taco, Inc.

G. Compression tank:

1. General – provide compression tanks of size and number as indicated. Construct of steel for 125 psi pressure rating complying with ASME Boiler and pressure Vessel Code and stamped with” U” symbol. Furnish National Board Form U-1 denoting compliance. Provide tappings in bottom of tank for tank fitting.

a. Tank fittings – provide tank fittings for compression tanks as indicated, sized for compression tank diameter. Design tank fittings for 125 psi pressure rating and include manual vent to establish proper air volume in tank on initial fill.

2. Manufacturer – subject to compliance with requirements, provide compression tanks and tank fittings of one of the following:

   a. Armstrong Pumps, Inc.
   b. Bell & Gossett, ITT Fluid Handling Div.
   c. Taco, Inc.

H. Diaphragm type compression tanks:

1. General – provide diaphragm compression tanks of size and number as indicated. Construct tank of welded steel, constructed, tested and stamped in accordance with Section VII of the ASME Boiler and Pressure Vessel Code for a working pressure of 125 psi. Furnish National Board Form U-1 denoting compliance. Support vertical tanks with steel legs or base, support horizontal tanks with steel saddles. Provide specially compounded flexible diaphragm securely sealed into tank to permanently separate air charge from system water, to maintain design expansion capacity. Provide pressure gauge and air charging fitting.

2. Manufacturer – subject to compliance with requirements, provide diaphragm type compression tanks of the following:

   a. Bell & Gossett, ITT Fluid Handling Div.
   b. Armstrong Pumps, Inc.

I. Pump discharge valves:

1. General – provide pump discharge valves as indicated. Provide Non-slam check valve with spring loaded disc and calibrated adjustment feature permitting regulation of pump discharge flow and shutoff. Provide flanged cast iron valve body, pressure rated for 175 psi, maximum operating temperature of 300 degrees F. Provide straight or angle pattern as required.

2. Manufacturer – subject to compliance with requirements, provide Pump discharge valves of one of the following:

   a. Armstrong Pumps, Inc.
   b. Bell & Gossett, ITT Fluid Handling Div.

J. Shot feeders:

1. General – provide shot feeders of 5 gallon capacity or otherwise as indicated, constructed of cast iron or steel, for introducing chemicals in hydronic system. Provide funnel and valve on top for loading drain valve in bottom, and recirculating valves on side. Construct for pressure rating of 125 psi.

2. Manufacturer – subject to compliance with requirements, provide shot feeders of one of the following:

   a. Culligan USA
   b. Laboratories, Subsidiary of Clow Corp.
   c. Mougul Div., The Dexter Corp.

K. Water relief valves:

1. General – provide water relief valves as indicated, of size and capacity as selected by Installer for proper relieving capacity, in accordance with ASME Boiler and Pressure Vessel Code.

   a. Combined pressure temperature relief valves – bronze body, test lever, thermostat, complying with ANSI Z21.22 listing requirements for temperature discharge capacity. Provide temperature relief at 210 degrees F (99 C) and pressure relief as indicated on drawing.
   b. Pressure relief valves – bronze body, test lever, ASME rated. Provide pressure relief at as indicated on drawing.

2. Manufacturer – subject to compliance with requirements, provide water relief valves of one of the following:

   a. Bell & Gossett, ITT Fluid Handling Div.
   b. Taco, Inc.
   c. Armstrong Pump Co.

L. Pressure Reducing Valves:

1. General – provide pressure reducing valves as indicated, of size and capacity as selected by Installer to maintain operating pressure on boiler system.

2. Construction – brass body, low inlet pressure check valve, inlet strainer removable without system shutdown, non-corrosive valve seat and stem, factory set at operating pressure.

3. Manufacturer – subject to compliance with requirements, provide pressure reducing valves of one of the following:

   a. Bell & Gossett, ITT Fluid Handling Div.
   b. Taco, Inc.
   c. Armstrong Pumps, Inc.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Balance valves:

1. General - Install on each hydronic terminal and elsewhere as indicated.

B. Vent valves:

1. Manual vent valves - install manual vent valves on each hydronic terminal at highest point, and on each hydronic piping drop in direction of low for mains, branches and runouts and elsewhere as indicated.

2. Automatic vent valves - install automatic vent valves at top of each hydronic riser and elsewhere as indicated. Install shutoff valve between riser and vent valve, pipe outlet to suitable plumbing drain, or as indicated.

C. Flow control valves:

1. General - install flow control valves on discharge of each pump serving a hot water heating system or zone and elsewhere as indicated. Install in upright position in a horizontal line with adequate clearance for service and replacement. Adjust flow sensitivity for automatic operation.

D. Diverting fittings:

1. General - install diverting fittings as indicated and in accordance with manufacturer's instructions. Position fittings on supply and return mains with proper orientation for flow.

E. Air separators:

1. Dip tube fittings – install dip tube fittings in boiler outlet in accordance with manufacturer's instructions. Run piping to compression tank pitched towards tank at 1" rise in 5' runs (1.7%).

2. In-Line air separators – install in-line air separators in pump suction lines. Connect inlet and outlet piping. Run piping to compression tank pitched towards tank at 1" rise in 5' run (1.7%). Install drain valve on units 2" and over.

3. Combination separator/strainer – install external combination separators/strainers in pump suction lines. Connect inlet and outlet piping. Run piping to compression tank pitched towards tank at 1" rise in 5' run (1.7%). Install blowdown valve and piping. Remove and clean strainer after 24 hours and again after 30 days of system operation.

F. Compression tanks:

1. General – install compression tanks on trapeze hangers sized for tank fully loaded, or otherwise as indicated. Install tank fitting and drain valve in tank bottom and charge tank in accordance with manufacturer's instructions.

G. Diaphragm type compression tanks:

1. General – install diaphragm type compression tanks on floor as indicated, in accordance with manufacturer's instructions. Vent and purge air from hydronic system, charge tank with proper air charge as recommended by manufacturer.

H. Pump discharge valves:

1. General – at engineers option, install pump discharge valves on each pump discharge line in lieu of separate shutoff valve, check valve, and balance cock. Install in horizontal or vertical position with stem in upward position, allow clearance above stem for check mechanism removal. After hydronic system has been completed, mark calibrated name plate with stripe of yellow lacquer to permanently mark final balanced position.

I. Shot feeders:

1. General – install shot feeders on each hydronic system at pump discharge and elsewhere as indicated. Install in upright position with top of funnel not more than 48" above floor. Install in pump discharge line as indicated.

J. Water relief valves:

1. General – Install on hot water generators and elsewhere as indicated. Pipe discharge to floor. Comply with ASME Boiler and Pressure Vessel Code. Cut discharge pipe at 45° angle.

K. Pressure reducing valves:

1. Install for each hot water boiler or heat exchanger as indicated, and in accordance with manufacturer's installation instructions.

END OF SECTION

DIVISION 23 – HEATING, VENTILATING AND AIR CONDITIONING (HVAC)

SECTION 232300 – REFRIGERATION PIPING SYSTEMS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 Specifications sections, apply to work of this section.

1.02 DESCRIPTION OF WORK

A. Extent of refrigeration piping systems work is indicated on drawings and schedules, and by requirements of this section.

B. Applications for refrigeration piping systems include the following:

1. Refrigerant suction line piping between compressors and cooling coils.
2. Refrigerant liquid line piping between liquid receivers and cooling coils.
3. Refrigerant discharge line piping between compressors and condensers.
4. Refrigerant condenser drain line piping between condensers and liquid receivers.

C. Insulation for refrigeration piping is specified in applicable Division 23 sections, and is included as work of this section.

D. Refer to appropriate Division 23 sections for insulation required in connection with refrigeration piping, not work of this section.

1.03 QUALITY ASSURANCE

A. Materials and equipment shall be provided by one of the manufacturers listed in Part 2 - Products. Materials and equipment from other manufacturers may be accepted if proven equal to those specified. This contractor is liable for and shall pay for all architectural and engineering review and redesign costs for substitute materials and equipment. This contractor also is liable for all costs of changes in the work required by substitute equipment.

B. The length of time the manufacturer has been in business, the location and capability of complete repair facilities, availability of repair parts and annual maintenance contracts all will be considered in determining equality.

C. Refer to General Conditions Section GC31, "Submissions", for requirements pertaining to substitute materials and equipment.

D. Installer - a firm with at least 3 years of successful installation experience on projects with refrigeration piping system work similar to that required for project.

E. ANSI code compliance - comply with applicable provisions of ANSI B31.5, "Refrigeration Piping" and extend applicable lower pressure limits to pressures below 15 psig.

F. Safety code compliance - comply with applicable portions of ANSI/ASHRAE 15, "Safety Code for Mechanical Refrigeration".

G. Brazing - comply with applicable requirements of ANSI/ASME B31.5, "Refrigeration Piping", pertaining to brazing of refrigeration piping for shop and project site locations.

1.04 SUBMITTALS

A. Product data - submit manufacturer's data for refrigeration piping systems materials and products.

B. Brazing certification - certify brazing procedures, brazers and operators in accordance with ANSI/ASME B31.5.

C. Shop drawings - submit scaled layout drawings of installed refrigeration pipe and fittings including, but not necessarily limited to, pipe sizes, locations, elevations and slopes of horizontal runs, wall and floor penetrations, and connections. Show interface and spatial relationship between piping and proximate equipment.

PART 2 - PRODUCTS

2.01 REFRIGERATION PIPING MATERIALS AND PRODUCTS

A. General - provide piping materials and factory fabricated piping products of sizes, types, pressure ratings, temperature ratings, and capacities as indicated. Where not indicated, provide proper selection as determined by engineer and manufacturer of equipment to comply with installation requirements. Provide materials and products complying with ANSI/ASME B31.5 Code for Refrigeration Piping where applicable, base pressure rating of refrigeration piping system maximum design pressures. Provide sizes and types matching piping and equipment connections, provide fittings of materials which match pipe materials used in refrigeration piping systems. Where more than one type of materials or products are indicated, selection is engineers' option.

2.02 BASIC IDENTIFICATION

A. General - provide identification complying with Division 23 Basic Materials and Methods section in accordance with the following listing:

1. Refrigeration piping - plastic pipe markers.

2.03 BASIC PIPE, TUBE AND FITTINGS

A. General - provide pipe, tube and fittings complying with Division 23 Basic Materials and Methods section "Pipe, Tube and Fittings", in accordance with the following listing:

1. Pipe size 2" and smaller - black steel pipe.

    a. Pipe weight - Schedule 40.
    b. Pipe weight - Schedule 80.
    c. Fittings - forged steel, socket welding.
    d. Fittings - wrought steel, buttwelding.

2. Pipe size 2 1/2" and larger - black steel pipe.

    a. Pipe weight - Schedule 40
    b. Pipe weight - Schedule 80.
    c. Fittings - wrought steel, buttwelding.

3. Tube size 3" and smaller - copper tube.

    a. Wall thickness - Type K, hard drawn temper.
    b. Wall thickness - Type L, hard drawn temper.
    c. Fittings - wrought copper, solder joints.

d. Joints - soldered, silver lead solder, ANSI/ASTM B 32, Grade 96 TS.
e. Joints - brazed, American Welding Society (AWS) classification BCuP-4 for brazing filler metal.

4. Tube size 4 1/8" and smaller - copper tube.

a. Wall thickness - type ACR, hard drawn temper.
b. Fittings - wrought copper, solder joints.
c. Joints - soldered, silver lead solder, ANSI/ASTM B 32, Grade 96 TS.
d. Joints - brazed, American Welding Society (AWS) classification BCuP-4 for brazing filler metal.

5. Tube size 3/4" and smaller - copper tube.

a. Wall thickness - type ACR, soft annealed temper.
b. Fittings - cast copper alloy for flared copper tubes.
c. Joints - flared.

6. Tube size 7/8" through 4 1/8" - copper tube.

a. Wall thickness - type ACR, soft annealed temper.
b. Fittings - wrought copper, solder joints.
c. Joints - soldered, silver solder, ANSI/ASTM B 32, Grade 96 TS.
d. Joints - brazed, American Welding Society (AWS) classification BCuP-4 for brazing filler metal.

2.04 BASIC PIPING SPECIALTIES

A. General - provide piping specialties complying with Division 23 Basic Materials and Methods section "Piping Specialties", in accordance with the following listing:

1. Pipe escutcheons.
2. Pipe sleeves.

2.05 BASIC SUPPORTS, ANCHORS AND SEALS

A. General - provide supports, anchors and seals complying with Division 23 Basic Materials and Methods section "Supports, Anchors and Seals", in accordance with the following listing:

1. Adjustable steel clevises, adjustable roller hangers, and adjustable pipe roll stands for horizontal piping hangers and supports.
2. Two bolt riser clamps for vertical piping supports.
3. Concrete inserts, C-clamps, and steel brackets for building attachments.
4. Protection shields for insulated piping support in hangers.
5. Copper flashings for piping penetrations.

2.06 SPECIAL REFRIGERATION VALVES

A. General - special valves required for refrigeration piping systems include the following types:

1. Globe and check valves:

a. Globe shutoff valves - forged brass, packed, back seating, winged seal cap, 300 degrees F (149 C) temperature rating, 500 psi working pressure.

b. Check valves - forged brass, accessible internal parts, soft synthetic seat, fully guided brass piston and stainless steel spring, 250 degrees F (121 C) temperature rating, 500 psi working pressure.

c. Available manufacturers - subject to compliance with requirements, manufacturers offering globe and check valves which may be incorporated in the work include, but are not limited to, the following:

d. Manufacturer - one of the following:

1) Henry Valve Co.
2) Parker Hannifin Corp, Refrigeration & Air Conditioning Div.
3) Sporlan Valve Co.

2. Solenoid valves:

a. 2-way solenoid valves - forged brass, designed to conform to ARI 760, normally closed, teflon valve seat, NEMA 1 solenoid enclosure, 24 volt, 60 Hz., UL listed, 1/2" conduit adapter, 250 degrees F (121 C) temperature rating, 400 psi working pressure.

1) Manual operator - provide manual operator to open valve.

b. Available manufacturers - subject to compliance with requirements, manufacturers offering solenoid valves which may be incorporated in the work include, but are not limited to, the following:

c. Manufacturer - one of the following:

1) Alco Controls Div. Emerson Electric Co.
2) Automatic Switch Co.
3) Sporland Valve Co.

2.07 REFRIGERATION ACCESSORIES

A. Refrigerant strainers - brass shell and end connections, brazed joints, monel screen, 100 mesh, UL listed, 350 psi working pressure.

B. Moisture liquid indicators - forged brass, single port, removable cap, polished optical glass, solder connections, UL listed, 200 degrees F (93 C) temperature rating, 500 psi working pressure.

C. Refrigerant filter driers - steel shell, ceramic fired desiccant core, solder connections, UL listed, 500 psi working pressure.

D. Refrigerant filter driers - corrosion resistant steel shell, steel flange ring and spring, wrought copper fittings, ductile iron cover plate with steel cap screws, replaceable filter drier core, 500 psi working pressure.

E. Evaporator pressure regulators - provide corrosion resistant, spring loaded, stainless steel springs, pressure operated, evaporator pressure regulator, in size and working pressure indicated, with copper connections.

F. Refrigerant discharge line mufflers - provide discharge line mufflers as recommended by equipment manufacturer for use in service indicated, UL listed.

G. Available manufacturers - subject to compliance with requirements, manufacturers offering refrigeration accessories which may be incorporated in the work include, but are not limited to, the following:

H. Manufacturer - one of the following:

1. Alco Controls Div. Emerson Electric Co.
2. Henry Valve Co.
3. Sporlan Valve Co.

PART 3 - EXECUTION

3.01 INSTALLATION OF BASIC IDENTIFICATION

A. General -install mechanical identification in accordance with Division 23 Basic Materials and Methods section "Mechanical Identification"

3.02 INSTALLATION OF REFRIGERATION PIPING

A. General - install refrigeration piping in accordance with Division 23 Basic Materials and Methods section "Pipe, Tube and Fittings", and in compliance with equipment manufacturer's recommendations.

3.03 INSTALLATION OF PIPING SPECIALTIES

A. Install piping specialties in accordance with requirements of Division 23 Basic Materials and Methods section "Piping Specialties".

3.04 INSTALLATION OF SUPPORTS, ANCHORS AND SEALS

A. Install supports, anchors, and seals in accordance with requirements of Division 23 Basic Materials and Methods section "Supports, Anchors and Seals".

3.05 INSTALLATION OF SPECIAL REFRIGERATION VALVES

A. General - install refrigeration valves where indicated, and in accordance with manufacturer's instructions. Remove accessible internal parts before soldering or brazing, replace after joints are completed.

1. Solenoid valves - install in refrigerant piping as indicated with stem pointing upwards.

a. Wiring of solenoid valves is specified in applicable Division 26 sections and is included as work of this section.
b. Wiring of solenoid valves is specified in applicable Division 26 sections, not work of this section.

3.06 INSTALLATION OF REFRIGERATION ACCESSORIES

A. Refrigerant strainers - install in refrigerant lines as indicated and in accessible location for service.

B. Moisture liquid indicators - install as indicated on refrigerant liquid lines, in accessible location.

C. Refrigerant filter dryers - install in refrigerant lines as indicated, and in accessible location for service.

D. Evaporator pressure regulators - install in refrigerant suction lines or evaporator outlets as indicated. Adjust, if required, for proper evaporator pressure.

E. Refrigerant discharge line mufflers - install as indicated, in horizontal or downflow portion of hot-gas lines, immediately after leaving compressor, not in riser.

3.07 EQUIPMENT CONNECTIONS

A. General - connect refrigerant piping to mechanical equipment in manner shown, and comply with equipment manufacturer's instructions where not otherwise indicated.

3.08 FIELD QUALITY CONTROL

A. Refrigerant piping leak test - prior to initial operation, clean and test refrigerant piping in accordance with ANSI B31.5, "Refrigeration Piping". Perform initial test with dry nitrogen, using soap solution to test all joints. Perform final test with 27" vacuum and then 200 psi using halide torch. System must be entirely leak free.

B. Repair or replace refrigerant piping as required to eliminate leaks and retest as specified to demonstrate compliance.

END OF SECTION

DIVISION 23 – HEATING, VENTILATING AND AIR CONDITIONING (HVAC)

SECTION 233000 – AIR DISTRIBUTION

PART 1 – GENERAL

1.01 GENERAL

A. Construct all apparatus of materials suitable for the conditions encountered during operation.

B. Where corrosion can occur, appropriate corrosion-resistant materials and assembly methods must be used including isolation of dissimilar metals against galvanic interaction.

C. All factory applied acoustical and thermal insulation, including facing and adhesives, it to be fire-resistant and to conform to requirements of NBFU and State Codes.

D. Where in contact with the air stream, protect insulation against erosion or flaking by a factory applied plastic or mat facing.

E. Locate and arrange motors, eliminators, filters, cooling and heating coils, and other components and accessories so that they are accessible for repair, maintenance, and replacement.

F. Mount grease fitting directly on bearings unless the latter are not readily accessible. Where equipment bearings are not visible or are inaccessible, provide easily accessible extensions to bearing lubrication fittings.

G. Thoroughly clean the entire system before installing filters or operating the fans.

H. On systems containing filters, install filters and permanently seal the filter frames airtight before operating the fans. The Contractor, at his own expense, shall replace all dirty filters before turning over the system to the Owner, and furnish the Owner with one complete set of replacement filters for all banks. Seal all outlets around the edges to prevent air leakage.

I. Bracing and supports indicated are the minimum acceptable. Install additional bracing or supports to eliminate any distortion or vibration when the systems are operating or under tests.

J. Install ducts, castings, and hangers plumb and level, with joints square and devoid of sharp edges.

K. Unless otherwise specified, construct all duct work, including angles, bars, and other bracings, hangers, supports, and accessories of galvanized steel, all in accordance with schedules in the latest ASHRAE Guide.

L. Diffusers, grilles, registers, and transfers shall be sized and located as shown on the drawings.

END OF SECTION

DIVISION 23 – HEATING, VENTILATING AND AIR CONDITIONING (HVAC)

SECTION 233101 – DUCT CLEANING

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:

1. Removal and disposal of visible dirt, debris, and other contaminants.

2. Cleaning and decontamination of all supply, return and exhaust ductwork, diffusers, grilles and registers.

3. Chemical pressure washing and decontamination of all heating and cooling coils.

4. Cleaning and decontamination of dampers, supply air fans, exhaust air fans and other components of the HVAC systems.

5. Removal, disinfection, and/or sealing the supply duct lining with an anti-fungicidal coating as specified in the project drawings.

6. Verification and updating of working drawings.

1.02 SUBMITTALS

A. Product data for each product specified in this section.

B. Material safety data sheets for all products used.

C. Project Record Documents:

1. Upon completion of the project, submit one set of red-marked, duct layout drawings showing the location of all new access holes and openings installed in the duct systems to accommodate the cleaning process.

D. Qualifications, schedules and reports:

1. Qualification and experience documentation

2. Project schedule and procedures

3. Final report (3 copies)

E. Product-Data:

1. Submit manufacturer's data sheets, including Material Safety Data Sheets (MSDS) if applicable, for the following:

a. Air-tight plastic closure plugs
b. Vacuum cleaning machines and/or cleaning related equipment and accessories
c. Biocide sanitizing fluid
d. Anti-fungicidal duct work sealant
e. Others as applicable

1.03 QUALITY ASSURANCE

A. All work in this section shall be performed by an independent specialty HVAC duct cleaning contractor. The contractor shall be certified by NADCA (National Air Duct Cleaners Association). Submit information indicating qualifications and experience.

B. Conform to NFPA 90A

C. Conform to the requirements of the following standards that do not conflict with regulatory requirements or requirements of the contract documents:

1. SMACNA "HVAC Duct Construction Standards, Metal and Flexible."

2. NADCA "General Specifications for the Cleaning of Commercial Heating and Ventilation Systems."

D. Factory-Made Products - Listed by Underwriters Laboratories, Inc. (UL)

E. Video/photographic documentation before and after the cleaning process.

F. EPA registration for fungicide coating.

G. A project closing report shall be submitted upon completion of the entire cleaning project. Report shall include a dated summary of the duct systems and HVAC unit inspections and approvals by the Owner's designated representative. Project closing report shall be bound, neatly presented and organized according to HVAC unit, duct system or fan. Also include photographic documentation (min. 3" x 5" color prints) of before and after conditions of each system component or section.

1.04 FIELD MEASUREMENTS

A. Field measure related work to ensure proper fit and clearance.

B. Field measure existing work to ensure proper fit and clearance.

PART 2 – PRODUCTS

2.01 DUCT ACCESS PATCHES

A. Premanufactured sheet metal patches that are crossbroke, hemmed and predrilled, with insulation to match ductwork.

2.02 DUCT ACCESS DOOR

A. Premanufactured access door with locking seal.

2.03 DUCT SEALER

A. Product specifically rated for sealing duct work meeting NFPA requirements.

B. Seal modifications to existing ductwork in accordance with duct sealing described in SMACNA "HVAC Duct Construction Standards, Metal and Flexible."

2.04 HVAC DISINFECTANT/CLEANER

A. EPA registered formula for disinfection and cleaning of HVAC equipment equal to Foster Products 40-80.

B. Stabilized chlorine dioxide - Oxine or approved equivalent.

2.05 FUNGICIDAL PROTECTIVE COATING

A. EPA registered polyacrylate emulsion specifically formulated for long term fungicidal activity and HVAC application. Equal to Foster Products 40-20.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Examine elements and surface intended to support products.

B. Verify that each product conforms to regulatory requirements and to specification requirements.

C. Correct any unsatisfactory conditions before installing products of this section.

3.02 EQUIPMENT

A. HEPA filtered vacuum collector system capable of maintaining up to 1.0 inches of static pressure inside the isolated area of ductwork.

B. HEPA filtered wet/dry vacuums.

C. Air compressor as required.

1. The specific air or water pressure selected by the Contractor for air or water washing of various HVAC system components shall be appropriate to the item and component being washed. Water pressure utilized shall not exceed 1,000 psig.

2. Contractor shall repair or replace any system component damaged as a result of using excessive air or water pressure.

D. Rotary brush system for mechanical cleaning of ductwork.

3.03 PREPARATION

A. The location of each access hole or opening shall be shown and identified in a red- marked blue-lined print set of the duct system layout drawings.

B. Seal off ends and openings of any ductwork not being immediately worked on.

C. Isolate duct section to be worked upon, by using Protective seal barriers within the ductwork, to prevent loose dirt and debris from migrating to cleaned sections of the duct system.

D. Protect surrounding elements from damage and disfigurement resulting from work of this section.

E. Synthetic filter media (one inch thick 30% efficiency), or approved other, shall be temporarily fitted over each register, grille and diffuser in the duct system to intercept any migrating loose dirt and debris.

F. Each work area shall: be protected from being soiled with polyethylene plastic sheet. A protective sheet shall cover all furniture in each room of the work area. Furniture, in the case of laboratory rooms, shall, include all laboratory benches, fume hoods, desks, and related laboratory equipment. Upon completion of the duct system cleaning in each work area, protective sheeting shall be carefully removed with collected dirt and debris disposed of in an approved manner. Vacuum clean floors and other areas in each room restoring each room to its original clean condition.

G. Suitably support and brace any ductwork which will be entered by personnel.

3.04 SEQUENCE OF CLEANING AND DECONTAMINATING DUCTS

A. All work shall be conducted during unoccupied times and shall be coordinated with the designated owners' representative.

B. Take the fans off energy scheduling and allow them to run 24 hours except when the ductwork is being cleaned.

C. Clean the outside air intake grille and shaft.

D. Clean the return air ducts starting at the outer ends of the return air system and concluding at the mixed air chamber and the exhaust stack.

E. Clean the interior of the air handling unit. Remove and replace interior insulation at this time. Coordinate this work with mechanical drawings. Insulation replacement will not be required for new equipment.

F. Install products in compliance with manufacturer's instructions.

G. Pre-vacuum diffusers, grills and registers in the ductwork that are to remain. If necessary, remove, chemically wash/clean and reset (not required for existing diffusers to be replaced).

H. Existing ductwork and insulation shall be neatly cut as required to provide access to facilitate cleaning of the ductwork and components. As necessary, protect downstream areas from receiving particulates during the installation of access points.

I. Install vacuum collector unit at a predetermined location and clean the section of ductwork using omindirectional air nozzles and rotary brushes as necessary. Large crawlable ducts may be hand vacuumed or brushed and air washed.

J. Clean the supply ductwork starting from the supply fan and ending at the supply diffuser. At no point should uncleaned ductwork be upstream from clean ductwork.

K. Location of access holes and openings shall be approved by the Owner's designated representative.

L. Existing duct access panels shall be used wherever possible.

M. Upon completion of the cleaning operation, the round access openings shall be plugged air-tight with plastic caps designed for this purpose.

N. The rectangular access openings shall be closed using an overlapping galvanized sheet metal, or material to match existing ductwork, cover (cross broken) of the same gauge thickness as existing duct. Rectangular cover shall be fastened using self-tapping sheet metal screws with a silicone bead sealing gasket; or 3M No. 1202-T sealant tape used as a sealing gasket, at perimeter of cover. Seal all joints air-tight.

O. Where ducts are provided with exterior insulation, neatly cut and remove insulation as required to accommodate required duct access holes and openings. When complete, reinsulate at ducts at access points and install new vapor barriers to match existing.

P. Visually inspect the duct interior prior to cleaning each duct section. Use a fiber-optic borescope to accomplish the inspection task for all smaller ducts not otherwise accessible.

Q. Wash and vacuum clean each duct section:

Lined Ducts: Air pressure wash and vacuum or rotary brush and vacuum. The cleaning process shall not degrade the fiberglass insulation. Damaged insulation will be replaced or repaired at the discretion of the owners Representative.

1. Fog the interior of the ductwork with Oxine and allow to dry.

2. Upon completion of the cleaning of each fiberglass lined duct section, seal the surface of the fiberglass lined duct with Foster 40/20 or an approved white encapsulant equivalent.

Unlined Ducts: Air pressure wash and vacuum or rotary brush and vacuum. Hand wipe or hand vacuum if space allows. Fog the interior of the ductwork with Oxine and allow to dry.

R. Visually inspect each duct section using a borescope where necessary, to ensure the duct section is clean.

S. All registers, grilles and diffusers shall be removed, vacuum cleaned, washed and then reinstalled.

T. After duct section and reheat coils have been completely cleaned and sanitized, a final visual inspection, using a fiber-optic borescope as required, shall be accomplished with the Owner's designated representative for conditional approval. At this time, an owners' representative will take samples for mold contamination. The cleaning will receive final approval if the total fungal counts on a surface Rodac plate sample taken from the surface of the duct do not exceed 50 colony forming units on any plate. Verbal confirmation of the clearance surface sampling results will be given seven days after the final surface sample results are taken. If the desired cleaning effectiveness is not achieved, the area will have to be re-cleaned by the Contractor. The results of the cleaning effectiveness will be included in the final report. The cleaning contractor shall provide all ladders, lighting, fiber-optic borescope, and other miscellaneous equipment required to permit the owner's representative to inspect all portions of the project.

U. Repeat the cleaning process described above for succeeding duct sections until entire duct system is completely clean.

V. Reinsulate the exterior of the supply duct work if the interior insulation has been removed. Design sound attenuation modification if needed.

W. Verify that the building's air supply and return system is properly balanced.

X. Duct Access Doors:

1. A certified sheetmetal worker shall install all duct access doors.

2. Install duct access doors on the side of duct where adequate clearance is available.

3. Install duct access doors at other locations requiring access to duct interior for inspection, cleaning, adjusting, maintenance and operation.

4. Size: 18 inches by 16 inches unless duct is too small for this size.

Y. Install duct test holes as required.

3.05 CLEANING HVAC EQUIPMENT

A. Isolate HVAC unit housing from adjacent equipment and building room surfaces with polyethylene sheet.

B. Protect all motors, bearing assemblies, and belt drive assemblies within the HVAC unit housing with taped-on polyethylene sheet to prevent intrusion of potentially damaging wash water.

C. Carefully remove filters/filter media from holding frames and/or spools in an approved manner and store filters and protect from damage. Reinstall filter media after cleaning operation is complete, in accordance with filter manufacturer's instructions to insure a leak-free installation. Do not restart fans until all filters have been reinstalled and inspected by owner representative.

D. Insulation on the interior of the supply fan shall be removed and replaced with exterior insulation. Alternatively, IMCOA closed cell foam insulation or its approved equal may be applied to the interior of the supply fan.

E. Vacuum clean entire internal space of HVAC unit, including each component including component supports, frames, mounts, etc. contained therein, to remove loose dirt and debris.

F. Pressure wash, using an EPA approved cleansing agent, each HVAC unit. This shall include all the internal surfaces of the HVAC unit housing and all the internal components of the HVAC unit including fans, cooling and heating coil banks, filter bank support frames, and contiguous control damper assemblies.

G. Pressure washing of the heating and cooling coil banks shall be accomplished at both the upstream and downstream faces of the coils.

H. Where deemed necessary by the Cleaning Contractor, cleansing agent solution may be separately supplied prior to pressure wash.

I. Hand scrub where required to remove all residual dirt.

J. Rinse thoroughly with clear water to remove any residual dirt and cleansing agent.

K. Fan casings and impeller wheels shall be cleaned on all surfaces, inside and outside.

L. Vacuum clean all pressure washed surfaces. Vacuum collected wash water shall be disposed of outside of the HVAC unit.

M. A visual inspection of the HVAC unit, including all of its internal components shall be performed by the Owner's designated representative together with the Cleaning Contractor. At this time, an owner designated representative will take samples for mold contamination. The cleaning will receive final approval if the total fungal counts on a surface Rodac plate sample does not exceed 50 colony forming units on any plate. If the desired cleaning efficiency is not achieved, the area will have to be re-cleaned by the Contractor. Include this data in the final report.

3.06 APPLICATION OF FUNGICIDAL PROTECTIVE COATING

A. Apply fungicidal protective coating as per manufacturer's instructions with the HVAC system on interior fiberglass insulation that was previously cleaned and disinfected.

B. Do not coat coils, filters, controls or fans.

C. If the interior of a VAV box is encapsulated, the controls on the box must be protected from the encapsulant. The performance of the box must not be compromised by the duct cleaning.

3.07 FIELD QUALITY CONTROL

A. Inspect installed products to observe damage.

B. Test and demonstrate as required by the governing authority.

C. Do not allow discharge air from the fungicidal coating process to enter occupied spaces.

D. Ceiling and wall surfaces that are damaged by this work shall be replaced or repaired as required.

E. Testing, Adjusting and Balancing.

1. Secure all manual dampers at full open position.

2. Set splitters straight with the main duct.

3. Complete and clean the duct systems to prepare for testing, adjusting and balancing work.

F. FINAL PURGE

1. Work Area Preparation

a. Cover all terminal air outlets (diffusers, registers, grilles, etc.) with synthetic filter media at least 30% efficient. Tape filter to terminal device frame to eliminate air leakage.

2. Purge Procedure

a. Inform Owner's designated representative that outlets have been covered with synthetic filter media at least 30% efficient.
b. Insure all filters have been properly installed.

3. After receiving verbal confirmation about attainment of proper cleaning efficiency from an owner representative start HVAC units and in the event of variable speed/volume systems operate unit up and down between low and high speed to dislodge dirt and debris. Perform purge operation continuously for minimum of 1 hour.

4. Clean-Up:

a. Remove synthetic filter media from air terminal outlets, and wash and dry outlet frame with approved cleaning solution.
b. Vacuum and clean work areas to original condition.

END OF SECTION

DIVISION 23 – HEATING, VENTILATING AND AIR CONDITIONING (HVAC)

SECTION 233113 – DUCTWORK

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

A. Extent of ductwork is indicated on drawings and by requirements of this section.

B. Types of ductwork required for project include the following:

1. Heating supply and return air systems.
2. Air conditioning supply and return air systems.
3. Fresh air supply systems.
4. Mechanical exhaust systems.
5. Air relief systems.
6. Fume hood exhaust systems.
7. Wood shop exhaust system.

C. Specific Duct System Classifications:

Service	Material	Pressure Class	Velocity
HVAC Supply	Galvanized Steel	2" WG	2500 FPM
Return Relief Exhaust	Galvanized Steel	1" WG Negative	1500 FPM
Air Plenums	Galvanized Steel	2" WG	2500 FPM
Fume hood	Stainless Steel	4" WG Negative	4000 FPM
Woodshop	Galvanized Steel	5" WG Negative	3000 FPM

D. External insulation for ductwork is specified in Division 23 insulation sections, and is not included as work of this section.

E. Duct accessories are specified in Division 23 Section and are included as work of this section.

F. Inlets and outlets are specified in Division 23 section and are included as work of this section.

G. Duct lining, as specified herein and indicated on drawings, is included as work of this section.

1.02 SUBMITTALS

A. Product data: Submit manufacturer's specifications on manufactured products and factory fabricated ductwork, used for work of this section.

B. Shop drawings: Submit dimensioned layouts of ductwork showing both the accurately scaled ductwork and its relation to space enclosure. Duct dimensions shall be external and provide adequate space to include lining and maintain internal dimensions indicated on contract drawings. When appropriate, show modifications of indicated requirements made to conform to local shop practice, and how those modifications ensure that free area, materials, and rigidity are not reduced.

C. As-Built drawings: At project closeout, submit as-built drawings of installed ductwork, duct accessories, and outlets and inlets, in accordance with requirements of Division 01.

1.03 QUALITY ASSURANCE AND REQUIRED CODES AND STANDARDS

A. SMACNA standards (metal and flexible ductwork) - comply with SMACNA "HVAC Duct Construction Standards" latest edition for fabrication and installation of metal and flexible ductwork.

B. SMACNA standards (thermoplastic duct) - comply with SMACNA "Thermoplastic Duct (PVC) Construction Manual" latest edition for fabrication and installation of thermoplastic (PVC) ductwork.

C. SMACNA standards (fibrous glass ductwork) - comply with SMACNA "Fibrous Glass Duct Construction Standards" latest edition for fabrication and installation of fibrous glass ductwork.

D. SMACNA standards (industrial duct) - comply with SMACNA "Accepted Industry Practice for Industrial Duct Construction"; "Accepted Industry Practice for Round Industrial Duct Construction"; and "Accepted Industry Practice for Square Industrial Duct Construction", latest editions, for fabrication and installation of industrial ductwork.

E. SMACNA standards: Comply with SMACNA "Duct Liner Standards" for installations of duct liner in sheet metal ductwork.

F. NYS compliance: Comply with NFPA 90 A "Standard for the Installation of Air Conditioning and Ventilating Systems."

G. Mechanical Code of New York State

1.04 DELIVERY, STORAGE AND HANDLING

A. Protect shop fabricated and factory fabricated ductwork, accessories and purchased products from damage during shipping, storage and handling. Prevent end damage and prevent dirt and moisture from entering ducts and fittings.

B. Where possible, store ductwork inside and protect from weather. Where necessary to store outside, store above grade and enclose with waterproof wrapping.

PART 2 - PRODUCTS

2.01 DUCTWORK MATERIALS

A. Exposed ductwork materials: Where ductwork is indicated to be exposed to view in occupied spaces, provide materials which are free from visual imperfections including pitting, seam marks, roller marks, oil canning, stains and discolorations, and other imperfections, including those which would impair painting.

B. Sheet metal: Except as otherwise indicated, fabricate ductwork from galvanized sheet steel complying with ANSI/ASTM A 527, lockforming quality, with ANSI/ASTM A 525, G90 zinc coating, mill phosphatized for exposed locations.

C. Flexible Duct - Polyethylene Vapor Barrier Type. Where indicated, provide insulated flexible duct as follows:

1. Galvanized steel helix, formed and mechanically locked to fabric.
2. Aluminum foil trilaminate, fiberglass and aluminized polyester, mechanically locked (no adhesive).
3. Exterior fiberglass insulation blanket factory wrapped. Thermal conductance, C factor, not more than 0.23.
4. Outer jacket of gray fire retardant polyethylene material.

5. UL listed per UL 181, Class 1 Air Duct.
6. Operating temperature range -20 degrees to 250 degrees F.
7. Flame spread less than 25, smoke developed less than 50.
8. Working pressures:

    a. 6 inch w.g. positive (all diameters).
    b. 4 inch w.g. negative, through 16 inch diameters.
    c. 1 inch w.g. negative, 18 to 20 inch diameters.

9. Rated velocity: 4,000 FPM.
10. Manufacturer:

    a. Flexmaster, Type 3.
    b. Clevaflex USA, Inc.
    c. Thermaflex.

D. Flexible Duct Fittings: Provide factory manufactured galvanized steel fittings. Use 45 degree laterals, ball mouth tees, spin collars, or conical tees for duct taps. 90 degree tees shall not be allowed.

2.02 DUCT LINER

A. Fibrous-Glass Liner: Comply with NFPA 90A or NFPA 90B and with NAIMA AH124.

1. Manufacturers:

    a. CertainTeed Corp.; Insulation Group.
    b. Johns Manville International, Inc.
    c. Knauf Fiber Glass GmbH.
    d. Owens Corning.

B. Materials: ASTM C 1071; surfaces exposed to air stream shall be coated to prevent erosion of glass fibers.

    a. Thickness: 2 inches.
    b. Thermal Conductivity (k-Value): 0.26 at 75°F (0.037 at 24°C) mean temperature.
    c. Fire-Hazard Classification: Maximum flame-spread index of 25 and smoke-developed index of 50 when tested according to ASTM E 84.
    d. Liner Adhesive: Comply with NFPA 90A or NFPA 90B and with ASTM C 916.
    e. Mechanical Fasteners: Galvanized steel suitable for adhesive attachment, mechanical attachment, or welding attachment to duct without damaging liner when applied as recommended by manufacturer and without causing leakage in duct.

        1) Tensile Strength: Indefinitely sustain a 50-lb- (23-kg) tensile, dead-load test perpendicular to duct wall.
        2) Fastener Pin Length: As required for thickness of insulation and without projecting more than 1/8 inch (3 mm) into air stream.
        3) Adhesive for Attaching Mechanical Fasteners: Comply with fire-hazard classification of duct liner system.

2.03 MISCELLANEOUS DUCTWORK MATERIALS

A. General: Provide miscellaneous materials and products of types and sizes indicated and, where not otherwise indicated, provide type and size required to comply with ductwork system requirements including proper connection of ductwork and equipment.

B. Duct sealant: Non-hardening, non-migrating mastic elastic sealant (type applicable for fabrication/installation detail) as compounded and recommended by manufacturer specifically for sealing joints and seams in ductwork. Liquid allowed for slip joints only. Silicone base duct sealer shall be used on duct joints exposed to weather.

C. Ductwork support materials.

1. For galvanized steel ductwork, provide hot dipped galvanized steel fasteners, anchors, rods, straps, trim and angles.
2. For stainless steel ductwork, provide matching stainless steel support materials.
3. For flexible ductwork, provide hot dipped galvanized steel support material.

D. Duct Connector: Where duct system meets or exceeds pressure class of 2" w.g., positive or negative, incorporate the use of rolled, formed, machine manufactured duct connector.

1. Manufacturer: Subject to compliance with requirements, provide duct connector of one of the following:

2. Ward.
3. Ductmate.
4. United McGill.
5. Flexmaster.

2.04 SHOP FABRICATION

A. Shop fabricate ductwork in 4, 8, 10 or 12 foot lengths, unless otherwise indicated or required to complete runs. Pre-assemble work in shop to greatest extent possible, so as to minimize field assembly of systems. Disassemble systems only to extent necessary for shipping and handling. Match-mark sections for re-assembly and coordinated installation.

B. Shop fabricate ductwork of gages and reinforcement complying with applicable SMACNA standard.
C. Fabricate duct fittings to match adjoining ducts, and to comply with duct requirements as applicable to fittings. Except as otherwise indicated, fabricate elbows with inside radius equal to associated duct width. Limit angular tapers to 30 degrees for contracting tapers and 20 degrees for expanding tapers.

D. Fabricate ductwork with accessories installed during fabrication to the greatest extent possible. Refer to Division 23 section "Duct Accessories" for accessory requirements.

E. Fabricate ductwork with duct liner in each section of duct where indicated. Fabricate ductwork large enough to accept liner of thickness indicated and to maintain inside dimensions shown on contract drawings. Laminate liner to internal surfaces of duct in accordance with instructions by manufacturers of lining and adhesive, and fasten with mechanical fasteners.

F. Provide lining in all ductwork that is conveying below ambient temperature air and is not insulated. Provide lining in supply air and return air ductwork from air handling unit to 20 feet away from the unit. Provide lining in ductwork as indicated on drawings.

2.05 FACTORY FABRICATED DUCTWORK

A. General: At Installer's option, provide factory fabricated spiral, round or oval duct and fittings, in lieu of shop fabricated duct and fittings.

B. Gauge: Tables 3-2 and 3-3 SMACNA "HVAC Duct Construction Standards." No standing rib shall be allowed.

C. Oval Elbows: 3 gore 90 degree and 2 gore 45 degree with machine formed seam.

D. Round Elbows: one piece construction for 90 degree and 45 degree elbows 14" and smaller. Provide 5 gore 90 degree and 3 gore 45 degree construction for larger diameter with machine formed seam joint.

E. Divided flow fittings: 90 degree tees, constructed with saddle tap spot welded and bonded to duct fitting body.

F. Manufacturer: subject to compliance with requirement, provide factory fabricated ductwork of one of the following:

1. United Sheet Metal Div., United McGill Corp.
2. Semco

PART 3 - EXECUTION

3.01 INSTALLATION OF DUCTWORK

A. General: Assemble and install ductwork in accordance with recognized industry practices which will achieve air tight (5% leakage) and noiseless (no objectionable noise) systems, capable of performing each indicated service. Install each run with minimum of joints. Align ductwork accurately at connections, within 1/8" misalignment tolerance and with internal surfaces smooth. Support ducts rigidly with suitable ties, braces, hangers and anchors of type which will hold ducts true-to-shape and to prevent buckling.

B. Duct Sizing: Duct sizes indicated on drawings are inside dimensions.

C. Flexible Duct: Flexible duct may be used for connecting room diffuser to sheet metal duct and/or ceiling terminal box only. Extend flexible duct completely and limit lengths to five feet (5'), or as indicated on Drawings. Support according to SMACNA.

D. Seal ductwork to seal class as prescribed in SMACNA "HVAC Duct Construction Standards" for the static pressure classes indicated, unless otherwise recommended.

E. Complete fabrication of work at project as necessary to match shop fabricated work and accommodate installation requirements.

F. Locate ductwork runs, except as otherwise indicated, vertically and horizontally and avoid diagonal runs wherever possible. Locate runs as indicated by diagrams, details and notations or, if not otherwise indicated, run ductwork in shortest route which does not obstruct usable space or block access for servicing building and its equipment. Hold ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building. Limit clearance to 1/2" where furring is shown for enclosure or concealment of ducts, but allow for insulation thickness, if any. Where possible, locate insulated ductwork for 1" clearance outside of insulation. Wherever possible in finished and occupied spaces, conceal ductwork from view, by locating in mechanical shafts, hollow wall construction or above suspended ceilings. Do not encase horizontal runs in solid partitions, except as specifically shown. Coordinate layout with suspended ceiling and lighting layouts and similar finished work.

G. Electrical equipment spaces: Do not run ductwork through transformer vaults and their electrical equipment spaces and enclosures.

H. Boiler Rooms: Do not run ductwork through boiler rooms unless protected per NFPA requirements.

I. Where ducts pass through interior partitions and exterior walls, conceal space between construction opening and duct or duct-plus insulation with sheet metal flanges of same gage as duct. Overlap opening on four sides by at least 1-1/2".

J. Coordinate duct installations with installation of accessories, dampers, coil frames, equipment, controls and other associated work of ductwork system.

K. Support ductwork in manner complying with appropriate SMACNA standard.

3.02 INSTALLATION OF WOODSHOP EXHAUST (N/A)

3.03 APPLICATION OF LINER IN RECTANGULAR DUCTSS

A. Adhere a single layer of indicated thickness of duct liner with at least 90 percent adhesive coverage at liner contact surface area. Attaining indicated thickness with multiple layers of duct liner is prohibited.

B. Apply adhesive to transverse edges of liner facing upstream that do not receive metal nosing.

C. Butt transverse joints without gaps and coat joint with adhesive.

D. Fold and compress liner in corners of rectangular ducts or cut and fit to ensure butted-edge overlapping.

E. Do not apply liner in rectangular ducts with longitudinal joints, except at corners of ducts, unless duct size and standard liner product dimensions make longitudinal joints necessary.

F. Apply adhesive coating on longitudinal seams in ducts with air velocity of 2500 fpm (12.7 m/s).

G. Secure liner with mechanical fasteners 4 inches (100 mm) from corners and at intervals not exceeding 12 inches (300 mm) transversely; at 3 inches (75 mm) from transverse joints and at intervals not exceeding 18 inches (450 mm) longitudinally.

H. Secure transversely oriented liner edges facing the airstream with metal nosing's that have either channel or "Z" profiles or are integrally formed from duct wall. Fabricate edge facings at the following locations:

1. Fan discharges.
2. Intervals of lined duct preceding unlined duct.
3. Upstream edges of transverse joints in ducts where air velocities are greater than 2500 fpm (12.7 m/s) or where indicated.

I. Terminate inner ducts with buildouts attached to fire-damper sleeves, dampers, turning vane assemblies, or other devices. Fabricated buildouts (metal hat sections) or other buildout means are optional; when used; secure buildouts to duct walls with bolts, screws, rivets, or welds.

3.04 CLEANING AND PROTECTION

A. Clean ductwork internally, unit-by-unit as it is installed, of dust and debris. Clean external surfaces of foreign substances which might cause corrosive deterioration of metal or, where ductwork is to be painted, might interfere with painting or cause paint deterioration.

B. Strip protective paper from stainless ductwork surfaces, and repair finish wherever it has been damaged.

C. Temporary closure - at ends of ducts which are not connected to equipment or air distribution devices at time of ductwork installation, provide temporary closure of polyethylene film or other covering which will prevent entrance of dust and debris until time connections are to be completed.

3.05 BALANCING

A. Refer to Division 23 Section 230593 "Testing, Adjusting and Balancing" for air distribution balancing of ductwork. Seal any leaks in ductwork that become apparent in balancing process.

END OF SECTION

DIVISION 23 – HEATING, VENTILATING AND AIR CONDITIONING (HVAC)

SECTION 233300 – DUCT ACCESSORIES

PART 1 – GENERAL

1.01 SUMMARY OF ITEMS INCLUDED

A. Extent of duct accessories work is indicated on drawings and in schedules, and by requirements of this section.

B. Types of duct accessories required for project include the following:

1. Fire and smoke dampers(in compliance with NFPA80-STD for opening protectives)
2. Access doors
3. Turning vanes
4. Manual Dampers
    a. Butterfly manual dampers
    b. Opposed-blade manual dampers
5. Intake/Exhaust dampers
6. Flexible connections

1.02 SUBMITTALS

A. Product data - submit manufacturer's specifications for each type of duct accessory, including dimensions, capacities, and materials of construction, and installation instructions.

B. Shop drawings - submit assembly type shop drawings for each type of duct accessory showing interfacing requirements with ductwork, and method of fastening or support.

C. Maintenance data - submit manufacturer's maintenance data including parts lists for each type of duct accessory, include this data in Maintenance Manual.

1.03 QUALITY ASSURANCE

A. SMACNA compliance - comply with applicable portions of Sheet Metal and Air Conditioning Contractor's National Association (SMACNA) high pressure and low pressure duct construction standards.

B. Industry standards - comply with American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc. (ASHRAE) recommendations pertaining to construction of duct accessories, except as otherwise indicated.

C. UL compliance - construct, test and label fire dampers in accordance with Underwriters Laboratories (UL) Standard 555 "Fire Dampers and Ceiling Dampers".

D. NFPA compliance - comply with applicable provisions of ANSI/NFPA 90A "Air Conditioning and Ventilating Systems", pertaining to installation of duct accessories.

1.04 DELIVERY, STORAGE AND HANDLING

A. Deliver components with factory installed packing and protective containers.

B. Handle components carefully to prevent damage to components and finish. Do not install damaged components; replace with new.

C. Protect components from weather, dirt, construction traffic and debris, etc.

PART 2 - PRODUCTS

2.01 FIRE AND SMOKE DAMPERS

A. Standards, Fire and Smoke Dampers: Conform to the requirements of NFPA 90A and UL listed, labeled and rated 1-1/2 hours, and in compliance with NFPA80-STD for opening protectives.

B. Provide fusible links 165 degrees F., vibration proof and secured with clinched "S" hooks or stainless steel bolts and lock nuts.

C. Smoke Dampers: Conform to UL, fit with control shafts for operation by electric or pneumatic motors. Provide a 165 degrees F thermal link.

D. Access Doors: Provide adjacent to all fire and smoke dampers.

E. Manufacturer: Subject to compliance with requirements, provide products by one of the following.

1. Ruskin Mfg. Co.
2. Controlled Air, Inc.

2.02 ACCESS DOORS

A. Standard: Conform to SMACNA.

B. Location: Provide access doors in casings, plenums and ducts where shown on Drawings and where specified for ready access to operating parts including fire dampers, smoke dampers, valves, and concealed coils.

C. Pressure Classification: Construct and install access doors in accordance with SMACNA Standards to suit the static pressure classifications and the locations where installed.

D. Access Doors in Ducts: Provide and size doors as follows.

1. Minimum 24-inch by 24-inch clear opening.
2. When field conditions require an access opening smaller than 16-inch by 12-inch, provide a 24-inch long removable section of casing or duct, secured with quick acting locking devices, 6 inches on centers, to permit ready access without dismantling other equipment.

E. Door Requirements: Provide doors in casings and duct as follows.

1. Arrange doors so that system air pressure will assist closure and prevent opening when the system is in operation.
2. Coordinate doors and equipment to provide unrestricted passage through clear door opening, without removal of any equipment.
3. Where pressure regulating dampers are installed in ducts or plenums, provide access doors with a clear wire glass observation port, 6-inch by 6-inch minimum size. Anchor port with structural metal frame, resilient gaskets and stainless steel bolts.

F. Manufacturer: Subject to compliance with requirements, provide products by one of the following manufacturers.

1. Ruskin Mfg. Co.
2. Flexmaster USA, Inc.
3. Ductmate Ind., Inc.
4. United McGill Corp.

2.03 TURNING VANES

A. Acoustic Turning Vanes: Construct of airfoil shaped aluminum extrusions with perforated faces and fiberglass fill.

B. Manufacturer: Subject to compliance with requirements, provide products by one of the following manufacturers.

1. Air Filter Corp.
2. Anemostat Products Div., Dynamics Corp. of America.
3. Duro-Dyne Corp.
4. United McGill Corp.

2.04 MANUAL DAMPERS

A. Provide dampers of single blade (butterfly) type, constructed in accordance with SMACNA Duct Standards.

B. Provide dampers of multiple, opposed-blade type, constructed in accordance with SMACNA Duct Standards.

C. Bearings: Two piece molded synthetic.

D. Axles: 1/2" plated steel hew.

E. Control Shaft: 1/2" diameter.

F. Finish: Mill.

G. Manufacturer: Subject to compliance with requirements, provide products by one of the following manufacturers.

1. Ruskin Mfg. Co.
2. Controlled Air, Inc.
3. United McGill Corp.

2.05 INTAKE OR EXHAUST DAMPERS

A. General: Provide low leakage, airfoil dampers; opposed blade arrangement; AMCA rated 6 CFM/sq. ft. at 4" w.g.

B. Construction

1. Frame: 6063T5 extruded aluminum hat channel 0.125 wall thickness 5" x 1" (5" x 1/2" top and bottom 12" high or less).
2. Blades: 6" wide 6063T5 heavy gage extruded aluminum airfoil shape with extruded metal (aluminum) jam seals.
3. Linkage: Concealed.

4. Operators: Control operators specified under "Controls" Section, and is work of Division 23.

C. Manufacturer: Subject to compliance with requirements, provide products by one of the following manufacturers.

1. Construction Specialties, Inc.
2. Ruskin Mfg. Co.
3. Arrow United Industries, Inc.

2.06 FLEXIBLE CONNECTIONS

A. Fans: Provide flexible connections between fans and ducts or casings where indicated on the Drawings or required to accommodate expansion and vibration.

B. Material: Construct connections of cotton duck, minimum 20 ounces per square yard.

C. Elevated Temperature: For temperatures in excess of 100 degrees F., and corrosive, acid alkali or garage exhausts use close woven glass cloth, double neoprene coated, minimum 28 ounces per square yard.

D. Length: Limit flexible connections to 4-inch active length in the direction of airflow.

E. Standard: Construct in accordance with SMACNA Standards.

F. Attachment: Attach to fans, casings and ductwork as specified by manufacturer.

G. Manufacturer: Subject to compliance with requirements, provide products by one of the following manufacturers.

1. Vent Fabrics, Inc. or equal.

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine areas and conditions under which duct accessories will be installed. Do not proceed with work until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install duct accessories in accordance with manufacturer's installation instructions, with applicable portions of details of construction as shown in SMACNA standards, and in accordance with recognized industry practices to ensure that products serve intended function.

B. Install turning vanes in square or rectangular 90 degree elbows in supply and exhaust air systems, and elsewhere as indicated.

C. Install access doors to open against system air pressure, with latches operable from either side, except outside only where duct is too small for person to enter.

D. Coordinate with other work, including ductwork, as necessary to interface installation of duct accessories properly with other work.

E. Field quality control - operate installed duct accessories to demonstrate compliance with requirements. Test for air leakage while system is operating. Repair or replace faulty accessories, as required to obtain proper operation and leakproof performance.

END OF SECTION

DIVISION 23 – HEATING, VENTILATING AND AIR CONDITIONING (HVAC)

SECTION 233713 – DIFFUSERS, REGISTERS AND GRILLES

PART 1 – GENERAL

1.01 SUMMARY OF ITEMS INCLUDED

A. Scope: Extent of air diffuser and register work required in this Section is indicated on the Drawings and schedules and by the requirements of this Section.

B. Types required for project include the following:

1. Ceiling air diffusers.
2. Wall and duct registers and grilles.

1.02 SUBMITTALS

A. Product Data: Submit manufacturer's standard technical product data including capacity ratings, throw, drop, diffusion, terminal velocities, noise levels, adjustability, construction details, finish and mounting details.

B. Shop Drawings.

1. Provide dimensioned shop drawings of linear diffuser mounting, plenum dimensions, plenum connections, damper connections and branch ductwork connections.

a. Draw shop drawings showing plans, sections, mounting details and finishes.
b. Furnish certified test data, including acoustical performance of the air troffer/boot combination with maximum air quantities indicated on the drawings.

C. Schedule: Submit a schedule of proposed air diffusers, registers and grilles, keyed to the Contract Drawings and indicating the proposed type, size, air quantity, pressure drop and location of each device proposed under this Contract.

1. Manufacturer: Same for all diffusers and registers on project.

1.03 QUALITY ASSURANCE

A. ASHRAE: Test and rate air outlets and inlets in certified laboratories under the requirements of ASHRAE Standard 70.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Original Containers: Deliver air diffusers and registers to the site in manufacturer's original containers. Identify on outside of container type and location to be installed.

B. Protect From Damage: Do not install bent, marred or damaged devices. Replace with new. Store indoors, where possible, or outdoors in weatherproof enclosures above grade.

PART 2 - PRODUCTS

2.01 AIR DIFFUSERS AND REGISTERS: GENERAL

A. Construction: Provide devices as specified on drawings.

1. Treat steel with zinc phosphate or zinc chromate after fabrication.
2. Grind, polish and factory prime.
3. Factory finish with white baked enamel finish, unless otherwise indicated.
4. Roll or reinforce exterior faces and edges.
5. Ensure mitered joints and butt connections mate within 0.010-inch maximum crack.
6. Surface finish: Smooth within 0.005-inch at welds, joints, clamping points and splices.
7. Offsets and bends: Mitered.
8. Mate devices with the associated duct, plenum or boot to form an airtight joint.

B. Provide as scheduled on Drawings.

2.02 SUPPLY OR RETURN REGISTERS

A. Register Type: Adjustable single or double-deflection type, formed steel or extruded aluminum, as indicated on the Drawings; noise levels of NC 20 or less.

B. Bars: Provide adjustable or fixed face bars and fixed rear bars, as indicated by types on Drawings.

C. Frames: Provide stamped or rolled steel or extruded aluminum frames fitted with felt, neoprene or plastic gaskets.

D. Dampers: If indicated on drawings provide register dampers of formed steel, cadmium plated, gang key operated, opposed blade type, and arranged so that the operating mechanism does not project through any part of the register face.

E. Mounting Hardware: Provide round or countersunk head Phillips screws.

F. Air Extractors: Provide 18 gage frames, 22 gage curved steel blades, fixed pattern, screwed to the duct collar, and sized to match register dimensions.

G. Manufacturer: Subject to compliance with requirements, provide registers of one of the following:

1. Titus Products.
2. Anemostat Products Division, Dynamics Corp.
3. Carnes Co., Division of Wehr Corp.

2.03 RETURN GRILLES

A. Construction: Construct as specified for registers, except omit register damper.

B. Bars: Provide fixed horizontal face bars with 1/2-inch spacing and 35 degree downward blade angle.

C. Filters: If indicated on drawings provide 1-inch throw-away filters for return grilles.

D. Manufacturer: Subject to compliance with requirements, provide grille units of one of the following:

1. Titus Products.
2. Anemostat Products Division, Dynamics Corp.
3. Carnes Co., Division of Wehr Corp.

2.04 CEILING DIFFUSERS

A. Ceiling Diffusers: Provide circular, square or rectangular, as indicated on the Drawings; noise levels as indicated on drawings.

B. Diffuser Edge and Framing Details: Compatible with the type of ceilings in which the diffuser is installed. For plaster ceiling provide plaster frames or plaster rings, set flush with finished ceiling.

C. Materials: Refer to drawings.

D. Access: Provide removable internal parts of circular, square or rectangular diffusers, including volume regulators, diffuser face, dampers and equalizing devices.

1. Allow removal of parts, including internal assembly, without the use of special tools.
2. Do not allow removal of diffuser face to disturb the distribution pattern.

E. Finish: Provide baked enamel finish on visible face. Coordinate color with Architect.

1. Interior and concealed parts: Flat black or dark gray.

F. Adjustable Pattern: Provide adjustable pattern diffuser cones to vary the distribution from horizontal parallel to the ceiling to a downward distribution pattern into the space, not on exposed face.

G. Pressure Range: Design to allow equal distribution pattern, both horizontal and vertical, for diffusers with pressure drops from 0.10 to 0.40 inches water gage.

H. Dampers, Diffusers, and Extractors: Products of the same manufacturer.

I. Extractors: Provide adjustable extractors, furnished by the diffuser manufacturer, in each ceiling diffuser where indicated on drawings.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Coordination: Coordinate the location of grilles, registers and diffusers with other trades. Examine areas and conditions under which inlets and outlets are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected.

1. Examine architectural floor plans, reflected ceiling plans and elevations and arrange for duct taps to be so placed that the installation of air outlets will present a uniform relationship with architectural features, lighting, sprinkler heads, speakers and smoke detectors.
2. On plain walls, if not otherwise indicated, locate sidewall registers approximately 8 inches down from the finished ceilings.
3. Adjust the face and rear bars of supply registers to provide a diffusion pattern such that the terminal velocity point is approximately 70 percent of the "room" width and 5 to 6 feet above the finished floor, at a velocity of 20 to 50 fpm.
4. On projects with reflected ceiling plans, locate outlets to conform to that plan.
5. If no reflected ceiling plans are included in the Contract Documents, coordinate the location of air outlets with other trades before cutting in ceiling and sidewall taps. Provide coordination drawing in shop drawings.

END OF SECTION

DIVISION 15-HEATING, VENTILATION, & AIR-CONDITIONING
235599-HYDRONIC FIN TUBE ELEMENTS AND ENCLOSURES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. HYDRONIC FIN TUBE ELEMENTS & ENCLOSURES

1.02 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION

A. Division 23 Specifications - Controls and Instrumentation: Installation and wiring of thermostats and other control components.

1.03 RELATED SECTIONS

A. Division 23 Specifications - Hydronic Piping

B. Division 23 Specifications - Hydronic Specialties

C. Division 23 Specifications - Controls and Instrumentation

1.04 REFERENCES

A. UL 94 - Tests for Flammability of Plastic Materials for Parts in Devices and Appliances.

1.05 SUBMITTALS

A. Submit unit performance data including: capacity, nominal and operating performance.

B. Submit mechanical specifications for unit and accessories describing construction, components and options.

C. Submit shop drawings indicating overall dimensions as well as installation, operation and service clearances.

1.06 DELIVERY, STORAGE AND HANDLING

A. Comply with manufacturer's installation instructions for rigging, unloading, and transporting units.

B. Fin Tube elements shall ship based on field-measured dimensions by contractort & fin tube factory-authorized local reprfesentative.

C. Store in a clean dry place and protect from weather and construction traffic. Handle carefully to avoid damage to components, enclosures, and finish.

1.07 START-UP AND OPERATING REQUIREMENTS

A. Include manufacturers' descriptive literature, operating instructions, installation instructions, maintenance and repair data.

PART 2-PRODUCTS

2.01 General

A. The contractor shall furnish and install Rittling F-Series Fin Tube Enclosure with required mounting components and accessories to meet size, capacity and characteristics as required on the Equipment Schedule or on the plans.

B. Units shall be installed in a neat and workmanlike manner in accordance with specifications and manufacturer recommendations.

C. All material shall be manufactured by Zehnder Rittling or Approved Equivalent.

2.02 Heating Elements

A. Copper heating elements, as indicated on the plans, shall consist of aluminum fins not less than .016" thick with integral fin collars, which space the fins and provide good tube to fin surface contact, permanently bonded to copper seamless drawn tubing by mechanically expanding the copper tubing, to ensure durability and eliminate noise from loose fins, while assuring performance at specified catalog ratings.

B. The ends of the tube shall be finished OD (male) on one end and finished ID (female swaged) on the other end as to allow the use of standard domestic copper fittings.

C. Elements will be provided from 1 ft to 12 ft lengths in 6" increments.

2.03 Enclosures

A. Enclosures shall be of the size and style as shown on the plans.

B. Enclosures shall be manufactured from 16-gauge cold rolled steel.

C. All enclosures shall be reinforced with a (minimum of two) gussets welded at ends of each enclosure style.

D. The joining of enclosure shall be accomplished by use of internal joggle joiners providing added rigidity and alignment with adjoining enclosures.

E. No sheet metal screws or other fastening devices shall be visible.

F. Air discharge and inlet louvers will be of a “pencil proof” design.

G. Enclosures will be provided from 1 ft to 8 ft lengths in 6" increments.

H. The upper portion of the enclosure will be secured in a hinge type manner by use of a full length roll formed mounting channel or full back panel, while the lower portion of the enclosure will be secured to steel snap expansion brackets by use of a positive locking, bottom mounting clip using fasteners thus preventing removal without tools.

2.04 Finish

A. All enclosures and accessories shall be degreased and chemically phosphatized before application of a durable, attractive electrostatic epoxy powder coating.

B. Color to be selected from standard Zehnder Rittling color chart.

2.05 Accessories and Options

A. Mounting channel shall be die-formed from 23-gauge galvannealed steel and the full back panel from 20-gauge galvannealed steel. The top projection of the mounting channel or full back plate shall position the enclosure away from the wall so as to allow for installation or removal of enclosure without damage to wall. Where noted on drawings or schedules a urethane gasket shall be provided with the unit to form air seal at wall.

B. Snap expansion and second row brackets shall be die-formed from 16-gauge galvanneal for rigidity. Snap expansion brackets shall incorporate a positive locking, bottom mounting clip for fastening the enclosure, as well as supporting one row of finned tube. Brackets shall be self-gauging, allowing for a single measurement installation. All brackets must provide for lengthwise movement of elements during expansion and contraction as well as aligning elements to prevent contact with walls or enclosure.

C. Access doors shall be provided in 12" long access panels or in the enclosure where noted on plans. The doors shall have an overall size of 6" x 6" as standard (size may vary as space becomes limited) and be installed where flow control or shut off valves are located. Doors shall be hinged at the top and use a slotted fastener to operate. Recessed security Allen head operators shall be used in secure areas as indicated.

D. A variety of trim pieces may be used between ends of enclosures and walls on wall-to-wall installations (inside corners, outside corners, wall trims, end caps and removable access panels). Trims may be overlapping or butt-type depending on the application. All trims will be manufactured from 18-gauge cold rolled steel.

E. Units shall be manufactured in accordance with conformance to ISO 9001:2000 standards.

PART 3-EXECUTION

3.01 SHIPPING

A. Paper copies of the IOM shall also be shipped with each unit.

B. The manufacturer shall identify all shipments with the order number. Enough information shall be provided with each shipment to enable the Mechanical Contractor to confirm the receipt of units when they are received. For parts too small to mark individually, the manufacturer shall place them in containers.

C. After loading the equipment for shipment, the manufacturer shall contact the shipping contact on the order and provide the name of the carrier, description of equipment, order number, shipping point, and date of shipment.

3.02 EXAMINATION

A. Verify that surfaces are ready to receive work and opening dimensions are as indicated on the shop drawings and contract documents.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.

3.04 CLEANING

A. Clean work.

B. After construction is completed, including painting, clean exposed surfaces of units. Vacuum clean coils and inside enclosures.

C. Ensure all shipping materials have been removed.

END OF SECTION

DIVISION 23-HEATING, VENTILATION, & AIR-CONDITIONING
236423-Air-Cooled Scroll Water Chillers

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes design, performance criteria, refrigerants, controls, and installation requirements for air-cooled rotary scroll packaged chillers.

1.02 REFERENCES

A. AHRI 550/590 - Standard for Water Chilling Packages using the Vapor Compression Cycle

B. AHRI 370 - Sound Rating of Large Outdoor Refrigerating and Air-Conditioning Equipment

C. ASHRAE 15 - Safety Code for Mechanical Refrigeration

D. ASHRAE 90.1 - Energy Efficient Design of New Buildings

E. UL 60335-2-40 - Standard for HVAC equipment for safety requirements

F. ASTM B117 - Standard Method of Salt Spray (Fog) Testing

G. ASTM A123 - Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

H. ASTM A525 - Zinc (Hot-Dip Galvanized) Coatings on Sheet Steel Products

I. ASTM D1654 - Evaluation of Painted or Coated Specimens, Subjected to Corrosive Environments

J. ANSI/AFBMA 9-1978 - Load Ratings and Fatigue Life for Ball Bearings.

K. ISO 9001

L. California Administrative Code - Title 24

M. UL Listed ETL-2019

N. UL/CUL

1.03 SUBMITTALS

A. Submit dimensional plan and elevation view drawings, weights and loadings, required clearances, location and size of all field connections, electrical requirements and wiring diagrams.

B. Submit product data indicating rated capacities, accessories and any special data.

C. Submit manufacturer's installation instructions.

1.04 REGULATORY REQUIREMENTS

A. Comply with codes and standards specified.

B. Chiller must be built in an ISO 9001 classified facility.

1.05 VERIFICATION OF CAPACITY AND EFFICIENCY

A. All proposals for chiller performance must include an AHRI approved selection method. Verification of date and version of computer program selection or catalog is available through AHRI.

1.06 DELIVERY, HANDLING AND STORAGE

A. Comply with manufacturer's installation instructions for rigging, unloading, and transporting chillers.

B. Chiller shall be capable of withstanding -40ºF to 158ºF storage temperatures for an indefinite period of time.

1.07 WARRANTY

A. Provide a full parts warranty for one year from startup or 18 months from shipment, whichever occurs first.

B. 3 Year parts warranty less compressor

C. 3 Year refrigerant warranty

D. 5 Year compressor parts warranty

E. 5 Year labor warranty whole unit

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Trane model CGAM

B. Or Approved Equivalent.

2.02 CHILLER DESCRIPTION

A. The contractor shall furnish and install air-cooled water chiller with scroll compressors as shown as scheduled on the contract documents. The chillers shall be installed in accordance with this specification and perform at the specified conditions as scheduled.

2.03 CHILLER OPERATION

A. Chiller shall be able to start and operate in ambient conditions from 32ºF to 125ºF. Wide ambient operation is accomplished with factory installed and tested protection. If field installed wide ambient solution is used, this shall be purchased and installed at contractor expense.

B. Chiller shall be capable of Ice-making operation with a leaving solution temperature less than 42ºF.

C. Chiller shall be capable of starting up with 95ºF entering fluid temperature to the evaporator. Maximum water temperature that can be circulated with the Chiller not operating is 125ºF.

D. Chiller shall provide evaporator freeze protection and low limit control to avoid low evaporator refrigerant temperature trip-outs during critical periods of chiller operation. Whenever this control is in effect, the controller shall indicate that the chiller is in adaptive mode. If the condition exists for more than 30 seconds, a limit warning alarm relay shall energize.

E. Rapid Restart™ after power restoration. The Chiller shall be capable of starting in 85 seconds after power restoration and be able to attain 80% load in less than 150 seconds after power restoration.

F. Chiller shall be able to operate within 4 feet of a solid wall and/or 8 feet between two chillers side by side.

G. Chiller shall be able to operate with a 2 minute loop time for comfort cooling applications. Chiller manufacturer shall provide a buffer tank and contractor shall install at no additional cost to owner if additional loop time is required.

2.04 COMPRESSORS

A. Construct chiller using fully hermetic scroll type compressors with R454B optimized and dedicated scroll profile. Refrigerant shall have a GWP of less than 600.

B. Provide direct drive motor cooled by suction gas with only three major moving parts and a completely enclosed compression chamber that leads to increased efficiency.

C. Each compressor shall have overload protection internal to the compressor.

D. Each compressor shall include: centrifugal oil pump, oil level sight glass and oil charging valve.

E. Each compressor will have crankcase heaters installed and properly sized to minimize the amount of liquid refrigerant present in the oil sump during off cycles.

2.05 EVAPORATOR

A. The evaporator shall be a high efficiency, brazed plate-to-plate type heat exchanger consisting of parallel plates. Braze plates shall be stainless steel with copper braze material.

B. The water side working pressure shall be rated at 150 psig (10.3 bar) and tested at 1.5 times maximum allowable water side working pressure.

C. The refrigerant side working pressure shall be rated at 460 psig (29.6 bars) and tested at 1.1 maximum allowable refrigerant side working pressure.

D. Insulate the evaporator with a minimum of 1.25 inch (K=0.28) UV rated insulation. If the insulation is field installed, the additional money to cover material and installation costs in the field should be included in the bid.

E. Evaporator heaters shall be factory installed and shall protect chiller down to -20ºF. Contractor shall wire separate power to energize heat tape and protect evaporator while chiller is disconnected from the main power.

F. Provide water drain connection, vent and fittings. Factory installed leaving water temperature control and low temperature cutout sensors.

G. Water connections shall be grooved pipe.

H. Proof of flow shall be provided by the equipment manufacturer, mechanically installed and electrically wired, at the factory of origin.

I. Factory installed cleanable strainer.

2.06 FANS

A. Low sound fans shall by dynamically balanced and direct driven.

B. All condenser fan TEAO motors have permanently lubricated ball bearings and external overload protection.

2.07 CONDENSER

A. The condenser coils shall consist of copper tubes mechanically bonded into plate-type aluminum fins. A subcooling coil shall be an integral part of the main condenser coil.

B. The condenser coils shall have an integral sub-cooling circuit and shall be designed for at least 650 psig working pressure. Leak tested at 650 psig.

2.08 ENCLOSURES/CHILLER CONSTRUCTION

A. Units shall be constructed of a galvanized steel frame with galvanized steel panels and access doors.

B. Chiller panels, base rails and control panels shall be finished with a baked on powder paint. Control panel doors shall have door stays.

C. Mount starters and Terminal Blocks in a UL 60335-2-40 rated weatherproof panel provided with full opening access doors. If a circuit breaker is chosen, it should be a lockable, through-the-door type with an operating handle and clearly visible from outside of chiller indicating if power is on or off.

D. The coating or paint system shall withstand 500 hours in a salt-spray fog test in accordance with ASTM B117.

2.09 CHILLER MOUNTED STARTER

A. The starter shall be across-the-line configuration, factory-mounted and fully pre-wired to the compressor motor(s) and control panel.

B. Unit shall have a single point power connection.

C. A control power transformer shall be factory-installed and factory-wired to provide unit control power.

D. Control panel shall be dead front construction for enhanced service technician safety

E. Unit wiring shall run in liquid-tight conduit.

F. A molded case high fault interrupting capacity circuit breaker shall be factory pre-wired with terminal block power connections and equipped with a lockable external operator handle, making it available to disconnect the chiller from main power. Energy Meter capable of measuring line current by phase, average current, voltage by phase, average voltage, frequency, unit power consumption, reactive and apparent power, and power factor.

G. High short circuit current rating (SCCR) with selection of high fault protection device.

2.10 REFRIGERANT CIRCUIT

A. All chillers shall have 2 refrigeration circuits, each with two (manifolded) compressors on each circuit.

B. Provide for refrigerant circuit:

1. Liquid line shutoff valve
2. Discharge service valve
3. Filter
4. Liquid line sight glass.
5. Electronic expansion valve sized for maximum operating pressure
6. Charging valve

C. Full operating charge of R454B and oil.

2.11 CONTROLS

A. Factory-mounted to the control panel door, the operator interface has a 7 inch LCD touch-screen display

B. Display shall consist of a menu driven interface with easy touch screen navigation to organized sub-system reports for compressor, evaporator, and motor information as well as associated diagnostics.

C. The chiller control panel shall provide password protection of all set-points

D. Chilled water temperature control shall be microprocessor-based, proportional and integral controller to show water and refrigerant temperature, refrigerant pressure, and diagnostics. This microprocessor-based controller is to be supplied with each chiller by the chiller manufacturer.

E. The front of the chiller control panel shall display the following in clear language, without the use of codes, look-up tables, or gauges:

1. Run time.
2. Number of starts.
3. Current chiller operating mode.
4. Chilled water set point and set point source.
5. Electrical current limit set point and set point source.
6. Entering and leaving evaporator water temperatures.
7. Saturated evaporator and condenser refrigerant temperatures.
8. Evaporator and condenser refrigerant pressure.
9. Differential oil pressure.
10. Phase reversal/unbalance/single phasing and over/under voltage protection.
11. Low chilled water temperature protection.
12. High and low refrigerant pressure protection.
13. Load limit thermostat to limit compressor loading on high return water temperature.
14. Condenser fan sequencing to automatically cycle fans in response to load, expansion valve pressure, condenser pressure, and differential pressure to optimize chiller efficiency.
15. Display diagnostics.
16. Compressors: Status (on/off), %RLA, anti-short cycle timer, and automatic compressor lead-lag.

F. On chiller, mount weatherproof control panel, containing starters, power and control wiring, factory wired with terminal block power connection. Provide primary and secondary fused control power transformer.

G. The chiller controller shall utilize a microprocessor that will automatically take action to prevent chiller shutdown due to abnormal operating conditions associated with: evaporator refrigerant temperature, high condensing pressure and motor current overload.

H. Provide the following safety controls with indicating lights or diagnostic readouts.

1. Low chilled water temperature protection.
2. High refrigerant pressure.
3. Loss of chilled water flow.
4. Contact for remote emergency shutdown.
5. Motor current overload.
6. Phase reversal/unbalance/single phasing.
7. Over/under voltage.
8. Failure of water temperature sensor used by controller.
9. Compressor status (on or off).

I. Provide the following operating controls:

1. A variable method to control capacity in order to maintain leaving chilled water temperature based on PI algorithms. Five minute solid state anti-recycle timer to prevent compressor from short cycling. Compressor minimum stop-to-start time limit shall be 2 minutes. If a greater than 5 minute start-to-start, or greater than 2 minute stop-to-start timer is included, hot gas bypass shall be provided to insure accurate chilled water temperature control in light load applications.
2. Chilled water pump output relay that closes when the chiller is given a signal to start.
3. Load limit thermostat to limit compressor loading on high return water temperature to prevent nuisance trip outs.
4. High ambient unloader pressure controller that unloads compressors to keep head pressure under control and help prevent high pressure nuisance trip outs on days when outside ambient is above design.
5. Compressor current sensing unloader chiller that unloads compressors to help prevent current overload nuisance trip outs.
6. Low ambient lockout control with adjustable setpoint.
7. Condenser fan sequencing which adjusts the speed of all fans automatically in response to ambient, condensing pressure and expansion valve pressure differential thereby optimizing chiller efficiency.

J. Provide user interface on the front of the panel. If display is on the inside of the panel, then a control display access door shall be provided to allow access to the display without removal of panels. Provide user interface with a minimum of the following features:

1. Leaving chilled water setpoint adjustment from LCD input
2. Entering and leaving chilled water temperature output
3. Pressure output of condenser
4. Pressure output of evaporator
5. Ambient temperature output

6. Voltage output
7. Current limit setpoint adjustment from LCD input.

K. The chiller control panel shall provide leaving chilled water temperature reset based upon return water temperature.

L. Digital Communications to BAS system shall consist of a BACnet MS/TP interface via a single twisted pair wiring.

M. Provide factory installed contact closure input for initiation of ice building. Ice building termination shall be based on an adjustable entering water temperature setpoint. All compressors shall run at full load during ice building.

N. The controller shall be capable of controlling chiller in variable applications. At flow rate changes of 10% or less per minute, controller shall maintain leaving temperature control of +/-2degF). At flow rate changes of up to 30% or less per minutes, chiller shall stay online.

2.12 SOUND

A. Acoustics: Manufacturer must provide both sound power and sound pressure data in decibels. Sound pressure data per AHRI 370 must be provided at full load.

B. If manufacturer cannot meet the noise levels, sound attenuation devices and/or barrier walls must be installed to meet this performance level.

C. Provide acoustical treatment for compressor.

2.13 ACCESSORIES

A. Chiller shall have full architectural louvers panels.

B. Chiller shall ship with elastomeric isolators.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's requirements.

1. Level the chiller using the base rail as a reference. The chiller must be level within 1/2" in over the entire length and width. Use shims as necessary to level the chiller.

3.02 SERVICE AND STARTUP

A. Startup - Provide all labor and materials to perform startup. Startup shall be performed by a factory-trained technician from the original equipment manufacturer (OEM). Technician shall confirm that equipment has been correctly installed and passes specification checklist prior to equipment becoming operational and covered under OEM warranty. This shall be done in strict accordance with manufacturer's specifications and requirements. Third-party service agencies are not permitted.

B. A start-up log shall be furnished by the factory approved start-up technician to document the chiller's start-up date and shall be signed by the owner or his authorized representative prior to commissioning the chillers.

C. Chiller manufacturers shall maintain service capabilities no more than 50 miles from the jobsite.

D. Provide local service agent with direct access to factory support on equipment.

E. Service agreement.

F. During the first 12 months of operation, a factory-trained technician from the original equipment manufacturer (OEM) shall perform quarterly on-site operating inspections to confirm the chiller's operational performance. The manufacturer shall provide the owner with a report describing the condition of the equipment, current operating log, any issues found needing to be addressed, and recommended corrective actions.

END OF SECTION

DIVISION 23-HEATING, VENTILATION, & AIR-CONDITIONING

23 74 01-DEDICATED OUTSIDE AIR UNITS WITH ENERGY RECOVERY WHEEL/HEATING/COOLING

PART 1 - GENERAL

1.1. SUMMARY

A. This section includes units with integral heating and cooling for outdoor installation. Integral Energy Recovery device shall be a rotary air-to-air total enthalpy wheel. Integral heat source shall be hot water. Integral cooling source shall be packaged DX. Airflow arrangement shall be Outdoor Air only. Each unit shall incorporate additional product requirements as listed in Section 2 of this specification.

B. Related Sections include the following:

1. Division 01 through 23 Specifications: Scope of Work
2. Division 01 through 23 Specifications: General Provisions
3. Division 23 Specifications: Insulation
4. Division 22 Specifications: Plumbing
5. Division 23 Specifications: Controls and Instrumentation
6. Division 26 Specifications: Electrical

1.2. SUBMITTALS

A. Product Data: For each type or model include the following:

1. Complete fan performance curves for both Supply Air and Exhaust Air, with system operating conditions indicated, as tested in an AMCA certified chamber.
2. Sound performance data for both Supply Air and Exhaust Air, as tested in an AMCA certified chamber.
3. Motor ratings, electrical characteristics and motor and fan accessories.
4. Performance ratings for all chilled water or DX coils.
5. Dimensioned drawings for each type of installation, showing isometric and plan views, to include location of attached ductwork and service clearance requirements.
6. Estimated gross weight of each installed unit.
7. Installation, Operating and Maintenance manual (IOM) for each model.
8. Microprocessor Controller (DDC) specifications to include available options and operating protocols. Include complete data on all factory-supplied input devices.
9. Energy recovery performance data for both summer and winter operation.

1.3. QUALITY ASSURANCE

A. Source Limitations: Obtain unit with all appurtenant components or accessories from a single manufacturer.

B. For the actual fabrication, installation, and testing of work under this section, use only thoroughly trained and experienced workers completely familiar with the items required and with the manufacturer's current recommended methods of installation.

C. Product Options: Drawings must indicate size, profiles and dimensional requirements of unit and are to be based on the specific system indicated. Refer to Division 1 Section "Product Requirements".

D. End of line test with full report available upon request.

E. Certifications

1. Entire unit shall be ETL Certified per U.L. 60335-2-40 and bear an ETL sticker.
2. Unit shall be AHRI Certified Dedicated Outdoor Air Units (DOAS) to AHRI 920 Standard.
3. Energy Recovery Device shall be AHRI Certified, per Standard 1060.
4. Coils shall be Recognized Components for ANSI/UL 1995, CAN / CSA C22.2 No 236.05.

1.4. COORDINATION

A. Coordinate size and location of all building penetrations required for installation of each unit and associated plumbing and electrical systems.

B. Coordinate location of water system fittings to ensure correct positioning for connection to the water coil and condensate drain pipe.

C. Coordinate sequencing of construction of associated plumbing, HVAC, electrical supply, roofing contractor.

PART 2 - PRODUCTS

2.1. MANUFACTURERS

A. Available Manufacturers: Subject to compliance with specifications contained within this document, manufacturers offering products that may be incorporated into the work include, but are not limited to:

1. Valent Air Corporation, LLC
2. Greenheck
3. LG
4. Or Approved Equivalent

2.2. MANUFACTURED UNITS

A. Unit shall be fully assembled at the factory and consist of an insulated metal cabinet, exhaust air blower, evaporator coil, energy wheel, hot water coil, hot gas reheat coil, packaged DX system, motorized dampers, curb assembly, filter assembly intake air, supply air blower assembly, exhaust/relief blower assembly, filter assembly for exhaust air, and an electrical control center. All specified components and internal accessories factory installed are tested and prepared for single-point high voltage connection except with electric post heat and exhaust fan only power which have dual point power.

2.3. CABINET

A. Materials: Formed, double wall insulated metal cabinet, fabricated to permit access to internal components for maintenance.

1. Unit’s exterior shall be supplied from the manufacturer using G60 galvaneal steel with proprietary pre-painted material in the following finish color; Concrete Gray-RAL 7023. This has been subjected to a salt spray test per ASTM-B117 and evaluated using ASTM-D714 and ASTM-D610 showing no observable signs of rust or blistering until reaching 2,500 hours. This is Valent's Permatector™ option. Uncoated galvanized steel exterior is not acceptable.
2. Internal assemblies: 24 gauge, galvanized (G90) steel except for motor supports which shall be minimum 14 gauge galvanized (G90) steel.

B. Cabinet Insulation: Comply with NFPA 90A and NFPA 90B and erosion requirements of UL 181.

1. Materials: Rigid urethane injected foam. Foam board not acceptable.
   a. Thickness: 2 inch (50.8 mm)
   b. Thermal Resistance R16
   c. Thermally broken
   d. Meets UL94HF-1 flame requirements.
   e. Location and application: Full coverage of entire cabinet exterior to include walls, roof of unit, unit base, and doors.

2. Materials: Fiberglass insulation. If insulation other than fiberglass is used, it must also meet the Fire Hazard Classification shown below.
    a. Thickness: 2 inch (50.8 mm)
    b. Thermal Resistance R8
    c. Fire Hazard Classification: Maximum flame spread of 25 and smoke developed of 50, when tested in accordance with ASTM C 411.
    d. Location and application: Divider panels between outdoor air and return air/exhaust air streams.

C. Roof Insulation: 2 inch (50.8 mm) fiberglass located above the 1 inch (25.4 mm) foam panel.

D. Access panels / doors: Unit shall be equipped with insulated, hinged doors or removable access panels to provide easy access to all major components. Doors and access panels shall be fabricated of 18 gauge galvanized G90 steel or painted galvannealed steel.

E. Supply Air blower assemblies: Blower assembly shall consist of an electric motor and direct-drive fans. Assembly shall be mounted on heavy gauge galvanized steel rails and further mounted on 1.125 inch thick neoprene vibration isolators. Blower motors shall be capable of continuous speed modulation and controlled by a VFD.

F. Exhaust Air blower assemblies: Blower assembly shall consist of an electric motor and a direct-drive fan. Assembly shall be mounted on heavy gauge galvanized steel rails and further mounted on 1.125 inch thick neoprene vibration isolators. Blower motor shall be capable of continuous speed modulation and controlled by a VFD.

G. Evaporator Coil: Evaporator coil shall be (silver) soldered or brazed into the compressed refrigerant system. Coil shall be constructed of copper tubing, permanently bonded to aluminum fins and enclosed in a galvanized steel frame. If two compressors are used as components of the unit, then the evaporator coil shall be of "interlaced" configuration, permitting independent operation of either compressor without conflict with the other compressor.

H. Control panel / connections: Units shall have an electrical control center where all high and low voltage connections are made. Control center shall be constructed to permit single-point high voltage power supply connections. RTU shall be equipped with a Unit Disconnect Switch.

I. Condensate drain pan: Drain Pan shall be an integral part of the unit whenever a cooling option is included. Pan shall be formed of welded austenitic stainless steel sheet material and provided with a welded stainless steel drain connection at the front for connection to a P trap. Drain pan shall be sloped in two directions to provide positive draining and drain connector shall be sealed at penetration through cabinet wall.

J. P trap: If the unit is equipped with a condensate drain pan, contractor shall provide, or fabricate, and install an appropriate P trap, in accordance with all local and area codes and Best Practices.

K. Energy wheel: Unit energy wheel shall be sized for the full volume of outdoor and exhaust air without an energy wheel bypass damper(s). Energy wheel shall be of total enthalpy, rotary air-to-air type and shall be an element of a removable energy wheel cassette. The cassette shall consist of a galvanized steel framework (designed to produce laminar air flow through the wheel), an energy wheel as specified and a motor and drive assembly. The cassette shall incorporate a pre-tensioned urethane drive belt or a link style belt with a five-year warranty. The wheel media shall be a polymer film matrix in a stainless-steel framework and be comprised of individual segments that are removable for servicing. Non-segmented energy wheels are not acceptable. Silica gel desiccant shall be permanently bonded to the polymer film and is designed and constructed to permit cleaning and servicing. The energy wheel is to have a five-year warranty. Performance criteria are to be as specified in AHRI Standard 1060, complying with the Combined Efficiency data in the submittal.

L. Modulating frost control. Control system shall include an outdoor air thermostat and pressure sensor on the wheel assembly to initiate frost control sequence.

M. Reheat coil with factory installed modulating hot gas reheat valve.

N. Packaged DX System: Unit shall have an integral compressor(s) and evaporator coil located within the weather-tight unit housing. Condenser coils shall be all-aluminum micro channel design appurtenant condenser fan assemblies shall be factory installed as integral subassemblies of the unit and mounted on the unit's exterior. Lead condenser fan(s) will have an electronically commutated (EC) motor that will modulate to maintain a head pressure set

point.] Motors shall be UL Recognized and CSA Certified. The lead refrigerant compressor shall be inverter hermetic scroll-type. Additional compressor shall be single stage hermetic scroll-type paired in tandem with lead inverter compressor. Compressors shall be equipped with liquid line filter drier, electronic expansion valves (EEV) or thermostatic expansion valves (TXV) on non-inverter compressor circuits, manual reset high pressure and low pressure cutouts and all appurtenant sensors, service ports, leak detection sensors and safety devices. Compressed refrigerant system shall be fully charged with R-454B refrigerant. Compressors shall be mounted within an insulated access compartment and on a raised cabinet shelf to reduce sound and vibration. Each compressor shall be factory-equipped with an electric crankcase heater to boil off liquid refrigerant from the oil.

O. Condenser Fans: Fan blades must be constructed of aluminum or a composite material and have a geometry designed and documented to reduce sound and energy when compared to a traditional rectangular blade fan. Traditional rectangular blade fans are not allowed due to increased noise generated and increase power utilized. Condenser fan motors shall be three phase, external rotor, type 56 frame, open air over and shaft up. Each condenser fan motor shall have a vented frame, rated for continuous duty and be equipped with an automatic reset thermal protector. Lead condenser fan(s) will have an electronically commutated (EC) motor that will modulate to maintain a head pressure set point.] Motors shall be UL Recognized and CSA Certified. Single condenser fan running at max RPM and design static pressure shall not exceed an A-weighted sound power level of 75 db at free inlet/outlet test conditions.

P. Packaged DX Control and Diagnostics: The Packaged DX system shall be controlled by an onboard digital controller (DDC) that indicates both owner-supplied settings and fault conditions that may occur. The DDC shall be programmed to indicate the following faults:
    1. Global alarm condition (active when there is at least one alarm)
    2. Supply Air Proving alarm
    3. Dirty Filter Alarm
    4. Compressor Trip alarm
    5. Compressor Locked Out alarm
    6. Supply Air Temperature Low Limit alarm
        a. Sensor #1 Out of Range (outside air temperature)
        b. Sensor #2 Out of Range (supply air temperature)
        c. Sensor #3 Out of Range (cold coil leaving air temperature)

Q. Motorized dampers / Intake Air, Motorized dampers of low leakage type shall be factory installed.

R. Curb Assembly: Valent Air Corporation recommends the use of an engineered curb assembly in lieu of an owner-supplied rail system. The curb assembly provides full perimeter support of the unit and ensures proper flashing and insulation of all roof penetrations and provides adequate clearance for a P trap assembly.

S. A curb assembly made of 14 gauge galvanized steel shall be provided by the factory for assembly and installation as part of this division. The curb assembly shall provide perimeter support of the entire unit and shall have duct adapter(s) for supply air and return air. Curb assembly shall enclose the underside of the unit and shall be sized to fit into a recess in the bottom of the unit. Contractor shall be responsible for coordinating with roofing contractor to ensure curb unit is properly flashed to provide protection against weather/moisture penetration. Contractor shall provide and install appropriate insulation for the curb assembly. The curb shall be the height of 18”.

T. Service receptacle: 120 VAC GFCI service outlet shall be factory-provided and installed by this contractor in a location designated by the A / E. Service outlet requires a dedicated single phase electric circuit. Unit contains a 120 VAC transformer to provide power to service outlet.

2.4. BLOWER

A. Blower section construction, Supply Air: direct drive motor and blower shall be assembled on a 14 gauge galvanized steel platform and shall be equipped with 1.125 inch thick neoprene vibration isolation devices.

B. Blower assemblies: Shall be statically and dynamically balanced and designed for continuous operation at maximum rated fan speed and horsepower.

C. Fan: Direct drive, airfoil plenum fan with steel wheel statically and dynamically balanced. Prop or belt-drive fan not acceptable due to low static capabilities.

D. Blades: Painted steel blades only.

E. Blower section motor source quality control: Blower performance shall be factory tested for flow rate, pressure, power, air density, rotation speed and efficiency. Ratings are to be established in accordance with AMCA 210, "Laboratory Methods of Testing Fans for Rating".

2.5. MOTORS

A. General: Blower motors greater than 1/2 horsepower shall be "NEMA Premium" unless otherwise indicated. Compliance with EPAct minimum energy-efficiency standards for single speed ODP and TE enclosures is not acceptable. Motors shall be heavy-duty, permanently lubricated type to match the fan load and furnished at the specified voltage, phase and enclosure.

B. Motors shall be 60 cycle, 3 phase 460 volts.

2.6. UNIT CONTROLS

A. The unit shall be constructed so that it can function as a stand-alone heating and cooling system controlled by factory-supplied controllers, thermostats and sensors or it can be operated as a heating and cooling system controlled by a Building Management System (BMS). This unit shall be controlled by a factory-installed microprocessor programmable controller (DDC) that is connected to various optional sensors.

B. Unit shall incorporate a DDC controller with integral LCD screen that provides text readouts of status. DDC controller shall have a built-in keypad to permit operator to access read-out screens without the use of ancillary equipment, devices or software. DDC controllers that require the use of equipment or software that is not factory-installed in the unit are not acceptable. Alarm readouts consisting of flashing light codes are not acceptable. Owner-specified ventilating conditions can be input by means of push buttons.

C. Unit supply fan shall be configured for Constant Volume (ON/OFF).

D. Unit exhaust fan shall be configured for Constant Volume (ON/OFF).

E. Outside Air / Return Air damper control shall be

F. Economizer control shall be temperature / enthalpy.

G. Operating protocol: The DDC shall be factory-programmed for BACnet MSTP.

H. Variable Frequency Drive (VFD): unit shall have factory installed variable frequency drive for modulation of the supply and exhaust air blower assemblies. The VFD shall be factory-programmed for unit-specific requirements and shall not require additional field programming to operate.

2.7. FILTERS

A. Unit shall have permanent 2 inch (50.8 mm) aluminum filters located in the outdoor air intake and shall be accessible from the exterior of the unit. MERV 8 disposable pleated filters shall be provided in the supply airstream. MERV 8 disposable pleated filters shall be provided in the supply final air stream and MERV 8 filters in the exhaust air stream.

PART 3 - EXECUTION

3.1. EXAMINATION

A. Prior to start of installation, examine area and conditions to verify correct location for compliance with installation tolerances and other conditions affecting unit performance. See unit IOM.

B. Examine roughing-in of plumbing, electrical and HVAC services to verify actual location and compliance with unit requirements. See unit IOM.

C. Proceed with installation only after all unsatisfactory conditions have been corrected.

3.2. INSTALLATION

A. Installation shall be accomplished in accordance with these written specifications, project drawings, manufacturer's installation instructions as documented in manufacturer's IOM, Best Practices and all applicable building codes.

3.3. CONNECTIONS

A. In all cases, industry Best Practices shall be incorporated. Connections are to be made subject to the installation requirements shown above.

B. Piping installation requirements are specified in Division 22 (Plumbing). Drawings indicate general arrangement of piping, fittings and specialties.

C. Duct installation and connection requirements are specified in Division 23 of this document.

D. Electrical installation requirements are specified in Division 26 of this document.

3.4. FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory authorized service representative to inspect field assembled components and equipment installation, to include electrical and piping connections. Report results to A / E in writing. Inspection must include a complete startup checklist to include (as a minimum) the following: Completed Start-Up Checklists as found in manufacturer's IOM.

3.5. STARTUP SERVICE

A. Engage a factory authorized service representative to perform startup service. Clean entire unit, comb coil fins as necessary, install clean filters. Measure and record electrical values for voltage and amperage. Refer to Division 23 "Testing, Adjusting and Balancing" and comply with provisions therein.

3.6. DEMONSTRATION AND TRAINING

A. Engage a factory authorized service representative to train owner's maintenance personnel to adjust, operate and maintain the entire unit. Refer to Division 01 Section Closeout Procedures and Demonstration and Training.

DIVISION 23-HEATING, VENTILATION, & AIR-CONDITIONING

23 74 02-PACKAGED ROOFTOP UNITS WITH ENERGY RECOVERY WHEEL/HEATING/COOLING

PART 1 - GENERAL

1.1. SUMMARY

A. This section includes units with integral cooling for outdoor installation. Integral Energy Recovery device shall be a rotary air-to-air total enthalpy wheel. Integral cooling source shall be packaged DX. Airflow arrangement shall be Outdoor Air with Recirculation. Each unit shall incorporate additional product requirements as listed in Section 2 of this specification.

B. Related Sections include the following:

1. Division 01 through 23 Specifications: Scope of Work
2. Division 01 through 23 Specifications: General Provisions
3. Division 23 Specifications: Insulation
4. Division 22 Specifications: Plumbing
5. Division 23 Specifications: Controls and Instrumentation
6. Division 26 Specifications: Electrical

1.2. SUBMITTALS

A. Product Data: For each type or model include the following:

1. Complete fan performance curves for both Supply Air and Exhaust Air, with system operating conditions indicated, as tested in an AMCA certified chamber.
2. Sound performance data for both Supply Air and Exhaust Air, as tested in an AMCA certified chamber.
3. Motor ratings, electrical characteristics and motor and fan accessories.
4. Performance ratings for all chilled water or DX coils.
5. Dimensioned drawings for each type of installation, showing isometric and plan views, to include location of attached ductwork and service clearance requirements.
6. Estimated gross weight of each installed unit.
7. Installation, Operating and Maintenance manual (IOM) for each model.
8. Microprocessor Controller (DDC) specifications to include available options and operating protocols. Include complete data on all factory-supplied input devices.
9. Energy recovery performance data for both summer and winter operation.

1.3. QUALITY ASSURANCE

A. Source Limitations: Obtain unit with all appurtenant components or accessories from a single manufacturer.

B. For the actual fabrication, installation, and testing of work under this section, use only thoroughly trained and experienced workers completely familiar with the items required and with the manufacturer's current recommended methods of installation.

C. Product Options: Drawings must indicate size, profiles and dimensional requirements of unit and are to be based on the specific system indicated. Refer to Division 1 Section "Product Requirements".

D. End of line test with full report available upon request.

E. Certifications

1. Entire unit shall be ETL Certified per U.L. 60335-2-40 and bear an ETL sticker.
2. Energy Recovery Device shall be AHRI Certified, per Standard 1060.

3. Coils shall be Recognized Components for ANSI/UL 1995, CAN / CSA C22.2 No 236.05.

1.4. COORDINATION

A. Coordinate size and location of all building penetrations required for installation of each unit and associated plumbing and electrical systems.

B. Coordinate location of water system fittings to ensure correct positioning for connection to the water coil and condensate drain pipe.

C. Coordinate sequencing of construction of associated plumbing, HVAC, electrical supply, roofing contractor.

PART 2 - PRODUCTS

2.1. MANUFACTURERS

A. Available Manufacturers: Subject to compliance with specifications contained within this document, manufacturers offering products that may be incorporated into the work include, but are not limited to:

1. Valent Air Corporation, LLC
2. Greenheck
3. LG
4. Or Approved Equivalent

2.2. MANUFACTURED UNITS

A. Unit shall be fully assembled at the factory and consist of an insulated metal cabinet, 2" exhaust air blower, evaporator coil, energy wheel, hot gas reheat coil, packaged DX system, motorized dampers, motorized recirculating damper, curb assembly, filter assembly intake air, supply air blower assembly, exhaust/relief blower assembly, filter assembly for exhaust air, and an electrical control center. All specified components and internal accessories factory installed are tested and prepared for single-point high voltage connection except with electric post heat and exhaust fan only power which have dual point power.

2.3. CABINET

A. Materials: Formed, double wall insulated metal cabinet, fabricated to permit access to internal components for maintenance.

1. Unit’s exterior shall be supplied from the manufacturer using G60 galvaneal steel with proprietary pre-painted material in the following finish color; Concrete Gray-RAL 7023. This has been subjected to a salt spray test per ASTM-B117 and evaluated using ASTM-D714 and ASTM-D610 showing no observable signs of rust or blistering until reaching 2,500 hours. This is Valent's Permatector™ option. Uncoated galvanized steel exterior is not acceptable.
2. Internal assemblies: 24 gauge, galvanized (G90) steel except for motor supports which shall be minimum 14 gauge galvanized (G90) steel.

B. Cabinet Insulation: Comply with NFPA 90A and NFPA 90B and erosion requirements of UL 181.

1. Materials: Rigid urethane injected foam. Foam board not acceptable.
   a. Thickness: 2 inch (50.8 mm)
   b. Thermal Resistance R16
   c. Thermally broken
   d. Meets UL94HF-1 flame requirements.
   e. Location and application: Full coverage of entire cabinet exterior to include walls, roof of unit, unit base, and doors.
2. Materials: Fiberglass insulation. If insulation other than fiberglass is used, it must also meet the Fire Hazard Classification shown below.

a. Thickness: 2 inch (50.8 mm)
b. Thermal Resistance R8
c. Fire Hazard Classification: Maximum flame spread of 25 and smoke developed of 50, when tested in accordance with ASTM C 411.
d. Location and application: Divider panels between outdoor air and return air/exhaust air streams.

C. Roof Insulation: 2 inch (50.8 mm) fiberglass located above the 1 inch (25.4 mm) foam panel.

D. Access panels / doors: Unit shall be equipped with insulated, hinged doors or removable access panels to provide easy access to all major components. Doors and access panels shall be fabricated of 18 gauge galvanized G90 steel or painted galvannealed steel.

E. Supply Air blower assemblies: Blower assembly shall consist of an electric motor and direct-drive fans. Assembly shall be mounted on heavy gauge galvanized steel rails and further mounted on 1.125 inch thick neoprene vibration isolators. Blower motors shall be capable of continuous speed modulation and controlled by a VFD.

F. Exhaust Air blower assemblies: Blower assembly shall consist of an electric motor and a direct-drive fan. Assembly shall be mounted on heavy gauge galvanized steel rails and further mounted on 1.125 inch thick neoprene vibration isolators. Blower motor shall be capable of continuous speed modulation and controlled by a VFD.

G. Evaporator Coil: Evaporator coil shall be (silver) soldered or brazed into the compressed refrigerant system. Coil shall be constructed of copper tubing, permanently bonded to aluminum fins and enclosed in a galvanized steel frame. If two compressors are used as components of the unit, then the evaporator coil shall be of "interlaced" configuration, permitting independent operation of either compressor without conflict with the other compressor.

H. Control panel / connections: Units shall have an electrical control center where all high and low voltage connections are made. Control center shall be constructed to permit single-point high voltage power supply connections. RTU shall be equipped with a Unit Disconnect Switch.

I. Condensate drain pan: Drain Pan shall be an integral part of the unit whenever a cooling option is included. Pan shall be formed of welded austenitic stainless steel sheet material and provided with a welded stainless steel drain connection at the front for connection to a P trap. Drain pan shall be sloped in two directions to provide positive draining and drain connector shall be sealed at penetration through cabinet wall.

J. P trap: If the unit is equipped with a condensate drain pan, contractor shall provide, or fabricate, and install an appropriate P trap, in accordance with all local and area codes and Best Practices.

K. Energy wheel: Unit energy wheel shall be sized for the full volume of outdoor and exhaust air without an energy wheel bypass damper(s). Energy wheel shall be of total enthalpy, rotary air-to-air type and shall be an element of a removable energy wheel cassette. The cassette shall consist of a galvanized steel framework (designed to produce laminar air flow through the wheel), an energy wheel as specified and a motor and drive assembly. The cassette shall incorporate a pre-tensioned urethane drive belt or a link style belt with a five-year warranty. The wheel media shall be a polymer film matrix in a stainless-steel framework and be comprised of individual segments that are removable for servicing. Non-segmented energy wheels are not acceptable. Silica gel desiccant shall be permanently bonded to the polymer film and is designed and constructed to permit cleaning and servicing. The energy wheel is to have a five-year warranty. Performance criteria are to be as specified in AHRI Standard 1060, complying with the Combined Efficiency data in the submittal.

L. Modulating frost control. Control system shall include an outdoor air thermostat and pressure sensor on the wheel assembly to initiate frost control sequence.

M. Reheat coil with factory installed modulating hot gas reheat valve.

N. Packaged DX System: Unit shall have an integral compressor(s) and evaporator coil located within the weather-tight unit housing. Condenser coils shall be all-aluminum micro channel design appurtenant condenser fan assemblies shall be factory installed as integral subassemblies of the unit and mounted on the unit's exterior. Lead condenser fan(s) will have an electronically commutated (EC) motor that will modulate to maintain a head pressure set point.] Motors shall be UL Recognized and CSA Certified. The lead refrigerant compressor shall be inverter hermetic scroll-type. Additional compressor shall be single stage hermetic scroll-type

paired in tandem with lead inverter compressor. Compressors shall be equipped with liquid line filter drier, electronic expansion valves (EEV) or thermostatic expansion valves (TXV) on non-inverter compressor circuits, manual reset high pressure and low pressure cutouts and all appurtenant sensors, service ports, leak detection sensors and safety devices. Compressed refrigerant system shall be fully charged with R-454B refrigerant. Compressors shall be mounted within an insulated access compartment and on a raised cabinet shelf to reduce sound and vibration. Each compressor shall be factory-equipped with an electric crankcase heater to boil off liquid refrigerant from the oil.

O. Condenser Fans: Fan blades must be constructed of aluminum or a composite material and have a geometry designed and documented to reduce sound and energy when compared to a traditional rectangular blade fan. Traditional rectangular blade fans are not allowed due to increased noise generated and increase power utilized. Condenser fan motors shall be three phase, external rotor, type 56 frame, open air over and shaft up. Each condenser fan motor shall have a vented frame, rated for continuous duty and be equipped with an automatic reset thermal protector. Lead condenser fan(s) will have an electronically commutated (EC) motor that will modulate to maintain a head pressure set point.] Motors shall be UL Recognized and CSA Certified. Single condenser fan running at max RPM and design static pressure shall not exceed an A-weighted sound power level of 75 db at free inlet/outlet test conditions.

P. Packaged DX Control and Diagnostics: The Packaged DX system shall be controlled by an onboard digital controller (DDC) that indicates both owner-supplied settings and fault conditions that may occur. The DDC shall be programmed to indicate the following faults:

1. Global alarm condition (active when there is at least one alarm)
2. Supply Air Proving alarm
3. Dirty Filter Alarm
4. Compressor Trip alarm
5. Compressor Locked Out alarm
6. Supply Air Temperature Low Limit alarm
    a. Sensor #1 Out of Range (outside air temperature)
    b. Sensor #2 Out of Range (supply air temperature)
    c. Sensor #3 Out of Range (cold coil leaving air temperature)

Q. Motorized dampers / Intake Air, Motorized dampers of low leakage type shall be factory installed.

R. Curb Assembly: Valent Air Corporation recommends the use of an engineered curb assembly in lieu of an owner-supplied rail system. The curb assembly provides full perimeter support of the unit and ensures proper flashing and insulation of all roof penetrations and provides adequate clearance for a P trap assembly.

S. A curb assembly made of 18 gauge galvanized steel shall be provided by the factory for assembly and installation as part of this division. The curb assembly shall provide perimeter support of the entire unit and shall have duct adapter(s) for supply air and return air. Curb assembly shall enclose the underside of the unit and shall be sized to fit into a recess in the bottom of the unit. Contractor shall be responsible for coordinating with roofing contractor to ensure curb unit is properly flashed to provide protection against weather/moisture penetration. Contractor shall provide and install appropriate insulation for the curb assembly. The curb shall be the height of 18”.

T. Service receptacle: 120 VAC GFCI service outlet shall be factory-provided and installed by this contractor in a location designated by the A / E. Service outlet requires a dedicated single phase electric circuit. Unit contains a 120 VAC transformer to provide power to service outlet.

2.4. BLOWER

A. Blower section construction, Supply Air: direct drive motor and blower shall be assembled on a 14 gauge galvanized steel platform and shall be equipped with 1.125 inch thick neoprene vibration isolation devices.

B. Blower assemblies: Shall be statically and dynamically balanced and designed for continuous operation at maximum rated fan speed and horsepower.

C. Fan: Direct drive, airfoil plenum fan with steel wheel statically and dynamically balanced. Prop or belt-drive fan not acceptable due to low static capabilities.

D. Blades: Painted steel blades only.

E. Blower section motor source quality control: Blower performance shall be factory tested for flow rate, pressure, power, air density, rotation speed and efficiency. Ratings are to be established in accordance with AMCA 210, "Laboratory Methods of Testing Fans for Rating".

2.5. MOTORS

A. General: Blower motors greater than 1/2 horsepower shall be "NEMA Premium" unless otherwise indicated. Compliance with EPAct minimum energy-efficiency standards for single speed ODP and TE enclosures is not acceptable. Motors shall be heavy-duty, permanently lubricated type to match the fan load and furnished at the specified voltage, phase and enclosure.

B. Motors shall be 60 cycle, 3 phase 460 volts.

2.6. UNIT CONTROLS

A. The unit shall be constructed so that it can function as a stand-alone heating and cooling system controlled by factory-supplied controllers, thermostats and sensors or it can be operated as a heating and cooling system controlled by a Building Management System (BMS). This unit shall be controlled by a factory-installed microprocessor programmable controller (DDC) that is connected to various optional sensors.

B. Unit shall incorporate a DDC controller with integral LCD screen that provides text readouts of status. DDC controller shall have a built-in keypad to permit operator to access read-out screens without the use of ancillary equipment, devices or software. DDC controllers that require the use of equipment or software that is not factory-installed in the unit are not acceptable. Alarm readouts consisting of flashing light codes are not acceptable. Owner-specified ventilating conditions can be input by means of push buttons.

C. Unit supply fan shall be configured for Constant Volume (ON/OFF).

D. Unit exhaust fan shall be configured for damper tracking.

E. Outside Air / Return Air damper control shall be field adjustable two-position.

F. Economizer control shall be temperature / enthalpy.

G. Operating protocol: The DDC shall be factory-programmed for BACnet MSTP.

H. Variable Frequency Drive (VFD): unit shall have factory installed variable frequency drive for modulation of the supply and exhaust air blower assemblies. The VFD shall be factory-programmed for unit-specific requirements and shall not require additional field programming to operate.

2.7. FILTERS

A. Unit shall have permanent 1 inch (25.4 mm) aluminum filters located in the outdoor air intake and shall be accessible from the exterior of the unit. MERV 8 disposable pleated filters shall be provided in the supply airstream. MERV 13 disposable pleated filters shall be provided in the supply final air stream and MERV 8 filters in the exhaust air stream.

PART 3 - EXECUTION

3.1. EXAMINATION

A. Prior to start of installation, examine area and conditions to verify correct location for compliance with installation tolerances and other conditions affecting unit performance. See unit IOM.

B. Examine roughing-in of plumbing, electrical and HVAC services to verify actual location and compliance with unit requirements. See unit IOM.

C. Proceed with installation only after all unsatisfactory conditions have been corrected.

3.2. INSTALLATION

A. Installation shall be accomplished in accordance with these written specifications, project drawings, manufacturer's installation instructions as documented in manufacturer's IOM, Best Practices and all applicable building codes.

3.3. CONNECTIONS

A. In all cases, industry Best Practices shall be incorporated. Connections are to be made subject to the installation requirements shown above.

B. Piping installation requirements are specified in Division 22 (Plumbing). Drawings indicate general arrangement of piping, fittings and specialties.

C. Duct installation and connection requirements are specified in Division 23 of this document.

D. Electrical installation requirements are specified in Division 26 of this document.

3.4. FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory authorized service representative to inspect field assembled components and equipment installation, to include electrical and piping connections. Report results to A / E in writing. Inspection must include a complete startup checklist to include (as a minimum) the following: Completed Start-Up Checklists as found in manufacturer's IOM.

3.5. STARTUP SERVICE

A. Engage a factory authorized service representative to perform startup service. Clean entire unit, comb coil fins as necessary, install clean filters. Measure and record electrical values for voltage and amperage. Refer to Division 23 "Testing, Adjusting and Balancing" and comply with provisions therein.

3.6. DEMONSTRATION AND TRAINING

A. Engage a factory authorized service representative to train owner's maintenance personnel to adjust, operate and maintain the entire unit. Refer to Division 01 Section Closeout Procedures and Demonstration and Training.

DIVISION 23-HEATING, VENTILATION, & AIR-CONDITIONING

SECTION 238126 – SINGLE-ZONE, HEAT PUMP HVAC SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes complete single-zone, heat pump HVAC system(s) which may include, but not limited to, the following components:

1. Outdoor, air-source heat pump units.
2. Indoor, suspended, ceiling-mounted units.
3. HVAC system controllers.
4. HVAC system refrigerant piping.

1.2 QUALITY ASSURANCE

A. Manufacturer Qualifications:

1. Nationally recognized manufacturer of HVAC systems and products having shipped HVAC systems with similar requirements to U.S. market for a continuous period of five years within time of bid.
2. Having complete published online catalog literature, installation, and operation and maintenance manuals for all products intended for use. Resources must be publicly available without login or sign-in as registered account.

B. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by HVAC system manufacturer.

1. Each employee shall be certified to have successfully completed training for proper installation of systems, including, but not limited to, equipment, piping, controls, and accessories indicated and furnished for installation.

C. ISO Compliance: System equipment and components furnished by HVAC system manufacturer shall be manufactured in an ISO 9001 and ISO 14001 facility.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store products in a clean and dry place. Protect products from weather, dirt, dust, water, construction debris, and physical damage.

1. Retain factory-applied coverings on equipment to protect finishes during construction and remove just prior to operating unit.

B. Cover unit openings before installation to prevent dirt and dust from entering inside of units. If required to remover coverings during unit installation, reapply coverings over openings after unit installation and remove just prior to operating unit.

C. Comply with manufacturer's written rigging and installation instructions for unloading and

moving to final installed location.

1.4 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace equipment and components that fail(s) in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures.
b. Faulty operation.
c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.

2. Warranty Period:

a. For Compressor, Ten **(10)** years from date of Substantial Completion.
b. For Parts, Ten (10) years from date of Substantial Completion.

B. Installer's Labor Warranty: Installer agrees to repair or replace equipment and components that fail(s) in materials or workmanship within specified warranty period.

1. Warranty Period: One year from date of substantial completion.

PART 2 - PRODUCTS

2.1 SINGLE-ZONE, HEAT PUMP HVAC SYSTEMS

A. Manufacturers: Basis of design product series is SMART MULTI. Subject to compliance with requirements, provide products by one of the following brands only:

1. Mitsubishi Electric & Electronics USA, Inc.
2. Trane, Inc.
3. LG
4. Or Approved Equivalent

2.2 SYSTEM DESCRIPTION

A. Single-zone HVAC system(s) with variable capacity in response to varying cooling loads. System shall consist of outdoor unit, indoor unit, piping, controls, and electrical power to make complete operating system(s) complying with requirements indicated.

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. AHRI Compliance: System and equipment performance certified according to AHRI 210/240-2024 and AHRI 1380.

D. UL Compliance: Comply with UL 60335-2-40.

2.3 OUTDOOR, AIR-SOURCE HEAT PUMP UNITS

A. Description: Factory-assembled and tested complete unit module designed for use in systems with all cooling demands.

B. Cabinet:

1. Galvanized steel and coated with a corrosion-resistant finish.

a. Coating with documented salt spray test performance of 2000 hours according to ASTM B117 surface scratch test (SST) procedure.

2. Internal Access: Removable panels or hinged doors of adequate size for field access to internal components for inspection, cleaning, service, and replacement.

C. Compressor and Motor Assembly:

1. Positive-displacement, direct-drive and hermetically sealed rotary or scroll compressor with inverter drive. Non-inverter compressors—where LRA applies—are not allowed.
2. **Cold-Climate Compressor: Hot-gas injection to allow increased compression ratio for extended periods without damage or excessive wear**.
3. Protection: Integral protection against the following-

a. High and low refrigerant pressure.

b. High refrigerant and oil temperature.
c. Thermal and overload.
d. Voltage fluctuations.
e. Short cycling.

4. Vibration Control: Integral isolation to dampen vibration transmission.
5. Crankcase heater.
6. Accumulator.
7. Fusible plug.

D. Heat-Exchanger Assembly: Documented salt spray test performance of 2000 hours according to ASTM B117 surface test (SST) procedure.

1. Plate Fin Coils:

a. Casing: Aluminum, galvanized, or stainless steel.
b. Fins: Aluminum or copper, mechanically bonded to tubes, with arrangement required by performance.
c. Tubes: Copper, of diameter and thickness required by performance.

E. Heat-Exchanger Fan and Motor Assembly:

1. Fan(s): Propeller type.

a. Horizontal discharge.
b. Direct-drive arrangement.
c. Fabricated from non-ferrous components.
d. Statically and dynamically balanced.

2. Fan Guards: Removable safety guards complying with OSHA regulations. If using metal materials, coat with corrosion-resistant coating to match performance indicated for heat

exchanger.

3. Motor(s): Brushless DC or electronically commutated with permanently lubricated bearings and rated for outdoor duty.
4. Motor Protection: Integral protection against thermal, overload, and voltage fluctuations.

F. DX Capacity Control: Electronic modulating type expansion valve with linear or proportional characteristics.

G. Standard Operating Range:

1. COOL Mode: 23°F to 115°F DB.

a. Unit shall deliver 100 percent cooling capacity at minimum range.

2. HEAT Mode:

a. Standard heat pump as indicated on Drawings:

1) -4°F to 59°F WB

b. Hyper Heating or Cold Climate heat pump as indicated on Drawings:

1) -13°F to 59°F WB

H. Field-Installed Unit Accessories:

1. **Heat Exchanger Hail Guards**.
2. **Central Drain Pan with Socket**.
3. **Snow and Rain Diverter to divert elements such as rooftop snow melt or condensation from other units installed above unit casing**.
4. **Vertical Air Deflector allowing minimum 48 inch distance between horizontal discharge units**.]

I. Unit Controls:

1. Factory-Installed Sensors:

a. Refrigerant suction temperature.
b. Refrigerant discharge temperature.
c. Compressor surface temperature.
d. Refrigerant high pressure.
e. Outdoor air temperature.
f. Outdoor coil heat sink temperature.

g. Outdoor coil two-phase pipe temperature.Features and Functions: Self-diagnostics, 3-minute time delay, auto-restart after power interruption.

3. Backup Rotation Function: Where one Deluxe controller is connected to two indoor units per Drawings, outdoor units shall operate alternately to maintain equal runtimes and equivalent wear. During fault code or system lockout condition in one unit the other shall continue to operate.

J. Refrigerant:

1. R-454b
2. Precharged refrigerant supplied within unit for up to **100 feet** line length.

K. Refrigerant Piping Allowances: System shall operate up to maximum limits without need for line size changes, traps or additional oil.

1. Standard heat pump as indicated on Drawings:

a. Outdoor unit sizes 18 and smaller: Up to **100 feet** total length, up to **100 feet** height difference, up to 15 long-radius elbows.
b. Outdoor unit sizes 24 and larger: Up to **165 feet** total length, up to **100 feet** height difference, up to 15 long-radius elbows.

2. Hyper Heating or Cold Climate heat pump as indicated on Drawings:

a. Outdoor unit sizes 24 and smaller: Up to **165 feet** total length, up to **100 feet** height difference, up to 15 long-radius elbows.
b. Outdoor unit sizes 30 and larger: Up to **245 feet** total length, up to **100 feet** height difference, up to 15 long-radius elbows

L. Unit Electrical:

1. Field Connection: Single point connection to power each outdoor unit and integral controls.
2. Disconnecting Means: Field-installed circuit breaker or switch, complying with NFPA 70.

2.4 INDOOR, CONCEALED, CEILING-MOUNTED UNITS FOR DUCTING

A. Description: Factory-assembled and tested complete unit with components, piping, wiring, and controls required for mating to ductwork, piping, power, and controls field connections.

B. Cabinet:

1. Material: Galvanized steel.
2. Insulation: Closed-cell, fiberglass-free internal insulation to provide thermal resistance and prevent condensation.
3. Duct Connections: Extended collar or flange, or designated exterior cabinet surface, designed for attaching field-installed ductwork.
4. Internal Access: Removable panels or hinged doors of adequate size for field access to internal components for inspection, cleaning, service, and replacement.

C. Coil Assembly:

1. Coil Casing: Aluminum, galvanized, or stainless steel.
2. Coil Fins: Aluminum, mechanically bonded to tubes, with arrangement required by performance.
3. Coil Tubes: Copper, of diameter and thickness required by performance.
4. Unit Internal Tubing: Copper tubing with brazed joints.
5. Unit Internal Tubing Insulation: Closed-cell, of thickness to prevent condensation.
6. Factory Charge: Dehydrated air or nitrogen.
7. Testing: Factory pressure tested and verified to be without leaks.

D. Drain Assembly:

1. Pan: Non-ferrous material, with bottom sloped to low point drain connection.
2. Condensate Removal: Unit-mounted lifting mechanism, capable of lifting drain water to an elevation above top of cabinet.

3. Field Piping Connection: Non-ferrous material.

E. Fan and Motor Assembly:

1. Fan(s):

a. Direct-drive arrangement.
b. Single or multiple fans connected to a common motor shaft and driven by a single motor.
c. Fabricated from non-ferrous components or ferrous components with corrosion-resistant finish.
d. Wheels statically and dynamically balanced.

2. Motor: PSC, Brushless DC or electronically commutated with permanently lubricated bearings.
3. Motor Protection: Integral protection against thermal, overload, and voltage fluctuations.
4. Speed Settings and Control: Multiple or variable speed with speed setting adjustable via central or wall controllers when present.
5. External Static Settings: 0.14, 0.20, 0.28, 0.40, or 0.60” WG.
6. Vibration Control: Integral isolation to dampen vibration transmission.

F. Filter Assembly:

1. Access: Bottom, side, or rear to accommodate field installation and replacement without need for tools.
2. Media: Poly Propylene Honeycomb Fabric (Washable).

G. Field-Installed Unit Accessories:

1. **Side-access filter box with one set MERV 13 Filter**.
2. **Condensate pump capable of at least 10 feet of lift**.

H. Unit Controls:

1. Factory-Installed Sensors:

a. Unit inlet air temperature.
b. Coil entering refrigerant temperature.
c. Refrigerant detection.

2. Interlocked control sequence: Dry (volt-free contacts) contacts shall be provided to achieve interlock function; relay adapter kits may be required. Required interlock sequence(s) include-

a. **backup heat control**.
b. **on/off control**.
c. **on/off and fault status**.
d. **THERMO-ON status (compressor operation)**.

I. Refrigerant Leak Detection:

1. Integral refrigerant sensor: Factory-installed.
2. Sequence upon leak detection:

a. Compressor stops.

b. Indoor unit fan operates regardless of setting.
c. Alarm indicator(s) may include sound from indoor unit or controller, flashing LED, error code or message on wall controller or central controller.

J. Unit Electrical:

1. Field Connection: Single point connection from outdoor unit provides power for indoor unit and signal for integral controls.

a. 3-wire plus ground 14 AWG copper wire for wire length unit up to 148 feet. Consult manufacturer installation manuals for wire sizes for longer lengths.

2. Disconnecting Means: Field-installed 3-pole switch, complying with NFPA 70.

2.5 HVAC SYSTEM CONTROLLERS

A. Wired Controllers for Indoor Units

1. Simple Controllers for Indoor Units:

a. Single controller capable of controlling multiple indoor units as group.
b. Integral room temperature sensor
c. Temperature Units: Fahrenheit and Celsius.
d. On/Off: Turns indoor unit on or off.
e. Operation Mode: Cool, Heat, Auto, Dehumidification, Fan Only.
f. Temperature Display and Set-Point: Separate set points for Cooling, Heating. Adjustable in 1-degree Fahrenheit increments between.
g. Fan Speed Setting: Select between available options furnished with unit.
h. Airflow Direction Setting: If applicable to indoor unit style, select between available options furnished with the unit.
i. Service Notification Display: "Filter".
j. Error Code Notification Display: Used by service personnel to troubleshoot abnormal operation and equipment failure.
k. Low-voltage power required for controller shall be powered through non-polar connections to indoor unit.

2. Residential / Multi-Family Style Controllers for Indoor Units:

a. Wall-mounted controller with integral room temperature and humidity sensors and adapter providing connection to indoor unit.
b. Color LCD with click-wheel operation and Proximity Sensor to wake controller screen when approached.
c. Automatic switching between Cool and Dry modes to meet target humidity level (user-selectable between 35-75%).
d. Temperature Units: Fahrenheit and Celsius.
e. On/Off: Turns indoor unit on or off.
f. Hold: Hold operation settings until hold is released.
g. Operation Mode: Cool, Heat, Auto, Dehumidification, Fan Only, and Setback.
h. Temperature Display and Set-Point: Separate set points for Cooling, Heating. Adjustable in 1-degree Fahrenheit increments between.
i. Fan Speed Setting: Select between available options furnished with unit.
j. Airflow Direction Setting: If applicable to indoor unit style, select between available options furnished with the unit.
k. Seven-day programmable operating schedule with up to five events per day.

Operations shall include On/Off, Operation Mode, and Temperature Set-Point.

l. Error Code Notification Display: Used by service personnel to troubleshoot abnormal operation and equipment failure.
m. User and Service Passwords: Capable of preventing adjustments by unauthorized users.
n. Setting stored in nonvolatile memory to ensure that settings are not lost if power is lost.
o. Low-voltage power required for controller shall be powered through polarity-specific connections to indoor unit.
p. Limits central control (when present) to monitor-only functionality.

3. Deluxe Controllers for Indoor Units:

a. Single controller capable of controlling multiple indoor units as group.
b. Integral room temperature sensor
c. Configurable LCD Touch Screen with Auto Timeout: Timeout duration shall be adjustable.
d. Temperature Units: Fahrenheit and Celsius.
e. On/Off: Turns indoor unit on or off.
f. Hold: Hold operation settings until hold is released.
g. Operation Mode: Cool, Heat, Auto, Dehumidification, Fan Only, and Setback.
h. Temperature Display and Set-Point: Separate set points for Cooling, Heating. Adjustable in 1-degree Fahrenheit increments between.
i. Fan Speed Setting: Select between available options furnished with unit.
j. Airflow Direction Setting: If applicable to indoor unit style, select between available options furnished with the unit.
k. Seven-day programmable operating schedule with up to five events per day. Operations shall include On/Off, Operation Mode, and Temperature Set-Point.
l. Auto Off Timer: Operates unit for an adjustable time duration and then turns unit off.
m. Service Notification Display: "Filter".
n. Service Run Tests: Limit use by service personnel to troubleshoot operation.
o. Error Code Notification Display: Used by service personnel to troubleshoot abnormal operation and equipment failure.
p. User and Service Passwords: Capable of preventing adjustments by unauthorized users.
q. Setting stored in nonvolatile memory to ensure that settings are not lost if power is lost.
r. Low-voltage power required for controller shall be powered through non-polar connections to indoor unit.

4. Color Touch Screen Controllers with Bluetooth Connectivity for Indoor Units:

a. Single controller capable of controlling multiple indoor units as group.
b. Integral room temperature sensor
c. Configurable color LCD Touch Screen with Auto Timeout: import custom image, timeout duration shall be adjustable.
d. Configurable and controller via mobile app via Bluetooth™; Bluetooth shall have rotating security PIN.
e. Temperature Units: Fahrenheit and Celsius.
f. On/Off: Turns indoor unit on or off.
g. Hold: Hold operation settings until hold is released.
h. Operation Mode: Cool, Heat, Auto, Dehumidification, Fan Only, and Setback.
i. Temperature Display and Set-Point: Separate set points for Cooling, Heating. Adjustable in 1-degree Fahrenheit increments between.
j. Fan Speed Setting: Select between available options furnished with unit.

k. Airflow Direction Setting: If applicable to indoor unit style, select between available options furnished with the unit.
l. Seven-day programmable operating schedule with up to five events per day. Operations shall include On/Off, Operation Mode, and Temperature Set-Point.
m. Auto Off Timer: Operates unit for an adjustable time duration and then turns unit off.
n. Service Notification Display: "Filter".
o. Service Run Tests: Limit use by service personnel to troubleshoot operation.
p. Error Code Notification Display: Used by service personnel to troubleshoot abnormal operation and equipment failure.
q. User and Service Passwords: Capable of preventing adjustments by unauthorized users.
r. Setting stored in nonvolatile memory to ensure that settings are not lost if power is lost.
s. Low-voltage power required for controller shall be powered through non-polar connections to indoor unit.

5. Conventional Thermostat Interface and Thermostat

a. Provide with 24V transformer to power thermostat.
b. Thermostat to be provided by Mitsubishi.
c. Indoor unit modes: COOL, HEAT, FAN, and OFF (AUTO function only at thermostat level).
d. Three input terminals to control fan speed control:

1) High.
2) Medium.
3) Low.

e. Auto recovery after power failure.
f. Limits central control (when present) to monitoring mode status and error alarm only.

B. Wireless Controllers for Indoor Units:

1. Wireless Wall-Mounted Controllers for Indoor Units:

a. Wall-mounted controller with integral room temperature sensor and receiver providing connection to indoor unit.
b. Temperature sensing shall be **integral sensor within controller**.
c. Temperature Units: Fahrenheit and Celsius.
d. On/Off: Turns indoor unit on or off.
e. Hold: Hold operation settings until hold is released.
f. Operation Mode: Cool, Heat, Auto, Dehumidification, Fan Only, and Setback.
g. Temperature Display and Set-Point: Separate set points for Cooling, Heating. Adjustable in 1-degree Fahrenheit increments between.
h. Fan Speed Setting: Select between available options furnished with unit.
i. Airflow Direction Setting: If applicable to indoor unit style, select between available options furnished with the unit.
j. Seven-day programmable operating schedule with up to five events per day. Operations shall include On/Off, Operation Mode, and Temperature Set-Point.
k. Service Notification Display: "Filter".
l. User and Service Passwords: Capable of preventing adjustments by unauthorized users.
m. Setting stored in nonvolatile memory to ensure that settings are not lost if power is lost.

n. Two AA alkaline batteries (supplied with controller) required for controller power.
o. Receiver connects to indoor unit control board with 1 m cable.
p. Limits central control (when present) to monitor-only functionality.

2. Handheld Wireless Controllers for Indoor Units:

a. Controller communicates to remote-mounted receiver that is wired to indoor unit(s).

1) Include receivers with handheld wireless controllers as required to complete installation.
2) Low-voltage power required for receivers shall be powered by indoor unit.

b. One handheld wireless controller shall be capable of communicating with one or multiple receivers to control one or multiple indoor units as a group.
c. Temperature Units: Fahrenheit and Celsius.
d. On/Off: Turns indoor unit on or off.
e. Operation Mode: Cool, Heat, Auto, Dehumidification, and Fan Only.
f. Fan Speed Setting: Select between available options furnished with indoor unit.
g. Airflow Direction Setting: If applicable to unit, select between available options furnished with indoor unit.
h. Auto Off Timer: Operates unit for an adjustable time duration and then turns unit off.
i. Service Run Tests: Limit use by service personnel to troubleshoot operation.
j. Receiver Error Notification LED: Used by service personnel to troubleshoot abnormal operation and equipment failure.

2.6 HVAC SYSTEM REFRIGERANT PIPING

A. Refrigerant Piping:

1. Copper Tube: ASTM B280, Type ACR.
2. Wrought-Copper Fittings: ASME B16.22.
3. Brazing Filler Metals: AWS A5.8/A5.8M.

B. Refrigerant Tubing Kits:

1. Factory-rolled and -bundled, soft-copper tubing with tubing termination fittings at each end.
2. Standard one-piece length for connecting to indoor units.
3. Pre-insulated with flexible elastomeric insulation of thickness to comply with governing energy code and sufficient to eliminate condensation.
4. Factory Charge: dehydrated air or nitrogen.

PART 3 - EXECUTION

3.1 EQUIPMENT INSTALLATION, GENERAL

A. Clearance:

1. Maintain manufacturer's recommended clearances for service and maintenance.
2. Maintain clearances required by governing code.

B. Equipment Restraint Installation: Install equipment with seismic-restraint device. Comply with requirements for seismic-restraint devices specified in Section 230548 "Vibration and Seismic Controls for HVAC."

3.2 INSTALLATION OF INDOOR UNITS

A. Install units to be level and plumb while providing a neat and finished appearance.

B. Unless otherwise required by HVAC system manufacturer, support ceiling-mounted units from structure above using threaded rods; minimum rod size of **3/8 inch (10 mm)**.

C. Adjust supports of exposed and recessed units to draw units tight to adjoining surfaces.

D. Protect finished surfaces of ceilings, floors, and walls that come in direct contact with units. Refinish or replaced damaged areas after units are installed.

E. In rooms with ceilings, conceal piping and tubing, controls, and electrical power serving units above ceilings.

F. In rooms without ceiling, arrange piping and tubing, controls, and electrical power serving units to provide a neat and finished appearance.

G. Provide lateral bracing if needed to limit movement of suspended units to not more than **0.25 inch (13 mm)**.

3.3 INSTALLATION OF OUTDOOR UNITS

A. Install units to be level and plumb while providing a neat and finished appearance.

B. Attachment to pad, bracket, or equipment supports: Install anchor bolts to elevations required for proper attachment to supported equipment.

3.4 GENERAL REQUIREMENTS FOR PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping and tubing systems. Install piping and tubing as indicated unless deviations to layout are approved on coordination drawings.

B. Install piping and tubing in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

C. Install piping and tubing at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install piping and tubing above accessible ceilings to allow sufficient space for ceiling panel removal.

E. Install piping and tubing to permit valve servicing.

F. Install piping and tubing free of sags.

G. Install piping and tubing to allow application of insulation.

H. Install groups of pipes and tubing parallel to each other, spaced to permit applying insulation with service access between insulated piping and tubing.

I. Install sleeves for piping and tubing penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 230500 "Common Work Results for HVAC."

J. Install escutcheons for piping and tubing penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 230500 "Common Work Results for HVAC."

3.5 INSTALLATION OF SYSTEM CONDENSATE DRAIN PIPING

A. General Requirements for Drain Piping and Tubing:

1. Install a union in piping at each threaded unit connection.
2. Install an adjustable stainless steel hose clamp with adjustable gear operator on unit hose connections. Tighten clamp to provide a leak-free installation.
3. If required for unit installation, provide a trap assembly in drain piping to prevent air circulated through unit from passing through drain piping. Comply with more stringent of the following:

    a. Details indicated on Drawings.
    b. Manufacturer's requirements.
    c. Governing codes.
    d. In the absence of requirements, comply with requirements of ASHRAE handbooks.

4. Extend drain piping from units with drain connections to drain receptors as indicated on Drawings. If not indicated on Drawings, terminate drain connection at nearest accessible location that is not exposed to view by occupants.
5. Provide each 90-degree change in direction with a Y- or T-fitting. Install a threaded plug connection in the dormant side of fitting or future use as a service cleanout.

B. Gravity Drains:

1. Slope piping from unit connection toward drain termination at a constant slope of not less than one percent.

C. Pumped Drains:

1. If unit condensate pump or lift mechanism is not included with an integral check valve, install a full-size check valve in each branch pipe near unit connection to prevent backflow into unit.

3.6 INSTALLATION OF REFRIGERANT PIPING

A. Refrigerant Tubing Kits:

1. Unroll and straighten tubing to suit installation. Deviations in straightness of exposed tubing shall be unnoticeable to observer.
2. Support tubing as specified in Section 230516 “Hangers and Supports for HVAC Piping

and Equipment."

3. Prepare tubing ends and make mating connections to provide a pressure tight and leak-free installation.

B. Select system components with minimum **650 psig** pressure rating.

C. Install piping as short and direct as possible, with a minimum number of joints and fittings.

D. Install refrigerant piping and tubing in protective conduit where installed below ground.

E. Unless otherwise required by HVAC system manufacturer, slope refrigerant piping and tubing as follows:

1. Install horizontal hot-gas discharge piping and tubing with a uniform slope downward away from compressor.
2. Install horizontal suction lines with a uniform slope downward to compressor.
3. Traps to entrain oil in vertical runs are not allowed.
4. Liquid lines may be installed level.

F. When brazing, remove or protect components that could be damaged by heat. Braze pipes with a dry nitrogen purge to avoid oxidation.

G. Before installation, clean piping, tubing, and fittings to cleanliness level required by HVAC system manufacturer.

H. Joint Construction:

1. Brazed Joints

a. Ream ends of tubes and remove burrs.
b. Remove scale, slag, dirt, and debris from inside and outside of tube and fittings before assembly.
c. Construct joints in accordance with AWS's "Brazing Handbook," "Pipe and Tube" Chapter.
d. Use Type BAg (cadmium-free silver) alloy for joining copper with bronze.
e. The piping being brazed shall be purged of air to remove the oxygen and filled with one of the following inert gases: oxygen-free nitrogen, helium or argon. The piping system shall be purged with an inert gas for a minimum time corresponding to five volume changes through the piping system prior to brazing. The pre-purge rate shall be at a minimum velocity of 100 feet per minute (0.508 m/s). The inert gas shall be directly connected to the tube system being brazed to prevent the entrainment of ambient air. After the pre-purge, the inert gas supply shall be maintained through the piping during the brazing operation at a minimum pressure of **1.0 psi** (**6.89 kPa**) and a maximum pressure of **3.0 psi** (**20.67 kPa**). The joint shall be brazed with a filler metal conforming to AWS A5.8

2. Mechanically Pressed Joints

a. The installing contractor shall be fully trained and qualified by the manufacturer of the mechanically pressed joints to install the selected piping connections.
b. Mechanical joints shall be installed in accordance with the manufacturer's instructions.

3. Flared Joints

a. Flared fittings shall be installed in accordance with the manufacturer's instructions. The fitting shall be used with the tube material specified by the fitting manufacturer. The flared tube end shall be made by a tool designed for that operation and refrigerant classification.

4. Soldered Joints

a. Use of soldered joints is prohibited within systems.

I. Elbows: Only long-radius 90 degree elbows are allowed. Up to 15 are allowed per system; sweeping bends with 24 inch or greater radius do not count as elbow.

3.7 INSTALLATION OF PIPING AND TUBING 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. Installation to maintain a continuous vapor barrier.

B. 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.

C. 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 unavailable, 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. 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.

D. 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.

E. 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.

3.8 INSTALLATION OF DUCT, ACCESSORIES, AND AIR OUTLETS

A. Where installing ductwork adjacent to equipment, allow space for service and maintenance.

B. Comply with requirements for metal ducts specified in Section 233113 "Metal Ducts."

C. Comply with requirements for nonmetal ducts specified in Section 233116 "Nonmetal Ducts."

D. Comply with requirements for air duct accessories specified in Section 233300 "Air Duct Accessories."

E. Comply with requirements for flexible ducts specified in Section 233346 "Flexible Ducts."

F. Comply with requirements for air diffusers specified in Section 233713.13 "Air Diffusers."

G. Comply with requirements for registers and grilles specified in Section 233713.23 "Registers and Grilles."

3.9 IDENTIFICATION

A. Identify system equipment, piping, tubing, and valves. Comply with requirements for identification specified in Section 230553 "Identification for HVAC Piping and Equipment."

3.10 STARTUP SERVICE

A. Installer shall complete system startup service according to manufacturer's written instructions.

B. Startup checks shall include, but not be limited to, the following:

1. Check control communications of equipment and each operating component in system(s).
2. Check each outdoor unit’s power supply is connected 12 to 24 hours before startup of system.
3. Check each indoor unit's response to demand for cooling and changes to airflow settings.
4. Check each indoor unit and outdoor unit for proper condensate removal.

C. System Operation Report:

1. After completion of startup service, manufacturer shall issue a report for each separate system.
2. Report shall include complete documentation describing each startup check, the result, and any corrective action required.

3.11 ADJUSTING

A. Adjust equipment and components to function smoothly and lubricate as recommended by manufacturer.

B. Adjust initial temperature set points. Adjust initial airflow settings and discharge airflow patterns in accordance with Drawings or manufacturer specifications.

C. Set field-adjustable switches according to HVAC system manufacturer's written instructions, and as indicated.

DIVISION 23-HEATING, VENTILATION, & AIR-CONDITIONING

238129 – MULTIZONE, HEAT-PUMP HVAC SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes complete Multizone, Heat-Pump HVAC system(s) which may include, but not limited to, the following components:

1. Outdoor, air-source heat-pump units.
2. Indoor, exposed, wall-mounted units.
3. Indoor, recessed, ceiling-mounted units with 33x33” grilles.
4. Indoor, recessed, ceiling-mounted units with 24x24” grilles.
5. Indoor, suspended, ceiling-mounted units.
6. HVAC system controls.
7. HVAC system refrigerant and oil.
8. HVAC system condensate drain piping.
9. HVAC system refrigerant piping.
10. HVAC system control cable.

1.2 QUALITY ASSURANCE

A. Manufacturer Qualifications:

1. Nationally recognized manufacturer of HVAC systems and products.
2. Shipped HVAC systems with similar requirements to local market for a continuous period of **five** (5) years within time of bid.
3. HVAC systems and products that have been successfully tested and in use on at least Five (5) completed projects.
4. Having complete published online catalog literature, installation, and operation and maintenance manuals for all products intended for use. Resources must be publicly available without login or sign-in as registered account.
5. Having full-time in-house employees for the following:

    a. Product research and development.
    b. Product and application engineering.
    c. Product manufacturing, testing, and quality control.
    d. Technical support for system installation training, startup, commissioning, and troubleshooting of installations.
    e. Owner training.

B. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by HVAC system manufacturer.

1. Each employee shall be certified to have successfully completed manufacturer training for proper installation of systems, including, but not limited to, equipment, piping, controls, and accessories indicated and furnished for installation.
2. Installer certificate shall be valid and current for duration of Project.
3. Retain copies of Installer certificates on-site and make available on request.

4. Each person assigned to Project shall have demonstrated past experience.

    a. Demonstrated past experience with products being installed for period within Five (5) consecutive years before time of bid.
    b. Demonstrated past experience on Five (5) projects of similar system complexity, scope, and value.

C. ISO Compliance: System equipment and components furnished by HVAC system manufacturer shall be manufactured in an ISO 9001 and ISO 14001 facility.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store products in a clean and dry place. Protect products from weather, dirt, dust, water, construction debris, and physical damage.

1. Retain factory-applied coverings on equipment to protect finishes during construction and remove just prior to operating unit.

B. Cover unit openings before installation to prevent dirt and dust from entering inside of units. If required to remover coverings during unit installation, reapply coverings over openings after unit installation and remove just prior to operating unit.

C. Comply with manufacturer's written rigging and installation instructions for unloading and moving to final installed location.

1.4 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace equipment and components that fail(s) in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

    a. Structural failures.
    b. Faulty operation.
    c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.

2. Warranty Period:

    a. For Compressor, Seven (7) year(s) from date of Substantial Completion.
    b. For Parts, Five (5) year(s) from date of Substantial Completion.

B. Installer’s Labor Warranty: Installer agrees to repair or replace equipment and components that fail(s) in materials or workmanship within specified warranty period.

1. Warranty Period Two (2) year(s) from date of substantial completion.

PART 2 - PRODUCTS

2.1 MULTIZONE, HEAT-PUMP HVAC SYSTEMS

A. Manufacturers: Basis of design product series is SMART MULTI. Subject to compliance with

requirements, provide products by one of the following brands only:

1. Mitsubishi Electric & Electronics USA, Inc.
2. Trane, Inc.
3. LG
4. Or Approved Equivalent

2.2 SYSTEM DESCRIPTION

A. Multi-zone HVAC system(s) with variable capacity in response to varying cooling and heating loads. System shall consist of multiple VRF-style indoor units, outdoor unit, piping, controls, and electrical power to make complete operating system(s) complying with requirements indicated.

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. AHRI Compliance: System and equipment performance certified according to AHRI 1230-2023.

D. UL Compliance: Comply with UL 60335-2-40.

2.3 OUTDOOR, AIR-SOURCE HEAT-PUMP UNITS

A. Description: Factory-assembled and tested complete unit module designed for use in systems with either all heating or all cooling demands, but not for use in systems with simultaneous heating and cooling.

B. Cabinet:

1. Galvanized steel and coated with a corrosion-resistant finish.

    a. Coating with documented salt spray test performance of 2000 hours according to ASTM B117 surface scratch test (SST) procedure.

2. Internal Access: Removable panels or hinged doors of adequate size for field access to internal components for inspection, cleaning, service, and replacement.

C. Compressor and Motor Assembly:

1. One or more positive-displacement, direct-drive and hermetically sealed rotary or scroll compressor(s) with inverter drive. Non-inverter compressors—where LRA applies—are not allowed.
2. **Cold-Climate Compressor: Hot-gas injection to allow increased compression ratio for extended periods without damage or excessive wear**.
3. Protection: Integral protection against the following-

    a. Refrigerant overcharge and undercharge
    b. High and low refrigerant pressure.
    c. High refrigerant and oil temperature.
    d. Thermal and overload.
    e. Voltage fluctuations.
    f. Phase failure and phase reversal.
    g. Short cycling.

4. Speed Control: Variable to maintain refrigerant evaporating and condensing temperatures while varying refrigerant flow to satisfy cooling and heating loads.
5. Vibration Control: Integral isolation to dampen vibration transmission.
6. Crankcase heaters with integral control to maintain safe operating temperature.
7. Fusible plug.

D. Heat-Exchanger Assembly: Documented salt spray test performance of 2000 hours according to ASTM B117 surface test (SST) procedure.

1. Plate Fin Coils:

a. Casing: Aluminum, galvanized, or stainless steel.
b. Fins: Aluminum or copper, mechanically bonded to tubes, with arrangement required by performance.
c. Tubes: Copper, of diameter and thickness required by performance.

E. Heat-Exchanger Defrost Strategy: Reverse-cycle method to maximize comfort during extreme ambient temperatures.

F. Heat-Exchanger Fan and Motor Assembly:

1. Fan(s): Propeller type.

a. Horizontal discharge
b. Direct-drive arrangement.
c. Fabricated from non-ferrous components.
d. Statically and dynamically balanced.

2. Fan Guards: Removable safety guards complying with OSHA regulations. If using metal materials, coat with corrosion-resistant coating to match performance indicated for heat exchanger.
3. Motor(s): Brushless DC or electronically commutated with permanently lubricated bearings and rated for outdoor duty.
4. Motor Protection: Integral protection against thermal, overload, and voltage fluctuations.

G. Standard Operating Range:

1. COOL Mode: 23°F to 115°F DB.
2. HEAT Mode:

a. Standard heat pump as indicated on Drawings:

1) -4°F to 59°F WB

b. Hyper Heating or Cold Climate heat pump as indicated on Drawings:

1) -13°F to 59°F WB

H. Field-Installed Unit Accessories:

1. **Heat Exchanger Hail Guards**
2. **Central Drain Pan with Socket**.
3. **Snow and Rain Diverter to divert elements such as rooftop snow melt or condensation from other units installed above unit casing**.
4. **Wall-Mounted Equipment Support Bracket**.

I. Unit Controls:

1. Factory-Installed Sensors:

a. Refrigerant suction temperature.
b. Refrigerant discharge temperature.
c. Outdoor air temperature.
d. Refrigerant high pressure.
e. Refrigerant low pressure.

2. Features and Functions: Self-diagnostics, time delay, auto-restart.

3. Interlock control sequence: Customizable operation based on external input or contact closure. Required interlock sequence(s) include-

a. **Multi-stage demand limit**.
b. **Low noise (nighttime) limit**.
c. **Lock COOL or HEAT mode**.
d. **Compressor on/off and fault status**.
e. **Refrigerant leak detected**

J. Refrigerant Leak Detection:

1. Sequence upon receiving leak detection signal from any indoor unit:

a. Switch to COOL operation regardless of previous operation mode.
b. Close liquid shutoff valve and run pump-down operation.
c. Upon completion of pump-down operation, close suction shutoff valve.
d. Stop compressor operation

K. Unit Electrical:

1. Field Connection: Single point connection to power each unit module and integral controls.
2. Disconnecting Means: Field-installed circuit breaker or switch, complying with NFPA 70.

2.4 INDOOR, RECESSED, CEILING-MOUNTED UNITS WITH 33x33” GRILLES

A. Description: Factory-assembled and tested complete unit with components, piping, wiring, and controls required for mating to ductwork, piping, power, and controls field connections.

B. Cabinet:

1. Material: Painted steel, or coated steel frame covered by a plastic cabinet, with an architectural acceptable finish suitable for tenant occupancy on exposed surfaces.
2. Insulation: Closed-cell internal insulation to provide thermal resistance and prevent condensation.
3. Internal Access: Removable panels of adequate size for field access to internal components for inspection, cleaning, service, and replacement.

C. DX Coil Assembly:

1. Coil Casing: Aluminum, galvanized, or stainless steel.
2. Coil Fins: Aluminum, mechanically bonded to tubes, with arrangement required by performance.

3. Coil Tubes: Copper, of diameter and thickness required by performance.
4. Capacity Control: Electronic modulating type valve with linear or proportional characteristics.
5. Internal Tubing: Copper tubing with brazed joints.
6. Internal Tubing Insulation: Closed-cell, of thickness to prevent condensation.
7. Factory Charge: Dehydrated air or nitrogen.
8. Testing: Factory pressure tested and verified to be without leaks.

D. Drain Assembly:

1. Pan: Non-ferrous material, with bottom sloped to low point drain connection.
2. Condensate Removal: Unit-mounted integral lifting mechanism, capable of lifting drain water to an elevation above top of cabinet.
3. Field Piping Connection: Non-ferrous material.

E. Fan and Motor Assembly:

1. Fan(s):

    a. Direct-drive arrangement.
    b. Single or multiple fans connected to a common motor shaft and driven by a single motor.
    c. Fabricated from non-ferrous components or ferrous components with corrosion protection finish.
    d. Wheels statically and dynamically balanced.

2. Motor: Brushless DC or electronically commutated with permanently lubricated bearings.
3. Motor Protection: Integral protection against thermal, overload, and voltage fluctuations.
4. Speed Settings and Control: Multiple or variable speed with speed setting adjustable via central or wall controllers when present.

    a. Airflow volume shall vary based on three unit height settings.

5. Vibration Control: Integral isolation to dampen vibration transmission.

F. Filter Assembly:

1. Access: Bottom, to accommodate filter replacement without the need for tools.
2. Media: Washable screen.

G. Return/Discharge-Air Grille Assembly: Attached to bottom of unit cabinet.

1. Discharge Pattern: Include accessory air outlet shutter plates as required for two, three, or four-way throw as indicated on Drawings.

    a. Discharge Pattern Adjustment: Field-adjustable settings for up and down range of motion.

    b. Discharge Pattern Closure: Ability to close individual discharges of units with multiple patterns using wall-mounted controller.

2. Motorized Vanes: Modulating up and down flow pattern for uniform room air distribution.
3. Alternate Branch Supply Duct Connection: Sheet metal knockout for optional connection to one supply branch duct as shown on Drawings. Utilize accessory air outlet shutter plate with branch ducting.

H. Integral Occupant and Location Detection: Unit includes occupant and location detection for automatic air distribution and energy saving setback control in the following manner.

1. Air Distribution

a. **Default distribution operation: Integral occupant and location detection will not be utilized to control air distribution. During COOL mode, vanes move to horizontal airflow direction. During HEAT mode, vanes move to down airflow direction**.
b. **Area temperature distribution: Vanes move to down airflow direction toward areas with a high floor temperature during COOL mode and toward areas with a low floor temperature during HEAT mode. Otherwise, vanes move to the horizontal airflow direction**.

2. Energy Saving

a. **Default energy operation: Integral occupant and location detection will not be utilized to automatically enable setback or mode changes. Set point and setback and mode determined by wall controller or central control when provided**.
b. **No occupancy-based energy save: If there are no persons in the room for 60 minutes or more, energy saving operation (setback) equal to 4°F is performed**.
c. **Room occupancy-based energy save: If occupancy rate decreases to approximately 30% of the maximum occupancy rate, energy saving operation (setback) equal to 2°F is performed**.
d. **No occupancy Auto-OFF: If no persons are in the room for set amount of time (60–180 minutes), MODE is automatically changed (OFF, COOL, or HEAT)**.

I. Outdoor Air Ventilation Connection: Sheet metal knockout for connection to outdoor air ventilation duct per Drawings.

J. Field-Installed Unit Accessories:

1. [**None**.]
2. **Multi-function casement with MERV 10 filter element**.
3. **Left/right horizontal airflow vane kit to further optimize air distribution and energy saving configurations (adds 3 inches to casement height)**.
4. **Condensate pump capable of at least 10 feet of lift**.

K. Unit Controls:

1. Factory-Installed Sensors:

a. Unit inlet air temperature.
b. Coil entering refrigerant temperature.
c. Coil leaving refrigerant temperature.
d. Room occupancy/location.
e. Refrigerant detection.

2. Interlock control sequence: Four digital inputs and three digital outputs for use in defined or customizable interlock sequences; relay adapter kits may be required. Required interlock sequence(s) include-

a. **backup heat control**.
b. **on/off control**.
c. **on/off and fault status**.
d. **mode and fan status**.
e. **indoor unit float switch connection**.
f. **branch controller float switch connection**.
g. **fan speed control**.
h. **forced fan operation**.

3. Features and Functions:

a. Integral occupancy and location sensor.
b. Time delay.
c. Auto-restart.
d. Auto operation mode.
e. Manual operation mode.
f. Filter service notification.
g. Drain assembly high water level safety shutdown and notification.
h. Run test switch.

L. Refrigerant Leak Detection:

1. Integral refrigerant sensor: Factory-installed.
2. Sequence upon leak detection:

a. Refrigerant detection communicated to outdoor unit or shut-off valve kit.
b. Indoor unit fan operates regardless of setting.
c. Alarm indicator(s) may include sound from indoor unit or controller, flashing LED, error code or message on wall controller or central controller.

M. Unit Electrical:

1. Field Connection: Single point connection to power entire unit and integral controls.
2. Disconnecting Means: Field-installed circuit breaker or switch, complying with NFPA 70.

2.5 INDOOR, RECESSED, CEILING-MOUNTED UNITS WITH 24x24” GRILLES

A. Description: Factory-assembled and tested complete unit with components, piping, wiring, and controls required for mating to ductwork, piping, power, and controls field connections.

B. Cabinet:

1. Material: Painted steel, or coated steel frame covered by a plastic cabinet, with an architectural acceptable finish suitable for tenant occupancy on exposed surfaces.
2. Insulation: Closed-cell internal insulation to provide thermal resistance and prevent condensation.
3. Internal Access: Removable panels of adequate size for field access to internal components for inspection, cleaning, service, and replacement.

C. DX Coil Assembly:

1. Coil Casing: Aluminum, galvanized, or stainless steel.
2. Coil Fins: Aluminum, mechanically bonded to tubes, with arrangement required by performance.

3. Coil Tubes: Copper, of diameter and thickness required by performance.
4. Capacity Control: Electronic modulating type valve with linear or proportional characteristics.
5. Internal Tubing: Copper tubing with brazed joints.
6. Internal Tubing Insulation: Closed-cell, of thickness to prevent condensation.
7. Factory Charge: Dehydrated air or nitrogen.
8. Testing: Factory pressure tested and verified to be without leaks.

D. Drain Assembly:

1. Pan: Non-ferrous material, with bottom sloped to low point drain connection.
2. Condensate Removal: Unit-mounted integral lifting mechanism, capable of lifting drain water to an elevation above top of cabinet.
3. Field Piping Connection: Non-ferrous material.

E. Fan and Motor Assembly:

1. Fan(s):

    a. Direct-drive arrangement.
    b. Single or multiple fans connected to a common motor shaft and driven by a single motor.
    c. Fabricated from non-ferrous components or ferrous components with corrosion protection finish.
    d. Wheels statically and dynamically balanced.

2. Motor: Brushless DC or electronically commutated with permanently lubricated bearings.
3. Motor Protection: Integral protection against thermal, overload, and voltage fluctuations.
4. Speed Settings and Control: Multiple or variable speed with speed setting adjustable via central or wall controllers when present.
5. Vibration Control: Integral isolation to dampen vibration transmission.

F. Filter Assembly:

1. Access: Bottom, to accommodate filter replacement without the need for tools.
2. Media: Washable screen.

G. Return/Discharge-Air Grille Assembly: Attached to bottom of unit cabinet.

1. Discharge Pattern: Four-way throw.

    a. Discharge Pattern Adjustment: Field-adjustable settings for up and down range of motion for individual vanes. Provide Deluxe controller to enable configuration.

2. Motorized Vanes: Modulating up and down flow pattern for uniform room air distribution.

H. Integral Occupant and Location Detection: Unit includes occupant and location detection for automatic air distribution and energy saving setback control in the following manner-

1. Air Distribution

    c. **Default distribution operation: Integral occupant and location detection will not be utilized to control air distribution. During COOL mode, vanes move to horizontal airflow direction. During HEAT mode, vanes move to down airflow direction**.

d. **Area: Vanes move to down airflow direction toward areas with a high floor temperature during COOL mode and toward areas with a low floor temperature during HEAT mode. Otherwise, vanes move to the horizontal airflow direction**.

2. Energy Saving

a. **Default energy operation: Integral occupant and location detection will not be utilized to automatically enable setback or mode changes. Set point and setback and mode determined by wall controller or central control when provided**.
b. **"No occupancy energy save": If there are no persons in the room for 60 minutes or more, energy saving operation (setback) equal to 4°F is performed**.
c. **"Room occupancy energy save": If occupancy rate decreases to approximately 30% of the maximum occupancy rate, energy saving operation (setback) equal to 2°F is performed**.
d. **No occupancy Auto-OFF: If no persons are in the room for set amount of time (60–180 minutes), MODE is automatically changed (OFF, COOL, or HEAT)**.

I. Outdoor Air Ventilation Connection: Sheet metal knockout for optional connection to outdoor air ventilation duct per Drawings.

J. Field-Installed Unit Accessories:

1. **Accessory grille with integral occupancy and location sensor**.
2. **Condensate pump capable of at least 10 feet of lift**.

K. Unit Controls:

1. Factory-Installed Sensors:

a. Unit inlet air temperature.
b. Coil entering refrigerant temperature.
c. Coil leaving refrigerant temperature.
d. Refrigerant detection.

2. Interlock control sequence: Four digital inputs and three digital outputs for use in defined or customizable interlock sequences; relay adapter kits may be required. Required interlock sequence(s) include-

a. **backup heat control**.
b. **humidifier control**.
c. **on/off control**.
d. **on/off and fault status**.
e. **mode and fan status**.
f. **indoor unit float switch connection**.
g. **branch controller float switch connection**.
h. **fan speed control**.
i. **forced fan operation**.

3. Features and Functions:

a. Integral occupancy and location sensor.

b. Time delay.
c. Auto-restart.
d. Auto operation mode.
e. Manual operation mode.
f. Filter service notification.
g. Drain assembly high water level safety shutdown and notification.
h. Run test switch.

L. Refrigerant Leak Detection:

1. Integral refrigerant sensor: Factory-installed.
2. Sequence upon leak detection:

a. Refrigerant detection communicated to outdoor unit or shut-off valve kit.
b. Indoor unit fan operates regardless of setting.
c. Alarm indicator(s) may include sound from indoor unit or controller, flashing LED, error code or message on wall controller or central controller.

M. Unit Electrical:

1. Field Connection: Single point connection to power entire unit and integral controls.
2. Disconnecting Means: Field-installed circuit breaker or switch, complying with NFPA 70.

2.6 HVAC SYSTEM CONTROLS

A. General Requirements:

1. Network: Indoor units and outdoor units shall include integral controls and connect through a manufacturer-selected control network.
2. Network Communication Protocol: Manufacturer proprietary control communication between interconnected units.
3. Integration with Building Automation System: ASHRAE 135, BACnet IP and certified by BACnet Testing Lab (BTL), including the following-

a. Ethernet connection via RJ-45 connectors and port with transmission at **100** Mbps or higher.
b. Integration shall include **control**, **monitoring, scheduling**, **change of value notifications**.

4. Operator Interface:

a. Operators shall interface with system and unit controls through the following:

1) **Manufacturer-provided central controller**.

2) **Integration with Building Automation System**.

b. Users shall be capable of interface with controllers for indoor units' control to extent privileges are enabled. Control features available to users shall include the following:

1) On/off control.
2) Room Temperature Setpoints shall only be adjustable through Building Management System (BMS).

B. HVAC System Operator Interface via PC:

1. Central controller(s) connected local-area-network shall be accessible through standard web browser software requiring no manufacturer-specific software be installed on owner-furnished PC.
2. Browser interface shall provide operator with a graphic user interface to allow monitoring and control of multiple central controllers from a single device location through point-and-click mouse exchange.
3. Plan views shall show building plans with location of indoor units and identification superimposed on plans.
4. Controls operation mode of indoor units as individual units, by selected groups of indoor units, or as collection of all indoor units. Operation modes available through central controller shall match those operation modes of controllers for indoor units.
5. Schedules operation of indoor units as individual units, by selected groups of indoor units, or as collection of all indoor units. Schedules daily, weekly, and annual events.
6. Changes operating set points of indoor units as individual units, by selected groups of indoor units, or as collection of all indoor units.
7. Night setback feature to operate indoor units at energy-conserving heating and cooling temperature set-points during unoccupied periods.
8. Supports Multiple Languages: English, French, or Spanish.
9. Supports Imperial and Metric Temperature Units
10. Displays service notifications and error codes.
11. Monitors and displays cumulative operating time of indoor units.
12. Able to disable and enable operation of individual controllers for indoor units.
13. Information displayed on individual controllers shall also be available for display.

C. Central Controllers:

1. Centralized control for all indoor and outdoor units from a single central controller location.

    a. Include multiple interconnected controllers as required.
    b. **Include backlit, high-resolution color display touch panel**.

2. Controls operation mode of indoor units as individual units, by selected groups of indoor units, or as collection of all indoor units. Operation modes available through central controller shall match those operation modes of controllers for indoor units.
3. Schedule operation of indoor units as individual units, by selected groups of indoor units, or as collection of all indoor units.

    a. Sets schedule for daily, weekly, and annual events.
    b. Schedule options available through central controller shall at least include the schedule options of controllers for indoor units.

4. Changes operating set points of indoor units as individual units, by selected groups of indoor units, or as collection of all indoor units.
5. Optimized start feature to start indoor units before scheduled time to reach temperature set-point at scheduled time based on operating history.
6. Night setback feature to operate indoor units at energy-conserving heating and cooling temperature set-points during unoccupied periods.
7. Able to disable and enable operation of individual controllers for indoor units.
8. Information displayed on individual controllers shall also be available for display through central controller.
9. Multiple RJ-45 ports for direct connection to a local PC and an Ethernet network switch.
10. Start/stop control capability for third-party equipment as required.
11. **Accessory surface-mount case**.
12. **Accessory recess-mount case (for use in 3-1/2” wall cavity)**.
13. **DIN rail mounting kit for installation of central controller in an enclosure**.

14. **License for Integration with Building Automation System: BACnet over IP communication of indoor unit monitor and control points**.
15. **Niagara Driver for direct BMS connection to central controller(s) for enhanced data set including indoor unit and control points plus outdoor unit monitor points in lieu of BACnet license**.

D. Wired Controllers and Sensors for Indoor Units

1. Simple Controllers for Indoor Units:

    a. Single controller capable of controlling multiple indoor units as group.
    b. Integral room temperature sensor
    c. Temperature Units: Fahrenheit and Celsius.
    d. On/Off: Turns indoor unit on or off.
    e. Operation Mode: Cool, Heat, Auto, Dehumidification, Fan Only.
    f. Temperature Display and Set-Point: Separate set points for Cooling, Heating. Adjustable in 1-degree Fahrenheit increments between.
    g. Fan Speed Setting: Select between available options furnished with unit.
    h. Airflow Direction Setting: If applicable to indoor unit style, select between available options furnished with the unit.
    i. Service Notification Display: "Filter".
    j. Error Code Notification Display: Used by service personnel to troubleshoot abnormal operation and equipment failure.
    k. Low-voltage power required for controller shall be powered through non-polar connections to indoor unit.

2. Residential / Multi-Family Style Controllers for Indoor Units:

    a. Wall-mounted controller with integral room temperature and humidity sensors and adapter providing connection to indoor unit.
    b. Color LCD with click-wheel operation and Proximity Sensor to wake controller screen when approached.
    c. Automatic switching between Cool and Dry modes to meet target humidity level (user-selectable between 35-75%).
    d. Temperature Units: Fahrenheit and Celsius.
    e. On/Off: Turns indoor unit on or off.
    f. Hold: Hold operation settings until hold is released.
    g. Operation Mode: Cool, Heat, Auto, Dehumidification, Fan Only, and Setback.
    h. Temperature Display and Set-Point: Separate set points for Cooling, Heating. Adjustable in 1-degree Fahrenheit increments between.
    i. Fan Speed Setting: Select between available options furnished with unit.
    j. Airflow Direction Setting: If applicable to indoor unit style, select between available options furnished with the unit.
    k. Seven-day programmable operating schedule with up to five events per day. Operations shall include On/Off, Operation Mode, and Temperature Set-Point.
    l. Error Code Notification Display: Used by service personnel to troubleshoot abnormal operation and equipment failure.
    m. User and Service Passwords: Capable of preventing adjustments by unauthorized users.
    n. Setting stored in nonvolatile memory to ensure that settings are not lost if power is lost.
    o. Low-voltage power required for controller shall be powered through polarity-specific connections to indoor unit.
    p. Limits central control (when present) to monitor-only functionality.

3. Deluxe Controllers for Indoor Units:

a. Single controller capable of controlling multiple indoor units as group.
b. Integral room temperature sensor
c. Configurable LCD Touch Screen with Auto Timeout: Timeout duration shall be adjustable.
d. Temperature Units: Fahrenheit and Celsius.
e. On/Off: Turns indoor unit on or off.
f. Hold: Hold operation settings until hold is released.
g. Operation Mode: Cool, Heat, Auto, Dehumidification, Fan Only, and Setback.
h. Temperature Display and Set-Point: Separate set points for Cooling, Heating. Adjustable in 1-degree Fahrenheit increments between.
i. Fan Speed Setting: Select between available options furnished with unit.
j. Airflow Direction Setting: If applicable to indoor unit style, select between available options furnished with the unit.
k. Seven-day programmable operating schedule with up to five events per day. Operations shall include On/Off, Operation Mode, and Temperature Set-Point.
l. Auto Off Timer: Operates unit for an adjustable time duration and then turns unit off.
m. Service Notification Display: "Filter".
n. Service Run Tests: Limit use by service personnel to troubleshoot operation.
o. Error Code Notification Display: Used by service personnel to troubleshoot abnormal operation and equipment failure.
p. User and Service Passwords: Capable of preventing adjustments by unauthorized users.
q. Setting stored in nonvolatile memory to ensure that settings are not lost if power is lost.
r. Low-voltage power required for controller shall be powered through non-polar connections to indoor unit.

4. Color Touch Screen Controllers with Bluetooth Connectivity for Indoor Units:

a. Single controller capable of controlling multiple indoor units as group.
b. Integral room temperature sensor
c. Configurable color LCD Touch Screen with Auto Timeout: import custom image, timeout duration shall be adjustable.
d. Configurable and controller via mobile app via Bluetooth™; Bluetooth shall have rotating security PIN.
e. Temperature Units: Fahrenheit and Celsius.
f. On/Off: Turns indoor unit on or off.
g. Hold: Hold operation settings until hold is released.
h. Operation Mode: Cool, Heat, Auto, Dehumidification, Fan Only, and Setback.
i. Temperature Display and Set-Point: Separate set points for Cooling, Heating. Adjustable in 1-degree Fahrenheit increments between.
j. Fan Speed Setting: Select between available options furnished with unit.
k. Airflow Direction Setting: If applicable to indoor unit style, select between available options furnished with the unit.
l. Seven-day programmable operating schedule with up to five events per day. Operations shall include On/Off, Operation Mode, and Temperature Set-Point.
m. Auto Off Timer: Operates unit for an adjustable time duration and then turns unit off.
n. Service Notification Display: "Filter".
o. Service Run Tests: Limit use by service personnel to troubleshoot operation.
p. Error Code Notification Display: Used by service personnel to troubleshoot abnormal operation and equipment failure.
q. User and Service Passwords: Capable of preventing adjustments by unauthorized users.
r. Setting stored in nonvolatile memory to ensure that settings are not lost if power is

lost.

s. Low-voltage power required for controller shall be powered through non-polar connections to indoor unit.

5. Conventional Thermostat Interface and Thermostat

a. Provide with <**insert thermostat brand and model**> and 24V transformer to power thermostat.
b. Indoor unit modes: COOL, HEAT, FAN, and OFF (AUTO function only at thermostat level).
c. Three input terminals to control fan speed control:

1) High.
2) Medium.
3) Low.

d. Auto recovery after power failure.
e. Limits central control (when present) to monitoring mode status and error alarm only.

6. Wired Sensor-Only for Indoor Units:

a. **Surface-mount** sensors in lieu of local controllers.

E. Wireless Controllers for Indoor Units:

1. Wireless Wall-Mounted Controllers for Indoor Units:

a. Wall-mounted controller with integral room temperature sensor and receiver providing connection to indoor unit.
b. Temperature sensing shall be **integral sensor within controller.**
c. Temperature Units: Fahrenheit and Celsius.
d. On/Off: Turns indoor unit on or off.
e. Hold: Hold operation settings until hold is released.
f. Operation Mode: Cool, Heat, Auto, Dehumidification, Fan Only, and Setback.
g. Temperature Display and Set-Point: Separate set points for Cooling, Heating. Adjustable in 1-degree Fahrenheit increments between.
h. Fan Speed Setting: Select between available options furnished with unit.
i. Airflow Direction Setting: If applicable to indoor unit style, select between available options furnished with the unit.
j. Seven-day programmable operating schedule with up to five events per day. Operations shall include On/Off, Operation Mode, and Temperature Set-Point.
k. Service Notification Display: "Filter".
l. User and Service Passwords: Capable of preventing adjustments by unauthorized users.
m. Setting stored in nonvolatile memory to ensure that settings are not lost if power is lost.
n. Two AA alkaline batteries (supplied with controller) required for controller power.
o. Receiver connects to indoor unit control board with 1 m cable.
p. Limits central control (when present) to monitor-only functionality.

2. Handheld Wireless Controllers for Indoor Units:

a. Controller communicates to remote-mounted receiver that is wired to indoor unit(s).

1) Include receivers with handheld wireless controllers as required to complete installation.
2) Low-voltage power required for receivers shall be powered by indoor unit.

b. One handheld wireless controller shall be capable of communicating with one or multiple receivers to control one or multiple indoor units as a group.
c. Temperature Units: Fahrenheit and Celsius.
d. On/Off: Turns indoor unit on or off.
e. Operation Mode: Cool, Heat, Auto, Dehumidification, and Fan Only.
f. Fan Speed Setting: Select between available options furnished with indoor unit.
g. Airflow Direction Setting: If applicable to unit, select between available options furnished with indoor unit.
h. Auto Off Timer: Operates unit for an adjustable time duration and then turns unit off.
i. Service Run Tests: Limit use by service personnel to troubleshoot operation.
j. Receiver Error Notification LED: Used by service personnel to troubleshoot abnormal operation and equipment failure.

2.7 HVAC SYSTEM REFRIGERANT AND OIL

A. Refrigerant:

1. As required by HVAC system manufacturer for system to comply with performance requirements indicated.
2. ASHRAE 34, Class A2L refrigerant classification.
3. R-454b[**or**]<**Insert refrigerant**>.

B. Oil:

1. As required by HVAC system manufacturer and to comply with performance requirements indicated.

2.8 HVAC SYSTEM CONDENSATE DRAIN PIPING

A. If more than one material is listed, material selection is Contractor's option.

B. Copper Tubing:

1. Drawn-Temper Tubing: According to [**ASTM B88, Type L (ASTM B88M, Type B)**.
2. Wrought-Copper Fittings: ASME B16.22.
3. Wrought-Copper Unions: ASME B16.22.
4. Solder Filler Metals: ASTM B32, lead-free alloys, and water-flushable flux according to ASTM B813.

C. Reducers: Where applied to piping connected to unit-mounted integral lifting mechanism, only eccentric reducers oriented horizontally are allowed.

2.9 HVAC SYSTEM REFRIGERANT PIPING

A. Refrigerant Piping:

1. Copper Tube: ASTM B280, Type ACR.

2. Wrought-Copper Fittings: ASME B16.22.
3. Brazing Filler Metals: AWS A5.8/A5.8M.

B. Refrigerant Tubing Kits:

1. Factory-rolled and -bundled, soft-copper tubing with tubing termination fittings at each end.
2. Standard one-piece length for connecting to indoor units.
3. Pre-insulated with flexible elastomeric insulation of thickness to comply with governing energy code and sufficient to eliminate condensation.
4. Factory Charge: dehydrated air or nitrogen.

C. Assemblies and Specialties:

1. Divided-Flow Specialty Fittings: Where required by HVAC system manufacturer for proper system operation, HVAC system manufacturer shall furnish specialty fittings with identification and instructions for proper installation by Installer.
2. **Refrigerant Isolation Ball Valves: Uni-body full port design with Schrader valve for refrigerant service, rated for maximum system temperature and not less than 800 psig pressure, and factory tested under pressure to ensure tight shutoff**.

2.10 HVAC SYSTEM CONTROL CABLE

A. General Requirements: Refer to and verify all wire and cabling requirements with the manufacturer's current installation and operation manuals to ensure compliance with the latest standards and specifications. Cables may not be spliced and shall be continuous from terminal to terminal. Do not splice cable.

B. Low-Voltage Control Network Cabling:

1. Plenum-Rated, Paired Cable: NFPA 70, Type CMP.

a. Shielded wire (2-core) 16 AWG—CVVS, CPEVS or MVVS.
b. PVC insulation and jacket.
c. Foil shielded.
d. Flame Resistance: Comply with NFPA 262.
e. Maximum cable distance (distance to farthest components) is **1,640 feet**.
f. Maximum cable distance from OU to connected IU is **656 feet**.
g. Maximum total cable length (sum of all network cabling) is **6,560 feet**.

C. Low-Voltage Wall-Mounted Controller Cabling to Indoor Units:

1. Plenum-Rated, Paired Cable: NFPA 70, Type CMP.

a. 22 AWG, 2-conductor unshielded 7-stranded bare copper wire.

1) Residential / multi-family style controllers require 4-conductor.
2) Touch controllers with integral occupancy and light sensing controllers require low-voltage control network cabling to the network.

b. PVC insulation and jacket.
c. Flame Resistance: Comply with NFPA 262.
d. Maximum cable distance (distance from controller to indoor unit) varies by controller style. Refer to manufacturer Submittal or Installation Guides.

D. Transmission power booster provided if additional signal power is required based on connected devices. Coordinate with manufacturer and install near middle of communication bus when required.

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 products before installation. Reject products that are wet, moisture damaged, or mold damaged.

C. Examine roughing-in for piping and tubing to verify actual locations of connections before equipment installation.

D. Examine roughing-in for ductwork to verify actual locations of connections before equipment installation.

E. Examine roughing-in for wiring and conduit to verify actual locations of connections before equipment installation.

F. Examine walls, floors, roofs, and outdoor pads for suitable conditions where equipment will be installed.

G. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

H. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 EQUIPMENT INSTALLATION, GENERAL

A. Clearance:

1. Maintain manufacturer's recommended clearances for service and maintenance.
2. Maintain clearances required by governing code.

B. Equipment Restraint Installation: Install equipment with seismic-restraint device. Comply with requirements for seismic-restraint devices specified in Section 230548 "Vibration and Seismic Controls for HVAC."

3.3 INSTALLATION OF INDOOR UNITS

A. Install units to be level and plumb while providing a neat and finished appearance.

B. Unless otherwise required by HVAC system manufacturer, support ceiling-mounted units from structure above using threaded rods; minimum rod size of **3/8 inch (10 mm)**.

C. Adjust supports of exposed and recessed units to draw units tight to adjoining surfaces.

D. Protect finished surfaces of ceilings, floors, and walls that come in direct contact with units. Refinish or replaced damaged areas after units are installed.

E. In rooms with ceilings, conceal piping and tubing, controls, and electrical power serving units above ceilings.

F. In rooms without ceiling, arrange piping and tubing, controls, and electrical power serving units to provide a neat and finished appearance.

G. Provide lateral bracing if needed to limit movement of suspended units to not more than **0.25 inch (13 mm)**.

3.4 INSTALLATION OF OUTDOOR UNITS

A. Install units to be level and plumb while providing a neat and finished appearance.

B. Install outdoor units on support structures indicated on Drawings.

C. Pad-Mounted Installations: Install outdoor units on cast-in-place concrete equipment bases. Comply with requirements for equipment bases and foundations specified in Section 033000 "Cast-in-Place Concrete."

1. Attachment: Install anchor bolts to elevations required for proper attachment to supported equipment.
2. Grouting: Place grout under equipment supports and make bearing surface smooth.

D. Roof-Mounted Installations: Install outdoor units on equipment supports specified in Section 077200 "Roof Accessories." Anchor units to supports with removable, stainless-steel fasteners.

3.5 GENERAL REQUIREMENTS FOR PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping and tubing systems. Install piping and tubing as indicated unless deviations to layout are approved on coordination drawings.

B. Install piping and tubing in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

C. Install piping and tubing at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install piping and tubing above accessible ceilings to allow sufficient space for ceiling panel removal.

E. Install piping and tubing to permit valve servicing.

F. Install piping and tubing at indicated slopes.

G. Install piping and tubing free of sags.

H. Install fittings for changes in direction and branch connections.

I. Install piping and tubing to allow application of insulation.

J. Install groups of pipes and tubing parallel to each other, spaced to permit applying insulation with service access between insulated piping and tubing.

K. Install sleeves for piping and tubing penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 230500 "Common Work Results for HVAC."

L. Install escutcheons for piping and tubing penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 230500 "Common Work Results for HVAC."

3.6 INSTALLATION OF SYSTEM CONDENSATE DRAIN PIPING

A. General Requirements for Drain Piping and Tubing:

1. Install a union in piping at each threaded unit connection.
2. Install an adjustable stainless steel hose clamp with adjustable gear operator on unit hose connections. Tighten clamp to provide a leak-free installation.
3. If required for unit installation, provide a trap assembly in drain piping to prevent air circulated through unit from passing through drain piping. Comply with more stringent of the following:

    a. Details indicated on Drawings.
    b. Manufacturer's requirements.
    c. Governing codes.
    d. In the absence of requirements, comply with requirements of ASHRAE handbooks.

4. Extend drain piping from units with drain connections to drain receptors as indicated on Drawings. If not indicated on Drawings, terminate drain connection at nearest accessible location that is not exposed to view by occupants.
5. Provide each 90-degree change in direction with a Y- or T-fitting. Install a threaded plug connection in the dormant side of fitting or future use as a service cleanout.

B. Gravity Drains:

1. Slope piping from unit connection toward drain termination at a constant slope of not less than one percent.

C. Pumped Drains:

1. If unit condensate pump or lift mechanism is not included with an integral check valve, install a full-size check valve in each branch pipe near unit connection to prevent backflow into unit.

3.7 INSTALLATION OF REFRIGERANT PIPING

A. Refrigerant Tubing Kits:

1. Unroll and straighten tubing to suit installation. Deviations in straightness of exposed tubing shall be unnoticeable to observer.
2. Support tubing as specified in Section 230516 “Hangers and Supports for HVAC Piping and Equipment.”
3. Prepare tubing ends and make mating connections to provide a pressure tight and leak-free installation.

B. Select system components with minimum **650 psig** pressure rating.

C. Install piping as short and direct as possible, with a minimum number of joints and fittings.

D. Arrange piping to allow inspection and service of equipment. Install valves and specialties in accessible locations to allow for service and inspection. Install access doors or panels as specified in Section 083113 "Access Doors and Frames" if valves or equipment requiring maintenance is concealed behind finished surfaces.

E. Install refrigerant piping and tubing in protective conduit where installed below ground.

F. Install refrigerant piping and tubing in rigid or flexible conduit in locations where exposed to mechanical damage.

G. Unless otherwise required by HVAC system manufacturer, slope refrigerant piping and tubing as follows:

1. Install horizontal hot-gas discharge piping and tubing with a uniform slope downward away from compressor.
2. Install horizontal suction lines with a uniform slope downward to compressor.
3. Traps to entrain oil in vertical runs are not allowed.
4. Inverted traps for twinned systems may be required by manufacturer.
5. Liquid lines may be installed level.

H. When brazing, remove or protect components that could be damaged by heat. Braze pipes with a dry nitrogen purge to avoid oxidation.

I. Before installation, clean piping, tubing, and fittings to cleanliness level required by HVAC system manufacturer.

J. Joint Construction:

1. Brazed Joints

    a. Ream ends of tubes and remove burrs.
    b. Remove scale, slag, dirt, and debris from inside and outside of tube and fittings before assembly.
    c. Construct joints in accordance with AWS's "Brazing Handbook," "Pipe and Tube" Chapter.
    d. Use Type BAg (cadmium-free silver) alloy for joining copper with bronze.
    e. The piping being brazed shall be purged of air to remove the oxygen and filled with one of the following inert gases: oxygen-free nitrogen, helium or argon. The piping system shall be purged with an inert gas for a minimum time corresponding to five volume changes through the piping system prior to brazing. The pre-purge rate shall be at a minimum velocity of 100 feet per minute (0.508 m/s). The inert gas shall be directly connected to the tube system being brazed to prevent the entrainment of ambient air. After the pre-purge, the inert gas supply shall be maintained through the piping during the brazing operation at a minimum pressure of **1.0 psi** (**6.89 kPa**) and a maximum pressure of **3.0 psi** (**20.67 kPa**). The joint shall be brazed with a filler metal conforming to AWS A5.8

2. Mechanically Pressed Joints

    a. The installing contractor shall be fully trained and qualified by the manufacturer of the mechanically pressed joints to install the selected piping connections.

b. Mechanical joints shall be installed in accordance with the manufacturer's instructions.

3. Flared Joints

a. Flared fittings shall be installed in accordance with the manufacturer's instructions. The flared fitting shall be used with the tube material specified by the fitting manufacturer. The flared tube end shall be made by a tool designed for that operation.

4. Soldered Joints

a. Use of soldered joints is prohibited within systems.

3.8 INSTALLATION OF PIPING AND TUBING 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. Installation to maintain a continuous vapor barrier.

B. 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.

C. 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 unavailable, 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. 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.

D. 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.

E. 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.

3.9 INSTALLATION OF DUCT, ACCESSORIES, AND AIR OUTLETS

A. Where installing ductwork adjacent to equipment, allow space for service and maintenance.

B. Comply with requirements for metal ducts specified in Division 23 Specifications on "Metal

Ducts."

C. Comply with requirements for nonmetal ducts specified in Division 23 Specifications on "Nonmetal Ducts."

D. Comply with requirements for air duct accessories specified in Division 23 Specifications on "Air Duct Accessories."

E. Comply with requirements for flexible ducts specified in Division 23 Specifications on "Flexible Ducts."

F. Comply with requirements for air diffusers specified in Division 23 Specifications on "Air Diffusers."

G. Comply with requirements for registers and grilles specified in Division 23 Specifications on "Registers and Grilles."

3.10 IDENTIFICATION

A. Identify system equipment, piping, tubing, and valves. Comply with requirements for identification specified in Division 23 Specifications on "Identification for HVAC Piping and Equipment."

3.11 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage HVAC system manufacturer's service representative to advise and assist installers; witness testing; and observe and inspect components, assemblies, and equipment installations, including controls and connections.

1. Field service shall be performed by a manufacturer-trained and authorized service representative of HVAC system manufacturer whose primary job responsibilities are to provide direct technical support of its products.
2. Manufacturer-trained and authorized service representative shall provide on-site visits during construction at installation milestones indicated. System Installer shall coordinate each visit in advance to give manufacturer sufficient notice to plan the visit.

    a. First Visit: Kick-off meeting.

    b. Second Visit: At approximately **25** percent completion of system(s).
    c. Third Visit: At approximately **50** percent completion of system(s).
    d. Fourth Visit: At approximately **75** percent completion of system(s).
    e. Fifth Visit: Final inspection before system startup.

3. Kick-off Meeting:

    a. Meeting shall include system Installer and other related trades with sole purpose of reviewing HVAC system installation requirements and close coordination required to make a successful installation.
    b. Meeting shall be held at Project site and scheduled at a mutually agreed to time that occurs before the start of any part of system installation.
    c. Meeting shall cover the following as a minimum requirement:

        1) Review of latest issue of Contract Documents, Drawings, and Specifications, relevant to HVAC systems.

2) Manufacturer's installation requirements specific to systems being installed.
3) Review of all relevant HVAC system submittals, including delegated-design submittals.
4) Required field activities related installation of HVAC system.
5) Project team communication protocol, contact information, and exchange of responsibilities for each party involved, including manufacturer, supplier, system Installer, and other related trades.

4. Site Visits: Activities for each site visit shall include the following:

a. Meet with HVAC system Installer to discuss field activities, issues, and suggested methods to result in a successful installation.
b. Offer technical support to Installer and related trades as related to system(s) being installed.
c. Review progress of HVAC system(s) installation for strict compliance with manufacturer's requirements.
d. Advise and if necessary, assist Installer with updating related refrigerant calculations and system documentation.

5. Final Inspection before Startup:

a. Before inspection, Installer to provide written request to manufacturer stating the system is fully installed according to manufacturer's requirements and ready for final inspection.
b. All system equipment and operating components shall be inspected. If components are inaccessible for inspection, they shall be made accessible before the final inspection can be completed.
c. A factory-trained and authorized service representative shall provide a comprehensive inspection of all equipment and each operating component that comprise the complete system(s). Inspection shall follow a detailed checklist specific to each equipment and operating component.
d. Inspection reports for indoor units shall include, but not be limited to, the following:

1) Unit designation on Drawings.
2) Manufacturer model number.
3) Serial number.
4) Network address, if applicable.
5) Each equipment setting.
6) Mounting, supports, and restraints properly installed.
7) Proper service clearance provided.
8) Wiring and power connections correct.
9) Line-voltage reading(s) within acceptable range.
10) Wiring and controls connections correct.
11) Low voltage reading(s) within an acceptable range.
12) Controller type and model controlling unit.
13) Controller location.
14) Temperature settings and readings within an acceptable range.
15) Condensate removal acceptable.
16) Fan settings and readings within an acceptable range.
17) Unit airflow direction within an acceptable range.
18) If applicable, fan external static pressure setting.
19) Filter type and condition acceptable.
20) Noise level within an acceptable range.
21) Refrigerant or hydronic piping properly connected and insulated.
22) Condensate drain piping properly connected and insulated.
23) If applicable, ductwork properly connected.

24) If applicable, external interlocks properly connected.
25) Remarks.

e. Inspection reports for outdoor units shall include, but not be limited to, the following:

1) Unit designation on Drawings.
2) Manufacturer model number.
3) Serial number.
4) Network address, if applicable.
5) Each equipment setting, including compressor speed control.
6) Mounting, supports, and restraints properly installed.
7) Proper service clearance provided.
8) Wiring and power connections correct.
9) Line-voltage reading(s) within acceptable range.
10) Wiring and controls connections correct.
11) Low voltage reading(s) within an acceptable range.
12) Condensate removal acceptable.
13) Noise level within an acceptable range.
14) Refrigerant piping properly connected and insulated.
15) Condensate drain piping properly connected and insulated.
16) For water-source outdoor units, water piping properly connected and insulated.
17) For water-source outdoor units, proof of water flow checked for proper operation.
18) Remarks.

f. Installer shall provide manufacturer with the requested documentation including as-built piping lengths and technical support during inspection.
g. Installer shall correct observed deficiencies found by the inspection.
h. Upon completing the on-site inspection, manufacturer shall provide a written report with complete documentation describing each inspection step, the result, and any corrective action required.
i. If corrective action is required by Installer that cannot be completed during the same visit, provide additional visits, as required, until deficiencies are resolved, and systems are deemed ready for startup.
j. Final report shall indicate the system(s) inspected are installed according to manufacturer's requirements and are ready for startup.

B. Perform the following tests and inspections with the assistance of manufacturer's service representative:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
3. Operational Test: Not less than 24 hours 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.

C. Refrigerant and Hydronic Tubing Positive Pressure Testing:

1. Comply with more stringent of HVAC system manufacturer's requirements and requirements indicated.
2. After completion of tubing installation, pressurize tubing systems to a test pressure:

a. Refrigerant piping to a test pressure of not less than **600 psig** using dry nitrogen.
b. Hydronic piping to a test pressure of not less than **43 psig**.

3. Successful testing shall maintain a test pressure for a continuous and uninterrupted period of 24 hours. Allowance for pressure changes attributed to changes in ambient temperature are acceptable.
4. Prepare test report to record the following information for each test:

a. Name of person starting test, company name, phone number, and e-mail address.
b. Name of manufacturer's service representative witnessing test, company name, phone number, and e-mail address.
c. Detailed description of extent of tubing tested.
d. Date and time at start of test.
e. Test pressure at start of test.
f. Outdoor temperature at start of test.
g. Name of person ending test, company name, phone number, and e-mail address.
h. Date and time at end of test.
i. Test pressure at end of test.
j. Outdoor temperature at end of test.
k. Remarks:

5. Submit test reports for Project record and to system manufacturer.

D. Refrigerant Tubing Evacuation Testing:

1. Comply with more stringent of HVAC system manufacturer's requirements and requirements indicated.
2. After completion of tubing positive-pressure testing, evacuate tubing systems to a pressure of 500 microns.
3. Successful testing shall maintain a test pressure for a continuous and uninterrupted period of one hour with no change.
4. Prepare test report to record the following information for each test:

a. Name of person starting test, company name, phone number, and e-mail address.
b. Name of manufacturer's service representative witnessing test, company name, phone number, and e-mail address.
c. Detailed description of extent of tubing tested.
d. Date and time at start of test.
e. Test pressure at start of test.
f. Outdoor temperature at start of test.
g. Name of person ending test, company name, phone number, and e-mail address.
h. Date and time at end of test.
i. Test pressure at end of test.
j. Outdoor temperature at end of test.
k. Remarks:

5. Submit test reports for Project record and to system manufacturer.
6. Upon successful completion of evacuation testing, system shall be charged with refrigerant.

E. System Refrigerant Charge:

1. System Installer shall consult system manufacturer to determine the correct system refrigerant charge based on as-built piping lengths.
2. Installer shall charge system following HVAC system manufacturer's written instructions.

3. Total refrigerant charge shall be recorded and permanently displayed at the system's outdoor unit.

3.12 STARTUP SERVICE

A. Installer shall engage a factory-trained and authorized service representative of HVAC system manufacturer to perform system(s) startup supervision.

1. Complete startup service of each separate system.
2. Complete system startup service according to manufacturer's written instructions.

B. Startup checks shall include, but not be limited to, the following:

1. Check control communications of equipment and each operating component in system(s).
2. Check each outdoor unit’s power supply is connected 12 to 24 hours before startup of system.
3. Check each indoor unit's response to demand for cooling and heating.
4. Check each indoor unit's response to changes in airflow settings.
5. Check each indoor unit and outdoor unit for proper condensate removal.

C. Installer shall accompany factory-trained and authorized service representative during startup service and provide manufacturer's service representative with requested documentation and technical support during startup service.

1. Installer shall correct deficiencies found during startup service for reverification.

D. System Operation Report:

1. After completion of startup service, manufacturer shall issue a report for each separate system.
2. Report shall include complete documentation describing each startup check, the result, and any corrective action required.
3. Manufacturer shall electronically record not less than one hour of continuous operation of each system and submit with report for historical reference.

a. All available system operating parameters shall be included in the information submitted.

E. Witness:

1. Invite **Architect**, **Owner, and Commissioning Agent** to witness startup service procedures.
2. Provide written notice not less than twenty (**20)** business days before start of startup service.

3.13 ADJUSTING

A. Adjust equipment and components to function smoothly and lubricate as recommended by manufacturer.

B. Adjust initial temperature set points. Adjust initial airflow settings and discharge airflow patterns.

C. Set field-adjustable switches according to HVAC system manufacturer's written instructions, and as indicated.

3.14 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include **12** months' full maintenance by **skilled employees of system Installer who are manufacturer's authorized service representative**. Include **four (4)** service visits for preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper equipment and system operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

3.15 DEMONSTRATION

A. Engage a HVAC system manufacturer's factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain entire system.

B. Instructor:

1. Instructor shall be factory trained and certified by HVAC system manufacturer with current training on the system(s), equipment, and controls that are installed.

C. Schedule:

1. Schedule training with Owner at least 10 business days before first training session.
2. Training shall occur before Owner occupancy.
3. Training shall be held at mutually agreed date and time during normal business hours.

D. Location: Owner shall provide a suitable on-site location to host classroom training.

E. Training Attendance: For record purposes, document training attendees at the start of each new training session. Record attendee's name, signature, phone number, and e-mail address.

F. Training Format: Individual training modules shall include classroom training followed by hands-on field demonstration and training.

G. Training Materials: Provide training materials in electronic format to each attendee.

1. Offer online instructional videos showing general operation and maintenance that are coordinated with operation and maintenance manuals.

H. Acceptance: Obtain **Architect**, **Commissioning Agent**, **or Owner** written acceptance that training is complete, and requirements indicated have been satisfied.

END OF SECTION 238129

DIVISION 23-HEATING, VENTILATION, & AIR-CONDITIONING

238130 - VARIABLE-REFRIGERANT-FLOW HVAC SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes complete VRF HVAC system(s) which may include, but not limited to, the following components:

1. Indoor, exposed, wall-mounted units.
2. Indoor, concealed, ceiling-mounted units for ducting.
3. Indoor, concealed, multi-position units for ducting.
4. Indoor, recessed, ceiling-mounted units with 33x33” grilles.
5. Indoor, recessed, ceiling-mounted units with 24x24” grilles.
6. Indoor, recessed, one-way ceiling-mounted units.
7. Indoor, suspended, ceiling-mounted units.
8. Indoor, energy recovery ventilator.
9. Indoor, shut-off valve kits (SVKs)
10. Indoor, heat recovery control units (HRCUs).
11. Indoor, water-source heat recovery units.
12. Outdoor, air-source heat-pump units.
13. Outdoor, air-source heat recovery units.
14. VRF system controls.
15. VRF system refrigerant and oil.
16. VRF system condensate drain piping.
17. VRF system refrigerant piping.
18. VRF system control cable.

1.2 QUALITY ASSURANCE

A. Manufacturer Qualifications:

1. Nationally recognized manufacturer of VRF HVAC systems and products.
2. Shipped VRF HVAC systems with similar requirements to local market for a continuous period of Ten (10) years within time of bid.
3. VRF HVAC systems and products that have been successfully tested and in use on at least Five (5) completed projects.
4. Having complete published online catalog literature, installation, and operation and maintenance manuals for all products intended for use. Resources must be publicly available without login or sign-in as registered account.
5. Having full-time in-house employees for the following:

    a. Product research and development.
    b. Product and application engineering.
    c. Product manufacturing, testing, and quality control.
    d. Technical support for system installation training, startup, commissioning, and troubleshooting of installations.
    e. Owner training.

B. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by VRF HVAC system manufacturer.

1. Each employee shall be certified to have successfully completed manufacturer training for proper installation of systems, including, but not limited to, equipment, piping, controls, and accessories indicated and furnished for installation.
2. Installer certificate shall be valid and current for duration of Project.
3. Retain copies of Installer certificates on-site and make available on request.
4. Each person assigned to Project shall have demonstrated past experience.

a. Demonstrated experience with VRF products being installed for period within Five (5) consecutive years before time of bid.
b. Demonstrated experience on Five (5) projects of similar VRF system complexity, scope, and value.

C. ISO Compliance: System equipment and components furnished by VRF HVAC system manufacturer shall be manufactured in an ISO 9001 and ISO 14001 facility.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store products in a clean and dry place. Protect products from weather, dirt, dust, water, construction debris, and physical damage.

1. Retain factory-applied coverings on equipment to protect finishes during construction and remove just prior to operating unit.

B. Cover unit openings before installation to prevent dirt and dust from entering inside of units. If required to remove coverings during unit installation, reapply coverings over openings after unit installation and remove just prior to operating unit.

C. Comply with manufacturer's written rigging and installation instructions for unloading and moving to final installed location.

1.4 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace equipment and components that fail(s) in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures.
b. Faulty operation.
c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.

2. Warranty Period:

a. For Compressor, Ten (10) year(s) from date of Substantial Completion.
b. For Parts, Ten (10) year(s) from date of Substantial Completion.

B. Installer’s Labor Warranty: Installer agrees to repair or replace equipment and components that fail(s) in materials or workmanship within specified warranty period.

1. Warranty Period Two (2) year(s) from date of substantial completion.

PART 2 - PRODUCTS

2.1 VRF HVAC SYSTEMS

A. Manufacturers: Basis of design is CITY MULTI. Subject to compliance with requirements, provide products by one of the following brands only:

1. Mitsubishi Electric & Electronics USA, Inc.
2. Trane, Inc.
3. LG
4. Or Approved Equivalent

2.2 SYSTEM DESCRIPTION

A. VRF HVAC system(s) with variable capacity in response to varying cooling and heating loads. System shall consist of multiple indoor units, outdoor unit module(s), and HRCUs or SVKs when shown on Drawings. Piping, controls, and electrical power to components make operating system(s) complying with requirements indicated.

1. System(s) operation being heat pump or heat recovery as indicated on Drawings.
2. Each system with one refrigerant circuit serving all indoor units connected to system.

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. AHRI Compliance: System and equipment performance certified according to AHRI 1230-2023.

D. UL Compliance: Comply with UL 60335-2-40.

2.3 INDOOR, RECESSED, CEILING-MOUNTED UNITS WITH 33x33” GRILLES

A. Description: Factory-assembled and tested complete unit with components, piping, wiring, and controls required for mating to ductwork, piping, power, and controls field connections.

B. Cabinet:

1. Material: Painted steel, or coated steel frame covered by a plastic cabinet, with an architectural acceptable finish suitable for tenant occupancy on exposed surfaces.
2. Insulation: Manufacturer's standard internal insulation to provide thermal resistance and prevent condensation.
3. Internal Access: Removable panels of adequate size for field access to internal components for inspection, cleaning, service, and replacement.

C. Coil Assembly:

1. Coil Casing: Aluminum, galvanized, or stainless steel.
2. Coil Fins: Aluminum, mechanically bonded to tubes, with arrangement required by performance.
3. Coil Tubes: Copper, of diameter and thickness required by performance.
4. Capacity Control: DX coil by electronic modulating type valve with linear or proportional characteristics. Hydronic coil by modulating control valve.
5. Internal Tubing: Copper tubing with brazed joints.

6. Internal Tubing Insulation: Manufacturer's standard insulation, of thickness to prevent condensation.
7. Factory Charge: Dehydrated air or nitrogen.
8. Testing: Factory pressure tested and verified to be without leaks.

D. Drain Assembly:

1. Pan: Non-ferrous material, with bottom sloped to low point drain connection.
2. Condensate Removal: Unit-mounted integral lifting mechanism, capable of lifting drain water to an elevation above top of cabinet.
3. Field Piping Connection: Non-ferrous material.

E. Fan and Motor Assembly:

1. Fan(s):

    a. Direct-drive arrangement.
    b. Single or multiple fans connected to a common motor shaft and driven by a single motor.
    c. Fabricated from non-ferrous components or ferrous components with corrosion protection finish.
    d. Wheels statically and dynamically balanced.

2. Motor: Brushless DC or electronically commutated with permanently lubricated bearings.
3. Motor Protection: Integral protection against thermal, overload, and voltage fluctuations.
4. Speed Settings and Control: Multiple or variable speed with speed setting adjustable via central or wall controllers when present.

    a. Airflow volume shall vary based on three unit height settings.

5. Vibration Control: Integral isolation to dampen vibration transmission.

F. Filter Assembly:

1. Access: Bottom, to accommodate filter replacement without the need for tools.
2. Media: Washable screen.

G. Return/Discharge-Air Grille Assembly: Attached to bottom of unit cabinet.

1. Discharge Pattern: Include accessory air outlet shutter plates as required for two, three, or four-way throw as indicated on Drawings.

    a. Discharge Pattern Adjustment: Field-adjustable settings for up and down range of motion.

    b. Discharge Pattern Closure: Ability to close individual discharges of units with multiple patterns using wall-mounted controller.

2. Motorized Vanes: Modulating up and down flow pattern for uniform room air distribution.
3. Alternate Branch Supply Duct Connection: Sheet metal knockout for optional connection to one supply branch duct as shown on Drawings. Utilize accessory air outlet shutter plate with branch ducting.

H. Integral Occupant and Location Detection: Unit includes occupant and location detection for automatic air distribution and energy saving setback control in the following manner.

1. Air Distribution

    a. **Default distribution operation: Integral occupant and location detection will not be utilized to control air distribution. During COOL mode, vanes move to horizontal airflow direction. During HEAT mode, vanes move to down airflow direction**.
    b. **Area temperature distribution: Vanes move to down airflow direction toward areas with a high floor temperature during COOL mode and toward areas with a low floor temperature during HEAT mode. Otherwise, vanes move to the horizontal airflow direction**.

2. Energy Saving

    a. **Default energy operation: Integral occupant and location detection will not be utilized to automatically enable setback or mode changes. Set point and setback and mode determined by wall controller or central control when provided**.
    b. **No occupancy-based energy save: If there are no persons in the room for 60 minutes or more, energy saving operation (setback) equal to 4°F is performed**.
    c. **Room occupancy-based energy save: If occupancy rate decreases to approximately 30% of the maximum occupancy rate, energy saving operation (setback) equal to 2°F is performed**.

I. Outdoor Air Ventilation Connection: Sheet metal knockout for connection to outdoor air ventilation duct per Drawings.

J. Field-Installed Unit Accessories:

1. **Multi-function casement with MERV 10 filter element**.
2. **Left/right horizontal airflow vane kit to further optimize air distribution and energy saving configurations (adds 3 inches to casement height)**.
3. **Condensate pump capable of at least 10 feet of lift**.

K. Unit Controls:

1. Factory-Installed Sensors:

    a. Unit inlet air temperature.
    b. Coil entering refrigerant or water temperature.
    c. Coil leaving refrigerant or water temperature.
    d. Room occupancy/location.
    e. Refrigerant detection if coil is DX

2. Interlock control sequence: Four digital inputs and three digital outputs for use in defined or customizable interlock sequences; relay adapter kits may be required. Required interlock sequence(s) include-

    a. **backup heat control**.
    b. **on/off control**.
    c. **on/off and fault status**.
    d. **mode and fan status**.
    e. **indoor unit float switch connection**.
    f. **branch controller float switch connection**.
    g. **fan speed control**.

h. **forced fan operation**.

3. Features and Functions:

a. Integral occupancy and location sensor.
b. Time delay.
c. Auto-restart.
d. Auto operation mode.
e. Manual operation mode.
f. Filter service notification.
g. Drain assembly high water level safety shutdown and notification.
h. Run test switch.

L. Unit Electrical:

1. Field Connection: Single point connection to power entire unit and integral controls.
2. Disconnecting Means: Field-installed circuit breaker or switch, complying with NFPA 70.

2.4 INDOOR, RECESSED, CEILING-MOUNTED UNITS WITH 24x24” GRILLES

A. Description: Factory-assembled and tested complete unit with components, piping, wiring, and controls required for mating to ductwork, piping, power, and controls field connections.

B. Cabinet:

1. Material: Painted steel, or coated steel frame covered by a plastic cabinet, with an architectural acceptable finish suitable for tenant occupancy on exposed surfaces.
2. Insulation: Manufacturer's standard internal insulation to provide thermal resistance and prevent condensation.
3. Internal Access: Removable panels of adequate size for field access to internal components for inspection, cleaning, service, and replacement.

C. Coil Assembly:

1. Coil Casing: Aluminum, galvanized, or stainless steel.
2. Coil Fins: Aluminum, mechanically bonded to tubes, with arrangement required by performance.
3. Coil Tubes: Copper, of diameter and thickness required by performance.
4. Capacity Control: DX coil by electronic modulating type valve with linear or proportional characteristics. Hydronic coil by modulating control valve.
5. Internal Tubing: Copper tubing with brazed joints.
6. Internal Tubing Insulation: Manufacturer's standard insulation, of thickness to prevent condensation.
7. Factory Charge: Dehydrated air or nitrogen.
8. Testing: Factory pressure tested and verified to be without leaks.

D. Drain Assembly:

1. Pan: Non-ferrous material, with bottom sloped to low point drain connection.
2. Condensate Removal: Unit-mounted integral lifting mechanism, capable of lifting drain water to an elevation above top of cabinet.
3. Field Piping Connection: Non-ferrous material.

E. Fan and Motor Assembly:

1. Fan(s):

    a. Direct-drive arrangement.
    b. Single or multiple fans connected to a common motor shaft and driven by a single motor.
    c. Fabricated from non-ferrous components or ferrous components with corrosion protection finish.
    d. Wheels statically and dynamically balanced.

2. Motor: Brushless DC or electronically commutated with permanently lubricated bearings.
3. Motor Protection: Integral protection against thermal, overload, and voltage fluctuations.
4. Speed Settings and Control: Multiple or variable speed with speed setting adjustable via central or wall controllers when present.
5. Vibration Control: Integral isolation to dampen vibration transmission.

F. Filter Assembly:

1. Access: Bottom, to accommodate filter replacement without the need for tools.
2. Media: Washable screen.

G. Return/Discharge-Air Grille Assembly: Attached to bottom of unit cabinet.

1. Discharge Pattern: Four-way throw.

    a. Discharge Pattern Adjustment: Field-adjustable settings for up and down range of motion for individual vanes. Provide Deluxe controller to enable configuration.

2. Motorized Vanes: Modulating up and down flow pattern for uniform room air distribution.

H. Integral Occupant and Location Detection: Unit includes occupant and location detection for automatic air distribution and energy saving setback control in the following manner-

1. Air Distribution

    a. **Default distribution operation: Integral occupant and location detection will not be utilized to control air distribution. During COOL mode, vanes move to horizontal airflow direction. During HEAT mode, vanes move to down airflow direction**.
    b. **Area: Vanes move to down airflow direction toward areas with a high floor temperature during COOL mode and toward areas with a low floor temperature during HEAT mode. Otherwise, vanes move to the horizontal airflow direction**.

2. Energy Saving

    a. **Default energy operation: Integral occupant and location detection will not be utilized to automatically enable setback or mode changes. Set point and setback and mode determined by wall controller or central control when provided**.
    b. **“No occupancy energy save”: If there are no persons in the room for 60 minutes or more, energy saving operation (setback) equal to 4°F is performed**.
    c. **“Room occupancy energy save”: If occupancy rate decreases to approximately 30% of the maximum occupancy rate, energy saving operation (setback) equal to 2°F is performed**.

I. Outdoor Air Ventilation Connection: Sheet metal knockout for optional connection to outdoor air ventilation duct.

J. Field-Installed Unit Accessories:

1. **Accessory grille with integral occupancy and location sensor**.
2. **Condensate pump capable of at least 10 feet of lift**.

K. Unit Controls:

1. Factory-Installed Sensors:

a. Unit inlet air temperature.
b. Coil entering refrigerant or water temperature.
c. Coil leaving refrigerant or water temperature.
d. Refrigerant detection if coil is DX.

2. Interlock control sequence: Four digital inputs and three digital outputs for use in defined or customizable interlock sequences; relay adapter kits may be required. Required interlock sequence(s) include-

a. **backup heat control**.
b. **on/off control**.
c. **on/off and fault status**.
d. **mode and fan status**.
e. **indoor unit float switch connection**.
f. **branch controller float switch connection**.
g. **fan speed control**.
h. **forced fan operation**.

3. Features and Functions:

a. Integral occupancy and location sensor.
b. Time delay.
c. Auto-restart.
d. Auto operation mode.
e. Manual operation mode.
f. Filter service notification.
g. Drain assembly high water level safety shutdown and notification.
h. Run test switch.

L. Unit Electrical:

1. Field Connection: Single point connection to power entire unit and integral controls.
2. Disconnecting Means: Field-installed circuit breaker or switch, complying with NFPA 70.

2.5 INDOOR, SUSPENDED, CEILING-MOUNTED UNITS

A. Description: Factory-assembled and tested complete unit with components, piping, wiring, and controls required for mating to piping, power, and controls field connections.

B. Cabinet:

1. Material: Painted or coated steel frame covered by a plastic cabinet, with an architectural

acceptable finish suitable for tenant occupancy on exposed surfaces.

2. Insulation: Manufacturer's standard internal insulation to provide thermal resistance and prevent condensation.
3. Internal Access: Removable panels of adequate size for field access to internal components for inspection, cleaning, service, and replacement.

C. DX Coil Assembly:

1. Coil Casing: Aluminum, galvanized, or stainless steel.
2. Coil Fins: Aluminum, mechanically bonded to tubes, with arrangement required by performance.
3. Coil Tubes: Copper, of diameter and thickness required by performance.
4. Expansion Valve: Electronic modulating type with linear or proportional characteristics.
5. Internal Tubing: Copper tubing with brazed joints.
6. Internal Tubing Insulation: Manufacturer's standard insulation, of thickness to prevent condensation.
7. Factory Charge: Dehydrated air or nitrogen.
8. Testing: Factory pressure tested and verified to be without leaks.

D. Drain Assembly:

1. Pan: Non-ferrous material, with bottom sloped to low point drain connection.
2. Condensate Removal: Gravity.

    a. If a floor drain is not available at unit, provide unit with field-installed condensate pump accessory.

3. Field Piping Connection: Non-ferrous material.

E. Fan and Motor Assembly:

1. Fan(s):

    a. Direct-drive arrangement.
    b. Single or multiple fans connected to a common motor shaft and driven by a single motor.
    c. Fabricated from non-ferrous components or ferrous components with corrosion protection finish.
    d. Wheels statically and dynamically balanced.

2. Motor: Brushless DC or electronically commutated with permanently lubricated bearings.
3. Motor Protection: Integral protection against thermal, overload, and voltage fluctuations.
4. Speed Settings and Control: Multiple or variable speed with speed setting adjustable via central or wall controllers when present.
5. Vibration Control: Integral isolation to dampen vibration transmission.

F. Filter Assembly:

1. Access: Bottom, to accommodate filter replacement without the need for tools.
2. Media: Manufacturer's washable filter with antimicrobial treatment.

G. Discharge-Air Grille Assembly: Mounted in front of unit cabinet.

1. Discharge Pattern: One-way throw.

2. Discharge Pattern Adjustment: Field-adjustable limits for range of pattern.
3. Motorized Vanes: Modulating up and down flow pattern for uniform room air distribution.

H. Return-Air Grille Assembly: Manufacturer's standard.

I. Outdoor Air Ventilation Connection: Sheet metal knockout for optional connection to outdoor air ventilation duct.

J. Field-Installed Unit Accessories:

1. **Condensate pump capable of at least 10 feet of lift with drain pan level sensor and overflow switch**.

K. Unit Controls:

1. Factory-Installed Sensors:

a. Unit inlet air temperature.
b. Coil entering refrigerant temperature.
c. Coil leaving refrigerant temperature.
d. Refrigerant detection.

2. Interlock control sequence: Four digital inputs and three digital outputs for use in defined or customizable interlock sequences; relay adapter kits may be required. Required interlock sequence(s) include-

a. **backup heat control**.
b. **on/off control**.
c. **on/off and fault status**.
d. **mode and fan status**.
e. **indoor unit float switch connection**.
f. **branch controller float switch connection**.
g. **fan speed control**.
h. **forced fan operation**.

3. Features and Functions:

a. Time delay.
b. Auto-restart.
c. Auto operation mode.
d. Manual operation mode.
e. Filter service notification.
f. Drain assembly high water level safety shutdown and notification.
g. Run test switch.

L. Unit Electrical:

1. Field Connection: Single point connection to power entire unit and integral controls.
2. Disconnecting Means: Field-installed circuit breaker or switch, complying with NFPA 70.

2.6 INDOOR, SHUT-OFF VALVE KITS (SVKs)

A. Description: Factory-assembled and tested complete unit with components, piping, wiring, and controls required for mating to piping, power, and controls field connections.

1. Specially designed for use in heat pump systems to reduce Mrel for all indoor units along each SVK line.
2. Systems may include one or multiple units designed by variable refrigerant system manufacturer for field interconnection.

B. Cabinet:

1. Galvanized-steel construction.
2. Insulation: Manufacturer's standard internal insulation to provide thermal resistance and prevent condensation.
3. Internal Access:

    a. Removable panels or hinged doors of adequate size.
    b. Access to all internal components for inspection, cleaning, service, or replacement.

C. Assemblies and Specialties:

1. Kit shall have refrigerant shut-off valve set and coil.
2. Accessory piping reducer set shall be provided with SVK

D. Unit Controls:

1. Interlock control sequence: digital output for use in interlock sequences; relay adapter kit may be required. Required interlock sequence(s) include-

    a. **Refrigerant detection by any connected indoor unit**.

E. Refrigerant Leak Detection:

1. Sequence upon receiving leak detection signal from any DX indoor unit within SVK line:

    a. Shut-off valves for liquid and suction lines close.
    b. If indoor unit fan(s) where refrigerant is detected is set to AUTO, fan switches to ON.
    c. Refrigerant detection signal output activated.

F. Unit Electrical:

1. Field Connection: Single point connection to power entire unit and integral controls.
2. Disconnecting Means: Field-installed circuit breaker or switch, complying with NFPA 70.

2.7 INDOOR, HEAT RECOVERY CONTROL UNITS (HRCUs)

A. Description: Factory-assembled and tested complete unit with components, piping, wiring, and controls required for mating to piping, power, and controls field connections.

1. Specially designed for use in systems with simultaneous heating and cooling.
2. Systems shall include one or multiple units designed by variable refrigerant system manufacturer for field interconnection to make a single refrigeration circuit and multiple indoor units.
3. Units shall respond to calls for HEAT or COOL operation from indoor units by enabling refrigerant or water flow as equipment shown on Drawings require.

    a. If flow direction from HRCU alternates, flow in COOL direction to indoor units in

HEAT mode during outdoor unit defrost sequence is not allowed.

B. Cabinet:

1. Galvanized-steel construction.
2. Insulation: Manufacturer's standard internal insulation to provide thermal resistance and prevent condensation.
3. Internal Access:

    a. Removable panels or hinged doors of adequate size.
    b. Access to all internal components for inspection, cleaning, service, or replacement.

C. Drain Pan: If required by manufacturer's design, provide unit with non-ferrous drain pan with bottom sloped to a low point drain connection.

D. Assemblies and Specialties:

1. Specially designed by manufacturer for type of VRF HVAC system being installed, either two or three pipe.
2. Each branch circuit shall have refrigerant and/or water control valve(s) to control flow.
3. Units serving DX indoor units shall include mitigation shut-off valves at each branch circuit.
4. **Each branch port connection shall be fitted with an isolation valve to simplify service to any individual branch**.

E. Unit Controls:

1. Factory-Installed Sensors:

    a. Liquid inlet temperature.
    b. Bypass exit area temperature.
    c. Bypass outlet temperature.
    d. Bypass inlet temperature.
    e. High pressure sensor.
    f. Medium pressure sensor.

2. Interlock control sequence: digital output for use in interlock sequences; relay adapter kit may be required. Required interlock sequence(s) include-

    a. **Refrigerant detection by any connected indoor unit**.

F. Refrigerant Leak Detection:

1. Sequence upon receiving leak detection signal from any DX indoor unit:

    a. Shut-off valves for each port(s) connected DX indoor unit(s) having detected refrigerant close.
    b. If indoor unit fan(s) where refrigerant is detected is set to AUTO, fan switches to ON.
    c. Refrigerant detection signal output activated.
    d. Normal operation continues uninterrupted for ports and DX indoor units where refrigerant is not detected.

G. Unit Electrical:

1. Field Connection: Single point connection to power entire unit and integral controls.
2. Disconnecting Means: Field-installed circuit breaker or switch, complying with NFPA 70.

2.8 OUTDOOR, AIR-SOURCE HEAT-PUMP UNITS

A. Description: Factory-assembled and tested complete unit module designed for use in systems with either all heating or all cooling demands, but not for use in systems with simultaneous heating and cooling.

1. Systems consist of one unit, or multiple unit modules that are designed by manufacturer for field interconnection to make a single refrigeration circuit, and multiple indoor units.

B. Cabinet:

1. Galvanized steel and coated with a corrosion-resistant finish.

a. Coating with documented salt spray test performance of 2000 hours according to ASTM B117 surface scratch test (SST) procedure.

2. Internal Access: Removable panels or hinged doors of adequate size for field access to internal components for inspection, cleaning, service, and replacement.

C. Compressor and Motor Assembly:

1. One or more positive-displacement, direct-drive and hermetically sealed scroll compressor(s) with inverter drive. Non-inverter compressors—where LRA applies—are not allowed.
2. **Cold-Climate Compressor: Hot-gas injection to allow increased compression ratio for extended periods without damage or excessive wear**.
3. Protection: Integral protection against the following-

a. Refrigerant overcharge and undercharge
b. High and low refrigerant pressure.
c. High refrigerant and oil temperature.
d. Liquid flood back.
e. Thermal and overload.
f. Voltage fluctuations.
g. Phase failure and phase reversal.
h. Short cycling.

4. Speed Control: Configurable to maintain refrigerant evaporating and condensing temperatures while varying refrigerant flow to satisfy cooling and heating loads.

a. Cooling mode fixed 32°F evaporator temperature.
b. Cooling mode fixed 43°F evaporator temperature.
c. Cooling mode variable 32-48°F evaporator temperature.
d. **Cooling mode high ambient operation**.
e. Heating mode high COP operation.
f. Heating mode high heating output operation.

5. Vibration Control: Integral isolation to dampen vibration transmission.
6. Oil Management: Timed sequence enabled during extended periods of reduced refrigerant flow to ensure proper lubrication over entire operating range. Sequences which rely on sensing oil level risk sensor failure or sensor placement not accounting for

line length and are not allowed.
7. Crankcase heaters with integral control to maintain safe operating temperature.
8. Fusible plug.

D. Heat-Exchanger Assembly: Individual coil segments for each unit face to simplify future service replacement costs. Documented salt spray test performance of 2000 hours according to ASTM B117 surface test (SST) procedure.

1. Plate Fin Coils:

a. Casing: Aluminum, galvanized, or stainless steel.
b. Fins: Aluminum or copper, mechanically bonded to tubes, with arrangement required by performance.
c. Tubes: Copper, of diameter and thickness required by performance.

2. Zinc-Coated Aluminum Microchannel Coils:

a. Series of flat tubes containing a series of multiple, parallel flow microchannels layered between refrigerant header manifolds.
b. Construct fins, tubes, and header manifolds of aluminum alloy.
c. Provide field-installed coil panel heaters for heating operation below 0°F ambient per Drawings.

E. Heat-Exchanger Defrost Strategy:

1. Alternate methods based on ambient temperatures.

a. Hot-gas method to maximize efficiency during mild ambient temperatures. Method prolongs defrost sequence.

1) Segmented coil (single-module systems) or alternating modules (twinned systems) to deliver simultaneous defrost and reduced HEAT delivery indoors.

b. Reverse-cycle method to maximize comfort during extreme ambient temperatures. Method shortens defrost sequence.

1) Leverage below 33.8°F for single-module systems and below 23°F for twinned systems to deliver shorter defrost cycles.

2. Preheat Defrost Operation: Signal to indoor units operating in HEAT to increase space temperature before the start of defrost sequence.

F. Heat-Exchanger Fan and Motor Assembly:

1. Fan(s): Propeller type.

a. Direct-drive arrangement.
b. Fabricated from non-ferrous components.
c. Statically and dynamically balanced.

2. Fan Guards: Removable safety guards complying with OSHA regulations. If using metal materials, coat with corrosion-resistant coating to match performance indicated for heat exchanger.
3. Motor(s): Brushless DC or electronically commutated with permanently lubricated

bearings and rated for outdoor duty.
4. Motor Protection: Integral protection against thermal, overload, and voltage fluctuations.

G. Field-Installed Unit Accessories:

1. **Low Ambient Cooling Kit: Provide heat-exchanger coil wind deflectors and fan hood assembly for low ambient cooling operation to -15°F as indicated in Drawings**.
2. **Snow/Hail Protection Kit: Provide heat exchanger coil guards and fan hoods to protect against hail damage**.
3. **Refrigerant Filter/Cleaning System: Replaceable filter core in bypass arrangement from main suction flow to enhance installation quality assurance**.

H. Unit Controls:

1. Factory-Installed Sensors:

a. Refrigerant suction temperature.
b. Refrigerant discharge temperature.
c. Outdoor air temperature.
d. Refrigerant high pressure.
e. Refrigerant low pressure.

2. Features and Functions: Self-diagnostics, time delay, auto-restart.

3. Interlock control sequence: Customizable operation based on external input or contact closure. Required interlock sequence(s) include-

a. **Multi-stage demand limit**.
b. **Low noise (nighttime) limit**.
c. **Lock COOL or HEAT mode**.
d. **Compressor on/off and fault status**.
e. **System Refrigerant detection status**.

I. Unit Electrical:

1. Field Connection: Single point connection to power each unit module or factory-twinned unit and integral controls.
2. Disconnecting Means: Field-installed circuit breaker or switch, complying with NFPA 70.

2.9 OUTDOOR, AIR-SOURCE HEAT RECOVERY UNITS

A. Description: Factory-assembled and tested complete unit designed for use in systems with simultaneous heating and cooling.

1. Systems shall consist of one unit, or multiple unit modules that are designed by variable refrigerant system manufacturer for field interconnection to make a single refrigeration circuit, heat recovery control unit(s), and multiple indoor units.

B. Cabinet:

1. Galvanized steel and coated with a corrosion-resistant finish.

a. Coating with documented salt spray test performance of 2000 hours according to

ASTM B117 surface scratch test (SST) procedure.

2. Internal Access: Removable panels or hinged doors of adequate size for field access to internal components for inspection, cleaning, service, and replacement.

C. Compressor and Motor Assembly:

1. One or more positive-displacement, direct-drive and hermetically sealed scroll compressor(s) with inverter drive. Non-inverter compressors—where LRA applies—are not allowed.
2. **Cold-Climate Compressor: Hot gas injection to allow increased compression ratio for extended periods without damage or excessive wear**.
3. Protection: Integral protection against the following-

    a. Refrigerant overcharge and undercharge
    b. High and low refrigerant pressure.
    c. High refrigerant and oil temperature.
    d. Liquid flood back.
    e. Thermal and overload.
    f. Voltage fluctuations.
    g. Phase failure and phase reversal.
    h. Short cycling.

4. Speed Control: Configurable to maintain refrigerant evaporating and condensing temperatures while varying refrigerant flow to satisfy cooling and heating loads.

    a. Cooling mode fixed 32°F evaporator temperature.
    b. Cooling mode fixed 43°F evaporator temperature.
    c. Cooling mode variable 32-48°F evaporator temperature.
    d. **Cooling mode high ambient operation**.
    e. Heating mode high COP operation.
    f. Heating mode high heating output operation.

5. Vibration Control: Integral isolation to dampen vibration transmission.
6. Oil Management: Timed sequence enabled during extended periods of reduced refrigerant flow to ensure proper lubrication over entire operating range. Sequences which rely on sensing oil level risk sensor failure or sensor placement not accounting for line length and are not allowed.
7. Crankcase heaters with integral control to maintain safe operating temperature.
8. Fusible plug.

D. Heat-Exchanger Assembly: Individual coil segments for each unit face to simplify future service replacement costs. Documented salt spray test performance of 2000 hours according to ASTM B117 surface test (SST) procedure.

1. Plate Fin Coils:

    a. Casing: Aluminum, galvanized, or stainless steel.
    b. Fins: Aluminum or copper, mechanically bonded to tubes, with arrangement required by performance.
    c. Tubes: Copper, of diameter and thickness required by performance.

2. Zinc-Coated Aluminum Vertical Flat Tube Coils:

    a. Series of tubes containing a series of multiple, parallel flow channels layered

between refrigerant header manifolds.
b. Construct fins, tubes, and header manifolds of aluminum alloy.

E. Heat-Exchanger Defrost Strategy:

1. Alternate methods based on ambient temperatures.

a. Hot-gas method to maximize efficiency during mild ambient temperatures. Method prolongs defrost sequence.

1) Segmented coil (single-module systems) or alternating modules (twinned systems) to deliver simultaneous defrost and HEAT delivery indoors.

b. Reverse-cycle method to maximize comfort during extreme ambient temperatures. Method shortens defrost sequence.

1) Leverage below 33.8°F for single-module systems and below 23°F for twinned systems to deliver shorter defrost cycles.

2. Preheat Defrost Operation: Signal to indoor units operating in HEAT to increase space temperature before the start of defrost sequence.

F. Heat-Exchanger Fan and Motor Assembly:

1. Fan(s): Propeller type.

a. Direct-drive arrangement.
b. Fabricated from non-ferrous components.
c. Statically and dynamically balanced.

2. Fan Guards: Removable safety guards complying with OSHA regulations. If using metal materials, coat with corrosion-resistant coating to match performance indicated for heat exchanger coil.
3. Motor(s): Brushless DC or electronically commutated with permanently lubricated bearings and rated for outdoor duty.
4. Motor Protection: Integral protection against thermal, overload, and voltage fluctuations.

G. Field-Installed Unit Accessories:

1. **Snow/Hail Protection Kit: Provide heat exchanger coil guards and fan hoods to protect against hail damage**.
2. **Refrigerant Filter/Cleaning System: Replaceable filter core in bypass arrangement from main suction flow to enhance installation quality assurance**.

H. Unit Controls:

1. Enclosure: Manufacturer's standard, and suitable for unprotected outdoor locations.
2. Factory-Installed Controller: Configurable digital control.

3. Factory-Installed Sensors:

a. Refrigerant suction temperature.
b. Refrigerant discharge temperature.
c. Outdoor air temperature.
d. Refrigerant high pressure.

e. Refrigerant low pressure.

4. Features and Functions: Self-diagnostics, time delay, auto-restart, USB connector to allow running system data up to five days based on storage capacity of memory stick when provided.

5. Interlock control sequence: Customizable operation based on external input or contact closure. Required interlock sequence(s) include-

a. **Multi-stage demand limit**.
b. **Low noise (nighttime) limit**.
c. **Lock COOL or HEAT mode**.
d. **Compressor on/off and fault status**.
e. **System Refrigerant detection status**.

I. Unit Electrical:

1. Field Connection: Single point connection to power each unit module or factory-twinned unit and integral controls.
2. Disconnecting Means: Field-installed circuit breaker or switch, complying with NFPA 70.

2.10 VRF SYSTEM CONTROLS

A. General Requirements:

1. Communicating network may include: Indoor units, outdoor units, HRCUs, SVKs and integral controls connect through a manufacturer-selected network.
2. Network Communication Protocol: Manufacturer proprietary control communication between interconnected units.
3. Integration with Building Automation System: ASHRAE 135, BACnet IP and certified by BACnet Testing Lab (BTL), including the following-

a. Ethernet connection via RJ-45 connectors and port with transmission at **100** Mbps or higher.
b. Integration shall include **control**, **monitoring**, **scheduling**, **change of value notifications**.

4. Operator Interface:

a. Operators shall interface with system and unit controls through the following:

1) Operator interfaces integral to controllers
2) **Manufacturer-provided central controller**.
3) **Integration with Building Automation System**.
4) **Secure-cloud access through web browser software with 1-year prepaid service subscription**.

b. Users shall be capable of interface with controllers for indoor units' control to extent privileges are enabled. Control features available to users shall include the following:

1) On/off control.
2) Temperature set-point adjustment.
3) Fan speed control.

c. **Interface via secure-cloud access shall allow downloading of system diagnostic information, viewable system diagnostic charts, and email notification of error codes**.

B. VRF HVAC System Operator Interface via PC:

1. Central controller(s) connected local-area-network shall be accessible through standard web browser software requiring no manufacturer-specific software be installed on owner-furnished PC.
2. Browser interface shall provide operator with a graphic user interface to allow monitoring and control of multiple central controllers from a single device location through point-and-click mouse exchange.
3. Plan views shall show building plans with location of indoor units and identification superimposed on plans.
4. Controls operation mode of indoor units as individual units, by selected groups of indoor units, or as collection of all indoor units. Operation modes available through central controller shall match those operation modes of controllers for indoor units.
5. Schedules operation of indoor units as individual units, by selected groups of indoor units, or as collection of all indoor units. Schedules daily, weekly, and annual events.
6. Changes operating set points of indoor units as individual units, by selected groups of indoor units, or as collection of all indoor units.
7. Night setback feature to operate indoor units at energy-conserving heating and cooling temperature set-points during unoccupied periods.
8. Supports Multiple Languages: English, French, or Spanish.
9. Supports Imperial and Metric Temperature Units
10. Displays service notifications and error codes.
11. Monitors and displays cumulative operating time of indoor units.
12. Able to disable and enable operation of individual controllers for indoor units.
13. Information displayed on individual controllers shall also be available for display.

C. Central Controllers:

1. Centralized control for all indoor and outdoor units from a single central controller location.

    a. Include multiple interconnected controllers as required.
    b. **Include backlit, high-resolution color display touch panel**.

2. Controls operation mode of indoor units as individual units, by selected groups of indoor units, or as collection of all indoor units. Operation modes available through central controller shall match those operation modes of controllers for indoor units.
3. Schedule operation of indoor units as individual units, by selected groups of indoor units, or as collection of all indoor units.

    a. Sets schedule for daily, weekly, and annual events.
    b. Schedule options available through central controller shall at least include the schedule options of controllers for indoor units.

4. Changes operating set points of indoor units as individual units, by selected groups of indoor units, or as collection of all indoor units.
5. Optimized start feature to start indoor units before scheduled time to reach temperature set-point at scheduled time based on operating history.
6. Night setback feature to operate indoor units at energy-conserving heating and cooling temperature set-points during unoccupied periods.
7. Able to disable and enable operation of individual controllers for indoor units.

8. Information displayed on individual controllers shall also be available for display through

central controller.

9. Multiple RJ-45 ports for direct connection to a local PC and an Ethernet network switch.
10. Start/stop control capability for third-party equipment as required.
11. **Accessory surface-mount case**.
12. **DIN rail mounting kit for installation of central controller in an enclosure**.
13. **License for Integration with Building Automation System: BACnet over IP communication of indoor unit monitor and control points**.
14. **Niagara Driver for direct BMS connection to central controller(s) for enhanced data set including indoor unit and control points plus outdoor unit monitor points in lieu of BACnet license**.

D. Wired Controllers and Sensors for Indoor Units

1. Simple Controllers for Indoor Units:

    a. Single controller capable of controlling multiple indoor units as group.
    b. Integral room temperature sensor
    c. Temperature Units: Fahrenheit and Celsius.
    d. On/Off: Turns indoor unit on or off.
    e. Operation Mode: Cool, Heat, Auto, Dehumidification, Fan Only.
    f. Temperature Display and Set-Point: Separate set points for Cooling, Heating. Adjustable in 1-degree Fahrenheit increments between.
    g. Fan Speed Setting: Select between available options furnished with unit.
    h. Airflow Direction Setting: If applicable to indoor unit style, select between available options furnished with the unit.
    i. Service Notification Display: "Filter".
    j. Error Code Notification Display: Used by service personnel to troubleshoot abnormal operation and equipment failure.
    k. Low-voltage power required for controller shall be powered through non-polar connections to indoor unit.

2. Residential / Multi-Family Style Controllers for Indoor Units:

    a. Wall-mounted controller with integral room temperature and humidity sensors and adapter providing connection to indoor unit.
    b. Color LCD with click-wheel operation and Proximity Sensor to wake controller screen when approached.
    c. Automatic switching between Cool and Dry modes to meet target humidity level (user-selectable between 35-75%).
    d. Temperature Units: Fahrenheit and Celsius.
    e. On/Off: Turns indoor unit on or off.
    f. Hold: Hold operation settings until hold is released.
    g. Operation Mode: Cool, Heat, Auto, Dehumidification, Fan Only, and Setback.
    h. Temperature Display and Set-Point: Separate set points for Cooling, Heating. Adjustable in 1-degree Fahrenheit increments between.
    i. Fan Speed Setting: Select between available options furnished with unit.
    j. Airflow Direction Setting: If applicable to indoor unit style, select between available options furnished with the unit.
    k. Seven-day programmable operating schedule with up to five events per day. Operations shall include On/Off, Operation Mode, and Temperature Set-Point.
    l. Error Code Notification Display: Used by service personnel to troubleshoot abnormal operation and equipment failure.
    m. User and Service Passwords: Capable of preventing adjustments by unauthorized users.
    n. Setting stored in nonvolatile memory to ensure that settings are not lost if power is lost.

o. Low-voltage power required for controller shall be powered through polarity-specific connections to indoor unit.
p. Limits central control (when present) to monitor-only functionality.

3. Deluxe Controllers for Indoor Units:

a. Single controller capable of controlling multiple indoor units as group.
b. Integral room temperature sensor
c. Configurable LCD Touch Screen with Auto Timeout: Timeout duration shall be adjustable.
d. Temperature Units: Fahrenheit and Celsius.
e. On/Off: Turns indoor unit on or off.
f. Hold: Hold operation settings until hold is released.
g. Operation Mode: Cool, Heat, Auto, Dehumidification, Fan Only, and Setback.
h. Temperature Display and Set-Point: Separate set points for Cooling, Heating. Adjustable in 1-degree Fahrenheit increments between.
i. Fan Speed Setting: Select between available options furnished with unit.
j. Airflow Direction Setting: If applicable to indoor unit style, select between available options furnished with the unit.
k. Seven-day programmable operating schedule with up to five events per day. Operations shall include On/Off, Operation Mode, and Temperature Set-Point.
l. Auto Off Timer: Operates unit for an adjustable time duration and then turns unit off.
m. Service Notification Display: "Filter".
n. Service Run Tests: Limit use by service personnel to troubleshoot operation.
o. Error Code Notification Display: Used by service personnel to troubleshoot abnormal operation and equipment failure.
p. User and Service Passwords: Capable of preventing adjustments by unauthorized users.
q. Setting stored in nonvolatile memory to ensure that settings are not lost if power is lost.
r. Low-voltage power required for controller shall be powered through non-polar connections to indoor unit.

4. Color Touch Screen Controllers with Bluetooth Connectivity for Indoor Units:

a. Single controller capable of controlling multiple indoor units as group.
b. Integral room temperature sensor
c. Configurable color LCD Touch Screen with Auto Timeout: import custom image, timeout duration shall be adjustable.
d. Configurable and controller via mobile app via Bluetooth™; Bluetooth shall have rotating security PIN.
e. Temperature Units: Fahrenheit and Celsius.
f. On/Off: Turns indoor unit on or off.
g. Hold: Hold operation settings until hold is released.
h. Operation Mode: Cool, Heat, Auto, Dehumidification, Fan Only, and Setback.
i. Temperature Display and Set-Point: Separate set points for Cooling, Heating. Adjustable in 1-degree Fahrenheit increments between.
j. Fan Speed Setting: Select between available options furnished with unit.
k. Airflow Direction Setting: If applicable to indoor unit style, select between available options furnished with the unit.
l. Seven-day programmable operating schedule with up to five events per day. Operations shall include On/Off, Operation Mode, and Temperature Set-Point.
m. Auto Off Timer: Operates unit for an adjustable time duration and then turns unit off.
n. Service Notification Display: "Filter".

o. Service Run Tests: Limit use by service personnel to troubleshoot operation.
p. Error Code Notification Display: Used by service personnel to troubleshoot abnormal operation and equipment failure.
q. User and Service Passwords: Capable of preventing adjustments by unauthorized users.
r. Setting stored in nonvolatile memory to ensure that settings are not lost if power is lost.
s. Low-voltage power required for controller shall be powered through non-polar connections to indoor unit.

5. Touch Controllers with Integral Occupancy and Light Sensing for Indoor Units:

a. Single controller capable of controlling multiple indoor units as group.
b. Integral room temperature, humidity, light and occupancy sensors.
c. Multiple configurable automatic energy-save strategies by integral occupancy sensor (e.g., unit off, unit setback, fan mode, set point ± 4°F).
d. Light sensor may be used to disable energy-save by occupancy sensing.
e. Configurable color LED operation indication.
f. LCD Touch Screen with Auto Timeout: Timeout duration shall be adjustable.
g. Temperature Units: Fahrenheit and Celsius.
h. On/Off: Turns indoor unit on or off.
i. Hold: Hold operation settings until hold is released.
j. Operation Mode: Cool, Heat, Auto, Dehumidification, Fan Only, and Setback.
k. Temperature Display and Set-Point: Separate set points for Cooling, Heating. Adjustable in 1-degree Fahrenheit increments between.
l. Fan Speed Setting: Select between available options furnished with unit.
m. Airflow Direction Setting: If applicable to indoor unit style, select between available options furnished with the unit.
n. Seven-day programmable operating schedule with up to five events per day. Operations shall include On/Off, Operation Mode, and Temperature Set-Point.
o. Auto Off Timer: Operates unit for an adjustable time duration and then turns unit off.
p. Service Notification Display: "Filter".
q. Service Run Tests: Limit use by service personnel to troubleshoot operation.
r. Error Code Notification Display: Used by service personnel to troubleshoot abnormal operation and equipment failure.
s. User and Service Passwords: Capable of preventing adjustments by unauthorized users.
t. Setting stored in nonvolatile memory to ensure that settings are not lost if power is lost.
u. Low-voltage power required for controller shall be powered through non-polar connections to indoor unit.

6. Conventional Thermostat Interface and Thermostat

a. Provide with 24V transformer to power thermostat.
b. Indoor unit modes: COOL, HEAT, FAN, and OFF (AUTO function only at thermostat level).
c. Thermostat to be provided by Mitsubishi.
d. Three input terminals to control fan speed control:

1) High.
2) Medium.
3) Low.

e. Auto recovery after power failure.

f. Limits central control (when present) to monitoring mode status and error alarm only.

7. Wired Sensor-Only for Indoor Units:

a. **Surface-mount**, **Paintable** sensors in lieu of local controllers.

E. Wireless Controllers for Indoor Units:

1. Wireless Wall-Mounted Controllers for Indoor Units:

a. Wall-mounted controller with integral room temperature sensor and receiver providing connection to indoor unit.
b. Temperature sensing shall be **integral sensor within controller**.
c. Temperature Units: Fahrenheit and Celsius.
d. On/Off: Turns indoor unit on or off.
e. Hold: Hold operation settings until hold is released.
f. Operation Mode: Cool, Heat, Auto, Dehumidification, Fan Only, and Setback.
g. Temperature Display and Set-Point: Separate set points for Cooling, Heating. Adjustable in 1-degree Fahrenheit increments between.
h. Fan Speed Setting: Select between available options furnished with unit.
i. Airflow Direction Setting: If applicable to indoor unit style, select between available options furnished with the unit.
j. Seven-day programmable operating schedule with up to five events per day. Operations shall include On/Off, Operation Mode, and Temperature Set-Point.
k. Service Notification Display: "Filter".
l. User and Service Passwords: Capable of preventing adjustments by unauthorized users.
m. Setting stored in nonvolatile memory to ensure that settings are not lost if power is lost.
n. Two AA alkaline batteries (supplied with controller) required for controller power.
o. Receiver connects to indoor unit control board with 1 m cable.
p. Limits central control (when present) to monitor-only functionality.

2. Handheld Wireless Controllers for Indoor Units:

a. Controller communicates to remote-mounted receiver that is wired to indoor unit(s).

1) Include receivers with handheld wireless controllers as required to complete installation.
2) Low-voltage power required for receivers shall be powered by indoor unit.

b. One handheld wireless controller shall be capable of communicating with one or multiple receivers to control one or multiple indoor units as a group.
c. Temperature Units: Fahrenheit and Celsius.
d. On/Off: Turns indoor unit on or off.
e. Operation Mode: Cool, Heat, Auto, Dehumidification, and Fan Only.
f. Fan Speed Setting: Select between available options furnished with indoor unit.
g. Airflow Direction Setting: If applicable to unit, select between available options furnished with indoor unit.
h. Auto Off Timer: Operates unit for an adjustable time duration and then turns unit off.
i. Service Run Tests: Limit use by service personnel to troubleshoot operation.
j. Receiver Error Notification LED: Used by service personnel to troubleshoot

abnormal operation and equipment failure.

2.11 VRF SYSTEM REFRIGERANT AND OIL

A. Refrigerant:

1. As required by VRF HVAC system manufacturer for system to comply with performance requirements indicated.
2. ASHRAE 34, Class A2L refrigerant classification.
3. R-32.

B. Oil:

1. As required by VRF HVAC system manufacturer and to comply with performance requirements indicated.

2.12 VRF SYSTEM CONDENSATE DRAIN PIPING

A. If more than one material is listed, material selection is Contractor's option.

B. Copper Tubing:

1. Drawn-Temper Tubing: According to **ASTM B88, Type L (ASTM B88M, Type B)**.
2. Wrought-Copper Fittings: ASME B16.22.
3. Wrought-Copper Unions: ASME B16.22.
4. Solder Filler Metals: ASTM B32, lead-free alloys, and water-flushable flux according to ASTM B813.

C. CPVC plastic pipe according to ASTM F441/F441M, Schedule 40, with socket-type pipe fittings according to ASTM F438 and solvent cement according to ASTM F493.

D. PVC plastic pipe according to ASTM D1785, Schedule 40, with socket-type pipe fittings according to ASTM D2466 and solvent cement according to ASTM D2564, primer according to ASTM F656.

E. Reducers: Where applied to piping connected to unit-mounted integral lifting mechanism, only eccentric reducers oriented horizontally are allowed.

2.13 VRF SYSTEM REFRIGERANT PIPING

A. Refrigerant Piping:

1. Copper Tube: ASTM B280, Type ACR.
2. Wrought-Copper Fittings: ASME B16.22.
3. Brazing Filler Metals: AWS A5.8/A5.8M.

B. Refrigerant Tubing Kits:

1. Factory-rolled and -bundled, soft-copper tubing with tubing termination fittings at each end.
2. Standard one-piece length for connecting to indoor units.

3. Pre-insulated with flexible elastomeric insulation of thickness to comply with governing energy code and sufficient to eliminate condensation.
4. Factory Charge: dehydrated air or nitrogen.

C. Assemblies and Specialties:

1. Divided-Flow Specialty Fittings: Where required by VRF HVAC system manufacturer for proper system operation, VRF HVAC system manufacturer shall furnish specialty fittings with identification and instructions for proper installation by Installer.
2. [**Refrigerant Isolation Ball Valves: Uni-body full port design with Schrader valve for refrigerant service, rated for maximum system temperature and not less than 800 psig pressure, and factory tested under pressure to ensure tight shutoff**.]

2.14 VRF SYSTEM CONTROL CABLE

A. General Requirements: Refer to and verify all wire and cabling requirements with the manufacturer's current installation and operation manuals to ensure compliance with the latest standards and specifications. Cables may not be spliced and shall be continuous from terminal to terminal. Do not splice cable.

B. Low-Voltage Control Network Cabling:

1. Plenum-Rated, Paired Cable: NFPA 70, Type CMP.

a. Shielded wire (2-core) 16 AWG—CVVS, CPEVS or MVVS.
b. PVC insulation and jacket.
c. Foil shielded.
d. Flame Resistance: Comply with NFPA 262.
e. Maximum cable distance (distance to farthest components) is **1,640 feet**.
f. Maximum cable distance from OU to connected IU is **656 feet**.
g. Maximum total cable length (sum of all network cabling) is **6,560 feet**.

C. Low-Voltage Wall-Mounted Controller Cabling to Indoor Units:

1. Plenum-Rated, Paired Cable: NFPA 70, Type CMP.

a. 22 AWG, 2-conductor unshielded 7-stranded bare copper wire.

1) Residential / multi-family style controllers require 4-conductor.
2) Touch controllers with integral occupancy and light sensing controllers require low-voltage control network cabling to the network.

b. PVC insulation and jacket.
c. Flame Resistance: Comply with NFPA 262.
d. Maximum cable distance (distance from controller to indoor unit) varies by controller style. Refer to manufacturer Submittal or Installation Guides.

D. Transmission power booster provided if additional signal power is required based on connected devices. Coordinate with VRF manufacturer and install near middle of communication bus when required.

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 products before installation. Reject products that are wet, moisture damaged, or mold damaged.

C. Examine roughing-in for piping and tubing to verify actual locations of connections before equipment installation.

D. Examine roughing-in for ductwork to verify actual locations of connections before equipment installation.

E. Examine roughing-in for wiring and conduit to verify actual locations of connections before equipment installation.

F. Examine walls, floors, roofs, and outdoor pads for suitable conditions where equipment will be installed.

G. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

H. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 EQUIPMENT INSTALLATION, GENERAL

A. Clearance:

1. Maintain manufacturer's recommended clearances for service and maintenance.
2. Maintain clearances required by governing code.

B. Equipment Restraint Installation: Install equipment with seismic-restraint device. Comply with requirements for seismic-restraint devices specified in Section 230548 "Vibration and Seismic Controls for HVAC."

3.3 INSTALLATION OF INDOOR UNITS

A. Install units to be level and plumb while providing a neat and finished appearance.

B. Unless otherwise required by VRF HVAC system manufacturer, support ceiling-mounted units from structure above using threaded rods; minimum rod size of **3/8 inch (10 mm)**.

C. Adjust supports of exposed and recessed units to draw units tight to adjoining surfaces.

D. Protect finished surfaces of ceilings, floors, and walls that come in direct contact with units. Refinish or replaced damaged areas after units are installed.

E. In rooms with ceilings, conceal piping and tubing, controls, and electrical power serving units above ceilings.

F. In rooms without ceiling, arrange piping and tubing, controls, and electrical power serving units to provide a neat and finished appearance.

G. Provide lateral bracing if needed to limit movement of suspended units to not more than **0.25 inch (13 mm)**.

3.4 INSTALLATION OF OUTDOOR UNITS

A. Install units to be level and plumb while providing a neat and finished appearance.

B. Install outdoor units on support structures indicated on Drawings.

C. Pad-Mounted Installations: Install outdoor units on cast-in-place concrete equipment bases. Comply with requirements for equipment bases and foundations specified in Section 033000 "Cast-in-Place Concrete."

1. Attachment: Install anchor bolts to elevations required for proper attachment to supported equipment.
2. Grouting: Place grout under equipment supports and make bearing surface smooth.

D. Roof-Mounted Installations: Install outdoor units on equipment supports specified in Section 077200 "Roof Accessories." Anchor units to supports with removable, stainless-steel fasteners.

3.5 GENERAL REQUIREMENTS FOR PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping and tubing systems. Install piping and tubing as indicated unless deviations to layout are approved on coordination drawings.

B. Install piping and tubing in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

C. Install piping and tubing at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install piping and tubing above accessible ceilings to allow sufficient space for ceiling panel removal.

E. Install piping and tubing to permit valve servicing.

F. Install piping and tubing at indicated slopes.

G. Install piping and tubing free of sags.

H. Install fittings for changes in direction and branch connections.

I. Install piping and tubing to allow application of insulation.

J. Install groups of pipes and tubing parallel to each other, spaced to permit applying insulation with service access between insulated piping and tubing.

K. Install sleeves for piping and tubing penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 230500 "Common Work Results for HVAC."

L. Install escutcheons for piping and tubing penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 230500 "Common Work Results for HVAC."

3.6 INSTALLATION OF SYSTEM CONDENSATE DRAIN PIPING

A. General Requirements for Drain Piping and Tubing:

1. Install a union in piping at each threaded unit connection.
2. Install an adjustable stainless steel hose clamp with adjustable gear operator on unit hose connections. Tighten clamp to provide a leak-free installation.
3. If required for unit installation, provide a trap assembly in drain piping to prevent air circulated through unit from passing through drain piping. Comply with more stringent of the following:

    a. Details indicated on Drawings.
    b. Manufacturer's requirements.
    c. Governing codes.
    d. In the absence of requirements, comply with requirements of ASHRAE handbooks.

4. Extend drain piping from units with drain connections to drain receptors as indicated on Drawings. If not indicated on Drawings, terminate drain connection at nearest accessible location that is not exposed to view by occupants.
5. Provide each 90-degree change in direction with a Y- or T-fitting. Install a threaded plug connection in the dormant side of fitting or future use as a service cleanout.

B. Gravity Drains:

1. Slope piping from unit connection toward drain termination at a constant slope of not less than one percent.

C. Pumped Drains:

1. If unit condensate pump or lift mechanism is not included with an integral check valve, install a full-size check valve in each branch pipe near unit connection to prevent backflow into unit.

3.7 INSTALLATION OF REFRIGERANT PIPING

A. Refrigerant Tubing Kits:

1. Unroll and straighten tubing to suit installation. Deviations in straightness of exposed tubing shall be unnoticeable to observer.
2. Support tubing as specified in Section 230516 “Hangers and Supports for HVAC Piping and Equipment.”
3. Prepare tubing ends and make mating connections to provide a pressure tight and leak-free installation.

B. Select system components with minimum **650 psig** pressure rating.

C. Install piping as short and direct as possible, with a minimum number of joints and fittings.

D. Arrange piping to allow inspection and service of equipment. Install valves and specialties in accessible locations to allow for service and inspection. Install access doors or panels as

specified in Section 083113 "Access Doors and Frames" if valves or equipment requiring maintenance is concealed behind finished surfaces.

E. Install refrigerant piping and tubing in protective conduit where installed below ground.

F. Install refrigerant piping and tubing in rigid or flexible conduit in locations where exposed to mechanical damage.

G. Unless otherwise required by VRF HVAC system manufacturer, slope refrigerant piping and tubing as follows:

1. Install horizontal hot-gas discharge piping and tubing with a uniform slope downward away from compressor.
2. Install horizontal suction lines with a uniform slope downward to compressor.
3. Traps to entrain oil in vertical runs are not allowed.
4. Inverted traps for twinned systems may be required by manufacturer.
5. Liquid lines may be installed level.

H. When brazing, remove or protect components that could be damaged by heat. Braze pipes with a dry nitrogen purge to avoid oxidation.

I. Before installation, clean piping, tubing, and fittings to cleanliness level required by VRF HVAC system manufacturer.

J. Joint Construction:

1. Brazed Joints

a. Ream ends of tubes and remove burrs.
b. Remove scale, slag, dirt, and debris from inside and outside of tube and fittings before assembly.
c. Construct joints in accordance with AWS's "Brazing Handbook," "Pipe and Tube" Chapter.
d. Use Type BAg (cadmium-free silver) alloy for joining copper with bronze.
e. The piping being brazed shall be purged of air to remove the oxygen and filled with one of the following inert gases: oxygen-free nitrogen, helium or argon. The piping system shall be purged with an inert gas for a minimum time corresponding to five volume changes through the piping system prior to brazing. The pre-purge rate shall be at a minimum velocity of 100 feet per minute (0.508 m/s). The inert gas shall be directly connected to the tube system being brazed to prevent the entrainment of ambient air. After the pre-purge, the inert gas supply shall be maintained through the piping during the brazing operation at a minimum pressure of **1.0 psi** (**6.89 kPa**) and a maximum pressure of **3.0 psi** (**20.67 kPa**). The joint shall be brazed with a filler metal conforming to AWS A5.8

2. Mechanically Pressed Joints

a. The installing contractor shall be fully trained and qualified by the manufacturer of the mechanically pressed joints to install the selected piping connections.
b. Mechanical joints shall be installed in accordance with the manufacturer’s instructions.

3. Flared Joints

a. Flared fittings shall be installed in accordance with the manufacturer’s instructions.

The flared fitting shall be used with the tube material specified by the fitting manufacturer. The flared tube end shall be made by a tool designed for that operation.

4. Soldered Joints

a. Use of soldered joints is prohibited within VRF systems.

3.8 INSTALLATION OF PIPING AND TUBING 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. Installation to maintain a continuous vapor barrier.

B. 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.

C. 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 unavailable, 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. 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.

D. 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.

E. 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.

3.9 INSTALLATION OF DUCT, ACCESSORIES, AND AIR OUTLETS

A. Where installing ductwork adjacent to equipment, allow space for service and maintenance.

B. Comply with requirements for metal ducts specified in Section 233113 "Metal Ducts."

C. Comply with requirements for nonmetal ducts specified in Section 233116 "Nonmetal Ducts."

D. Comply with requirements for air duct accessories specified in Section 233300 "Air Duct Accessories."

E. Comply with requirements for flexible ducts specified in Section 233346 "Flexible Ducts."

F. Comply with requirements for air diffusers specified in Section 233713.13 "Air Diffusers."

G. Comply with requirements for registers and grilles specified in Section 233713.23 "Registers and Grilles."

3.10 IDENTIFICATION

A. Identify system equipment, piping, tubing, and valves. Comply with requirements for identification specified in Section 230553 "Identification for HVAC Piping and Equipment."

3.11 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage VRF HVAC system manufacturer's service representative to advise and assist installers; witness testing; and observe and inspect components, assemblies, and equipment installations, including controls and connections.

1. Field service shall be performed by a manufacturer-trained and authorized service representative of VRF HVAC system manufacturer whose primary job responsibilities are to provide direct technical support of its products.
2. Manufacturer-trained and authorized service representative shall provide on-site visits during construction at installation milestones indicated. System Installer shall coordinate each visit in advance to give manufacturer sufficient notice to plan the visit.

    a. First Visit: Kick-off meeting.

    b. Second Visit: At approximately **25**] percent completion of system(s).
    c. Third Visit: At approximately **50** percent completion of system(s).
    d. Fourth Visit: At approximately **75** percent completion of system(s).
    e. Fifth Visit: Final inspection before system startup.

3. Kick-off Meeting:

    a. Meeting shall include system Installer and other related trades with sole purpose of reviewing VRF HVAC system installation requirements and close coordination required to make a successful installation.
    b. Meeting shall be held at Project site and scheduled at a mutually agreed to time that occurs before the start of any part of system installation.
    c. Meeting shall cover the following as a minimum requirement:

        1) Review of latest issue of Contract Documents, Drawings, and Specifications, relevant to VRF HVAC systems.
        2) Manufacturer's installation requirements specific to systems being installed.
        3) Review of all relevant VRF HVAC system submittals, including delegated-design submittals.
        4) Required field activities related installation of VRF HVAC system.
        5) Project team communication protocol, contact information, and exchange of responsibilities for each party involved, including manufacturer, supplier, system Installer, and other related trades.

4. Site Visits: Activities for each site visit shall include the following:

    a. Meet with VRF HVAC system Installer to discuss field activities, issues, and

suggested methods to result in a successful installation.

b. Offer technical support to Installer and related trades as related to VRF system(s) being installed.
c. Review progress of VRF HVAC system(s) installation for strict compliance with manufacturer's requirements.
d. Advise and if necessary, assist Installer with updating related refrigerant calculations and system documentation.

5. Final Inspection before Startup:

a. Before inspection, Installer to provide written request to manufacturer stating the system is fully installed according to manufacturer's requirements and ready for final inspection.
b. All system equipment and operating components shall be inspected. If components are inaccessible for inspection, they shall be made accessible before the final inspection can be completed.
c. A factory-trained and authorized service representative shall provide a comprehensive inspection of all equipment and each operating component that comprise the complete system(s). Inspection shall follow a detailed checklist specific to each equipment and operating component.
d. Inspection reports for indoor units shall include, but not be limited to, the following:

1) Unit designation on Drawings.
2) Manufacturer model number.
3) Serial number.
4) Network address, if applicable.
5) Each equipment setting.
6) Mounting, supports, and restraints properly installed.
7) Proper service clearance provided.
8) Wiring and power connections correct.
9) Line-voltage reading(s) within acceptable range.
10) Wiring and controls connections correct.
11) Low voltage reading(s) within an acceptable range.
12) Controller type and model controlling unit.
13) Controller location.
14) Temperature settings and readings within an acceptable range.
15) Condensate removal acceptable.
16) Fan settings and readings within an acceptable range.
17) Unit airflow direction within an acceptable range.
18) If applicable, fan external static pressure setting.
19) Filter type and condition acceptable.
20) Noise level within an acceptable range.
21) Refrigerant or hydronic piping properly connected and insulated.
22) Condensate drain piping properly connected and insulated.
23) If applicable, ductwork properly connected.
24) If applicable, external interlocks properly connected.
25) Remarks.

e. Inspection reports for outdoor units shall include, but not be limited to, the following:

1) Unit designation on Drawings.
2) Manufacturer model number.
3) Serial number.
4) Network address, if applicable.
5) Each equipment setting, including compressor speed control.

6) Mounting, supports, and restraints properly installed.
7) Proper service clearance provided.
8) Wiring and power connections correct.
9) Line-voltage reading(s) within acceptable range.
10) Wiring and controls connections correct.
11) Low voltage reading(s) within an acceptable range.
12) Condensate removal acceptable.
13) Noise level within an acceptable range.
14) Refrigerant piping properly connected and insulated.
15) Condensate drain piping properly connected and insulated.
16) For water-source outdoor units, water piping properly connected and insulated.
17) For water-source outdoor units, proof of water flow checked for proper operation.
18) Remarks.

f. Installer shall provide manufacturer with the requested documentation including as-built piping lengths and technical support during inspection.
g. Installer shall correct observed deficiencies found by the inspection.
h. Upon completing the on-site inspection, manufacturer shall provide a written report with complete documentation describing each inspection step, the result, and any corrective action required.
i. If corrective action is required by Installer that cannot be completed during the same visit, provide additional visits, as required, until deficiencies are resolved, and systems are deemed ready for startup.
j. Final report shall indicate the system(s) inspected are installed according to manufacturer's requirements and are ready for startup.

B. Perform the following tests and inspections with the assistance of manufacturer's service representative:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
3. Operational Test: Not less than 24 hours 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.

C. Refrigerant and Hydronic Tubing Positive Pressure Testing:

1. Comply with more stringent of VRF HVAC system manufacturer's requirements and requirements indicated.
2. After completion of tubing installation, pressurize tubing systems to a test pressure:

a. Refrigerant piping to a test pressure of not less than **600 psig** using dry nitrogen.
b. Hydronic piping to a test pressure of not less than **43 psig**.

3. Successful testing shall maintain a test pressure for a continuous and uninterrupted period of 24 hours. Allowance for pressure changes attributed to changes in ambient temperature are acceptable.
4. Prepare test report to record the following information for each test:

a. Name of person starting test, company name, phone number, and e-mail address.
b. Name of manufacturer's service representative witnessing test, company name,

phone number, and e-mail address.
c. Detailed description of extent of tubing tested.
d. Date and time at start of test.
e. Test pressure at start of test.
f. Outdoor temperature at start of test.
g. Name of person ending test, company name, phone number, and e-mail address.
h. Date and time at end of test.
i. Test pressure at end of test.
j. Outdoor temperature at end of test.
k. Remarks:

5. Submit test reports for Project record and to system manufacturer.

D. Refrigerant Tubing Evacuation Testing:

1. Comply with more stringent of VRF HVAC system manufacturer's requirements and requirements indicated.
2. After completion of tubing positive-pressure testing, evacuate tubing systems to a pressure of 500 microns.
3. Successful testing shall maintain a test pressure for a continuous and uninterrupted period of one hour with no change.
4. Prepare test report to record the following information for each test:

a. Name of person starting test, company name, phone number, and e-mail address.
b. Name of manufacturer's service representative witnessing test, company name, phone number, and e-mail address.
c. Detailed description of extent of tubing tested.
d. Date and time at start of test.
e. Test pressure at start of test.
f. Outdoor temperature at start of test.
g. Name of person ending test, company name, phone number, and e-mail address.
h. Date and time at end of test.
i. Test pressure at end of test.
j. Outdoor temperature at end of test.
k. Remarks:

5. Submit test reports for Project record and to system manufacturer.
6. Upon successful completion of evacuation testing, system shall be charged with refrigerant.

E. System Refrigerant Charge:

1. System Installer shall consult system manufacturer to determine the correct system refrigerant charge based on as-built piping lengths.
2. Installer shall charge system following VRF HVAC system manufacturer's written instructions.
3. Total refrigerant charge shall be recorded and permanently displayed at the system's outdoor unit.

3.12 STARTUP SERVICE

A. Installer shall engage a factory-trained and authorized service representative of VRF HVAC system manufacturer to perform system(s) startup supervision.

1. Complete startup service of each separate system.
2. Complete system startup service according to manufacturer's written instructions.

B. Startup checks shall include, but not be limited to, the following:

1. Check control communications of equipment and each operating component in system(s).
2. Check each outdoor unit’s power supply is connected 12 to 24 hours before startup of system.
3. Check each indoor unit's response to demand for cooling and heating.
4. Check each indoor unit's response to changes in airflow settings.
5. Check each indoor unit, outdoor unit, and HRCU when present for proper condensate removal.

C. Installer shall accompany factory-trained and authorized service representative during startup service and provide manufacturer's service representative with requested documentation and technical support during startup service.

1. Installer shall correct deficiencies found during startup service for reverification.

D. System Operation Report:

1. After completion of startup service, manufacturer shall issue a report for each separate system.
2. Report shall include complete documentation describing each startup check, the result, and any corrective action required.
3. Manufacturer shall electronically record not less than one hour of continuous operation of each system and submit with report for historical reference.

a. All available system operating parameters shall be included in the information submitted.

E. Witness:

1. Invite **Architect**, **Owner**, **and Commissioning Agent** to witness startup service procedures.
2. Provide written notice not less than Twenty (**20**) business days before start of startup service.

3.13 ADJUSTING

A. Adjust equipment and components to function smoothly and lubricate as recommended by manufacturer.

B. Adjust initial temperature set points. Adjust initial airflow settings and discharge airflow patterns.

C. Set field-adjustable switches according to VRF HVAC system manufacturer's written instructions, and as indicated.

3.14 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include **12** months' full maintenance by **skilled employees of system Installer who are**

manufacturer's authorized service representative. Include **four** service visits for preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper equipment and system operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

3.15 DEMONSTRATION

A. Engage a VRF HVAC system manufacturer's factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain entire system.

B. Instructor:

1. Instructor shall be factory trained and certified by VRF HVAC system manufacturer with current training on the system(s), equipment, and controls that are installed.

C. Schedule:

1. Schedule training with Owner at least 10 business days before first training session.
2. Training shall occur before Owner occupancy.
3. Training shall be held at mutually agreed date and time during normal business hours.

D. Location: Owner shall provide a suitable on-site location to host classroom training.

E. Training Attendance: For record purposes, document training attendees at the start of each new training session. Record attendee's name, signature, phone number, and e-mail address.

F. Training Format: Individual training modules shall include classroom training followed by hands-on field demonstration and training.

G. Training Materials: Provide training materials in electronic format to each attendee.

1. Offer online instructional videos showing general operation and maintenance that are coordinated with operation and maintenance manuals.

H. Acceptance: Obtain **Architect**, **Commissioning Agent**, **or Owner** written acceptance that training is complete, and requirements indicated have been satisfied.

END OF SECTION 238129

DIVISION 15-HEATING, VENTILATION, & AIR-CONDITIONING
23 82 19 CABINET UNIT HEATERS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. CABINET UNIT HEATERS

1.02 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION

A. Division 23 Specifications - Controls and Instrumentation: Installation and wiring of thermostats and other control components.

B. Division 26 Specifications - Equipment Wiring Systems: Electrical connections to building equipment.

1.03 RELATED SECTIONS

A. Division 23 Specifications - Hydronic Piping

B. Division 23 Specifications - Hydronic Specialties

C. Division 23 Specifications - Controls and Instrumentation

D. Division 26 Specifications - Equipment Wiring Systems: Electrical supply to units

1.04 REFERENCES

A. ANSI/NFPA 70 - National Electrical Code

B. NFPA 90 A & B - Installation of Air Conditioning and Ventilation Systems and Installation of Warm Air Heating and Air Conditioning Systems

C. UL 883 - Fan-Coil Units and Room Fan-Heater Units Standard for safety requirements

D. UL 94 - Tests for Flammability of Plastic Materials for Parts in Devices and Appliances.

E. AHRI 350 - Standard for Sound Rating of Non-Ducted Indoor Air-Conditioning Equipment

F. ANSI S1.32 - Precision methods for the determination of sound power levels of discrete-frequency and narrow-band noise sources in reverberation rooms

G. ASHRAE Standard 62-89R - Ventilation for acceptable indoor air quality

H. ASHRAE 79 - Methods of testing for Room Fan-Coil Air-Conditioners

I. UL 181 - Factory Made Air Ducts and Connectors

1.05 SUBMITTALS

A. Submit unit performance data including: capacity, nominal and operating performance.

B. Submit mechanical specifications for unit and accessories describing construction, components and options.

C. Submit shop drawings indicating overall dimensions as well as installation, operation and service clearances. Indicate lift points and recommendations. Indicate unit shipping, installation and operating weights including dimensions.

D. Submit data on electrical requirements. Include safety and start-up instructions.

1.06 REGULATORY REQUIREMENTS

A. Units must be UL listed as a Fan-Coil Units and meet UL 883 - Room Fan-Heater Units Standard for safety requirements, and UL 94 - Tests for Flammability of Plastic Materials for Parts in Devices and Appliances.

B. In the event the unit is not UL/CUL or ETL approved, the contractor shall, at his expense provide for a field inspection by a UL/CUL representative to verify conformance. If necessary, contractor shall perform modifications to the unit to comply with UL/CUL or ETL as directed by the representative, at no additional expense to the Owner.

1.07 DELIVERY, STORAGE AND HANDLING

A. Comply with manufacturer's installation instructions for rigging, unloading, and transporting units.

B. Units shall ship fully assembled.

C. Store in a clean dry place and protect from weather and construction traffic. Handle carefully to avoid damage to components, enclosures, and finish.

D. Units shall be delivered to site with factory mounted piping package.

1.08 START-UP AND OPERATING REQUIREMENTS

A. Do not operate units for any purpose, temporary or permanent, until ductwork is clean, filters in place, condensate properly trapped, piping connections verified and leak-tested, all shipping braces removed, and fan has been test run under observation.

B. Include manufacturers' descriptive literature, operating instructions, installation instructions, maintenance and repair data, including filter replacement.

1.09 WARRANTY

A. The equipment purchaser shall be provided, at no additional cost, a standard parts warranty that covers a period of one year from unit start-up or 18 months from shipment, whichever occurs first. This warrants that all products are free from defects in material and workmanship and have capacities and ratings set forth in the equipment manufacturer's catalog and bulletins.

PART 2 - PRODUCTS

2.01 SUMMARY

A. The contractor shall furnish and install units as shown and scheduled in the plans. The units shall be installed in accordance with this specification and produce the specified performance in accordance with AHRI Standard 550/590-98.

B. Base bid shall be Trane unit with approved alternates being Carrier and York. Alternates must comply with the performance and features called for in this specification. Job awarded on basis of specified unit. Alternates will be considered after the job is awarded.

C. Manufacturer must clearly define any exceptions made to Plans and Specifications. Any deviations in layout or arrangement shall be submitted to engineer prior to bid date for approval. Mechanical Contractor is responsible for expenses that occur due to exceptions made.

2.02 GENERAL UNIT DESCRIPTION

A. CABINET CONSTRUCTION

1. Vertical and Slope Top Cabinet Units: The front panel shall be a constructed from a minimum 16-gauge galvanized steel. All other panels shall be fabricated from a minimum 18-gauge galvanized steel with rounded edges on all exposed corners. Side panels shall be removable for piping access.
2. Recessed Units: Recessed panels shall be fabricated from a minimum 18-gauge galvanized steel and shall ship separate from the unit.
    a. Horizontal Recessed Units: Bottom panels shall ship with tamperproof screw fasteners and safety chain. Units shall be provided with a telescoping panel to allow panel to be adjusted to be flush with the ceiling.
3. Finish: Factory applied baked powder coat on all visible surfaces of cabinet. Non-lead based paint must be used. To maintain a better long term appearance all bases, control doors and grilles shall be black. Standard finish shall meet ASTM B117 specifications.

B. ACCESSORIES

1. Filters: 1-inch MERV 8 plenum air filters shall be provided and installed on all units. Rating based on ASHRAE Standard 52.2.

2. Bar Grille Outlet: Bar grilles shall be a formed steel grille on the discharge. Grilles shall have a black paint finish with an 18-gauge steel construction. The louvers shall be formed at a 15° angle and fixed in one discharge direction.
3. Bar Grille Inlet: Bar grilles shall be a formed steel grille on the inlet. Grilles shall have a black paint finish with an 18-gauge steel construction. The louvers shall be formed at a 15° angle and fixed in one discharge direction.
4. Disconnect Switch: Unit shall be have a non-fused disconnect switch

C. CABINET INSULATION

1. Closed cell insulation shall be the only acceptable material for insulating in accordance with ASHRAE 62-89R. Matted or fiber-glass insulation of any type is not acceptable.
2. Insulation shall meet UL rating 94-5v for fire hazard classification which satisfies flame and smoke safety requirements.

D. FAN ASSEMBLY

1. Fans: Centrifugal forward-curved double-width, double-inlet corrosion resistant wheels, statically and dynamically balanced, direct driven. Fans shall be constructed of metal with metal housing for long-term high reliability and shall be in the blow through configuration.
2. Motors: All motors are brushless DC (BLDC)/electronically commutated motors (ECM) factory-programmed and run-tested in assembled units. The motor controller is mounted in a touch-safe control box with a built-in integrated user interface and LED tachometer. If adjustments are needed, motor parameters can be adjusted through momentary contact switches accessible without factory service personnel on the motor control board.
    a. Motors will soft-ramp between speeds to lessen the acoustics due to sudden speed changes. Motors can be operated at three speeds or with a field-supplied variable speed controller. The motor will choose the highest speed if there are simultaneous/conflicting speed requests.
    b. All motors have integral thermal overload protection with a maximum ambient operating temperature of 104°F and are permanently lubricated. Motors are capable of starting at 50 percent of rated voltage and

operating at 90 percent of rated voltage on all speed settings. Motors can operate up to 10 percent over voltage.

E. COILS

1. Hydronic heating coil shall be factory-installed and consist of aluminum plated fins and seamless copper tubes. Coils shall be constructed with 144 aluminum-plated fins per foot (.305 m). The 3/8 inch OD tubes shall be mechanically expanded into the fin collars. Coils shall be burst tested at 450 psi (air) and leak tested at 100 psi (air under water). Coil connections shall be 5/8 inch OD copper tubing.

F. PIPING PACKAGES

1. Provide complete factory-assembled, installed piping package. All packages shall be leak tested under water at 300 psig piping package. Bleed lines or ports will not be accepted. If piping package is shipped loose, the contractor is responsible for installing, and leak testing the piping package, without any additional cost to the owner.
2. Deluxe Piping Package with Manual Circuit Setter: Shall include a union, strainer, P/T port, and shut-off ball valve on the supply line. The return line has a union, control valve, and manual circuit setter. Three-way packages have a balancing fitting on the bypass line.

2.03 CONTROLS

A. DDC CONTROLLER

1. Terminal unit manufacturer shall provide price for factory mounting, continuity check, calibrating, and testing of direct digital controls to the ATC contractor. Field mounted DDC controls are not acceptable.
    a. Each Air Terminal shown on the plans shall include a factory mounted, tested and wired Air Terminal Controller (ATC). Each ATC shall include a microprocessor based controller and shall be an integral part of the equipment. The controller shall be used as a stand-alone application or with a compatible building automation system.
    b. The controller shall be located in a control box containing line voltage to 24VAC transformer, ECM engine board, adapter board and disconnect switch (optional). The wires from the transformer shall be terminated in

the factory on the control board. All factory mounted end devices shall be installed with wires terminated on the control board.

c. The controller shall be factory installed, wired and tested with an Air-Fi Wireless Communications Interface (WCI) for wireless communications with a Building Automation System (BAS) and optionally with a wireless zone sensor.

2. Refer to the current installation operation programming guide (IOM) for all available configurations and control options.

2.04 SENSORS

A. Wireless Zone Temperature Sensor: Shall be factory supplied and work with any controller that accepts a 10k thermistor temperature input. The sensor shall senses zone temperature and other configurable functions, such as occupancy override, temperature setpoint, fan, and system interface.

PART 3 - EXECUTION

3.01 SHIPPING

A. Paper copies of the IOM shall also be shipped with each unit.

B. The manufacturer shall identify all shipments with the order number. Enough information shall be provided with each shipment to enable the Mechanical Contractor to confirm the receipt of units when they are received. For parts too small to mark individually, the manufacturer shall place them in containers.

C. After loading the equipment for shipment, the manufacturer shall contact the shipping contact on the order and provide the name of the carrier, description of equipment, order number, shipping point, and date of shipment.

3.02 EXAMINATION

A. Verify that surfaces are ready to receive work and opening dimensions are as indicated on the shop drawings and contract documents.

B. Mechanical contractor shall verify that the proper power supply is available prior to starting the fan.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide units with shut-off valve on supply and lockshield balancing valve on return piping if factory packages are not factory provided.

3.04 CLEANING

A. Clean work.

B. After construction is completed, including painting, clean exposed surfaces of units. Vacuum clean coils and inside of cabinets.

C. Ensure all shipping materials have been removed.

D. Install new filters.

END OF SECTION

DIVISION 23-HEATING, VENTILATION, & AIR-CONDITIONING

238239-ELECTRICAL CABINET HEATERS

Part 1 General

1.1 SECTION INCLUDES

A. Electric cabinet unit heaters.

1.2 RELATED SECTIONS

A. Division 23 Specifications - Motors.

B. Division 23 Specifications - Sequence Of Operation.

C. Division 26 Specifications - Equipment Wiring

1.3 REFERENCES

A. UL (Underwriters Laboratories Inc.).

1.4 SUBMITTALS FOR REVIEW

A. Division 01 through 21 Specifications: Submission procedures.

B. Product Data: Provide typical catalogue of information including arrangements.

C. Shop Drawings:

1. Indicate cross sections of cabinets, grilles, bracing and reinforcing, and typical elevations.
2. Submit schedules of equipment and enclosures typically indicating length and number of pieces of element and enclosure, corner pieces, end caps, cap strips, access doors, pilaster covers, and comparison of specified heat required to actual heat output provided.
3. Indicate mechanical and electrical service locations and requirements.

1.5 CLOSEOUT SUBMITTALS

A. Section 01 78 10: Submission procedures.

B. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listings.

C. Warranty Documentation: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

D. Record Documentation: Record actual locations of components and locations of access doors in radiation cabinets required for access or valving.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum [thirty (30)] years [documented] experience.

1.7 REGULATORY REQUIREMENTS

A. Products Requiring Electrical Connection: Listed and classified by UL as suitable for the purpose specified and indicated.

1.8 WARRANTY

A. Section 01 78 10: Warranties.

B. Provide five (5) year manufacturer's warranty.

Part 2 Products

2.1 CEILING FAN HEATERS

A. Manufacturers:

1. Stelpro; Model ACF.
2. Substitutions: Refer to Section 01 62 00.

B. Assembly: built-in listed and labelled assembly with terminal box and cover, and controls.

C. Heating Elements: Instant-heating, nichrome, open type.

D. Cabinet: Epoxy polyester powder coat finish, with fixed louvres.

1. Material: 20 gauge steel cabinet, with 18 gauge steel grille.
2. Size: 8 inch x 17 inch nominal.

E. Mounting: Recessed to ceiling.

F. Fan: Direct drive axial type, statically and dynamically balanced.

G. Motor: Permanently lubricated, totally enclosed sleeve bearing type.

H. Control: Factory wired switches installed behind cover. Provide easy access junction box.

1. Thermostat: By others
2. Thermal overload protection, automatic reset, with pilot light showing activation.
3. 24v Control voltage.

I. Electrical Characteristics:

1. Capacity: As scheduled.
2. Control circuit: 24 VAC, single phase, 60 Hz.
3. Power: 480 volts, single phase, 60 Hz.
4. Refer to Section 26 05 80.

J. Accessories:

1. Built-in factory wired disconnect switch.

2.2 CABINET HEATERS

A. Manufacturers:

1. Stelpro
2. Or Approved Equivalent

B. Assembly: listed and labelled assembly with terminal box and cover, and controls.

C. Heating Elements: Instant-heating, nichrome, open type.

D. Cabinet: Epoxy polyester powder coat finish, [color by architect] with fixed louvres. Field-adaptable airflow configurations.

1. Material: 18 gauge satin coat steel, 16 gauge front panel.
2. Width: 24 inch.
3. Back panel: Factory finished, with knockouts.

E. Mounting: Floor mounted w/subbase.

F. Element Hangers: Steel, porcelain enamelled.

G. Fan: Direct drive centrifugal type, statically and dynamically balanced.

H. Motor: 50 W, 1/15 hp size, permanently lubricated, totally enclosed sleeve bearing type.

I. Outside Air: Provide factory mounted outside air inlet collar with motorized damper. Damper to close when unit is not running. Outside air inlet to be sized to provide scheduled outside air amount. 0-100% adjustable outside air dampers will not be acceptable.

J. Control: Factory wired switches installed behind cover. Provide easy access junction box.

1. Optional Disconnect Switch: Factory mounted.
2. Thermal overload protection, automatic reset.

K. Electrical Characteristics:

1. Capacity: As per schedule
2. Control circuit: 24 VAC for stats by others.
3. Power: 480 volts, three-phase, 60 Hz.
4. Refer to Division 26 Specifications.

L. Accessories:

1. Built-in factory wired disconnect switch.
2. Recessed mounting frame

Part 3 Execution

3.1 INSTALLATION

A. Install equipment exposed to finished areas after walls and ceiling are finished and painted. Avoid damage.

B. Protection: Provide finished cabinet units with protective covers during balance of construction.

C. Install electric heating equipment including devices provided by manufacturer but not factory-mounted. Provide copy of manufacturer's wiring diagram submittal. Install electrical wiring to manufacturer's submittals and Section 26 05 80.

3.2 CLEANING

A. Division 01 Specifications: Cleaning installed work.

B. After construction is completed, including painting, clean exposed surfaces of units. Vacuum clean coils and inside of cabinets.

C. Touch-up marred or scratched surfaces of factory-finished cabinets, using finish materials provided by manufacturer.

END OF SECTION

DIVISION 23-HEATING, VENTILATION, & AIR CONDITIONING

239800- SYSTEM CONTROLLER

PART 1-GENERAL

1.0 BUILDING AUTOMATION SYSTEM - GENERAL DESCRIPTION

A. Provide a new Building Automation System (BAS) to integrate and control all mechanical equipment associated with this project.

1. The Building Automation System shall be as indicated on the drawings and described in these specifications. System must be fully integrated and coordinated with mechanical equipment DDC controllers furnished and installed in the equipment manufacturer's factory as specified in those sections. The intent of the BAS is to integrate all mechanical equipment into one system for global monitoring, control, and alarming associated with the building. It is the BAS manufacturer's responsibility to provide all the design, engineering, and field coordination required to ensure all equipment sequence of operations are met as specified and the designated BAS operators have the capability of managing the building mechanical system to ensure occupant comfort while maintaining energy efficiency.

2. The BAS shall meet open standard protocol communication standards (As defined in System Communications Section) to ensure the system maintains "interoperability" to avoid proprietary arrangements that will make it difficult for the Owner to consider other BAS manufacturers in future projects.

3. Direct Digital Control (DDC) technology shall be used to provide the functions necessary for control of mechanical systems and terminal devices on this project.

4. Approved vendors, products and web services shall comply with SOC2 Type I as defined by the AICPA. SOC2 Type 1 compliance is a certification that confirms that a service provider has established and implemented effective controls to secure their clients' data in accordance with the Trust Services Criteria (TSC).

a. SOC2 Type 1 compliance provides assurance to customers that the service provider has established and implemented effective security controls and is committed to protecting their data.

b. To achieve SOC2 Type 1 compliance, the manufacturer shall have completed an independent audit to assess design and implementation of their controls, policies, and procedures.

5. The BAS shall accommodate simultaneous multiple user operation. Access to the control system data should be limited only by the security permissions of the operator role. Multiple users shall have access to all valid system data. An operator shall be able to log onto any workstation on the control system and have access to all appropriate data.

1.1 APPROVED CONTROL SYSTEM MANUFACTURERS

A. Approved BAS Manufacturers:

1. Trane Tracer®– Basis of Design

1.2 SYSTEM COMMUNICATION

A. System Communications

1. Each workstation, building controller, and equipment controller communication interface shall utilize the BACnet™ protocol with an Ethernet (IEEE 802.3), Wi-Fi (IEEE 802.11), RS485 (EIA-485), or Zigbee® (802.15.4) physical interface and an appropriate data link technology as defined in ANSI®/ASHRAE® Standard 135-2012. (e.g. BACnet over IP, BACnet over IPv6, BACnet SC, BACnet over MS/TP, BACnet Zigbee).

2. All system controllers shall be BTL listed as a BACnet Building Controller (B-BC) as defined in ANSI®/ASHRAE® Standard 135-2012.

3. All documented status and control points, schedule, alarm, and data-log services or objects shall be available as standard object types as defined in ANSI®/ASHRAE® Standard 135-2012.

4. Each System Controller shall communicate with a network of Custom Application and Application Specific Controllers utilizing one or more of the interfaces documented within Field Bus Communications below.

5. All Operator Workstations (B-OWS, B-AWS) and Building Controllers (B-BC) shall support BACnet Secure Connect (BACnet SC), a secure and encrypted datalink layer specifically designed for those networks.

B. Field Bus Communications

1. BACnet™

a. All equipment and plant controllers shall be BTL listed as a BACnet Application Specific Controller (B-ASC) or a BACnet Advanced Application Controller (B-AAC) as defined in ANSI®/ASHRAE® Standard 135-2012.

b. All communication shall conform to ANSI®/ASHRAE® Standard 135-2012.

c. System Controller shall function as a BACnet router to each unit controller providing a globally unique BACnet Device ID for all BACnet controllers within the system.

d. BACnet Zigbee®

1) Communication between System Controller and equipment/plant controllers shall utilize BACnet Zigbee as defined in ANSI®/ASHRAE® Standard 135-2012.

2) Each equipment controller wireless communication interface shall self-heal to maintain operation in the event of network communication failure.

3) Each zone sensor wireless communication interface shall be capable of many-to-one sensors per controller to support averaging, monitoring, and multiple zone applications. Sensing options shall include temperature, relative humidity, CO2, and occupancy.

e. BACnet MS/TP

1) Communication between System Controller and equipment/plant controllers shall utilize BACnet MS/TP as defined in ANSI®/ASHRAE® Standard 135-2012.

2. The VRF indoor equipment shall support wireless zone sensors. Sensing options shall include temperature, relative humidity, CO2, and occupancy. Each zone sensor wireless communication interface shall be capable of many-to-one sensors per controller to support averaging, monitoring, and multiple zone applications.

1.3 OPERATOR INTERFACE

A. Provide Building Operator Web Interface

1. Manufacturer shall provide a user interface with time-of-day schedules, data collection, dashboards, reports and building summary, system applications, and self-expiring timed overrides. Manufacturer shall provide a published user and applications guide(s) that detail the system application operation, configuration, setup and troubleshooting.

2. The building operator web interface shall be accessible via a web browser without requiring any “plug-ins” (i.e. JAVA Runtime Environment (JRE), Adobe Flash).

3. User Roles

a. The system shall include pre-defined “roles” that allow a system administrator to quickly assign permissions to a user.

b. User logon/logoff attempts shall be recorded.

c. The system shall protect itself from unauthorized use by automatically logging off following the last keystroke. The delay time shall be user definable.

4. On-Line Help and Training

a. Provide a context sensitive, on line help system to assist the operator in operation and configuration of the system.

b. On-line help shall be available for all system functions and shall provide the relevant data for each particular screen.

5. Equipment and Application Pages

a. The building operator web interface shall include standard pages for all equipment and applications. These pages shall allow an operator to obtain information relevant to the operation of the equipment and/or application, including:

1) Animated Equipment Graphics for each major piece of equipment and floor plan in the System. This includes:

a) Each Chiller, Air Handler, VAV Terminal, Fan Coil, Boiler, and Cooling Tower. These graphics shall show all points dynamically as specified in the points list.

b) Animation capabilities shall include the ability to show a sequence of images reflecting the position of analog outputs, such as valve or damper positions. Graphics shall be capable of launching other web pages.

2) Alarms relevant to the equipment or application without requiring a user to navigate to an alarm page and perform a filter.

3) Historical Data (As defined in Trend Logs section of CONTROLLER SOFTWARE) for the equipment or application without requiring a user to navigate to a Data Log page and perform a filter.

6. System Graphics. Building operator web interface shall be graphically based and shall include at least one graphic per piece of equipment or occupied zone, graphics for each chilled water and hot water system, and graphics that summarize conditions on each floor of each building area included in this contract. Indicate thermal comfort on floor plan summary graphics using colors to represent zone temperature relative to zone set point.

a. Graphic imagery – graphics shall use 3D images for all standard and custom graphics. The only allowable exceptions will be photo images, maps, schematic drawings, and selected floor plans.

b. Animation. Graphics shall be able to animate by displaying different Image lies for changed object status.

c. Alarm Indication. Indicate areas or equipment in an alarm condition using color or other visual indicator.

7. Graphics Library. Furnish a library of standard HVAC equipment such as chillers, air handlers, terminals, fan coils, unit ventilators, rooftop units, and VAV boxes, in 3-dimensional graphic depictions. The library shall be furnished in a file format compatible with the graphics generation package program.

8. Manual Control and Override

a. Point Control. Provide a method for a user to view, override, and edit if applicable, the status of any object and property in the system. The point status shall be available by menu, on graphics or through custom programs.

b. Temporary Overrides. The user shall be able to perform a temporary override wherever an override is allowed, automatically removing the override after a specified period of time.

c. Override Owners. The system shall convey to the user the owner of each override for all priorities that an override exists.

d. Provide a specific icon to show timed override or operator override, when a point, unit controller or application has been overridden manually.

9. Scheduling. - The scheduling application shall provide graphical representation of the day, week, month and exception events.

10. Alarm/Event Notification

a. Alarm/Event Log. The operator shall be able to view all logged system alarms/events from any building operator web interface.

1) The operator shall be able to sort and filter alarms from events. Alarms shall be sorted in a minimum of 4 categories based on severity.

2) The operator shall be able to acknowledge and add comments to alarms

3) Alarm/event messages shall use full language, easily recognized descriptors.

b. Alarm Suppression. Alarms shall be able to be suppressed based on load/source relationships to present the likely root cause to the building operator as described in ASHRAE Guideline 36. Load/Source relationships shall be configurable by the user through a web interface.

11. Reports and Logs.

a. The building operator web interface shall provide a reporting package that allows the operator to select reports.

b. The building operator web interface shall provide the ability to schedule reports to run at specified intervals of time.

c. The following standard reports shall be available without requiring a user to manually configure the report:

1) All Points in Alarm Report: Provide an on demand report showing all current alarms.

2) All Points in Override Report: Provide an on demand report showing all overrides in effect.

3) Commissioning Report: Provide a one-time report that lists all equipment with the unit configuration and present operation.

4) Points report: Provide a report that lists the current value of all points

d. The controls vendor shall provide a hardening report that summarizes the port configuration details to ensure sites have not been exposed to the Internet in alignment with Cyber Security best practices.

B. Provide Mobile App Interface

1. Provide mobile (smart phone or tablet) interfaces to the building automation system, compatible with iOS and Android™ operating systems.

2. Controls manufacturer shall provide a phone/tablet interface with the ability to view/override status and setpoints, view/change schedules, view/acknowledge/comment on alarms, and view graphics for all spaces and equipment.

3. This phone/tablet interface shall resize itself appropriately for the size of the interface (i.e. no "pinching and zooming" required).

4. This phone/tablet interface shall function remotely from the facility while following IT security best practices (e.g. no ports exposed to the internet).

5. The operator interface shall support system access on a mobile device via a mobile app to:

a. Alarm log

b. System Status

c. Equipment status

d. Space Status

e. Standard Equipment graphics

f. Override set points

g. Override occupancy

h. Acknowledge Alarms

i. Add Comment(s) to Alarms

1.4 BUILDING / SYSTEM CONTROLLERS

A. There shall be one or more independent, standalone microprocessor based System Controllers to manage the global strategies described in CONTROLLER SOFTWARE section.

1. The controller shall provide a USB communications port for connection to a PC.

2. The operating system of the Controller shall manage the input and output communications signals to allow distributed controllers to share real and virtual point information and allow central monitoring and alarms.

3. All System Controllers shall have a real time clock and shall be able to accept a BACnet time synchronization command for automatic time synchronization.

4. Data shall be shared between networked System Controllers.

5. Serviceability – The System Controller shall have a display on the main board that indicates the current operating mode of the controller.

B. Controls manufacturer shall provide secure remote access to the Building Automation System (BAS). Secure remote access shall not require IP ports to be "exposed" (i.e. port-forwarded or external public IP addresses) to the Internet. Controls manufacturer shall update secure remote access software as necessary to follow cyber security best practices and respond to cyber security events.

1.5 BUILDING CONTROLLER SOFTWARE

A. Manufacturer shall provide standard applications to deliver HVAC system control. Standard applications include Time of Day Scheduling with Optimal Start/Stop, VAV Air Systems Control, Chiller Plant Control, Historical Trend Logs and Trim and Respond. Manufacturer shall provide system optimization strategies for functions such as fan pressure optimization and ventilation optimization.

1. Trend Logs

a. The system shall harvest trend logs for defined key measurements for each controlled HVAC device and HVAC application. Trend logs shall be captured for a minimum of 5 key operating points for each piece of HVAC equipment and HVAC application and stored for no less than 1 year at 15-minute intervals. Data Logs shall be capable of being configured on an interval or change of value basis.

1) Fan Coil

a) Discharge Air Temperature

b) Space Temperature Active

c) Space Temperature Setpoint Active

d) Air Flow Setpoint Active

e) Discharge Air Flow

2) Water Source Heat Pump

a) Discharge Air Temperature

b) Space Temperature Active

c) Space Temperature Setpoint Active

d) Air Flow Setpoint Active

e) Discharge Air Flow

3) Air Handling Unit/Rooftop (VAV)

a) Discharge Air Temperature

b) Discharge Air Temperature Setpoint Active

c) Space Temperature Active

d) Cooling Capacity Status

e) Discharge Air Flow

4) Air Handling Unit/Rooftop (CV)

a) Discharge Air Temperature

b) Space Temperature Active

c) Space Temperature Setpoint Active

d) Cooling Capacity Status

e) Heating Capacity Primary Status

f) Outdoor Air Damper Position

5) VAV Box

a) Discharge Air Temperature

b) Space Temperature Active

c) Space Temperature Setpoint Active

d) Air Flow Setpoint Active

e) Discharge Air Flow

PART 2-PRODUCTS

(Not Applicable)

PART 3-EXECUTION

(Not Applicable)

END OF SECTION

DIVISION 23-HEATING, VENTILATION, & AIR CONDITIONING
239808-MIDDLE SCHOOL SEQUENCE OF OPERATIONS

PART 1-GENERAL

1.01 Applicable Sections

A. Specification *239800-System Controller*

PART 2-PRODUCTS

2.01 Applicable Sections

A. Specification *239800-System Controller*

2.02 Acceptable Manufacturers

A. Trane Tracer BMS System or Factory-Authorized Trane Tracer BMS Control Systems Dealer & Installer.

B. **Owner shall be purchasing Trane Tracer Control BMS System directly from Trane Company.**

PART 3-EXECUTION

3.01 Equipment General Controls Sequences

A. New Hydronic Cabinet Unit Heaters-Area "A" (CH-RM 42, CH-RM T6, CH-RM T5, CH-RM 59, CH-RM 58)

1. Occupied Hours (Heating)
    a. During occupied hours, the new (CH-RM 42, CH-RM T6, CH-RM T5, CH-RM 59, CH-RM 58) shall be enabled:
        i. New (CH-RM 42, CH-RM T6, CH-RM T5, CH-RM 59, CH-RM 58) Supply fan shall be enabled.
        ii. For New (CH-RM 42, CH-RM T6, CH-RM T5, CH-RM 59, CH-RM 58), the New three-way modulating DDC hot water control valve shall modulate the supply air discharge temperature based on a New DDC room thermostat (72 F adjust)

    b. In the event that New (CH-RM 42, CH-RM T6, CH-RM T5, CH-RM 59, CH-RM 58) has a command to enable either the supply air fan, hot water control valve, & return air damper positions and is still disabled an alarm will be displayed on the BMS.
    c. Heating shall be enabled when outside air temperature is 65 deg F (adj) & below.
2. Unoccupied Hours (Heating)
    a. During unoccupied hours, (CH-RM 42, CH-RM T6, CH-RM T5, CH-RM 59, CH-RM 58) shall be enabled:
        i. Supply fan shall be enabled.
        ii. Return air damper shall be 100% open.
        iii. New 3-way DDC modulating hot water control valve shall modulate the supply air discharge temperature based on a New DDC room thermostat (60 F adjust).

B. <u>New Hydronic Cabinet Unit Heaters-Area "B" (CH-RM 40B, CH-RM 40C, CH-RM 40D, CH-RM 40-1, CH-RM 40-2, CH-RM 45-1, CH-RM 45-2, CH-RM 45B, CH-RM 44, CH-RM 44B, CH-RM 41B, CH-RM 38, CH-RM 37B, CH-RM 37C, CH-RM 37D, CH-RM 37-1, CH-RM 37-2)</u>

1. Occupied Hours (Heating)
    a. During occupied hours, the new (CH-RM 40B, CH-RM 40C, CH-RM 40D, CH-RM 40-1, CH-RM 40-2, CH-RM 45-1, CH-RM 45-2, CH-RM 45B, CH-RM 44, CH-RM 44B, CH-RM 41B, CH-RM 38, CH-RM 37B, CH-RM 37C, CH-RM 37D, CH-RM 37-1, CH-RM 37-2) shall be enabled:
        i. New (CH-RM 40B, CH-RM 40C, CH-RM 40D, CH-RM 40-1, CH-RM 40-2, CH-RM 45-1, CH-RM 45-2, CH-RM 45B, CH-RM 44, CH-RM 44B, CH-RM 41B, CH-RM 38, CH-RM 37B, CH-RM 37C, CH-RM 37D, CH-RM 37-1, CH-RM 37-2) Supply fan shall be enabled.
        ii. For New (CH-RM 40B, CH-RM 40C, CH-RM 40D, CH-RM 40-1, CH-RM 40-2, CH-RM 45-1, CH-RM 45-2, CH-RM 45B, CH-RM 44, CH-RM 44B, CH-RM 41B, CH-RM 38, CH-RM 37B, CH-RM 37C, CH-RM 37D, CH-RM 37-1, CH-RM 37-2), the New three-way modulating DDC hot water control valve shall modulate the supply air discharge temperature based on a New DDC room thermostat (72 F adjust)

    b. In the event that New (CH-RM 40B, CH-RM 40C, CH-RM 40D, CH-RM 40-1, CH-RM 40-2, CH-RM 45-1, CH-RM 45-2, CH-RM 45B, CH-RM 44, CH-RM 44B, CH-RM 41B, CH-RM 38, CH-RM 37B, CH-RM 37C, CH-RM 37D, CH-RM 37-1, CH-RM 37-2) has a command to enable either the supply air fan, hot water control valve, & return air damper positions and is still disabled an alarm will be displayed on the BMS.
    c. Heating shall be enabled when outside air temperature is 65 deg F (adj) & below.
2. Unoccupied Hours (Heating)
    a. During unoccupied hours, (CH-RM 40B, CH-RM 40C, CH-RM 40D, CH-RM 40-1, CH-RM 40-2, CH-RM 45-1, CH-RM 45-2, CH-RM 45B, CH-RM 44, CH-RM 44B, CH-RM 41B, CH-RM 38, CH-RM 37B, CH-RM 37C, CH-RM 37D, CH-RM 37-1, CH-RM 37-2) shall be enabled:
        i. Supply fan shall be enabled.
        ii. Return air damper shall be 100% open.
        iii. New 3-way DDC modulating hot water control valve shall modulate the supply air discharge temperature based on a New DDC room thermostat (60 F adjust).

C. <u>New Hydronic Cabinet Unit Heaters-Area "C" (CH-RM 19, CH-RM 18, CH-RM T4, CH-RM T3)</u>

1. Occupied Hours (Heating)

a. During occupied hours, the new (CH-RM 19, CH-RM 18, CH-RM T4, CH-RM T3) shall be enabled:
    i. New (CH-RM 19, CH-RM 18, CH-RM T4, CH-RM T3) Supply fan shall be enabled.
    ii. For New (CH-RM 19, CH-RM 18, CH-RM T4, CH-RM T3), the New three-way modulating DDC hot water control valve shall modulate the supply air discharge temperature based on a New DDC room thermostat (72 F adjust)

b. In the event that New (CH-RM 19, CH-RM 18, CH-RM T4, CH-RM T3) has a command to enable either the supply air fan, hot water control valve, & return air damper positions and is still disabled an alarm will be displayed on the BMS.

c. Heating shall be enabled when outside air temperature is 65 deg F (adj) & below.

2. Unoccupied Hours (Heating)
    a. During unoccupied hours, (CH-RM 19, CH-RM 18, CH-RM T4, CH-RM T3) shall be enabled:
        i. Supply fan shall be enabled.
        ii. Return air damper shall be 100% open.
        iii. New 3-way DDC modulating hot water control valve shall modulate the supply air discharge temperature based on a New DDC room thermostat (60 F adjust).

D. <u>New Hydronic Cabinet Unit Heaters-Area "D" (CH-RM 59, CH-RM 61, CH-RM 15, CH-RM 13, CH-RM 12A, CH-RM 16-1, CH-RM 16-2, CH-RM 16E, 12F, CH-RM 12, CH-RM 13C, CH-RM 11B, CH-RM 11)</u>

1. Occupied Hours (Heating)
    a. During occupied hours, the new (CH-RM 59, CH-RM 61, CH-RM 15, CH-RM 13, CH-RM 12A, CH-RM 16-1, CH-RM 16-2, CH-RM 16E, 12F, CH-RM 12, CH-RM 13C, CH-RM 11B, CH-RM 11) shall be enabled:
        i. New (CH-RM 59, CH-RM 61, CH-RM 15, CH-RM 13, CH-RM 12A, CH-RM 16-1, CH-RM 16-2, CH-RM 16E, 12F, CH-RM 12, CH-RM 13C, CH-RM 11B, CH-RM 11) Supply fan shall be enabled.
        ii. For New (CH-RM 59, CH-RM 61, CH-RM 15, CH-RM 13, CH-RM 12A, CH-RM 16-1, CH-RM 16-2, CH-RM 16E, 12F, CH-RM 12, CH-RM 13C, CH-RM 11B, CH-RM 11), the New three-way modulating DDC hot water control valve shall modulate the supply air discharge temperature based on a New DDC room thermostat (72 F adjust)

b. In the event that New (CH-RM 19, CH-RM 18, CH-RM T4, CH-RM T3) has a command to enable either the supply air fan, hot water control valve, & return air damper positions and is still disabled an alarm will be displayed on the BMS.
c. Heating shall be enabled when outside air temperature is 65 deg F (adj) & below.

2. Unoccupied Hours (Heating)
    a. During unoccupied hours, (CH-RM 59, CH-RM 61, CH-RM 15, CH-RM 13, CH-RM 12A, CH-RM 16-1, CH-RM 16-2, CH-RM 16E, 12F, CH-RM 12, CH-RM 13C, CH-RM 11B, CH-RM 11) shall be enabled:
        i. Supply fan shall be enabled.
        ii. Return air damper shall be 100% open.
        iii. New 3-way DDC modulating hot water control valve shall modulate the supply air discharge temperature based on a New DDC room thermostat (60 F adjust).

E. <u>New Hydronic Cabinet Unit Heaters-Area "E" (CH-RM 2-1, CH-RM 2-2, CH-RM 2-3, CH-RM 2-4, CH-RM 39)</u>

1. Occupied Hours (Heating)
    a. During occupied hours, the new (CH-RM 2-1, CH-RM 2-2, CH-RM 2-3, CH-RM 2-4, CH-RM 39) shall be enabled:
        i. New (CH-RM 2-1, CH-RM 2-2, CH-RM 2-3, CH-RM 2-4, CH-RM 39) Supply fan shall be enabled.
        ii. For New (CH-RM 2-1, CH-RM 2-2, CH-RM 2-3, CH-RM 2-4, CH-RM 39), the New three-way modulating DDC hot water control valve shall modulate the supply air discharge temperature based on a New DDC room thermostat (72 F adjust)

    b. In the event that New (CH-RM 2-1, CH-RM 2-2, CH-RM 2-3, CH-RM 2-4, CH-RM 39) has a command to enable either the supply air fan, hot water control valve, & return air damper positions and is still disabled an alarm will be displayed on the BMS.
    c. Heating shall be enabled when outside air temperature is 65 deg F (adj) & below.
2. Unoccupied Hours (Heating)
    a. During unoccupied hours, (CH-RM 2-1, CH-RM 2-2, CH-RM 2-3, CH-RM 2-4, CH-RM 39) shall be enabled:
        i. Supply fan shall be enabled.
        ii. Return air damper shall be 100% open.
        iii. New 3-way DDC modulating hot water control valve shall modulate the supply air discharge

temperature based on a New DDC room thermostat (60 F adjust).

F. <u>New Hydronic Cabinet Unit Heaters-Area "F" (CH-RM T1, CH-RM T2, CH-RM 03, CH-RM 01A, CH-RM 4A, CH-RM 4B, CH-RM 4D, CH-RM B1, CH-RM 01)</u>

1. Occupied Hours (Heating)
    a. During occupied hours, the new (CH-RM T1, CH-RM T2, CH-RM 03, CH-RM 01A, CH-RM 4A, CH-RM 4B, CH-RM 4D, CH-RM B1, CH-RM 01) shall be enabled:
        i. New (CH-RM T1, CH-RM T2, CH-RM 03, CH-RM 01A, CH-RM 4A, CH-RM 4B, CH-RM 4D, CH-RM B1, CH-RM 01) Supply fan shall be enabled.
        ii. For New (CH-RM T1, CH-RM T2, CH-RM 03, CH-RM 01A, CH-RM 4A, CH-RM 4B, CH-RM 4D, CH-RM B1, CH-RM 01), the New three-way modulating DDC hot water control valve shall modulate the supply air discharge temperature based on a New DDC room thermostat (72 F adjust)

    b. In the event that New (CH-RM T1, CH-RM T2, CH-RM 03, CH-RM 01A, CH-RM 4A, CH-RM 4B, CH-RM 4D, CH-RM B1, CH-RM 01) has a command to enable either the supply air fan, hot water control valve, & return air damper positions and is still disabled an alarm will be displayed on the BMS.
    c. Heating shall be enabled when outside air temperature is 65 deg F (adj) & below.
2. Unoccupied Hours (Heating)
    a. During unoccupied hours, (CH-RM T1, CH-RM T2, CH-RM 03, CH-RM 01A, CH-RM 4A, CH-RM 4B, CH-RM 4D, CH-RM B1, CH-RM 01) shall be enabled:
        i. Supply fan shall be enabled.
        ii. Return air damper shall be 100% open.
        iii. New 3-way DDC modulating hot water control valve shall modulate the supply air discharge temperature based on a New DDC room thermostat (60 F adjust).

<u>New Hydronic Cabinet Unit Heaters-Control Points:</u>

1. New Unit Supply Fan Start-DI, DO
2. New Unit Supply Fan Stop-DI, DO
3. New Unit Supply Fan Alarm-DO
4. Return Air Damper Position-AI, AO
5. Hot Water Control Valve % Open-AI, AO
6. Return Air Temperature-AO
7. Supply Air Discharge Temperature-AO

G. New Hot Water Fin Tube (FT-A, FT-B, FT-C, FT-D, FT-E, FT-F)

1. Occupied Hours (Heating)
    a. During occupied hours, the new (FT-A, FT-B, FT-C, FT-D, FT-E, FT-F) shall be enabled:
        i. For New (FT-A, FT-B, FT-C, FT-D, FT-E, FT-F), the New two-way modulating DDC hot water control valve shall modulate the fin tube element output based on a new DDC room thermostat (72 F adjust)

    b. In the event that (FT-A, FT-B, FT-C, FT-D, FT-E, FT-F) has a command to enable the hot water control valve and is still disabled, an alarm will be displayed on the BMS.
    c. Heating shall be enabled when outside air temperature is 65 deg F (adj) & below.
2. Unoccupied Hours (Heating)
    a. During unoccupied hours, (FT-A, FT-B, FT-C, FT-D, FT-E, FT-F) shall be enabled:
        i. New 2-way DDC modulating hot water control valve shall modulate the fin tube element output based on a new DDC room thermostat (60 F adjust).

New Hot Water Fin Tube -Control Points:

1. Hot Water Control Valve % Open-AI, AO
2. Room Temperature-AI, AO

H. New Electrical Unit Heaters-Area "A" (ECH-VESTIBULE A1, ECH-JC T6B, ECH-VESTIBULE B1)

1. Occupied Hours (Heating)
    a. During occupied hours, the New (ECH-VESTIBULE A1, ECH-JC T6B, ECH-VESTIBULE B1) shall be enabled:
        i. New (ECH-VESTIBULE A1, ECH-JC T6B, ECH-VESTIBULE B1) Supply fan shall be enabled.
        ii. For New (ECH-VESTIBULE A1, ECH-JC T6B, ECH-VESTIBULE B1), the New electrical heating coil element shall modulate the supply air discharge temperature based on a New DDC room thermostat to meet room setpoint (72 F adjust)

    b. In the event that New (ECH-VESTIBULE A1, ECH-JC T6B, ECH-VESTIBULE B1) has a command to enable either the supply air fan, enable electrical heating

coil element, & return air damper positions and is still disabled an alarm will be displayed on the BMS.

c. Heating shall be enabled when outside air temperature is 65 deg F (adj) & below.

2. Unoccupied Hours (Heating)
    a. During unoccupied hours, (ECH-VESTIBULE A1, ECH-JC T6B, ECH-VESTIBULE B1) shall be enabled:
        i. Supply fan shall be enabled.
        ii. Return air damper shall be 100% open.
        iii. New electrical heating coil element shall modulate the supply air discharge temperature based on an New DDC room thermostat to meet room temperature setpoint (60 F adjust).

I. <u>New Electrical Unit Heaters-Area "B" (ECH-PASSAGE 40E, ECH-PE OFFICE TOILET 40B, ECH-PE OFFICE STORAGE 40B, ECH-PASSAGE 37E, ECH-PE OFFICE TOILET 37B, ECH-PE OFFICE STORAGE 37B, ECH-WOMEN TOILET 95, ECH-MEN TOILET 96)</u>

1. Occupied Hours (Heating)
    a. During occupied hours, the New (ECH-PASSAGE 40E, ECH-PE OFFICE TOILET 40B, ECH-PE OFFICE STORAGE 40B, ECH-PASSAGE 37E, ECH-PE OFFICE TOILET 37B, ECH-PE OFFICE STORAGE 37B, ECH-WOMEN TOILET 95, ECH-MEN TOILET 96) shall be enabled:
        i. New (ECH-PASSAGE 40E, ECH-PE OFFICE TOILET 40B, ECH-PE OFFICE STORAGE 40B, ECH-PASSAGE 37E, ECH-PE OFFICE TOILET 37B, ECH-PE OFFICE STORAGE 37B, ECH-WOMEN TOILET 95, ECH-MEN TOILET 96) Supply fan shall be enabled.
        ii. For New (ECH-PASSAGE 40E, ECH-PE OFFICE TOILET 40B, ECH-PE OFFICE STORAGE 40B, ECH-PASSAGE 37E, ECH-PE OFFICE TOILET 37B, ECH-PE OFFICE STORAGE 37B, ECH-WOMEN TOILET 95, ECH-MEN TOILET 96), the New electrical heating coil element shall modulate the supply air discharge temperature based on a New DDC room thermostat to meet room setpoint (72 F adjust)

    b. In the event that New (ECH-PASSAGE 40E, ECH-PE OFFICE TOILET 40B, ECH-PE OFFICE STORAGE 40B, ECH-PASSAGE 37E, ECH-PE OFFICE TOILET 37B, ECH-PE OFFICE STORAGE 37B, ECH-WOMEN TOILET 95, ECH-MEN TOILET 96) has a command to enable either the supply air fan, enable electrical heating coil element, & return air damper positions and is still disabled an alarm will be displayed on the BMS.
    c. Heating shall be enabled when outside air temperature is 65 deg F (adj) & below.
2. Unoccupied Hours (Heating)

a. During unoccupied hours, (ECH-PASSAGE 40E, ECH-PE OFFICE TOILET 40B, ECH-PE OFFICE STORAGE 40B, ECH-PASSAGE 37E, ECH-PE OFFICE TOILET 37B, ECH-PE OFFICE STORAGE 37B, ECH-WOMEN TOILET 95, ECH-MEN TOILET 96) shall be enabled:
    i. Supply fan shall be enabled.
    ii. Return air damper shall be 100% open.
    iii. New electrical heating coil element shall modulate the supply air discharge temperature based on an New DDC room thermostat to meet room temperature setpoint (60 F adjust).

J. <u>New Electrical Unit Heaters-Area "C" (ECH-WOMEN TOILET 56, ECH-MEN TOILET 57, ECH-ELEC ROOM 14)</u>

1. Occupied Hours (Heating)
    a. During occupied hours, the New (ECH-WOMEN TOILET 56, ECH-MEN TOILET 57, ECH-ELEC ROOM 14) shall be enabled:
        iii. New (ECH-WOMEN TOILET 56, ECH-MEN TOILET 57, ECH-ELEC ROOM 14) Supply fan shall be enabled.
        iv. For New (ECH-WOMEN TOILET 56, ECH-MEN TOILET 57, ECH-ELEC ROOM 14), the New electrical heating coil element shall modulate the supply air discharge temperature based on a New DDC room thermostat to meet room setpoint (72 F adjust)

    d. In the event that New (ECH-WOMEN TOILET 56, ECH-MEN TOILET 57, ECH-ELEC ROOM 14) has a command to enable either the supply air fan, enable electrical heating coil element, & return air damper positions and is still disabled an alarm will be displayed on the BMS.
    e. Heating shall be enabled when outside air temperature is 65 deg F (adj) & below.
2. Unoccupied Hours (Heating)
    a. During unoccupied hours, (ECH-WOMEN TOILET 56, ECH-MEN TOILET 57, ECH-ELEC ROOM 14) shall be enabled:
        i. Supply fan shall be enabled.
        ii. Return air damper shall be 100% open.
        iii. New electrical heating coil element shall modulate the supply air discharge temperature based on an New DDC room thermostat to meet room temperature setpoint (60 F adjust).

K. <u>New Electrical Unit Heaters-Area "D" (ECH-GYM WING VESTIBULE 39A, ECH-ELEC ROOM 15D)</u>

1. Occupied Hours (Heating)
    a. During occupied hours, the New (ECH-GYM WING VESTIBULE 39A, ECH-ELEC ROOM 15D) shall be enabled:
        i. New (ECH-GYM WING VESTIBULE 39A, ECH-ELEC ROOM 15D) Supply fan shall be enabled.
        ii. For New (ECH-GYM WING VESTIBULE 39A, ECH-ELEC ROOM 15D), the New electrical heating coil element shall modulate the supply air discharge temperature based on a New DDC room thermostat to meet room setpoint (72 F adjust)

    b. In the event that New (ECH-GYM WING VESTIBULE 39A, ECH-ELEC ROOM 15D) has a command to enable either the supply air fan, enable electrical heating coil element, & return air damper positions and is still disabled an alarm will be displayed on the BMS.
    c. Heating shall be enabled when outside air temperature is 65 deg F (adj) & below.
2. Unoccupied Hours (Heating)
    a. During unoccupied hours, (ECH-GYM WING VESTIBULE 39A, ECH-ELEC ROOM 15D) shall be enabled:
        i. Supply fan shall be enabled.
        ii. Return air damper shall be 100% open.
        iii. New electrical heating coil element shall modulate the supply air discharge temperature based on an New DDC room thermostat to meet room temperature setpoint (60 F adjust).

L. <u>New Electrical Unit Heaters-Area "E" (ECH-VEST E2, ECH-VEST E1)</u>

1. Occupied Hours (Heating)
    a. During occupied hours, the New (ECH-VEST E2, ECH-VEST E1) shall be enabled:
        i. New (ECH-VEST E2, ECH-VEST E1) Supply fan shall be enabled.
        ii. For New (ECH-VEST E2, ECH-VEST E1), the New electrical heating coil element shall modulate the supply air discharge temperature based on a New DDC room thermostat to meet room setpoint (72 F adjust)

    b. In the event that New (ECH-VEST E2, ECH-VEST E1) has a command to enable either the supply air fan, enable electrical heating coil element, &

return air damper positions and is still disabled an alarm will be displayed on the BMS.

c. Heating shall be enabled when outside air temperature is 65 deg F (adj) & below.

2. Unoccupied Hours (Heating)
    a. During unoccupied hours, (ECH-VEST E2, ECH-VEST E1) shall be enabled:
        i. Supply fan shall be enabled.
        ii. Return air damper shall be 100% open.
        iii. New electrical heating coil element shall modulate the supply air discharge temperature based on an New DDC room thermostat to meet room temperature setpoint (60 F adjust).

M. <u>New Electrical Unit Heaters-Area "F" (ECH-VEST E1, ECH-JC 7)</u>

1. Occupied Hours (Heating)
    a. During occupied hours, the New (ECH-VEST E1, ECH-JC 7) shall be enabled:
        i. New (ECH-VEST E1, ECH-JC 7) Supply fan shall be enabled.
        ii. For New (ECH-VEST E1, ECH-JC 7), the New electrical heating coil element shall modulate the supply air discharge temperature based on a New DDC room thermostat to meet room setpoint (72 F adjust)

    b. In the event that New (ECH-VEST E1, ECH-JC 7) has a command to enable either the supply air fan, enable electrical heating coil element, & return air damper positions and is still disabled an alarm will be displayed on the BMS.

    c. Heating shall be enabled when outside air temperature is 65 deg F (adj) & below.

2. Unoccupied Hours (Heating)
    a. During unoccupied hours, (ECH-VEST E1, ECH-JC 7) shall be enabled:
        i. Supply fan shall be enabled.
        ii. Return air damper shall be 100% open.
        iii. New electrical heating coil element shall modulate the supply air discharge temperature based on an New DDC room thermostat to meet room temperature setpoint (60 F adjust).

<u>New Electrical Cabinet Heaters-Control Points:</u>

1. New Unit Supply Fan Start-DI, DO
2. New Unit Supply Fan Stop-DI, DO
3. New Unit Supply Fan Alarm-DO
4. Return Air Damper Position-AI, AO
5. Outside Air Damper Position-AI, AO
6. Electrical Heating Element Enable/Disable-AI, AO
7. Return Air Temperature-AO
8. Supply Air Discharge Temperature-AO

O. Rooftop Units with Energy Recovery, Direct-Expansion Cooling, Hot Gas Reheat, and Propylene Glycol RTU Hot Water Coil (RTU-BAND ROOM, RTU-AUDITORIUM-STAGE)

1. General
    a. The Contractor shall provide, install, wire the following for each RTU: Wall Temperature and RH sensor, 8' averaging discharge air sensor, 8' averaging mixed air sensor, current relay wired to monitor the supply fan, fail-safe, normally closed outside air damper actuator, fail-safe, normally open, modulating heating control valve.
    b. The ATC contractor will provide and install a freeze-stat, wired to shut of the supply and exhaust fan in all positions of the H-O-A switch. Manual reset of the freezestat is required. As an added feature, the DDC controller will use the discharge air sensor to detect a potential freezing condition. The set point will be 5° higher than the set point of the freeze-stat. If such a condition occurs, the outside air damper shall close, the fans will shut down, the heating valve shall open, and an alarm generated at the DDC front-end.
    c. Whenever the unit's supply fan is off, the outside air damper shall be fully closed.
    d. Occupied/unoccupied cycle determination will be made via the BMS front-end.
    e. All setpoints will be adjustable from the BMS front-end.
2. Occupied Hours (Cooling Mode)
    a. During occupied hours, RTU shall be enabled:
        i. The supply fan shall run continuously.
        ii. Once the fan is proven running, the Outside air damper shall open to minimum outside air position and the Return air damper shall open to a percentage based on (100% open – Minimum Outside Air Damper Position %)
        iii. DX Cooling stage(s) shall be enabled. Unit shall modulate discharge air temperature to maintain room temperature setpoint (74 F adjust.)
    b. In the event that RTU has a command to enable either the supply air fan, modulating steam control valve, return & outside air damper positions, DX cooling stage(s) and is still disabled, an alarm will be displayed on the BMS.
3. Occupied Hours (Dehumidification Mode)
    a. During occupied hours, when the supply fan is proven running, the BMS controller will enable the dehumidification/hot gas reheat command at the RTU to maintain the space relative humidity set point.
4. Unoccupied Hours (Cooling Mode)
    a. During unoccupied hours, RTU shall be disabled with outside air damper position at 0% open.

5. Occupied Hours (Heating Mode)
    a. During occupied hours, RTU shall be enabled:
        i. The supply fan shall run continuously.
        ii. Once the fan is proven running, the Outside air damper shall open to minimum outside air position and the Return air damper shall open to a percentage based on (100% open – Minimum Outside Air Damper Position %)
    b. New RTU Propylene Glycol Hot Water Coils
        i. New DDC modulating control valve shall modulate the supply air discharge temperature based on a new DDC room thermostat (72 F adjust). Whenever the space temperature is below the space set point of (adjustable), the heating valve will be open to maintain the discharge air temperature at the discharge heating setpoint. The discharge air setpoint shall reset automatically between the discharge high limit of 100°F (adjustable) and low limit of 60°F (adjustable) reset based on deviation of the space temperature from the space heating setpoint. As the space temperature rises above the space set point (adjustable), the outside air damper shall modulate open beyond their minimum position, up to 100% to maintain the cooling space setpoint. The controller's program will maintain a minimum discharge temperature of 60°F (adjustable) by enabling the heating and modulating the outside air damper, beyond the minimum position required volumetric flow rate of outside air, in sequence without overlap.
    c. In the event that RTU has a command to enable either the supply air fan, modulating control valve, return & outside air damper positions, new modulating hot water control valve is still disabled, or freeze stat trips on hot water duct coil, an alarm will be displayed on the BMS.
6. Unoccupied Hours (Heating Mode)
    a. During Unoccupied hours, RTU shall be enabled:
        i. The supply fan shall run continuously.
        ii. Once the fan is proven running, the Outside air damper shall open to minimum outside air position and the Return air damper shall open to a percentage based on (100% open – Minimum Outside Air Damper Position %)
    b. New RTU Propylene Glycol Hot Water Coils
        i. New DDC modulating control valve shall modulate the supply air discharge temperature based on a new DDC room thermostat (60 F adjust). Whenever the space temperature is below the space set point of (adjustable), the heating valve will be open to maintain the discharge air temperature at the discharge heating setpoint. The discharge air setpoint shall reset automatically between the discharge high limit of 100°F (adjustable) and low limit of 60°F (adjustable) reset based on deviation of the space temperature from the space heating setpoint. As the space temperature rises above the space set point (adjustable), the outside air damper shall modulate open beyond their minimum position, up to 100% to maintain the cooling space setpoint. The controller's program will maintain a minimum discharge temperature of 60°F (adjustable) by enabling the heating and modulating the outside air damper,

beyond the minimum position required volumetric flow rate of outside air, in sequence without overlap.

c. In the event that RTU has a command to enable either the supply air fan, modulating control valve, return & outside air damper positions, new modulating hot water control valve is still disabled, or freeze stat trips on hot water duct coil, an alarm will be displayed on the BMS.

7. Occupied Hours (Energy Wheel)
    a. During occupied hours, the energy wheel will be enabled to run whenever the RTU is on a call for heating or mechanical cooling.
    b. The energy wheel will be disabled whenever the unit is on a call for economizer cooling.
    c. The energy wheel will be disabled during the unoccupied mode.
    d. Energy wheel frost controls will be factory provided.
    e. Energy wheel VFD speed set point will be set at the BMS front-end, and ERV alarm status will be monitored at the BMS front-end.
8. Occupied Hours-Economizer Mode (Outside Air Temperature 55 deg F)
    a. During occupied hours, when outside air temperature is 55 deg F (adj.) the supply & exhaust/return dampers shall each go to 100% open. Upon proof of each damper opening to 100%, the supply fan and exhaust fan shall each ramp up to 100% speed & unit shall be in Economizer Mode..
    b. The energy wheel will be disabled whenever the unit is on a call for economizer cooling.
    c. The energy wheel will be disabled during Economizer mode.
9. Occupied Hours-Economizer Mode (Outside Air Temperature 45 deg F)
    a. During occupied hours, when outside air temperature is 45 deg F (adj.) the supply & exhaust/return dampers shall each go to 100% open. Upon proof of each damper opening to 100%, the supply fan and exhaust fan shall each ramp up to 100% speed & unit shall be in Economizer Mode..
    b. The energy wheel VFD shall adjust the rotational speed of the energy wheel in order to maintain a leaving supply airstream dry bulb temperature of 55 deg F.
10. Occupied Hours-Economizer Mode (Outside Air Temperature 65 deg F)
    a. During occupied hours, when outside air temperature is 65 deg F (adj.) the supply & exhaust/return dampers shall each go to 100% open. Upon proof of each damper opening to 100%, the supply fan and exhaust fan shall each ramp up to 100% speed & unit shall be in Economizer Mode..
    b. The energy wheel VFD shall adjust the rotational speed of the energy wheel in order to maintain a leaving supply airstream dry bulb temperature of 55 deg F.

Control Points

1. RTU Start-DI, DO
2. RTU Stop-DI, DO
3. RTU Alarm-DO
4. DX Cooling Enable-DI, DO
5. DX Cooling Disable-DI, DO
6. DX Cooling Alarm-DO
7. Hot Gas Reheat Status-DO

8. Outside Air Damper Position-AI, AO
9. Return/Mixed Air Damper Position-AI, AO
10. Relief Air Damper Position-AI, AO
11. Outside Air Temperature-AO
12. Supply Air Discharge Temperature-AO
13. Mixed Air Temperature-AO
14. Return Air Temperature-AO
15. Room Temperature-AI, AO
16. Room Relative Humidity Percentage-AI, AO
17. Return Temperature Relative Humidity Percentage-AO
18. Supply Air Discharge Relative Humidity Percentage-AO
19. Energy Wheel Start-DI, DO
20. Energy Wheel Stop-DI, DO
21. Energy Wheel Alarm-DO
22. Energy Wheel Speed-AO
23. Energy Wheel VFD % Speed-AI, AO
24. Energy Wheel VFD Start-DI, DO
25. Energy Wheel VFD Stop-DI, DO
26. Energy Wheel VFD Alarm-DO
27. Supply Fan Start-DI, DO
28. Supply Fan Stop-DI, DO
29. Supply Fan Alarm-DO
30. Supply Fan VFD Start-DI, DO
31. Supply Fan VFD Stop-DI, DO
32. Supply Fan VFD Alarm- DO
33. Supply Fan VFD % Speed-AI, AO
34. Return Fan Start-DI, DO
35. Return Fan Stop-DI, DO
36. Return Fan Alarm-DO
37. Return Fan VFD Start-DI, DO
38. Return Fan VFD Stop-DI, DO
39. Return Fan VFD Alarm- DO
40. Return Fan VFD % Speed-AI, AO
41. DDC Hot Water Heating Control Valve % Open -AI, AO
42. Entering Hot Water Supply Temperature-AO
43. Leaving Hot Water Return Temperature-AO
44. DDC Hot Water Heating Control Valve Failure -DO
45. Freeze Stat Status-DO

P. Rooftop Units with Energy Recovery, Direct-Expansion Cooling, Hot Gas Reheat, and Hot Water Duct Hot Water Coil (RTU-GYM A, RTU-GYM B, RTU-LOBBY)

11. General
    a. The Contractor shall provide, install, wire the following for each RTU: Wall Temperature and RH sensor, 8' averaging discharge air sensor, 8' averaging mixed air sensor, current relay wired to monitor the supply fan, fail-safe, normally closed outside air damper actuator, fail-safe, normally open, modulating heating control valve.

b. The ATC contractor will provide and install a freeze-stat, wired to shut of the supply and exhaust fan in all positions of the H-O-A switch. Manual reset of the freezestat is required. As an added feature, the DDC controller will use the discharge air sensor to detect a potential freezing condition. The set point will be 5° higher than the set point of the freeze-stat. If such a condition occurs, the outside air damper shall close, the fans will shut down, the heating valve shall open, and an alarm generated at the DDC front-end.
c. Whenever the unit's supply fan is off, the outside air damper shall be fully closed.
d. Occupied/unoccupied cycle determination will be made via the BMS front-end.
e. All setpoints will be adjustable from the BMS front-end.

12. Occupied Hours (Cooling Mode)
    a. During occupied hours, RTU shall be enabled:
        i. The supply fan shall run continuously.
        ii. Once the fan is proven running, the Outside air damper shall open to minimum outside air position and the Return air damper shall open to a percentage based on (100% open – Minimum Outside Air Damper Position %)
        iii. DX Cooling stage(s) shall be enabled. Unit shall modulate discharge air temperature to maintain room temperature setpoint (74 F adjust.)
    b. In the event that RTU has a command to enable either the supply air fan, modulating steam control valve, return & outside air damper positions, DX cooling stage(s) and is still disabled, an alarm will be displayed on the BMS.
13. Occupied Hours (Dehumidification Mode)
    a. During occupied hours, when the supply fan is proven running, the BMS controller will enable the dehumidification/hot gas reheat command at the RTU to maintain the space relative humidity set point.
14. Unoccupied Hours (Cooling Mode)
    a. During unoccupied hours, RTU shall be disabled with outside air damper position at 0% open.
15. Occupied Hours (Heating Mode)
    a. During occupied hours, RTU shall be enabled:
        i. The supply fan shall run continuously.
        ii. Once the fan is proven running, the Outside air damper shall open to minimum outside air position and the Return air damper shall open to a percentage based on (100% open – Minimum Outside Air Damper Position %)
    b. New Hot Water Duct Coils (HWC-RTU GYM A, HWC-RTU GYM B, HWC-RTU LOBBY)
        i. New DDC modulating control valve shall modulate the supply air discharge temperature based on a new DDC room thermostat (72 F adjust). Whenever the space temperature is below the space set point of (adjustable), the heating valve will be open to maintain the discharge air temperature at the discharge heating setpoint. The discharge air setpoint shall reset automatically between the discharge high limit of 100°F (adjustable) and low limit of 60°F (adjustable) reset based on deviation of the space temperature from the space heating

setpoint. As the space temperature rises above the space set point (adjustable), the outside air damper shall modulate open beyond their minimum position, up to 100% to maintain the cooling space setpoint. The controller's program will maintain a minimum discharge temperature of 60°F (adjustable) by enabling the heating and modulating the outside air damper, beyond the minimum position required volumetric flow rate of outside air, in sequence without overlap.

c. In the event that RTU has a command to enable either the supply air fan, modulating control valve, return & outside air damper positions, new modulating hot water control valve is still disabled, or freeze stat trips on hot water duct coil, an alarm will be displayed on the BMS.

16. Unoccupied Hours (Heating Mode)
    a. During Unoccupied hours, RTU shall be enabled:
        i. The supply fan shall run continuously.
        ii. Once the fan is proven running, the Outside air damper shall open to minimum outside air position and the Return air damper shall open to a percentage based on (100% open – Minimum Outside Air Damper Position %)
    b. New Hot Water Duct Coils (HWC-RTU GYM A, HWC-RTU GYM B, HWC-RTU LOBBY)
        i. New DDC modulating control valve shall modulate the supply air discharge temperature based on a new DDC room thermostat (60 F adjust). Whenever the space temperature is below the space set point of (adjustable), the heating valve will be open to maintain the discharge air temperature at the discharge heating setpoint. The discharge air setpoint shall reset automatically between the discharge high limit of 100°F (adjustable) and low limit of 60°F (adjustable) reset based on deviation of the space temperature from the space heating setpoint. As the space temperature rises above the space set point (adjustable), the outside air damper shall modulate open beyond their minimum position, up to 100% to maintain the cooling space setpoint. The controller's program will maintain a minimum discharge temperature of 60°F (adjustable) by enabling the heating and modulating the outside air damper, beyond the minimum position required volumetric flow rate of outside air, in sequence without overlap.
    c. In the event that RTU has a command to enable either the supply air fan, modulating control valve, return & outside air damper positions, new modulating hot water control valve is still disabled, or freeze stat trips on hot water duct coil, an alarm will be displayed on the BMS.
17. Occupied Hours (Energy Wheel)
    a. During occupied hours, the energy wheel will be enabled to run whenever the RTU is on a call for heating or mechanical cooling.
    b. The energy wheel will be disabled whenever the unit is on a call for economizer cooling.
    c. The energy wheel will be disabled during the unoccupied mode.
    d. Energy wheel frost controls will be factory provided.
    e. Energy wheel VFD speed set point will be set at the BMS front-end, and ERV alarm status will be monitored at the BMS front-end.
18. Occupied Hours-Economizer Mode (Outside Air Temperature 55 deg F)

a. During occupied hours, when outside air temperature is 55 deg F (adj.) the supply & exhaust/return dampers shall each go to 100% open. Upon proof of each damper opening to 100%, the supply fan and exhaust fan shall each ramp up to 100% speed & unit shall be in Economizer Mode..
b. The energy wheel will be disabled whenever the unit is on a call for economizer cooling.
c. The energy wheel will be disabled during Economizer mode.

19. Occupied Hours-Economizer Mode (Outside Air Temperature 45 deg F)
    a. During occupied hours, when outside air temperature is 45 deg F (adj.) the supply & exhaust/return dampers shall each go to 100% open. Upon proof of each damper opening to 100%, the supply fan and exhaust fan shall each ramp up to 100% speed & unit shall be in Economizer Mode..
    b. The energy wheel VFD shall adjust the rotational speed of the energy wheel in order to maintain a leaving supply airstream dry bulb temperature of 55 deg F.
20. Occupied Hours-Economizer Mode (Outside Air Temperature 65 deg F)
    a. During occupied hours, when outside air temperature is 65 deg F (adj.) the supply & exhaust/return dampers shall each go to 100% open. Upon proof of each damper opening to 100%, the supply fan and exhaust fan shall each ramp up to 100% speed & unit shall be in Economizer Mode..
    b. The energy wheel VFD shall adjust the rotational speed of the energy wheel in order to maintain a leaving supply airstream dry bulb temperature of 55 deg F.

Control Points

1. RTU Start-DI, DO
2. RTU Stop-DI, DO
3. RTU Alarm-DO
4. DX Cooling Enable-DI, DO
5. DX Cooling Disable-DI, DO
6. DX Cooling Alarm-DO
7. Hot Gas Reheat Status-DO
8. Outside Air Damper Position-AI, AO
9. Return/Mixed Air Damper Position-AI, AO
10. Relief Air Damper Position-AI, AO
11. Outside Air Temperature-AO
12. Supply Air Discharge Temperature-AO
13. Mixed Air Temperature-AO
14. Return Air Temperature-AO
15. Room Temperature-AI, AO
16. Room Relative Humidity Percentage-AI, AO
17. Return Temperature Relative Humidity Percentage-AO
18. Supply Air Discharge Relative Humidity Percentage-AO
19. Energy Wheel Start-DI, DO
20. Energy Wheel Stop-DI, DO
21. Energy Wheel Alarm-DO
22. Energy Wheel Speed-AO

23. Energy Wheel VFD % Speed-AI, AO
24. Energy Wheel VFD Start-DI, DO
25. Energy Wheel VFD Stop-DI, DO
26. Energy Wheel VFD Alarm-DO
27. Supply Fan Start-DI, DO
28. Supply Fan Stop-DI, DO
29. Supply Fan Alarm-DO
30. Supply Fan VFD Start-DI, DO
31. Supply Fan VFD Stop-DI, DO
32. Supply Fan VFD Alarm- DO
33. Supply Fan VFD % Speed-AI, AO
34. Return Fan Start-DI, DO
35. Return Fan Stop-DI, DO
36. Return Fan Alarm-DO
37. Return Fan VFD Start-DI, DO
38. Return Fan VFD Stop-DI, DO
39. Return Fan VFD Alarm- DO
40. Return Fan VFD % Speed-AI, AO
41. DDC Hot Water Heating Control Valve % Open -AI, AO
42. Entering Hot Water Supply Temperature-AO
43. Leaving Hot Water Return Temperature-AO
44. DDC Hot Water Heating Control Valve Failure -DO
45. Freeze Stat Status-DO

Q. Dedicated Outside Air System (DOAS) Units with Energy Recovery, Direct-Expansion Cooling, Hot Gas Reheat, and Propylene Glycol DOAS Hot Water Coil (DOAS-AUDITROIUM WING-CAFÉ, DOAS-AUDITORIUM WIN-CLASSRM, DOAS-AUDITORIUM WING-MUSIC STE, DOAS-GYM WING-CLASSRM-A, DOAS-GYM WING-CLASSRM-B, DOAS-GYM WING-LOCKER SCI STE-A, DOAS-GYM WING-LOCKER SCI STE-B, DOAS-MIDDLE WING-CLASSRM-A, DOAS-MIDDLE WING-CLASSRM-B, DOAS-MIDDLE WING-OFFICE SUITE)

1. General
    c. The Contractor shall provide, install, wire the following for each DOAS: Wall Temperature and RH sensor, 8’ averaging discharge air sensor, 8’ averaging mixed air sensor, current relay wired to monitor the supply fan, fail-safe, normally closed outside air damper actuator, fail-safe, normally open, modulating heating control valve.
    d. The ATC contractor will provide and install a freeze-stat, wired to shut of the supply and exhaust fan in all positions of the H-O-A switch. Manual reset of the freezestat is required. As an added feature, the DDC controller will use the discharge air sensor to detect a potential freezing condition. The set point will be 5° higher than the set point of the freeze-stat. If such a condition occurs, the outside air damper shall close, the fans will shut down, the heating valve shall open, and an alarm generated at the DDC front-end.
    e. Whenever the unit’s supply fan is off, the outside air damper shall be fully closed.
    f. Occupied/unoccupied cycle determination will be made via the BMS front-end.

g. All setpoints will be adjustable from the BMS front-end.

2. Occupied Hours (Cooling Mode)
    h. During occupied hours, DOAS shall be enabled:
        i. The supply fan shall run continuously.
        ii. Once the fan is proven running, the Outside air damper shall open to minimum outside air position and the Return air damper shall open to a percentage based on (100% open – Minimum Outside Air Damper Position %)
        iii. DX Cooling stage(s) & hot-gas reheat coil shall be enabled. Unit shall modulate discharge air temperature to maintain supply air discharge temperature setpoint (72 F adjust.)
    i. In the event that DOAS has a command to enable either the supply air fan, modulating hot water 3-way control valve, return & outside air damper positions, DX cooling stage(s) and is still disabled, an alarm will be displayed on the BMS.
3. Occupied Hours (Dehumidification Mode)
    j. During occupied hours, when the supply fan is proven running, the BMS controller will enable the dehumidification/hot gas reheat command at the DOAS to maintain a 72 deg F (neutral air) supply air discharge temperature setpoint (adj.).
4. Unoccupied Hours (Cooling Mode)
    k. During unoccupied hours, DOAS shall be disabled with outside air damper position at 0% open.
5. Occupied Hours (Heating Mode)
    l. During occupied hours, DOAS shall be enabled:
        i. The supply fan shall run continuously.
        ii. Once the fan is proven running, the Outside air damper shall open to minimum outside air position and the Return air damper shall open to a percentage based on (100% open – Minimum Outside Air Damper Position %)
    m. New DOAS Propylene Glycol Hot Water Coils
        i. New DDC modulating control valve shall modulate the supply air discharge temperature based on a new DDC supply air discharge temperature sensor (72 F adjust). Whenever the supply air discharge temperature is below the set point of 72 deg F (adjustable), the heating valve will be open to maintain the discharge air temperature at the discharge heating setpoint. The discharge air setpoint shall reset automatically between the discharge high limit of 100°F (adjustable) and low limit of 60°F (adjustable) reset based on deviation of the supply air discharge temperature from the setpoint.
    n. In the event that DOAS has a command to enable either the supply air fan, modulating control valve, return & outside air damper positions, new modulating hot water control valve is still disabled, or freeze stat trips on hot water duct coil, an alarm will be displayed on the BMS.
6. Unoccupied Hours (Heating Mode)
    1. During unoccupied hours, DOAS shall be disabled with outside air damper position at 0% open.
7. Occupied Hours (Energy Wheel)
    o. During occupied hours, the energy wheel will be enabled to run whenever the DOAS is on a call for heating or mechanical cooling.

p. The energy wheel will be disabled whenever the unit is on a call for economizer cooling.
q. The energy wheel will be disabled during the unoccupied mode.
r. Energy wheel frost controls will be factory provided.
s. Energy wheel VFD speed set point will be set at the BMS front-end, and ERV alarm status will be monitored at the BMS front-end.

8. Occupied Hours-Economizer Mode (Outside Air Temperature 55 deg F)
    t. During occupied hours, when outside air temperature is 55 deg F (adj.) the supply & exhaust/return dampers shall each go to 100% open. Upon proof of each damper opening to 100%, the supply fan and exhaust fan shall each ramp up to 100% speed & unit shall be in Economizer Mode..
    u. The energy wheel will be disabled whenever the unit is on a call for economizer cooling.
    v. The energy wheel will be disabled during Economizer mode.
9. Occupied Hours-Economizer Mode (Outside Air Temperature 45 deg F)
    w. During occupied hours, when outside air temperature is 45 deg F (adj.) the supply & exhaust/return dampers shall each go to 100% open. Upon proof of each damper opening to 100%, the supply fan and exhaust fan shall each ramp up to 100% speed & unit shall be in Economizer Mode..
    x. The energy wheel VFD shall adjust the rotational speed of the energy wheel in order to maintain a leaving supply airstream dry bulb temperature of 55 deg F.
10. Occupied Hours-Economizer Mode (Outside Air Temperature 65 deg F)
    y. During occupied hours, when outside air temperature is 65 deg F (adj.) the supply & exhaust/return dampers shall each go to 100% open. Upon proof of each damper opening to 100%, the supply fan and exhaust fan shall each ramp up to 100% speed & unit shall be in Economizer Mode..
    z. The energy wheel VFD shall adjust the rotational speed of the energy wheel in order to maintain a leaving supply airstream dry bulb temperature of 55 deg F.

Control Points

1. RTU Start-DI, DO
2. RTU Stop-DI, DO
3. RTU Alarm-DO
4. DX Cooling Enable-DI, DO
5. DX Cooling Disable-DI, DO
6. DX Cooling Alarm-DO
7. Hot Gas Reheat Status-DO
8. Outside Air Damper Position-AI, AO
9. Return/Mixed Air Damper Position-AI, AO
10. Relief Air Damper Position-AI, AO
11. Outside Air Temperature-AO
12. Supply Air Discharge Temperature-AO
13. Mixed Air Temperature-AO
14. Return Air Temperature-AO
15. Room Temperature-AI, AO

16. Room Relative Humidity Percentage-AI, AO
17. Return Temperature Relative Humidity Percentage-AO
18. Supply Air Discharge Relative Humidity Percentage-AO
19. Energy Wheel Start-DI, DO
20. Energy Wheel Stop-DI, DO
21. Energy Wheel Alarm-DO
22. Energy Wheel Speed-AO
23. Energy Wheel VFD % Speed-AI, AO
24. Energy Wheel VFD Start-DI, DO
25. Energy Wheel VFD Stop-DI, DO
26. Energy Wheel VFD Alarm-DO
27. Supply Fan Start-DI, DO
28. Supply Fan Stop-DI, DO
29. Supply Fan Alarm-DO
30. Supply Fan VFD Start-DI, DO
31. Supply Fan VFD Stop-DI, DO
32. Supply Fan VFD Alarm- DO
33. Supply Fan VFD % Speed-AI, AO
34. Return Fan Start-DI, DO
35. Return Fan Stop-DI, DO
36. Return Fan Alarm-DO
37. Return Fan VFD Start-DI, DO
38. Return Fan VFD Stop-DI, DO
39. Return Fan VFD Alarm- DO
40. Return Fan VFD % Speed-AI, AO
41. DDC Hot Water Heating Control Valve % Open -AI, AO
42. Entering Hot Water Supply Temperature-AO
43. Leaving Hot Water Return Temperature-AO
44. DDC Hot Water Heating Control Valve Failure -DO
45. Freeze Stat Status-DO

N. <u>All Existing Exhaust Fans (as shown on the contract drawings)</u>

1. Occupied Hours
    a. During occupied hours, all existing exhaust fans shall be enabled:
        i. All existing Relief Air Motorized Damper shall be commanded to be 100% open. Upon proof of Relief Air Damper at 100% open, existing exhaust fans shall be commanded to enable.
        ii. Existing exhaust fans shall be enabled.

    b. In the event that any one of the existing exhaust fans have a command to enable either the exhaust air fan and/or relief air damper position and is still disabled an alarm will be displayed on the BMS.
    c. Owner shall have ability to set and modify occupied hours schedules. BMS contractor shall set occupied hours from 6AM to 7PM (adj.)
2. Unoccupied Hours
    a. During unoccupied hours, all existing exhaust fans shall be disabled (off)

Existing Exhaust Fan-Control Points:

1. Exhaust Fan Start-DI, DO
2. Exhaust Fan Stop-DI, DO
3. Exhaust Fan Alarm-DO
4. Relief Air Damper Position-AI, AO

P. Variable Refrigerant Flow (VRF) Split Systems (Area A-ACCU-56-57-58-59 VRF System; Indoor Units: AC-RM56, AC-RM57, AC-RM58, AC-RM 59)

1. General
    a. New VRF System shall be provided with Factory-Controls.
    b. All setpoints for spaces will be adjustable from the BMS front-end.
    c. Cooling locker out shall be below outside air temperature of 60F (adj.).
2. Occupied Hours (Cooling Mode)
    a. During occupied hours, VRF System referenced above shall be enabled:
        i. All indoor units shall energize & indoor unit supply fans shall come on.
        ii. Once indoor unit supply fans have been proven to be “on”, DX Cooling stage(s) shall be enabled. VRF system shall modulate the refrigerant flow in system to indoor unit in order to maintain room temperature setpoint (72 F adjust.)
    b. In the event that any indoor unit referenced above and/or the associated outdoor condensing unit each have a command to enable, or the indoor unit supply fans have a command to enable and are still “off”, an alarm will be displayed on the BMS.
    c. With indoor units which have a condensate removal pump associated with them, when condensate removal pump is commanded to enable on and is still “disabled”, the associated indoor unit shall then shut off immediately & an alarm shall be displayed on the BMS front end.
3. Unoccupied Hours (Cooling Mode)
    a. During unoccupied hours, The VRF System referenced above shall be “offline”.
4. Occupied Hours (Heating Mode)
    a. During occupied hours, VRF System referenced above shall be only come on heating mode when primary heating equipment in respective space(s) fails to meet heating room temperature setpoint of 72F (adj.):
        i. All indoor units shall energize & indoor unit supply fans shall come on.
        ii. Once indoor unit supply fans have been proven to be “on”, DX Heating stage(s) shall be enabled. VRF system shall modulate the refrigerant flow in system to indoor unit in order to maintain room temperature setpoint (72 F adjust.)
    b. In the event that any indoor unit referenced above and/or the associated outdoor condensing unit each have a command to enable, or the indoor unit supply fans have a command to enable and are still “off”, an alarm will be displayed on the BMS.
5. Unoccupied Hours (Heating Mode)

a. During occupied hours, VRF System referenced above shall be only come on heating mode when primary heating equipment in respective space(s) fails to meet heating room temperature setpoint of 60F (adj.):
    i. All indoor units shall energize & indoor unit supply fans shall come on.
    ii. Once indoor unit supply fans have been proven to be “on”, DX Heating stage(s) shall be enabled. VRF system shall modulate the refrigerant flow in system to indoor unit in order to maintain room temperature setpoint (60 F adjust.)
b. In the event that any indoor unit referenced above and/or the associated outdoor condensing unit each have a command to enable, or the indoor unit supply fans have a command to enable and are still “off”, an alarm will be displayed on the BMS.

Control Points

1. Indoor Unit Supply Fan Start-DI, DO
2. Indoor Unit Supply Fan Stop-DI, DO
3. Indoor Unit Supply Fan Alarm-DO
4. DX Cooling Enable-DI, DO
5. DX Cooling Disable-DI, DO
6. DX Cooling Alarm-DO
7. DX Heating Enable-DI, DO
8. DX Heating Disable-DI, DO
9. DX Heating Alarm-DO
10. Outside Air Temperature-AO
11. Room Temperature-AI, AO
12. Room Relative Humidity Percentage-AI, AO
13. Outdoor Condensing Unit Start-DI, DO
14. Outdoor Condensing Unit Stop-DI, DO
15. Outdoor Condensing Unit Alarm-DO
16. Factory VRF System Local Controller Status-DO
17. Energy Recovery Branch Box Controller Status-DO
18. Indoor Unit Condensate Removal Pump Status-DO

Q. Variable Refrigerant Flow (VRF) Split Systems (Area A-ACCU-52-53-54-55 VRF System; Indoor Units: AC-RM52, AC-RM53, AC-RM54, AC-RM 55)

1. General
    a. New VRF System shall be provided with Factory-Controls.
    b. All setpoints for spaces will be adjustable from the BMS front-end.
    c. Cooling locker out shall be below outside air temperature of 60F (adj.).
2. Occupied Hours (Cooling Mode)
    a. During occupied hours, VRF System referenced above shall be enabled:
        i. All indoor units shall energize & indoor unit supply fans shall come on.
        ii. Once indoor unit supply fans have been proven to be “on”, DX Cooling stage(s) shall be enabled. VRF system shall

modulate the refrigerant flow in system to indoor unit in order to maintain room temperature setpoint (72 F adjust.)

b. In the event that any indoor unit referenced above and/or the associated outdoor condensing unit each have a command to enable, or the indoor unit supply fans have a command to enable and are still “off”, an alarm will be displayed on the BMS.
c. With indoor units which have a condensate removal pump associated with them, when condensate removal pump is commanded to enable on and is still “disabled”, the associated indoor unit shall then shut off immediately & an alarm shall be displayed on the BMS front end.

3. Unoccupied Hours (Cooling Mode)
    a. During unoccupied hours, The VRF System referenced above shall be “offline”.
4. Occupied Hours (Heating Mode)
    a. During occupied hours, VRF System referenced above shall be only come on heating mode when primary heating equipment in respective space(s) fails to meet heating room temperature setpoint of 72F (adj.):
        i. All indoor units shall energize & indoor unit supply fans shall come on.
        ii. Once indoor unit supply fans have been proven to be “on”, DX Heating stage(s) shall be enabled. VRF system shall modulate the refrigerant flow in system to indoor unit in order to maintain room temperature setpoint (72 F adjust.)
    b. In the event that any indoor unit referenced above and/or the associated outdoor condensing unit each have a command to enable, or the indoor unit supply fans have a command to enable and are still “off”, an alarm will be displayed on the BMS.
5. Unoccupied Hours (Heating Mode)
    a. During occupied hours, VRF System referenced above shall be only come on heating mode when primary heating equipment in respective space(s) fails to meet heating room temperature setpoint of 60F (adj.):
        i. All indoor units shall energize & indoor unit supply fans shall come on.
        ii. Once indoor unit supply fans have been proven to be “on”, DX Heating stage(s) shall be enabled. VRF system shall modulate the refrigerant flow in system to indoor unit in order to maintain room temperature setpoint (60 F adjust.)
    b. In the event that any indoor unit referenced above and/or the associated outdoor condensing unit each have a command to enable, or the indoor unit supply fans have a command to enable and are still “off”, an alarm will be displayed on the BMS.

Control Points

1. Indoor Unit Supply Fan Start-DI, DO
2. Indoor Unit Supply Fan Stop-DI, DO
3. Indoor Unit Supply Fan Alarm-DO
4. DX Cooling Enable-DI, DO
5. DX Cooling Disable-DI, DO
6. DX Cooling Alarm-DO

7. DX Heating Enable-DI, DO
8. DX Heating Disable-DI, DO
9. DX Heating Alarm-DO
10. Outside Air Temperature-AO
11. Room Temperature-AI, AO
12. Room Relative Humidity Percentage-AI, AO
13. Outdoor Condensing Unit Start-DI, DO
14. Outdoor Condensing Unit Stop-DI, DO
15. Outdoor Condensing Unit Alarm-DO
16. Factory VRF System Local Controller Status-DO
17. Energy Recovery Branch Box Controller Status-DO
18. Indoor Unit Condensate Removal Pump Status-DO

R. Variable Refrigerant Flow (VRF) Split Systems (Area A-ACCU-47-49-51 VRF System; Indoor Units: AC-RM47, AC-RM49, AC-RM51)

6. General
    a. New VRF System shall be provided with Factory-Controls.
    b. All setpoints for spaces will be adjustable from the BMS front-end.
    c. Cooling locker out shall be below outside air temperature of 60F (adj.).
7. Occupied Hours (Cooling Mode)
    a. During occupied hours, VRF System referenced above shall be enabled:
        i. All indoor units shall energize & indoor unit supply fans shall come on.
        ii. Once indoor unit supply fans have been proven to be “on”, DX Cooling stage(s) shall be enabled. VRF system shall modulate the refrigerant flow in system to indoor unit in order to maintain room temperature setpoint (72 F adjust.)
    b. In the event that any indoor unit referenced above and/or the associated outdoor condensing unit each have a command to enable, or the indoor unit supply fans have a command to enable and are still “off”, an alarm will be displayed on the BMS.
    c. With indoor units which have a condensate removal pump associated with them, when condensate removal pump is commanded to enable on and is still “disabled”, the associated indoor unit shall then shut off immediately & an alarm shall be displayed on the BMS front end.
8. Unoccupied Hours (Cooling Mode)
    a. During unoccupied hours, The VRF System referenced above shall be “offline”.
9. Occupied Hours (Heating Mode)
    a. During occupied hours, VRF System referenced above shall be only come on heating mode when primary heating equipment in respective space(s) fails to meet heating room temperature setpoint of 72F (adj.):
        i. All indoor units shall energize & indoor unit supply fans shall come on.
        ii. Once indoor unit supply fans have been proven to be “on”, DX Heating stage(s) shall be enabled. VRF system shall

modulate the refrigerant flow in system to indoor unit in order to maintain room temperature setpoint (72 F adjust.)

b. In the event that any indoor unit referenced above and/or the associated outdoor condensing unit each have a command to enable, or the indoor unit supply fans have a command to enable and are still “off”, an alarm will be displayed on the BMS.

10. Unoccupied Hours (Heating Mode)
    a. During occupied hours, VRF System referenced above shall be only come on heating mode when primary heating equipment in respective space(s) fails to meet heating room temperature setpoint of 60F (adj.):
        i. All indoor units shall energize & indoor unit supply fans shall come on.
        ii. Once indoor unit supply fans have been proven to be “on”, DX Heating stage(s) shall be enabled. VRF system shall modulate the refrigerant flow in system to indoor unit in order to maintain room temperature setpoint (60 F adjust.)
    b. In the event that any indoor unit referenced above and/or the associated outdoor condensing unit each have a command to enable, or the indoor unit supply fans have a command to enable and are still “off”, an alarm will be displayed on the BMS.

Control Points

1. Indoor Unit Supply Fan Start-DI, DO
2. Indoor Unit Supply Fan Stop-DI, DO
3. Indoor Unit Supply Fan Alarm-DO
4. DX Cooling Enable-DI, DO
5. DX Cooling Disable-DI, DO
6. DX Cooling Alarm-DO
7. DX Heating Enable-DI, DO
8. DX Heating Disable-DI, DO
9. DX Heating Alarm-DO
10. Outside Air Temperature-AO
11. Room Temperature-AI, AO
12. Room Relative Humidity Percentage-AI, AO
13. Outdoor Condensing Unit Start-DI, DO
14. Outdoor Condensing Unit Stop-DI, DO
15. Outdoor Condensing Unit Alarm-DO
16. Factory VRF System Local Controller Status-DO
17. Energy Recovery Branch Box Controller Status-DO
18. Indoor Unit Condensate Removal Pump Status-DO

S. Variable Refrigerant Flow (VRF) Split Systems (Area A-ACCU-46-48-50 VRF System; Indoor Units: AC-RM46, AC-RM48, AC-RM50)

1. General
    a. New VRF System shall be provided with Factory-Controls.
    b. All setpoints for spaces will be adjustable from the BMS front-end.
    c. Cooling locker out shall be below outside air temperature of 60F (adj.).
2. Occupied Hours (Cooling Mode)
    a. During occupied hours, VRF System referenced above shall be enabled:
        i. All indoor units shall energize & indoor unit supply fans shall come on.
        ii. Once indoor unit supply fans have been proven to be “on”, DX Cooling stage(s) shall be enabled. VRF system shall modulate the refrigerant flow in system to indoor unit in order to maintain room temperature setpoint (72 F adjust.)
    b. In the event that any indoor unit referenced above and/or the associated outdoor condensing unit each have a command to enable, or the indoor unit supply fans have a command to enable and are still “off”, an alarm will be displayed on the BMS.
    c. With indoor units which have a condensate removal pump associated with them, when condensate removal pump is commanded to enable on and is still “disabled”, the associated indoor unit shall then shut off immediately & an alarm shall be displayed on the BMS front end.
3. Unoccupied Hours (Cooling Mode)
    a. During unoccupied hours, The VRF System referenced above shall be “offline”.
4. Occupied Hours (Heating Mode)
    a. During occupied hours, VRF System referenced above shall be only come on heating mode when primary heating equipment in respective space(s) fails to meet heating room temperature setpoint of 72F (adj.):
        i. All indoor units shall energize & indoor unit supply fans shall come on.
        ii. Once indoor unit supply fans have been proven to be “on”, DX Heating stage(s) shall be enabled. VRF system shall modulate the refrigerant flow in system to indoor unit in order to maintain room temperature setpoint (72 F adjust.)
    b. In the event that any indoor unit referenced above and/or the associated outdoor condensing unit each have a command to enable, or the indoor unit supply fans have a command to enable and are still “off”, an alarm will be displayed on the BMS.
5. Unoccupied Hours (Heating Mode)
    a. During occupied hours, VRF System referenced above shall be only come on heating mode when primary heating equipment in respective space(s) fails to meet heating room temperature setpoint of 60F (adj.):
        i. All indoor units shall energize & indoor unit supply fans shall come on.
        ii. Once indoor unit supply fans have been proven to be “on”, DX Heating stage(s) shall be enabled. VRF system shall modulate the refrigerant flow in system to indoor unit in order to maintain room temperature setpoint (60 F adjust.)
    b. In the event that any indoor unit referenced above and/or the associated outdoor condensing unit each have a command to enable, or the indoor

unit supply fans have a command to enable and are still “off”, an alarm will be displayed on the BMS.

Control Points

1. Indoor Unit Supply Fan Start-DI, DO
2. Indoor Unit Supply Fan Stop-DI, DO
3. Indoor Unit Supply Fan Alarm-DO
4. DX Cooling Enable-DI, DO
5. DX Cooling Disable-DI, DO
6. DX Cooling Alarm-DO
7. DX Heating Enable-DI, DO
8. DX Heating Disable-DI, DO
9. DX Heating Alarm-DO
10. Outside Air Temperature-AO
11. Room Temperature-AI, AO
12. Room Relative Humidity Percentage-AI, AO
13. Outdoor Condensing Unit Start-DI, DO
14. Outdoor Condensing Unit Stop-DI, DO
15. Outdoor Condensing Unit Alarm-DO
16. Factory VRF System Local Controller Status-DO
17. Energy Recovery Branch Box Controller Status-DO
18. Indoor Unit Condensate Removal Pump Status-DO

T. Variable Refrigerant Flow (VRF) Split Systems (Area B-ACCU-38-41-44-45 VRF System; Indoor Units: AC-RM38, AC-RM41, AC-RM44, AC-RM45)

1. General
    a. New VRF System shall be provided with Factory-Controls.
    b. All setpoints for spaces will be adjustable from the BMS front-end.
    c. Cooling locker out shall be below outside air temperature of 60F (adj.).
2. Occupied Hours (Cooling Mode)
    a. During occupied hours, VRF System referenced above shall be enabled:
        i. All indoor units shall energize & indoor unit supply fans shall come on.
        ii. Once indoor unit supply fans have been proven to be “on”, DX Cooling stage(s) shall be enabled. VRF system shall modulate the refrigerant flow in system to indoor unit in order to maintain room temperature setpoint (72 F adjust.)
    b. In the event that any indoor unit referenced above and/or the associated outdoor condensing unit each have a command to enable, or the indoor unit supply fans have a command to enable and are still “off”, an alarm will be displayed on the BMS.
    c. With indoor units which have a condensate removal pump associated with them, when condensate removal pump is commanded to enable on and is still “disabled”, the associated indoor unit shall then shut off immediately & an alarm shall be displayed on the BMS front end.
3. Unoccupied Hours (Cooling Mode)

a. During unoccupied hours, The VRF System referenced above shall be "offline".

4. Occupied Hours (Heating Mode)
    a. During occupied hours, VRF System referenced above shall be only come on heating mode when primary heating equipment in respective space(s) fails to meet heating room temperature setpoint of 72F (adj.):
        i. All indoor units shall energize & indoor unit supply fans shall come on.
        ii. Once indoor unit supply fans have been proven to be "on", DX Heating stage(s) shall be enabled. VRF system shall modulate the refrigerant flow in system to indoor unit in order to maintain room temperature setpoint (72 F adjust.)
    b. In the event that any indoor unit referenced above and/or the associated outdoor condensing unit each have a command to enable, or the indoor unit supply fans have a command to enable and are still "off", an alarm will be displayed on the BMS.
5. Unoccupied Hours (Heating Mode)
    a. During occupied hours, VRF System referenced above shall be only come on heating mode when primary heating equipment in respective space(s) fails to meet heating room temperature setpoint of 60F (adj.):
        i. All indoor units shall energize & indoor unit supply fans shall come on.
        ii. Once indoor unit supply fans have been proven to be "on", DX Heating stage(s) shall be enabled. VRF system shall modulate the refrigerant flow in system to indoor unit in order to maintain room temperature setpoint (60 F adjust.)
    b. In the event that any indoor unit referenced above and/or the associated outdoor condensing unit each have a command to enable, or the indoor unit supply fans have a command to enable and are still "off", an alarm will be displayed on the BMS.

Control Points

1. Indoor Unit Supply Fan Start-DI, DO
2. Indoor Unit Supply Fan Stop-DI, DO
3. Indoor Unit Supply Fan Alarm-DO
4. DX Cooling Enable-DI, DO
5. DX Cooling Disable-DI, DO
6. DX Cooling Alarm-DO
7. DX Heating Enable-DI, DO
8. DX Heating Disable-DI, DO
9. DX Heating Alarm-DO
10. Outside Air Temperature-AO
11. Room Temperature-AI, AO
12. Room Relative Humidity Percentage-AI, AO
13. Outdoor Condensing Unit Start-DI, DO
14. Outdoor Condensing Unit Stop-DI, DO
15. Outdoor Condensing Unit Alarm-DO
16. Factory VRF System Local Controller Status-DO

17. Energy Recovery Branch Box Controller Status-DO
18. Indoor Unit Condensate Removal Pump Status-DO

U. Variable Refrigerant Flow (VRF) Split Systems (Area B-ACCU-BOYS LOCKERS VRF System; Indoor Units: AC-RM37B, AC-RM37, AC-RM37C, AC-RM37D)

1. General
    a. New VRF System shall be provided with Factory-Controls.
    b. All setpoints for spaces will be adjustable from the BMS front-end.
    c. Cooling locker out shall be below outside air temperature of 60F (adj.).
2. Occupied Hours (Cooling Mode)
    a. During occupied hours, VRF System referenced above shall be enabled:
        i. All indoor units shall energize & indoor unit supply fans shall come on.
        ii. Once indoor unit supply fans have been proven to be “on”, DX Cooling stage(s) shall be enabled. VRF system shall modulate the refrigerant flow in system to indoor unit in order to maintain room temperature setpoint (72 F adjust.)
    b. In the event that any indoor unit referenced above and/or the associated outdoor condensing unit each have a command to enable, or the indoor unit supply fans have a command to enable and are still “off”, an alarm will be displayed on the BMS.
    c. With indoor units which have a condensate removal pump associated with them, when condensate removal pump is commanded to enable on and is still “disabled”, the associated indoor unit shall then shut off immediately & an alarm shall be displayed on the BMS front end.
3. Unoccupied Hours (Cooling Mode)
    a. During unoccupied hours, The VRF System referenced above shall be “offline”.
4. Occupied Hours (Heating Mode)
    a. During occupied hours, VRF System referenced above shall be only come on heating mode when primary heating equipment in respective space(s) fails to meet heating room temperature setpoint of 72F (adj.):
        i. All indoor units shall energize & indoor unit supply fans shall come on.
        ii. Once indoor unit supply fans have been proven to be “on”, DX Heating stage(s) shall be enabled. VRF system shall modulate the refrigerant flow in system to indoor unit in order to maintain room temperature setpoint (72 F adjust.)
    b. In the event that any indoor unit referenced above and/or the associated outdoor condensing unit each have a command to enable, or the indoor unit supply fans have a command to enable and are still “off”, an alarm will be displayed on the BMS.
5. Unoccupied Hours (Heating Mode)
    a. During occupied hours, VRF System referenced above shall be only come on heating mode when primary heating equipment in respective space(s) fails to meet heating room temperature setpoint of 60F (adj.):
        i. All indoor units shall energize & indoor unit supply fans shall come on.

ii. Once indoor unit supply fans have been proven to be “on”, DX Heating stage(s) shall be enabled. VRF system shall modulate the refrigerant flow in system to indoor unit in order to maintain room temperature setpoint (60 F adjust.)

b. In the event that any indoor unit referenced above and/or the associated outdoor condensing unit each have a command to enable, or the indoor unit supply fans have a command to enable and are still “off”, an alarm will be displayed on the BMS.

Control Points

1. Indoor Unit Supply Fan Start-DI, DO
2. Indoor Unit Supply Fan Stop-DI, DO
3. Indoor Unit Supply Fan Alarm-DO
4. DX Cooling Enable-DI, DO
5. DX Cooling Disable-DI, DO
6. DX Cooling Alarm-DO
7. DX Heating Enable-DI, DO
8. DX Heating Disable-DI, DO
9. DX Heating Alarm-DO
10. Outside Air Temperature-AO
11. Room Temperature-AI, AO
12. Room Relative Humidity Percentage-AI, AO
13. Outdoor Condensing Unit Start-DI, DO
14. Outdoor Condensing Unit Stop-DI, DO
15. Outdoor Condensing Unit Alarm-DO
16. Factory VRF System Local Controller Status-DO
17. Indoor Unit Condensate Removal Pump Status-DO

V. Variable Refrigerant Flow (VRF) Split Systems (Area B-ACCU-GIRLS LOCKERS VRF System; Indoor Units: AC-RM40B, AC-RM40, AC-RM40C, AC-RM40D)

1. General
    a. New VRF System shall be provided with Factory-Controls.
    b. All setpoints for spaces will be adjustable from the BMS front-end.
    c. Cooling locker out shall be below outside air temperature of 60F (adj.).
2. Occupied Hours (Cooling Mode)
    a. During occupied hours, VRF System referenced above shall be enabled:
        i. All indoor units shall energize & indoor unit supply fans shall come on.
        ii. Once indoor unit supply fans have been proven to be “on”, DX Cooling stage(s) shall be enabled. VRF system shall modulate the refrigerant flow in system to indoor unit in order to maintain room temperature setpoint (72 F adjust.)
    b. In the event that any indoor unit referenced above and/or the associated outdoor condensing unit each have a command to enable, or the indoor unit supply fans have a command to enable and are still “off”, an alarm will be displayed on the BMS.

c. With indoor units which have a condensate removal pump associated with them, when condensate removal pump is commanded to enable on and is still “disabled”, the associated indoor unit shall then shut off immediately & an alarm shall be displayed on the BMS front end.

3. Unoccupied Hours (Cooling Mode)
    a. During unoccupied hours, The VRF System referenced above shall be “offline”.
4. Occupied Hours (Heating Mode)
    a. During occupied hours, VRF System referenced above shall be only come on heating mode when primary heating equipment in respective space(s) fails to meet heating room temperature setpoint of 72F (adj.):
        i. All indoor units shall energize & indoor unit supply fans shall come on.
        ii. Once indoor unit supply fans have been proven to be “on”, DX Heating stage(s) shall be enabled. VRF system shall modulate the refrigerant flow in system to indoor unit in order to maintain room temperature setpoint (72 F adjust.)
    b. In the event that any indoor unit referenced above and/or the associated outdoor condensing unit each have a command to enable, or the indoor unit supply fans have a command to enable and are still “off”, an alarm will be displayed on the BMS.
5. Unoccupied Hours (Heating Mode)
    c. During occupied hours, VRF System referenced above shall be only come on heating mode when primary heating equipment in respective space(s) fails to meet heating room temperature setpoint of 60F (adj.):
        i. All indoor units shall energize & indoor unit supply fans shall come on.
        ii. Once indoor unit supply fans have been proven to be “on”, DX Heating stage(s) shall be enabled. VRF system shall modulate the refrigerant flow in system to indoor unit in order to maintain room temperature setpoint (60 F adjust.)
    d. In the event that any indoor unit referenced above and/or the associated outdoor condensing unit each have a command to enable, or the indoor unit supply fans have a command to enable and are still “off”, an alarm will be displayed on the BMS.

Control Points

1. Indoor Unit Supply Fan Start-DI, DO
2. Indoor Unit Supply Fan Stop-DI, DO
3. Indoor Unit Supply Fan Alarm-DO
4. DX Cooling Enable-DI, DO
5. DX Cooling Disable-DI, DO
6. DX Cooling Alarm-DO
7. DX Heating Enable-DI, DO
8. DX Heating Disable-DI, DO
9. DX Heating Alarm-DO
10. Outside Air Temperature-AO
11. Room Temperature-AI, AO
12. Room Relative Humidity Percentage-AI, AO

13. Outdoor Condensing Unit Start-DI, DO
14. Outdoor Condensing Unit Stop-DI, DO
15. Outdoor Condensing Unit Alarm-DO
16. Factory VRF System Local Controller Status-DO
17. Indoor Unit Condensate Removal Pump Status-DO

X. Variable Refrigerant Flow (VRF) Split Systems (Area C-ACCU-25-27-29 VRF System; Indoor Units: AC-RM25, AC-RM27, AC-RM29)

1. General
    a. New VRF System shall be provided with Factory-Controls.
    b. All setpoints for spaces will be adjustable from the BMS front-end.
    c. Cooling locker out shall be below outside air temperature of 60F (adj.).
2. Occupied Hours (Cooling Mode)
    a. During occupied hours, VRF System referenced above shall be enabled:
        i. All indoor units shall energize & indoor unit supply fans shall come on.
        ii. Once indoor unit supply fans have been proven to be “on”, DX Cooling stage(s) shall be enabled. VRF system shall modulate the refrigerant flow in system to indoor unit in order to maintain room temperature setpoint (72 F adjust.)
    b. In the event that any indoor unit referenced above and/or the associated outdoor condensing unit each have a command to enable, or the indoor unit supply fans have a command to enable and are still “off”, an alarm will be displayed on the BMS.
    c. With indoor units which have a condensate removal pump associated with them, when condensate removal pump is commanded to enable on and is still “disabled”, the associated indoor unit shall then shut off immediately & an alarm shall be displayed on the BMS front end.
3. Unoccupied Hours (Cooling Mode)
    a. During unoccupied hours, The VRF System referenced above shall be “offline”.
4. Occupied Hours (Heating Mode)
    a. During occupied hours, VRF System referenced above shall be only come on heating mode when primary heating equipment in respective space(s) fails to meet heating room temperature setpoint of 72F (adj.):
        i. All indoor units shall energize & indoor unit supply fans shall come on.
        ii. Once indoor unit supply fans have been proven to be “on”, DX Heating stage(s) shall be enabled. VRF system shall modulate the refrigerant flow in system to indoor unit in order to maintain room temperature setpoint (72 F adjust.)
    b. In the event that any indoor unit referenced above and/or the associated outdoor condensing unit each have a command to enable, or the indoor unit supply fans have a command to enable and are still “off”, an alarm will be displayed on the BMS.
5. Unoccupied Hours (Heating Mode)
    c. During occupied hours, VRF System referenced above shall be only come on heating mode when primary heating equipment in respective space(s) fails to meet heating room temperature setpoint of 60F (adj.):

iii. All indoor units shall energize & indoor unit supply fans shall come on.
iv. Once indoor unit supply fans have been proven to be “on”, DX Heating stage(s) shall be enabled. VRF system shall modulate the refrigerant flow in system to indoor unit in order to maintain room temperature setpoint (60 F adjust.)

d. In the event that any indoor unit referenced above and/or the associated outdoor condensing unit each have a command to enable, or the indoor unit supply fans have a command to enable and are still “off”, an alarm will be displayed on the BMS.

Control Points

1. Indoor Unit Supply Fan Start-DI, DO
2. Indoor Unit Supply Fan Stop-DI, DO
3. Indoor Unit Supply Fan Alarm-DO
4. DX Cooling Enable-DI, DO
5. DX Cooling Disable-DI, DO
6. DX Cooling Alarm-DO
7. DX Heating Enable-DI, DO
8. DX Heating Disable-DI, DO
9. DX Heating Alarm-DO
10. Outside Air Temperature-AO
11. Room Temperature-AI, AO
12. Room Relative Humidity Percentage-AI, AO
13. Outdoor Condensing Unit Start-DI, DO
14. Outdoor Condensing Unit Stop-DI, DO
15. Outdoor Condensing Unit Alarm-DO
16. Factory VRF System Local Controller Status-DO
17. Energy Recovery Branch Box Controller Status-DO
18. Indoor Unit Condensate Removal Pump Status-DO

Y. Variable Refrigerant Flow (VRF) Split Systems (Area C-ACCU-26-28-30 VRF System; Indoor Units: AC-RM26, AC-RM28, AC-RM30)

1. General
    a. New VRF System shall be provided with Factory-Controls.
    b. All setpoints for spaces will be adjustable from the BMS front-end.
    c. Cooling locker out shall be below outside air temperature of 60F (adj.).
2. Occupied Hours (Cooling Mode)
    a. During occupied hours, VRF System referenced above shall be enabled:
        i. All indoor units shall energize & indoor unit supply fans shall come on.
        ii. Once indoor unit supply fans have been proven to be “on”, DX Cooling stage(s) shall be enabled. VRF system shall modulate the refrigerant flow in system to indoor unit in order to maintain room temperature setpoint (72 F adjust.)

b. In the event that any indoor unit referenced above and/or the associated outdoor condensing unit each have a command to enable, or the indoor unit supply fans have a command to enable and are still “off”, an alarm will be displayed on the BMS.
c. With indoor units which have a condensate removal pump associated with them, when condensate removal pump is commanded to enable on and is still “disabled”, the associated indoor unit shall then shut off immediately & an alarm shall be displayed on the BMS front end.

3. Unoccupied Hours (Cooling Mode)
    a. During unoccupied hours, The VRF System referenced above shall be “offline”.
4. Occupied Hours (Heating Mode)
    a. During occupied hours, VRF System referenced above shall be only come on heating mode when primary heating equipment in respective space(s) fails to meet heating room temperature setpoint of 72F (adj.):
        i. All indoor units shall energize & indoor unit supply fans shall come on.
        ii. Once indoor unit supply fans have been proven to be “on”, DX Heating stage(s) shall be enabled. VRF system shall modulate the refrigerant flow in system to indoor unit in order to maintain room temperature setpoint (72 F adjust.)
    b. In the event that any indoor unit referenced above and/or the associated outdoor condensing unit each have a command to enable, or the indoor unit supply fans have a command to enable and are still “off”, an alarm will be displayed on the BMS.
5. Unoccupied Hours (Heating Mode)
    a. During occupied hours, VRF System referenced above shall be only come on heating mode when primary heating equipment in respective space(s) fails to meet heating room temperature setpoint of 60F (adj.):
        i. All indoor units shall energize & indoor unit supply fans shall come on.
        ii. Once indoor unit supply fans have been proven to be “on”, DX Heating stage(s) shall be enabled. VRF system shall modulate the refrigerant flow in system to indoor unit in order to maintain room temperature setpoint (60 F adjust.)
    b. In the event that any indoor unit referenced above and/or the associated outdoor condensing unit each have a command to enable, or the indoor unit supply fans have a command to enable and are still “off”, an alarm will be displayed on the BMS.

Control Points

1. Indoor Unit Supply Fan Start-DI, DO
2. Indoor Unit Supply Fan Stop-DI, DO
3. Indoor Unit Supply Fan Alarm-DO
4. DX Cooling Enable-DI, DO
5. DX Cooling Disable-DI, DO
6. DX Cooling Alarm-DO
7. DX Heating Enable-DI, DO
8. DX Heating Disable-DI, DO

9. DX Heating Alarm-DO
10. Outside Air Temperature-AO
11. Room Temperature-AI, AO
12. Room Relative Humidity Percentage-AI, AO
13. Outdoor Condensing Unit Start-DI, DO
14. Outdoor Condensing Unit Stop-DI, DO
15. Outdoor Condensing Unit Alarm-DO
16. Factory VRF System Local Controller Status-DO
17. Energy Recovery Branch Box Controller Status-DO
18. Indoor Unit Condensate Removal Pump Status-DO

Z. Variable Refrigerant Flow (VRF) Split Systems (Area C-ACCU-17A-19-21-23 VRF System; Indoor Units: AC-RM17A, AC-RM19, AC-RM21, AC-RM23)

1. General
    a. New VRF System shall be provided with Factory-Controls.
    b. All setpoints for spaces will be adjustable from the BMS front-end.
    c. Cooling locker out shall be below outside air temperature of 60F (adj.).
2. Occupied Hours (Cooling Mode)
    a. During occupied hours, VRF System referenced above shall be enabled:
        iii. All indoor units shall energize & indoor unit supply fans shall come on.
        iv. Once indoor unit supply fans have been proven to be “on”, DX Cooling stage(s) shall be enabled. VRF system shall modulate the refrigerant flow in system to indoor unit in order to maintain room temperature setpoint (72 F adjust.)
    b. In the event that any indoor unit referenced above and/or the associated outdoor condensing unit each have a command to enable, or the indoor unit supply fans have a command to enable and are still “off”, an alarm will be displayed on the BMS.
    c. With indoor units which have a condensate removal pump associated with them, when condensate removal pump is commanded to enable on and is still “disabled”, the associated indoor unit shall then shut off immediately & an alarm shall be displayed on the BMS front end.
3. Unoccupied Hours (Cooling Mode)
    b. During unoccupied hours, The VRF System referenced above shall be “offline”.
4. Occupied Hours (Heating Mode)
    c. During occupied hours, VRF System referenced above shall be only come on heating mode when primary heating equipment in respective space(s) fails to meet heating room temperature setpoint of 72F (adj.):
        iii. All indoor units shall energize & indoor unit supply fans shall come on.
        iv. Once indoor unit supply fans have been proven to be “on”, DX Heating stage(s) shall be enabled. VRF system shall modulate the refrigerant flow in system to indoor unit in order to maintain room temperature setpoint (72 F adjust.)
    d. In the event that any indoor unit referenced above and/or the associated outdoor condensing unit each have a command to enable, or the indoor unit supply fans have a command to enable and are still “off”, an alarm will be displayed on the BMS.

5. Unoccupied Hours (Heating Mode)
    c. During occupied hours, VRF System referenced above shall be only come on heating mode when primary heating equipment in respective space(s) fails to meet heating room temperature setpoint of 60F (adj.):
        iii. All indoor units shall energize & indoor unit supply fans shall come on.
        iv. Once indoor unit supply fans have been proven to be “on”, DX Heating stage(s) shall be enabled. VRF system shall modulate the refrigerant flow in system to indoor unit in order to maintain room temperature setpoint (60 F adjust.)
    d. In the event that any indoor unit referenced above and/or the associated outdoor condensing unit each have a command to enable, or the indoor unit supply fans have a command to enable and are still “off”, an alarm will be displayed on the BMS.

Control Points

1. Indoor Unit Supply Fan Start-DI, DO
2. Indoor Unit Supply Fan Stop-DI, DO
3. Indoor Unit Supply Fan Alarm-DO
4. DX Cooling Enable-DI, DO
5. DX Cooling Disable-DI, DO
6. DX Cooling Alarm-DO
7. DX Heating Enable-DI, DO
8. DX Heating Disable-DI, DO
9. DX Heating Alarm-DO
10. Outside Air Temperature-AO
11. Room Temperature-AI, AO
12. Room Relative Humidity Percentage-AI, AO
13. Outdoor Condensing Unit Start-DI, DO
14. Outdoor Condensing Unit Stop-DI, DO
15. Outdoor Condensing Unit Alarm-DO
16. Factory VRF System Local Controller Status-DO
17. Energy Recovery Branch Box Controller Status-DO
18. Indoor Unit Condensate Removal Pump Status-DO

AA. Variable Refrigerant Flow (VRF) Split Systems (Area C-ACCU-18-20-22-24 VRF System; Indoor Units: AC-RM18, AC-RM20, AC-RM22, AC-RM24)

1. General
    a. New VRF System shall be provided with Factory-Controls.
    b. All setpoints for spaces will be adjustable from the BMS front-end.
    c. Cooling locker out shall be below outside air temperature of 60F (adj.).
2. Occupied Hours (Cooling Mode)
    a. During occupied hours, VRF System referenced above shall be enabled:
        v. All indoor units shall energize & indoor unit supply fans shall come on.

vi. Once indoor unit supply fans have been proven to be “on”, DX Cooling stage(s) shall be enabled. VRF system shall modulate the refrigerant flow in system to indoor unit in order to maintain room temperature setpoint (72 F adjust.)

b. In the event that any indoor unit referenced above and/or the associated outdoor condensing unit each have a command to enable, or the indoor unit supply fans have a command to enable and are still “off”, an alarm will be displayed on the BMS.

c. With indoor units which have a condensate removal pump associated with them, when condensate removal pump is commanded to enable on and is still “disabled”, the associated indoor unit shall then shut off immediately & an alarm shall be displayed on the BMS front end.

3. Unoccupied Hours (Cooling Mode)
    a. During unoccupied hours, The VRF System referenced above shall be “offline”.
4. Occupied Hours (Heating Mode)
    a. During occupied hours, VRF System referenced above shall be only come on heating mode when primary heating equipment in respective space(s) fails to meet heating room temperature setpoint of 72F (adj.):
        i. All indoor units shall energize & indoor unit supply fans shall come on.
        ii. Once indoor unit supply fans have been proven to be “on”, DX Heating stage(s) shall be enabled. VRF system shall modulate the refrigerant flow in system to indoor unit in order to maintain room temperature setpoint (72 F adjust.)
    b. In the event that any indoor unit referenced above and/or the associated outdoor condensing unit each have a command to enable, or the indoor unit supply fans have a command to enable and are still “off”, an alarm will be displayed on the BMS.
5. Unoccupied Hours (Heating Mode)
    a. During occupied hours, VRF System referenced above shall be only come on heating mode when primary heating equipment in respective space(s) fails to meet heating room temperature setpoint of 60F (adj.):
        i. All indoor units shall energize & indoor unit supply fans shall come on.
        ii. Once indoor unit supply fans have been proven to be “on”, DX Heating stage(s) shall be enabled. VRF system shall modulate the refrigerant flow in system to indoor unit in order to maintain room temperature setpoint (60 F adjust.)
    b. In the event that any indoor unit referenced above and/or the associated outdoor condensing unit each have a command to enable, or the indoor unit supply fans have a command to enable and are still “off”, an alarm will be displayed on the BMS.

Control Points

1. Indoor Unit Supply Fan Start-DI, DO
2. Indoor Unit Supply Fan Stop-DI, DO
3. Indoor Unit Supply Fan Alarm-DO
4. DX Cooling Enable-DI, DO

5. DX Cooling Disable-DI, DO
6. DX Cooling Alarm-DO
7. DX Heating Enable-DI, DO
8. DX Heating Disable-DI, DO
9. DX Heating Alarm-DO
10. Outside Air Temperature-AO
11. Room Temperature-AI, AO
12. Room Relative Humidity Percentage-AI, AO
13. Outdoor Condensing Unit Start-DI, DO
14. Outdoor Condensing Unit Stop-DI, DO
15. Outdoor Condensing Unit Alarm-DO
16. Factory VRF System Local Controller Status-DO
17. Energy Recovery Branch Box Controller Status-DO
18. Indoor Unit Condensate Removal Pump Status-DO

AB. Variable Refrigerant Flow (VRF) Split Systems (Area D-ACCU-OFFICES A VRF System; Indoor Units: AC-RM58, AC-RM60, AC-RM61, AC-RM15C, AC-RM15A, AC-RM15, AC-RM15B)

6. General
    a. New VRF System shall be provided with Factory-Controls.
    b. All setpoints for spaces will be adjustable from the BMS front-end.
    c. Cooling locker out shall be below outside air temperature of 60F (adj.).
7. Occupied Hours (Cooling Mode)
    a. During occupied hours, VRF System referenced above shall be enabled:
        i. All indoor units shall energize & indoor unit supply fans shall come on.
        ii. Once indoor unit supply fans have been proven to be “on”, DX Cooling stage(s) shall be enabled. VRF system shall modulate the refrigerant flow in system to indoor unit in order to maintain room temperature setpoint (72 F adjust.)
    b. In the event that any indoor unit referenced above and/or the associated outdoor condensing unit each have a command to enable, or the indoor unit supply fans have a command to enable and are still “off”, an alarm will be displayed on the BMS.
    c. With indoor units which have a condensate removal pump associated with them, when condensate removal pump is commanded to enable on and is still “disabled”, the associated indoor unit shall then shut off immediately & an alarm shall be displayed on the BMS front end.
8. Unoccupied Hours (Cooling Mode)
    a. During unoccupied hours, The VRF System referenced above shall be “offline”.
9. Occupied Hours (Heating Mode)
    a. During occupied hours, VRF System referenced above shall be only come on heating mode when primary heating equipment in respective space(s) fails to meet heating room temperature setpoint of 72F (adj.):
        i. All indoor units shall energize & indoor unit supply fans shall come on.

ii. Once indoor unit supply fans have been proven to be “on”, DX Heating stage(s) shall be enabled. VRF system shall modulate the refrigerant flow in system to indoor unit in order to maintain room temperature setpoint (72 F adjust.)

b. In the event that any indoor unit referenced above and/or the associated outdoor condensing unit each have a command to enable, or the indoor unit supply fans have a command to enable and are still “off”, an alarm will be displayed on the BMS.

10. Unoccupied Hours (Heating Mode)
    a. During occupied hours, VRF System referenced above shall be only come on heating mode when primary heating equipment in respective space(s) fails to meet heating room temperature setpoint of 60F (adj.):
        i. All indoor units shall energize & indoor unit supply fans shall come on.
        ii. Once indoor unit supply fans have been proven to be “on”, DX Heating stage(s) shall be enabled. VRF system shall modulate the refrigerant flow in system to indoor unit in order to maintain room temperature setpoint (60 F adjust.)
    b. In the event that any indoor unit referenced above and/or the associated outdoor condensing unit each have a command to enable, or the indoor unit supply fans have a command to enable and are still “off”, an alarm will be displayed on the BMS.

Control Points

1. Indoor Unit Supply Fan Start-DI, DO
2. Indoor Unit Supply Fan Stop-DI, DO
3. Indoor Unit Supply Fan Alarm-DO
4. DX Cooling Enable-DI, DO
5. DX Cooling Disable-DI, DO
6. DX Cooling Alarm-DO
7. DX Heating Enable-DI, DO
8. DX Heating Disable-DI, DO
9. DX Heating Alarm-DO
10. Outside Air Temperature-AO
11. Room Temperature-AI, AO
12. Room Relative Humidity Percentage-AI, AO
13. Outdoor Condensing Unit Start-DI, DO
14. Outdoor Condensing Unit Stop-DI, DO
15. Outdoor Condensing Unit Alarm-DO
16. Factory VRF System Local Controller Status-DO
17. Energy Recovery Branch Box Controller Status-DO
18. Indoor Unit Condensate Removal Pump Status-DO

AC. Variable Refrigerant Flow (VRF) Split Systems (Area D-ACCU-OFFICES B VRF System; Indoor Units: AC-RM13, AC-RM13A, AC-RM13B, AC-RM13C, AC-RM11B, AC-RM11, AC-RM11A, AC-RM11C)

11. General
    a. New VRF System shall be provided with Factory-Controls.
    b. All setpoints for spaces will be adjustable from the BMS front-end.
    c. Cooling locker out shall be below outside air temperature of 60F (adj.).
12. Occupied Hours (Cooling Mode)
    a. During occupied hours, VRF System referenced above shall be enabled:
        i. All indoor units shall energize & indoor unit supply fans shall come on.
        ii. Once indoor unit supply fans have been proven to be “on”, DX Cooling stage(s) shall be enabled. VRF system shall modulate the refrigerant flow in system to indoor unit in order to maintain room temperature setpoint (72 F adjust.)
    b. In the event that any indoor unit referenced above and/or the associated outdoor condensing unit each have a command to enable, or the indoor unit supply fans have a command to enable and are still “off”, an alarm will be displayed on the BMS.
    c. With indoor units which have a condensate removal pump associated with them, when condensate removal pump is commanded to enable on and is still “disabled”, the associated indoor unit shall then shut off immediately & an alarm shall be displayed on the BMS front end.
13. Unoccupied Hours (Cooling Mode)
    a. During unoccupied hours, The VRF System referenced above shall be “offline”.
14. Occupied Hours (Heating Mode)
    a. During occupied hours, VRF System referenced above shall be only come on heating mode when primary heating equipment in respective space(s) fails to meet heating room temperature setpoint of 72F (adj.):
        i. All indoor units shall energize & indoor unit supply fans shall come on.
        ii. Once indoor unit supply fans have been proven to be “on”, DX Heating stage(s) shall be enabled. VRF system shall modulate the refrigerant flow in system to indoor unit in order to maintain room temperature setpoint (72 F adjust.)
    b. In the event that any indoor unit referenced above and/or the associated outdoor condensing unit each have a command to enable, or the indoor unit supply fans have a command to enable and are still “off”, an alarm will be displayed on the BMS.
15. Unoccupied Hours (Heating Mode)
    a. During occupied hours, VRF System referenced above shall be only come on heating mode when primary heating equipment in respective space(s) fails to meet heating room temperature setpoint of 60F (adj.):
        i. All indoor units shall energize & indoor unit supply fans shall come on.
        ii. Once indoor unit supply fans have been proven to be “on”, DX Heating stage(s) shall be enabled. VRF system shall modulate the refrigerant flow in system to indoor unit in order to maintain room temperature setpoint (60 F adjust.)
    b. In the event that any indoor unit referenced above and/or the associated outdoor condensing unit each have a command to enable, or the indoor

unit supply fans have a command to enable and are still “off”, an alarm will be displayed on the BMS.

Control Points

1. Indoor Unit Supply Fan Start-DI, DO
2. Indoor Unit Supply Fan Stop-DI, DO
3. Indoor Unit Supply Fan Alarm-DO
4. DX Cooling Enable-DI, DO
5. DX Cooling Disable-DI, DO
6. DX Cooling Alarm-DO
7. DX Heating Enable-DI, DO
8. DX Heating Disable-DI, DO
9. DX Heating Alarm-DO
10. Outside Air Temperature-AO
11. Room Temperature-AI, AO
12. Room Relative Humidity Percentage-AI, AO
13. Outdoor Condensing Unit Start-DI, DO
14. Outdoor Condensing Unit Stop-DI, DO
15. Outdoor Condensing Unit Alarm-DO
16. Factory VRF System Local Controller Status-DO
17. Energy Recovery Branch Box Controller Status-DO
18. Indoor Unit Condensate Removal Pump Status-DO

AD. Variable Refrigerant Flow (VRF) Split Systems (Area D-ACCU-OFFICES C VRF System; Indoor Units: AC-RM16A, AC-RM16E, AC-RM16B, AC-RM16C, AC-RM16D, AC-RM16-1, AC-RM16-2)

1. General
    a. New VRF System shall be provided with Factory-Controls.
    b. All setpoints for spaces will be adjustable from the BMS front-end.
    c. Cooling locker out shall be below outside air temperature of 60F (adj.).
2. Occupied Hours (Cooling Mode)
    a. During occupied hours, VRF System referenced above shall be enabled:
        i. All indoor units shall energize & indoor unit supply fans shall come on.
        ii. Once indoor unit supply fans have been proven to be “on”, DX Cooling stage(s) shall be enabled. VRF system shall modulate the refrigerant flow in system to indoor unit in order to maintain room temperature setpoint (72 F adjust.)
    b. In the event that any indoor unit referenced above and/or the associated outdoor condensing unit each have a command to enable, or the indoor unit supply fans have a command to enable and are still “off”, an alarm will be displayed on the BMS.
    c. With indoor units which have a condensate removal pump associated with them, when condensate removal pump is commanded to enable on and is still “disabled”, the associated indoor unit shall then shut off immediately & an alarm shall be displayed on the BMS front end.
3. Unoccupied Hours (Cooling Mode)

a. During unoccupied hours, The VRF System referenced above shall be "offline".

4. Occupied Hours (Heating Mode)
    a. During occupied hours, VRF System referenced above shall be only come on heating mode when primary heating equipment in respective space(s) fails to meet heating room temperature setpoint of 72F (adj.):
        i. All indoor units shall energize & indoor unit supply fans shall come on.
        ii. Once indoor unit supply fans have been proven to be "on", DX Heating stage(s) shall be enabled. VRF system shall modulate the refrigerant flow in system to indoor unit in order to maintain room temperature setpoint (72 F adjust.)
    b. In the event that any indoor unit referenced above and/or the associated outdoor condensing unit each have a command to enable, or the indoor unit supply fans have a command to enable and are still "off", an alarm will be displayed on the BMS.
5. Unoccupied Hours (Heating Mode)
    a. During occupied hours, VRF System referenced above shall be only come on heating mode when primary heating equipment in respective space(s) fails to meet heating room temperature setpoint of 60F (adj.):
        i. All indoor units shall energize & indoor unit supply fans shall come on.
        ii. Once indoor unit supply fans have been proven to be "on", DX Heating stage(s) shall be enabled. VRF system shall modulate the refrigerant flow in system to indoor unit in order to maintain room temperature setpoint (60 F adjust.)
    b. In the event that any indoor unit referenced above and/or the associated outdoor condensing unit each have a command to enable, or the indoor unit supply fans have a command to enable and are still "off", an alarm will be displayed on the BMS.

Control Points

1. Indoor Unit Supply Fan Start-DI, DO
2. Indoor Unit Supply Fan Stop-DI, DO
3. Indoor Unit Supply Fan Alarm-DO
4. DX Cooling Enable-DI, DO
5. DX Cooling Disable-DI, DO
6. DX Cooling Alarm-DO
7. DX Heating Enable-DI, DO
8. DX Heating Disable-DI, DO
9. DX Heating Alarm-DO
10. Outside Air Temperature-AO
11. Room Temperature-AI, AO
12. Room Relative Humidity Percentage-AI, AO
13. Outdoor Condensing Unit Start-DI, DO
14. Outdoor Condensing Unit Stop-DI, DO
15. Outdoor Condensing Unit Alarm-DO
16. Factory VRF System Local Controller Status-DO

17. Energy Recovery Branch Box Controller Status-DO
18. Indoor Unit Condensate Removal Pump Status-DO

AE. Variable Refrigerant Flow (VRF) Split Systems (Area D-ACCU-OFFICES D VRF System; Indoor Units: AC-RM12E, AC-RM12F, AC-RM12, AC-RM12D, AC-RM12A, AC-RM12B, AC-RM10, AC-RM10A, AC-RM10B)

1. General
    a. New VRF System shall be provided with Factory-Controls.
    b. All setpoints for spaces will be adjustable from the BMS front-end.
    c. Cooling locker out shall be below outside air temperature of 60F (adj.).
2. Occupied Hours (Cooling Mode)
    a. During occupied hours, VRF System referenced above shall be enabled:
        i. All indoor units shall energize & indoor unit supply fans shall come on.
        ii. Once indoor unit supply fans have been proven to be “on”, DX Cooling stage(s) shall be enabled. VRF system shall modulate the refrigerant flow in system to indoor unit in order to maintain room temperature setpoint (72 F adjust.)
    b. In the event that any indoor unit referenced above and/or the associated outdoor condensing unit each have a command to enable, or the indoor unit supply fans have a command to enable and are still “off”, an alarm will be displayed on the BMS.
    c. With indoor units which have a condensate removal pump associated with them, when condensate removal pump is commanded to enable on and is still “disabled”, the associated indoor unit shall then shut off immediately & an alarm shall be displayed on the BMS front end.
3. Unoccupied Hours (Cooling Mode)
    a. During unoccupied hours, The VRF System referenced above shall be “offline”.
4. Occupied Hours (Heating Mode)
    a. During occupied hours, VRF System referenced above shall be only come on heating mode when primary heating equipment in respective space(s) fails to meet heating room temperature setpoint of 72F (adj.):
        i. All indoor units shall energize & indoor unit supply fans shall come on.
        ii. Once indoor unit supply fans have been proven to be “on”, DX Heating stage(s) shall be enabled. VRF system shall modulate the refrigerant flow in system to indoor unit in order to maintain room temperature setpoint (72 F adjust.)
    b. In the event that any indoor unit referenced above and/or the associated outdoor condensing unit each have a command to enable, or the indoor unit supply fans have a command to enable and are still “off”, an alarm will be displayed on the BMS.
5. Unoccupied Hours (Heating Mode)
    a. During occupied hours, VRF System referenced above shall be only come on heating mode when primary heating equipment in respective space(s) fails to meet heating room temperature setpoint of 60F (adj.):
        i. All indoor units shall energize & indoor unit supply fans shall come on.

ii. Once indoor unit supply fans have been proven to be “on”, DX Heating stage(s) shall be enabled. VRF system shall modulate the refrigerant flow in system to indoor unit in order to maintain room temperature setpoint (60 F adjust.)

b. In the event that any indoor unit referenced above and/or the associated outdoor condensing unit each have a command to enable, or the indoor unit supply fans have a command to enable and are still “off”, an alarm will be displayed on the BMS.

Control Points

1. Indoor Unit Supply Fan Start-DI, DO
2. Indoor Unit Supply Fan Stop-DI, DO
3. Indoor Unit Supply Fan Alarm-DO
4. DX Cooling Enable-DI, DO
5. DX Cooling Disable-DI, DO
6. DX Cooling Alarm-DO
7. DX Heating Enable-DI, DO
8. DX Heating Disable-DI, DO
9. DX Heating Alarm-DO
10. Outside Air Temperature-AO
11. Room Temperature-AI, AO
12. Room Relative Humidity Percentage-AI, AO
13. Outdoor Condensing Unit Start-DI, DO
14. Outdoor Condensing Unit Stop-DI, DO
15. Outdoor Condensing Unit Alarm-DO
16. Factory VRF System Local Controller Status-DO
17. Energy Recovery Branch Box Controller Status-DO
18. Indoor Unit Condensate Removal Pump Status-DO

AF. Variable Refrigerant Flow (VRF) Split Systems (Area B-CAFETERIA VRF System; Indoor Units: AC-RM2-1, AC-RM2-1, AC-RM2-3, AC-RM2-4, AC-RM2-4, AC-RM2-5, AC-RM2-6)

1. General
    a. New VRF System shall be provided with Factory-Controls.
    b. All setpoints for spaces will be adjustable from the BMS front-end.
    c. Cooling locker out shall be below outside air temperature of 60F (adj.).
2. Occupied Hours (Cooling Mode)
    a. During occupied hours, VRF System referenced above shall be enabled:
        i. All indoor units shall energize & indoor unit supply fans shall come on.
        ii. Once indoor unit supply fans have been proven to be “on”, DX Cooling stage(s) shall be enabled. VRF system shall modulate the refrigerant flow in system to indoor unit in order to maintain room temperature setpoint (72 F adjust.)
    b. In the event that any indoor unit referenced above and/or the associated outdoor condensing unit each have a command to enable, or the indoor unit supply fans have a command to enable and are still “off”, an alarm will be displayed on the BMS.

c. With indoor units which have a condensate removal pump associated with them, when condensate removal pump is commanded to enable on and is still “disabled”, the associated indoor unit shall then shut off immediately & an alarm shall be displayed on the BMS front end.

3. Unoccupied Hours (Cooling Mode)
    a. During unoccupied hours, The VRF System referenced above shall be “offline”.
4. Occupied Hours (Heating Mode)
    a. During occupied hours, VRF System referenced above shall be only come on heating mode when primary heating equipment in respective space(s) fails to meet heating room temperature setpoint of 72F (adj.):
        i. All indoor units shall energize & indoor unit supply fans shall come on.
        ii. Once indoor unit supply fans have been proven to be “on”, DX Heating stage(s) shall be enabled. VRF system shall modulate the refrigerant flow in system to indoor unit in order to maintain room temperature setpoint (72 F adjust.)
    b. In the event that any indoor unit referenced above and/or the associated outdoor condensing unit each have a command to enable, or the indoor unit supply fans have a command to enable and are still “off”, an alarm will be displayed on the BMS.
5. Unoccupied Hours (Heating Mode)
    a. During occupied hours, VRF System referenced above shall be only come on heating mode when primary heating equipment in respective space(s) fails to meet heating room temperature setpoint of 60F (adj.):
        i. All indoor units shall energize & indoor unit supply fans shall come on.
        ii. Once indoor unit supply fans have been proven to be “on”, DX Heating stage(s) shall be enabled. VRF system shall modulate the refrigerant flow in system to indoor unit in order to maintain room temperature setpoint (60 F adjust.)
    b. In the event that any indoor unit referenced above and/or the associated outdoor condensing unit each have a command to enable, or the indoor unit supply fans have a command to enable and are still “off”, an alarm will be displayed on the BMS.

Control Points

1. Indoor Unit Supply Fan Start-DI, DO
2. Indoor Unit Supply Fan Stop-DI, DO
3. Indoor Unit Supply Fan Alarm-DO
4. DX Cooling Enable-DI, DO
5. DX Cooling Disable-DI, DO
6. DX Cooling Alarm-DO
7. DX Heating Enable-DI, DO
8. DX Heating Disable-DI, DO
9. DX Heating Alarm-DO
10. Outside Air Temperature-AO
11. Room Temperature-AI, AO
12. Room Relative Humidity Percentage-AI, AO

13. Outdoor Condensing Unit Start-DI, DO
14. Outdoor Condensing Unit Stop-DI, DO
15. Outdoor Condensing Unit Alarm-DO
16. Factory VRF System Local Controller Status-DO
17. Indoor Unit Condensate Removal Pump Status-DO

AF. Variable Refrigerant Flow (VRF) Split Systems (Area D-ACCU-01-02-03 D VRF System; Indoor Units: AC-RM03, AC-RM02, AC-RM01-1, AC-RM01-2, AC-RM01A)

1. General
    a. New VRF System shall be provided with Factory-Controls.
    b. All setpoints for spaces will be adjustable from the BMS front-end.
    c. Cooling locker out shall be below outside air temperature of 60F (adj.).
2. Occupied Hours (Cooling Mode)
    a. During occupied hours, VRF System referenced above shall be enabled:
        i. All indoor units shall energize & indoor unit supply fans shall come on.
        ii. Once indoor unit supply fans have been proven to be “on”, DX Cooling stage(s) shall be enabled. VRF system shall modulate the refrigerant flow in system to indoor unit in order to maintain room temperature setpoint (72 F adjust.)
    b. In the event that any indoor unit referenced above and/or the associated outdoor condensing unit each have a command to enable, or the indoor unit supply fans have a command to enable and are still “off”, an alarm will be displayed on the BMS.
    c. With indoor units which have a condensate removal pump associated with them, when condensate removal pump is commanded to enable on and is still “disabled”, the associated indoor unit shall then shut off immediately & an alarm shall be displayed on the BMS front end.
3. Unoccupied Hours (Cooling Mode)
    a. During unoccupied hours, The VRF System referenced above shall be “offline”.
4. Occupied Hours (Heating Mode)
    a. During occupied hours, VRF System referenced above shall be only come on heating mode when primary heating equipment in respective space(s) fails to meet heating room temperature setpoint of 72F (adj.):
        i. All indoor units shall energize & indoor unit supply fans shall come on.
        ii. Once indoor unit supply fans have been proven to be “on”, DX Heating stage(s) shall be enabled. VRF system shall modulate the refrigerant flow in system to indoor unit in order to maintain room temperature setpoint (72 F adjust.)
    b. In the event that any indoor unit referenced above and/or the associated outdoor condensing unit each have a command to enable, or the indoor unit supply fans have a command to enable and are still “off”, an alarm will be displayed on the BMS.
5. Unoccupied Hours (Heating Mode)
    a. During occupied hours, VRF System referenced above shall be only come on heating mode when primary heating equipment in respective space(s) fails to meet heating room temperature setpoint of 60F (adj.):

i. All indoor units shall energize & indoor unit supply fans shall come on.
ii. Once indoor unit supply fans have been proven to be “on”, DX Heating stage(s) shall be enabled. VRF system shall modulate the refrigerant flow in system to indoor unit in order to maintain room temperature setpoint (60 F adjust.)

b. In the event that any indoor unit referenced above and/or the associated outdoor condensing unit each have a command to enable, or the indoor unit supply fans have a command to enable and are still “off”, an alarm will be displayed on the BMS.

Control Points

1. Indoor Unit Supply Fan Start-DI, DO
2. Indoor Unit Supply Fan Stop-DI, DO
3. Indoor Unit Supply Fan Alarm-DO
4. DX Cooling Enable-DI, DO
5. DX Cooling Disable-DI, DO
6. DX Cooling Alarm-DO
7. DX Heating Enable-DI, DO
8. DX Heating Disable-DI, DO
9. DX Heating Alarm-DO
10. Outside Air Temperature-AO
11. Room Temperature-AI, AO
12. Room Relative Humidity Percentage-AI, AO
13. Outdoor Condensing Unit Start-DI, DO
14. Outdoor Condensing Unit Stop-DI, DO
15. Outdoor Condensing Unit Alarm-DO
16. Factory VRF System Local Controller Status-DO
17. Energy Recovery Branch Box Controller Status-DO
18. Indoor Unit Condensate Removal Pump Status-DO

AG. Variable Refrigerant Flow (VRF) Split Systems (Area B-MUSIC SUITE VRF System; Indoor Units: AC-RM4A, AC-RM4B, AC-RM4D, AC-RM6A, AC-RM6B)

1. General
    a. New VRF System shall be provided with Factory-Controls.
    b. All setpoints for spaces will be adjustable from the BMS front-end.
    c. Cooling locker out shall be below outside air temperature of 60F (adj.).
2. Occupied Hours (Cooling Mode)
    a. During occupied hours, VRF System referenced above shall be enabled:
        i. All indoor units shall energize & indoor unit supply fans shall come on.
        ii. Once indoor unit supply fans have been proven to be “on”, DX Cooling stage(s) shall be enabled. VRF system shall modulate the refrigerant flow in system to indoor unit in order to maintain room temperature setpoint (72 F adjust.)

b. In the event that any indoor unit referenced above and/or the associated outdoor condensing unit each have a command to enable, or the indoor unit supply fans have a command to enable and are still “off”, an alarm will be displayed on the BMS.
c. With indoor units which have a condensate removal pump associated with them, when condensate removal pump is commanded to enable on and is still “disabled”, the associated indoor unit shall then shut off immediately & an alarm shall be displayed on the BMS front end.

3. Unoccupied Hours (Cooling Mode)
    a. During unoccupied hours, The VRF System referenced above shall be “offline”.
4. Occupied Hours (Heating Mode)
    a. During occupied hours, VRF System referenced above shall be only come on heating mode when primary heating equipment in respective space(s) fails to meet heating room temperature setpoint of 72F (adj.):
        i. All indoor units shall energize & indoor unit supply fans shall come on.
        ii. Once indoor unit supply fans have been proven to be “on”, DX Heating stage(s) shall be enabled. VRF system shall modulate the refrigerant flow in system to indoor unit in order to maintain room temperature setpoint (72 F adjust.)
    b. In the event that any indoor unit referenced above and/or the associated outdoor condensing unit each have a command to enable, or the indoor unit supply fans have a command to enable and are still “off”, an alarm will be displayed on the BMS.
5. Unoccupied Hours (Heating Mode)
    a. During occupied hours, VRF System referenced above shall be only come on heating mode when primary heating equipment in respective space(s) fails to meet heating room temperature setpoint of 60F (adj.):
        i. All indoor units shall energize & indoor unit supply fans shall come on.
        ii. Once indoor unit supply fans have been proven to be “on”, DX Heating stage(s) shall be enabled. VRF system shall modulate the refrigerant flow in system to indoor unit in order to maintain room temperature setpoint (60 F adjust.)
    b. In the event that any indoor unit referenced above and/or the associated outdoor condensing unit each have a command to enable, or the indoor unit supply fans have a command to enable and are still “off”, an alarm will be displayed on the BMS.

Control Points

1. Indoor Unit Supply Fan Start-DI, DO
2. Indoor Unit Supply Fan Stop-DI, DO
3. Indoor Unit Supply Fan Alarm-DO
4. DX Cooling Enable-DI, DO
5. DX Cooling Disable-DI, DO
6. DX Cooling Alarm-DO
7. DX Heating Enable-DI, DO
8. DX Heating Disable-DI, DO

9. DX Heating Alarm-DO
10. Outside Air Temperature-AO
11. Room Temperature-AI, AO
12. Room Relative Humidity Percentage-AI, AO
13. Outdoor Condensing Unit Start-DI, DO
14. Outdoor Condensing Unit Stop-DI, DO
15. Outdoor Condensing Unit Alarm-DO
16. Factory VRF System Local Controller Status-DO
17. Indoor Unit Condensate Removal Pump Status-DO

AF. Existing Primary System Hot Water Heating Zone Pumps (P-1, P-1A):

1. Winter (Heating) Season (Occupied And Un-Occupied Hours)
   a. New Primary System Heating System is existing pumps (P-1, P-1A). Pump P-1A is standby pump.
   b. During Occupied Hours, Existing Primary System Heating Pump (P-1) shall enable.
   c. During Occupied Hours, Existing Primary System Heating Pump (P-1A) shall serve as a standby/backup pump if (P-1) fails or alarms.
   d. During Occupied Hours, when either Existing Boilers (B-1 or B-2) are enabled, Existing Primary System Pump (P-1) shall energize and be enabled.
   e. BMS Contractor shall map out & put on the New Proposed Trane Tracer BMS System the following:
      i. Create Existing Boiler Plant Graphics on New BMS Front End.
      ii. Controls Points:
         1) Primary System Hot Water Pump (P-1) Enable-DI, DO
         2) Primary System Hot Water Pump (P-1) Disable-DI, DO
         3) Primary System Hot Water Pump (P-1) Alarm-DO
         4) Primary System Hot Water Pump (P-1A) Enable-DI, DO
         5) Primary System Hot Water Pump (P-1A) Disable-DI, DO
         6) Primary System Hot Water Pump (P-1A) Alarm-DO
         7) Hot Water Return Going Into Existing Boiler #1 (B-1)-DO
         8) Hot Water Return Going Into Existing Boiler #2 (B-2)-DO
         9) Hot Water Supply Coming Out Of Existing Boiler #1 (B-1)-DO
         10) Hot Water Supply Coming Out Of Existing Boiler #2 (B-2)-DO
         11) Hot Water Supply Temperature for Primary Hot Water System Loop-DO
         12) Hot Water Return Temperature for Primary Hot Water System Loop -DO

AG. New Secondary System Propylene Glycol Hot Water Heating Zone Pumps (GHWP-2, GHWP-2A):

1. Winter (Heating) Season (Occupied And Un-Occupied Hours)
   a. New Secondary System Propylene Glycol Heating System is new pumps (GHWP-2, GHWP-2A). Pump GHWP-2A is standby pump.

b. During Occupied Hours, New Secondary System Propylene Glycol Heating Pump (GHWP-2) shall enable.
c. During Occupied Hours, New Secondary System Propylene Glycol Heating Pump (GHWP-2A) shall serve as a standby/backup pump if (GHWP-2) fails or alarms.
d. During Occupied Hours, when either Existing Boilers (B-1 or B-2) are enabled, New Secondary System Propylene Glycol Heating Pump (GHWP-2) shall energize and be enabled.
e. During Occupied Hours, existing Plate and Frame Heat Exchanger for Secondary System Propylene Glycol Hot Water System's new 3-way modulating DDC control valve shall modulate primary system hot water supply temperature going into existing heat exchanger to maintain secondary system propylene glycol hot water supply temperature of 180 deg F (adj.).
f. BMS Contractor shall map out & put on the New Proposed Trane Tracer BMS System the following:
    i. Controls Points:
        1) Secondary System Propylene Glycol Hot Water Pump (GHWP-2) Enable-DI, DO
        2) Secondary System Propylene Glycol Hot Water Pump (GHWP-2) Disable-DI, DO
        3) Secondary System Propylene Glycol Hot Water Pump (GHWP-2) Alarm-DO
        4) Secondary System Propylene Glycol Hot Water Pump (GHWP-2A) Enable-DI, DO
        5) Secondary System Propylene Glycol Hot Water Pump (GHWP-2A) Disable-DI, DO
        6) Secondary System Propylene Glycol Hot Water Pump (GHWP-2A) Alarm-DO
        7) Hot Water Supply Temperature for Secondary Propylene Glycol Hot Water System Loop-DO, DI
        8) Hot Water Return Temperature for Secondary Propylene Glycol Hot Water System Loop -DO

AH. New Secondary System Hot Water Heating Zone Pumps (P-3, P-3A) (SYSTEM #1 ON PLANS):

1. Winter (Heating) Season (Occupied And Un-Occupied Hours)

g. New Primary System Heating System is existing pumps (P-3, P-3A). Pump P-3A is standby pump.
h. During Occupied Hours, New Primary System Heating Pump (P-3) shall enable.
i. During Occupied Hours, New Primary System Pump (P-3A) shall serve as a standby/backup pump if (P-3) fails or alarms.
j. During Occupied Hours, when either Existing Boilers (B-1 or B-2) are enabled, New Secondary System Pump (P-3) shall energize and be enabled.
k. BMS Contractor shall map out & put on the New Proposed Trane Tracer BMS System the following:
    i. Controls Points:
        1) Secondary System Hot Water Pump (P-1) Enable-DI, DO

2) Secondary System Hot Water Pump (P-1) Disable-DI, DO
3) Secondary System Hot Water Pump (P-1) Alarm-DO
4) Secondary System Hot Water Pump (P-1A) Enable-DI, DO
5) Secondary System Hot Water Pump (P-1A) Disable-DI, DO
6) Secondary System Hot Water Pump (P-1A) Alarm-DO
7) Hot Water Supply Temperature for Secondary Hot Water System Loop-DO
8) Hot Water Return Temperature for Secondary Hot Water System Loop -DO

AI. New Secondary System Hot Water Heating Zone Pumps (P-4, P-4A) (SYSTEM #2 ON PLANS):

1. Winter (Heating) Season (Occupied And Un-Occupied Hours)
   a. New Primary System Heating System is existing pumps (P-4, P-3A). Pump P-4A is standby pump.
   b. During Occupied Hours, New Primary System Heating Pump (P-4) shall enable.
   c. During Occupied Hours, New Primary System Pump (P-4A) shall serve as a standby/backup pump if (P-4) fails or alarms.
   d. During Occupied Hours, when either Existing Boilers (B-1 or B-2) are enabled, New Secondary System Pump (P-4) shall energize and be enabled.
   e. During Occupied Hours, existing Plate and Frame Heat Exchanger for Secondary System Propylene Glycol Hot Water System's new 3-way modulating DDC control valve shall modulate primary system hot water supply temperature going into existing heat exchanger to maintain secondary system propylene glycol hot water supply temperature of 179 deg F (adj.).
   f. BMS Contractor shall map out & put on the New Proposed Trane Tracer BMS System the following:
      i. Controls Points:
         1) Secondary System Hot Water Pump (P-4) Enable-DI, DO
         2) Secondary System Hot Water Pump (P-4) Disable-DI, DO
         3) Secondary System Hot Water Pump (P-4) Alarm-DO
         4) Secondary System Hot Water Pump (P-4A) Enable-DI, DO
         5) Secondary System Hot Water Pump (P-4A) Disable-DI, DO
         6) Secondary System Hot Water Pump (P-4A) Alarm-DO
         7) Hot Water Supply Temperature for Secondary Hot Water System Loop-DO
         8) Hot Water Return Temperature for Secondary Hot Water System Loop -DO

AJ. New Hot Water Fin Tube -Control Points:

1. General
   a. All setpoints for spaces will be adjustable from the BMS front-end.
2. Occupied Hours (Heating Mode)
   a. During occupied hours, the new two-way DDC hot water control valve for new fin tube element shall modulate to maintain an occupied room temperature set point of 72F (adjustable).

b. In the event that the modulating two-way DDC control valve does not respond or has failed in the “open” position, an alarm will be displayed on the BMS.
c. New Two-way Modulating DDC hot water control valve shall fail in the “Open” position.

3. Un-Occupied Hours (Heating Mode)
   d. During occupied hours, the new two-way DDC hot water control valve for new fin tube element shall modulate to maintain an occupied room temperature set point of 65F (adjustable).
   e. In the event that the modulating two-way DDC control valve does not respond or has failed in the “open” position, an alarm will be displayed on the BMS.
   f. New Two-way Modulating DDC hot water control valve shall fail in the “Open” position.
   g. BMS Contractor shall map out & put on the New Proposed Trane Tracer BMS System the following:
      a. Controls Points:
         i. New Two-Way Modulating Hot Water Control Valve % Open-AI, AO
         ii. Room Temperature-AI,AO

3.02 Heating Mode Equipment Sequencing for Room Types

A. <u>Room Type A – Rooms Containing New Fin Tube and New VRF System</u>

1. Occupied Hours (Heating)
   a. During occupied hours, the New Fin Tube for the Room shall modulate the new two-way modulating DDC hot water control valve to meet room temperature setpoint of 72F (adj.)
   b. If the room temperature setpoint is still not being met, the new VRF system shall be enabled into “heating” mode and the indoor unit for the space shall energize and provide supplemental heating along with the new fin tube to help meet the room temperature setpoint.
2. Unoccupied Hours (Heating)
   a. During occupied hours, the New Fin Tube for the Room shall modulate the new two-way modulating DDC hot water control valve to meet room temperature setpoint of 60F (adj.)
   b. If the room temperature setpoint is still not being met, the new VRF system shall be enabled into “heating” mode and the indoor unit for the space shall energize and provide supplemental heating along with the new fin tube to help meet the room temperature setpoint.

B. <u>Room Type B – Rooms Containing New Fin Tube, New Hydronic Cabinet Heater, and New VRF System</u>

1. Occupied Hours (Heating)

a. During occupied hours, the New Fin Tube for the Room shall modulate the new two-way modulating DDC hot water control valve to meet room temperature setpoint of 72F (adj.)
b. If the room temperature setpoint is still not being met, the new Hydronic Cabinet Heater's new three-way modulating DDC hot water control valve modulate the new cabinet heater supply air discharge air temperature to assist the new hot water fin tube to help meet room temperature setpoint.
c. If the room temperature setpoint is still not being met then, the new VRF system shall be enabled into "heating" mode and the indoor unit for the space shall energize and provide supplemental heating along with the new fin tube & new hydronic cabinet heater to help meet the room temperature setpoint.

2. Unoccupied Hours (Heating)
    a. During occupied hours, the New Fin Tube for the Room shall modulate the new two-way modulating DDC hot water control valve to meet room temperature setpoint of 60F (adj.)
    d. If the room temperature setpoint is still not being met, the new Hydronic Cabinet Heater's new three-way modulating DDC hot water control valve modulate the new cabinet heater supply air discharge air temperature to assist the new hot water fin tube to help meet room temperature setpoint.
    e. If the room temperature setpoint is still not being met then, the new VRF system shall be enabled into "heating" mode and the indoor unit for the space shall energize and provide supplemental heating along with the new fin tube & new hydronic cabinet heater to help meet the room temperature setpoint.

C. <u>Room Type C – Rooms Containing New Hydronic Cabinet Heater, and New VRF System</u>

1. Occupied Hours (Heating)
    a. During occupied hours, the New Hydronic Cabinet Heater for the Room shall modulate the new three-way modulating DDC hot water control valve modulate the supply air discharge air temperature to meet room temperature setpoint of 72F (adj.)
    b. If the room temperature setpoint is still not being met then, the new VRF system shall be enabled into "heating" mode and the indoor unit for the space shall energize and provide supplemental heating along with the new fin tube & new hydronic cabinet heater to help meet the room temperature setpoint.

2. Unoccupied Hours (Heating)
    a. During occupied hours, the New Hydronic Cabinet Heater for the Room shall modulate the new three-way modulating DDC hot water control valve modulate the supply air discharge air temperature to meet room temperature setpoint of 60F (adj.)

b. If the room temperature setpoint is still not being met then, the new VRF system shall be enabled into “heating” mode and the indoor unit for the space shall energize and provide supplemental heating along with the new fin tube & new hydronic cabinet heater to help meet the room temperature setpoint.

3.03 Existing Equipment Sequences of Operation.

A. <u>Existing Cabinet Unit Heaters (CH-1-Serving Kitchen Storage Room)</u>

1. Occupied Hours (Heating)
    a. During occupied hours, the existing (CH-1 Serving Kitchen Storage Room) shall be enabled:
        i. Existing (CH-1 Serving Kitchen Storage Room) Supply fan shall be enabled.
        ii. For Existing (CH-1 Serving Kitchen Storage Room), the existing three-way modulating DDC hot water control valve shall modulate the supply air discharge temperature based on a existing DDC room thermostat (72 F adjust)

    b. In the event that existing (CH-1 Serving Kitchen Storage Room) has a command to enable either the supply air fan, hot water control valve, & return air damper positions and is still disabled an alarm will be displayed on the BMS.
    c. Heating shall be enabled when outside air temperature is 65 deg F (adj) & below.
2. Unoccupied Hours (Heating)
    a. During unoccupied hours, (CH-1 Serving Kitchen Storage Room) shall be enabled:
        i. Supply fan shall be enabled.
        ii. Return air damper shall be 100% open.
        iii. Existing 3-way DDC modulating hot water control valve shall modulate the supply air discharge temperature based on a existing DDC room thermostat (60 F adjust).

<u>Existing Cabinet Unit Heaters-Control Points:</u>

1. Existing Unit Supply Fan Start-DI, DO
2. Existing Unit Supply Fan Stop-DI, DO
3. Existing Unit Supply Fan Alarm-DO
4. Return Air Damper Position-AI, AO
5. Outside Air Damper Position-AI, AO
6. Hot Water Control Valve % Open-AI, AO
7. Return Air Temperature-AO
8. Supply Air Discharge Temperature-AO

B. Existing Hot Water Fin Tube (Serving Kitchen Storage Room, Science Rooms in Area "B", and Band Room in Area 'F")

1. Occupied Hours (Heating)
    a. During occupied hours, the new (Serving Kitchen Storage Room, Science Rooms in Area "B", and Band Room in Area 'F") shall be enabled:
        i. For New (FTR-1-Serving Kitchen Storage Room), the New two-way modulating DDC hot water control valve shall modulate the fin tube element output based on a new DDC room thermostat (72 F adjust)

    b. In the event that (Serving Kitchen Storage Room, Science Rooms in Area "B", and Band Room in Area 'F")) has a command to enable the hot water control valve and is still disabled, an alarm will be displayed on the BMS.
    c. Heating shall be enabled when outside air temperature is 65 deg F (adj) & below.
2. Unoccupied Hours (Heating)
    a. During unoccupied hours, (Serving Kitchen Storage Room, Science Rooms in Area "B", and Band Room in Area 'F")) shall be enabled:
        i. New 2-way DDC modulating hot water control valve shall modulate the fin tube element output based on a new DDC room thermostat (60 F adjust).
3. **Existing Fin Tube Controls Points:**
    a. Existing Two-Way Modulating Hot Water Control Valve % Open-AI, AO
    b. Room Temperature-AI,AO

C. Existing Hydronic Unit Heaters (UH-1-Serving Kitchen Storage Room, UH-1-Serving Lower Level Space Below Kitchen)

1. Occupied Hours (Heating)
    a. During occupied hours, the existing (UH-1-Serving Kitchen Storage Room, UH-1-Serving Lower Level Space Below Kitchen) shall be enabled:
        i. Existing (UH-1-Serving Kitchen Storage Room, UH-1-Serving Lower Level Space Below Kitchen) Supply fan shall be enabled.
        ii. For Existing (UH-1-Serving Kitchen Storage Room, UH-1-Serving Lower Level Space Below Kitchen), the existing three-way modulating DDC hot water control valve shall modulate the supply air discharge temperature based on a existing DDC room thermostat (72 F adjust)

b. In the event that existing (UH-1-Serving Kitchen Storage Room, UH-1-Serving Lower Level Space Below Kitchen) has a command to enable either the supply air fan, hot water control valve, & return air damper positions and is still disabled an alarm will be displayed on the BMS.
c. Heating shall be enabled when outside air temperature is 65 deg F (adj) & below.

2. Unoccupied Hours (Heating)
    a. During unoccupied hours, (CH-1 Serving Kitchen Storage Room) shall be enabled:
        i. Supply fan shall be enabled.
        ii. Return air damper shall be 100% open.
        iii. Existing 3-way DDC modulating hot water control valve shall modulate the supply air discharge temperature based on a existing DDC room thermostat (60 F adjust).

Existing Unit Heaters-Control Points:

1. Existing Unit Supply Fan Start-DI, DO
2. Existing Unit Supply Fan Stop-DI, DO
3. Existing Unit Supply Fan Alarm-DO
4. Return Air Damper Position-AI, AO
5. Outside Air Damper Position-AI, AO
6. Hot Water Control Valve % Open-AI, AO
7. Return Air Temperature-AO
8. Supply Air Discharge Temperature-AO

D. Existing Hydronic Unit Heaters (UH-2-Serving Boiler Room-Total of Two (2) Units)

1. Occupied Hours (Heating)
    a. During occupied hours, the existing (UH-2-Serving Boiler Room-Total of Two (2) Units) shall be enabled:
        i. Existing (UH-2-Serving Boiler Room-Total of Two (2) Units) Supply fan shall be enabled.
        ii. For Existing (UH-2-Serving Boiler Room-Total of Two (2) Units), the existing three-way modulating DDC hot water control valve shall modulate the supply air discharge temperature based on a existing DDC room thermostat (72 F adjust)

    b. In the event that existing (UH-2-Serving Boiler Room-Total of Two (2) Units) has a command to enable either the supply air fan, hot water control valve, & return air damper positions and is still disabled an alarm will be displayed on the BMS.

c. Heating shall be enabled when outside air temperature is 65 deg F (adj) & below.

2. Unoccupied Hours (Heating)
    a. During unoccupied hours, (CH-1 Serving Kitchen Storage Room) shall be enabled:
        i. Supply fan shall be enabled.
        ii. Return air damper shall be 100% open.
        iii. Existing 3-way DDC modulating hot water control valve shall modulate the supply air discharge temperature based on a existing DDC room thermostat (60 F adjust).

Existing Unit Heaters-Control Points:

1. Existing Unit Supply Fan Start-DI, DO
2. Existing Unit Supply Fan Stop-DI, DO
3. Existing Unit Supply Fan Alarm-DO
4. Return Air Damper Position-AI, AO
5. Outside Air Damper Position-AI, AO
6. Hot Water Control Valve % Open-AI, AO
7. Return Air Temperature-AO
8. Supply Air Discharge Temperature-AO

E. Existing Unit Ventilators with Heating (UV-43-Serves Kitchen)

1. Occupied Hours (Heating)
    a. During occupied hours, the existing (UV-43-Serves Kitchen) be enabled:
        i. For (UV-43-Serves Kitchen), the Outside air damper shall open to minimum outside air position.
        ii. For (UV-43-Serves Kitchen), the Return air damper shall open to a percentage based on (100% open – Minimum Outside Air Damper Position %)
        iii. For (UV-43-Serves Kitchen), Upon proof of fresh air and return air dampers opening to their respective positions, New UV-RMA16 shall be enabled.
        iv. Existing (UV-43-Serves Kitchen) Supply fan shall be enabled.
        v. For existing (UV-43-Serves Kitchen), the face & by-pass damper shall modulate the supply air discharge temperature based on a new DDC room thermostat (72 F adjust)
        vi. Existing Passive Ducted Relief Air System shall be re-used for relief air path/system for associated existing Unit Ventilator in space.
    b. Economizer Mode
        i. When the outside air enthalpy permits, the existing (UV-43-Serves Kitchen) shall go into economizer mode by fully opening

the outside air damper to 100% & the return air damper shall be 0% open.

ii. Upon proof of both dampers in their respective positions, the existing (UV-43-Serves Kitchen) supply air fan shall be enabled to bring in 100% outside air.

iii. Existing Passive Ducted Relief Air System shall be re-used for relief air path/system for associated existing Unit Ventilator in space.

c. In the event that (UV-43-Serves Kitchen) has a command to enable either the supply air fan, face-bypass camper, return & outside air damper positions and is still disabled, or freeze stat trips on hot water coil, an alarm will be displayed on the BMS.

d. Heating shall be enabled when outside air temperature is 65 deg F (adj) & below.

2. Unoccupied Hours (Heating)

a. During unoccupied hours, (UV-43-Serves Kitchen) shall be enabled:

i. For (UV-43-Serves Kitchen), the Outside air damper shall open to minimum outside air position.

ii. For (UV-43-Serves Kitchen), the Return air damper shall open to a percentage based on (100% open – Minimum Outside Air Damper Position %)

iii. For (UV-43-Serves Kitchen), Upon proof of fresh air and return air dampers opening to their respective positions, New UV-RMA16 shall be enabled.

iv. Existing (UV-43-Serves Kitchen) Supply fan shall be enabled.

v. For existing (UV-43-Serves Kitchen), the face & by-pass damper shall modulate the supply air discharge temperature based on a new DDC room thermostat (60 F adjust)

vi. Existing Passive Ducted Relief Air System shall be re-used for relief air path/system for associated existing Unit Ventilator in space.

Control Points:

1. UV Supply Fan Start-DI, DO
2. UV Supply Fan Stop-DI, DO
3. UV Supply Fan Alarm-DO
4. Return/Mixed Air Damper Position-AI, AO
5. Outside Air Damper Position-AI, AO
6. Face and Bypass Damper Position-AI, AO
7. Outside Air Temperature-AO
8. Mixed Air Temperature-AO
9. Lower Limit Supply Air Discharge Temperature Setpoint-AI,AO
10. Higher Limit Supply Air Discharge Temperature Setpoint-AI,AO

11. Heating Mode-Mixed Air Dry Bulb Temperature-AO
12. Heating Mode-Supply Air Dry Bulb Discharge Temperature-AO
13. Heating Mode-Return Air Dry Bulb Temperature-AO
14. Room Dry Bulb Temperature-AI, AO
15. Room Wet Bulb Temperature-AI, AO
16. Entering Hot Water Temperature-AO
17. Leaving Hot Water Temperature-AO

F. <u>Existing Sensible (Non-Condensing) Hot Water Boilers (B-1, B-2)</u>

1. Occupied Hours & Un-Occupied Hours (Heating)
    a. General: The proposed/new building BMS system serves as the front end of the system. The controller monitors outdoor temperature, indoor temperature, occupied and unoccupied times and signals the existing hot water boilers and boiler plant as required for heat operation. The Existing Boiler Master Control Panel is presumed to include the following: A modulating boiler sequencing controller, Automatic fuel changeover system and The life safety interlocks for e-stop and gas detection. The existing master control is started by a signal from the BMS control system, which signals the existing boilers, and existing auxiliary devices to start when the temperature drops below a preset value. The existing controller monitors hot water temperature via a header sensor and signals the respective existing boilers as needed to maintain temperature set point. Each existing boiler / burner unit is presumed to be complete with an individual burner control panel, that is presumed to perform the flame safeguard, motor controls, safety interlock and fuel train control functions.
    b. During occupied hours, the existing boilers (B-1) shall be enabled (Boiler B-1 is a standby boiler)
    c. With a “run” signal from the building BMS system, and all switches in the automatic position, the existing boiler controller is ready for operation. Upon a drop or signal for temperature rise, the existing master control panel’s lead / lag control will signal the lead boiler to start.
    d. The existing lead boiler with all boiler operating and limit controls in the closed position, under the direction of the flame safeguard control will begin the pre-ignition interlock and safety checks.
    e. With all safety checks completed, the existing lead burner begins the firing sequence starting with the energizing of the burner blower and boiler induced draft fan, a 90 second open damper pre-purge, a 10 second trail for ignition, a 10 second trail for main flame, and if successful, the burner will be placed in the “run” mode under the direction of the FSG control. When in the “run” mode, fuel firing rate control is permitted.

f. The existing lead burner will continue to operate in the run mode and the boiler's firing rate proportional control signal from the Sync-matic, will modulate the position and fuel flow rate of the burner. The firing rate shall increase for temperature drop and decrease on temperature rise.

g. Upon a further drop in water temperature or if the water temperature is not recovered within a specified period (field programmable) the existing lead lag control will signal the first lag burner to start.

h. The first lag burner will energize repeating the steps as described in paragraphs # d, # e and # f. If the temperature continues to drop, the second lag burner will energize repeating these same steps.

i. As the water temperature rises, the existing lag boiler will de-energize followed by the lead boiler when the final set point is reached. Each burner will have a 15 second post purge period, after which the flame safeguard control will return to the standby mode.

j. Subsequent burner cycles will follow the same sequence as the load demand requires.

k. The existing controller shall include an outdoor air temperature reset option. If enable, the controller will automatic reset the hot water temperature set point in response to the outdoor air temperature. Field selectable reset ratio curves shall be programmed into the control. See the schedule page for set point vs. outdoor air temp set points.

l. Existing Boiler System Annunciation and Alarms:
    i. Power On---Lamp or Display, Alarm
    ii. Limit Circuit Closed ---Lamp or Display
    iii. Pre-Purge--- Lamp or Display
    iv. Main Oil--- Lamp or Display
    v. Modulation Mode--- Lamp or Display
    vi. Flame Failure--- Lamp or Display, Alarm
    vii. High Limit--- Lamp or Display, Alarm
    viii. Low Water--- Lamp or Display, Alarm
    ix. Low Oil Pressure --- Lamp or Display, Alarm
    x. High Gas Pressure--- Lamp or Display, Alarm

m. Individual existing burners are presumed to have an alarm bell with an auto reset silencing switch.

Control Points:

1. Boiler #1 Enable-DI, DO
2. Boiler #1 Disable -DI, DO
3. Boiler #1 Alarm-DO
4. Boiler #2 Enable-DI, DO
5. Boiler #2 Disable -DI, DO
6. Boiler #2 Alarm-DO
7. Outside Air Temperature-AO
8. Hot Water Return Temperature-AO

9. Hot Water Supply Temperature-AO, AI

G. <u>Existing Exhaust Fans (Toilet Exhaust Fans and Science Room Exhaust Fans)</u>

1. Occupied Hours
    a. During occupied hours, the existing (Toilet Exhaust Fans and Science Room Exhaust Fans) shall be enabled:
        i. Existing Relief Air Motorized Damper shall be commanded to be 100% open. Upon proof of Relief Air Damper at 100% open, existing (Toilet Exhaust Fans and Science Room Exhaust Fans) shall be commanded to enable.
        ii. Existing (Toilet Exhaust Fans and Science Room Exhaust Fans) exhaust fan shall be enabled.

    d. In the event that existing (Toilet Exhaust Fans and Science Room Exhaust Fans) has a command to enable either the exhaust air fan and/or relief air damper position and is still disabled an alarm will be displayed on the BMS.
    e. Owner shall have ability to set and modify occupied hours schedules. BMS contractor shall set occupied hours from 6AM to 7PM (adj.)
2. Unoccupied Hours
    a. During unoccupied hours, (Toilet Exhaust Fans and Science Room Exhaust Fans) shall be disabled (off)

<u>Existing Exhaust Fan-Control Points:</u>

1. Exhaust Fan Start-DI, DO (Qty = 16)
2. Exhaust Fan Stop-DI, DO (Qty = 16)
3. Exhaust Fan Alarm-DO (Qty = 16)
4. Relief Air Damper Position-AI, AO (Qty = 16)

I. <u>Existing Kitchen Hood Exhaust Fan (Kitchen Hood Exhaust Fan)</u>

1. Occupied Hours
    a. During occupied hours, the existing (Kitchen Hood Exhaust Fan) shall be enabled manually by kitchen staff users:
        i. Existing Relief Air Motorized Damper shall be commanded to be 100% open. Upon proof of Relief Air Damper at 100% open, existing (Kitchen Hood Exhaust Fan) shall be commanded to enable.
        ii. Existing (Kitchen Hood Exhaust Fan) exhaust fan shall be enabled.

    b. In the event that existing (Kitchen Hood Exhaust Fan) has a command to enable either the exhaust air fan and/or relief air damper position and is still disabled an alarm will be displayed on the BMS.

2. Unoccupied Hours
    a. During unoccupied hours, (Kitchen Hood Exhaust Fan) shall be disabled (off)

Existing Kitchen Hood Exhaust Fan-Control Points:

1. Exhaust Fan Start-DI, DO
2. Exhaust Fan Stop-DI, DO
3. Exhaust Fan Alarm-DO
4. Relief Air Damper Position-AI, AO

END OF SECTION

DIVISION 23-HEATING, VENTILATION, & AIR CONDITIONING
239809-HIGH SCHOOL SEQUENCE OF OPERATIONS

PART 1-GENERAL

1.01 Applicable Sections

A. Specification *239800-System Controller*

PART 2-PRODUCTS

2.01 Applicable Sections

A. Specification *239800-System Controller*

2.02 Acceptable Manufacturers

A. Trane Tracer BMS System or Factory-Authorized Trane Tracer BMS Control Systems Dealer & Installer.

B. **Owner shall be purchasing Trane Tracer Control BMS System directly from Trane Company.**

PART 3-EXECUTION

3.01 Controls Sequences

A. Existing Cabinet Unit Heaters (CUH-1, CUH-2, & CUH-3)

1. Occupied Hours (Heating)
    a. During occupied hours, the existing (CUH-1, CUH-2, CUH-3) shall be enabled:
        i. Existing (CUH-1, CUH-2, CUH-3) Supply fan shall be enabled.
        ii. For Existing (CUH-1, CUH-2, CUH-3), the existing three-way modulating DDC hot water control valve shall modulate the supply air discharge temperature based on a existing DDC room thermostat (72 F adjust)

    b. In the event that existing (CUH-1, CUH-2, CUH-3) has a command to enable either the supply air fan, hot water control valve, & return air damper positions and is still disabled an alarm will be displayed on the BMS.
    c. Heating shall be enabled when outside air temperature is 65 deg F (adj) & below.
2. Unoccupied Hours (Heating)
    a. During unoccupied hours, (CUH-1, CUH-2, CUH-3) shall be enabled:
        i. Supply fan shall be enabled.
        ii. Return air damper shall be 100% open.
        iii. Existing 3-way DDC modulating hot water control valve shall modulate the supply air discharge temperature based on a existing DDC room thermostat (60 F adjust).

Existing Cabinet Unit Heaters-Control Points:

1. Existing Unit Supply Fan Start-DI, DO
2. Existing Unit Supply Fan Stop-DI, DO
3. Existing Unit Supply Fan Alarm-DO

4. Return Air Damper Position-AI, AO
5. Outside Air Damper Position-AI, AO
6. Hot Water Control Valve % Open-AI, AO
7. Return Air Temperature-AO
8. Supply Air Discharge Temperature-AO

B. <u>Existing Four-Pipe Ducted Fan Coil Units with Heating, Cooling, and Fresh Air (FC-1, FC-2, FC-3, FC-4, FC-5, FC-6, FC-7, & FC-8)</u>

1. Occupied Hours (Heating)
    a. During occupied hours, the existing (FC-1, FC-2, FC-3, FC-4, FC-5, FC-6, FC-7, & FC-8) shall be enabled:
        i. For (FC-1, FC-2, FC-3, FC-4, FC-5, FC-6, FC-7, & FC-8), the Outside air damper shall open to minimum outside air position.
        ii. For (FC-1, FC-2, FC-3, FC-4, FC-5, FC-6, FC-7, & FC-8), the Return air damper shall open to a percentage based on (100% open – Minimum Outside Air Damper Position %)
        iii. For (FC-1, FC-2, FC-3, FC-4, FC-5, FC-6, FC-7, & FC-8), Upon proof of fresh air and return air dampers opening to their respective positions, (FC-1, FC-2, FC-3, FC-4, FC-5, FC-6, FC-7, & FC-8) shall be enabled.
        iv. Existing (FC-1, FC-2, FC-3, FC-4, FC-5, FC-6, FC-7, & FC-8) Supply fan shall be enabled.
        v. For Existing (FC-1, FC-2, FC-3, FC-4, FC-5, FC-6, FC-7, & FC-8), the existing three-way modulating DDC hot water control valve shall modulate the supply air discharge temperature based on a new DDC room thermostat (72 F adjust)
        vi. <u>Low Limit Discharge</u> Supply Air Temperature shall be 60 deg F (adj.)
        vii. <u>High Limit Discharge</u> Air Temperature shall be 100 deg F (adj.)

    b. In the event that (FC-1, FC-2, FC-3, FC-4, FC-5, FC-6, FC-7, & FC-8) has a command to enable either the supply air fan, hot water control valve, return & outside air damper positions and is still disabled, or freeze stat trips on hot water coil, an alarm will be displayed on the BMS.
    c. Heating shall be enabled when outside air temperature is 65 deg F (adj) & below.
2. Unoccupied Hours (Heating)
    a. During unoccupied hours, (FC-1, FC-2, FC-3, FC-4, FC-5, FC-6, FC-7, & FC-8) shall be enabled:
        i. Supply fan shall be enabled.
        ii. Outside air damper shall be closed (0% open)
        iii. Return air damper shall be 100% open.

iv. Existing 3-way DDC modulating hot water control valve shall modulate the supply air discharge temperature based on a new DDC room thermostat (60 F adjust).

3. Occupied Hours (Cooling)
    a. During occupied hours, the new (FC-1, FC-2, FC-3, FC-4, FC-5, FC-6, FC-7, & FC-8) shall be enabled:
        i. For (FC-1, FC-2, FC-3, FC-4, FC-5, FC-6, FC-7, & FC-8), the Outside air damper shall open to minimum outside air position.
        ii. For (FC-1, FC-2, FC-3, FC-4, FC-5, FC-6, FC-7, & FC-8), the Return air damper shall open to a percentage based on (100% open – Minimum Outside Air Damper Position %)
        iii. For (FC-1, FC-2, FC-3, FC-4, FC-5, FC-6, FC-7, & FC-8), Upon proof of fresh air and return air dampers opening to their respective positions, (FC-1, FC-2, FC-3, FC-4, FC-5, FC-6, FC-7, & FC-8) shall be enabled.
        iv. Existing (FC-1, FC-2, FC-3, FC-4, FC-5, FC-6, FC-7, & FC-8) Supply fan shall be enabled.
        v. For Existing (FC-1, FC-2, FC-3, FC-4, FC-5, FC-6, FC-7, & FC-8), the existing three-way modulating DDC chilled water control valve shall modulate the supply air discharge temperature based on a new DDC room thermostat (72 F adjust)

    b. In the event that (FC-1, FC-2, FC-3, FC-4, FC-5, FC-6, FC-7, & FC-8) has a command to enable either the supply air fan, hot water control valve, return & outside air damper positions and is still disabled, an alarm will be displayed on the BMS.
    c. Cooling shall be enabled when outside air temperature is above 65 deg F (adj).
4. Unoccupied Hours (Cooling)
    a. During unoccupied hours, (FC-1, FC-2, FC-3, FC-4, FC-5, FC-6, FC-7, & FC-8) shall be disabled (off):

5. Economizer Mode
    a. During occupied hours, the when outside air dry bulb & wet bulb temperatures permit, existing (FC-1, FC-2, FC-3, FC-4, FC-5, FC-6, FC-7, & FC-8) shall be enabled in Economize Mode based on Outdoor Air Enthalpy for the following:
        i. For (FC-1, FC-2, FC-3, FC-4, FC-5, FC-6, FC-7, & FC-8), the Outside air damper shall open to 100% outside air position.
        ii. For (FC-1, FC-2, FC-3, FC-4, FC-5, FC-6, FC-7, & FC-8), the Return air damper shall fully close to 0% open.
        iii. For (FC-1, FC-2, FC-3, FC-4, FC-5, FC-6, FC-7, & FC-8), Upon proof of fresh air and return air dampers opening to their respective

positions, (FC-1, FC-2, FC-3, FC-4, FC-5, FC-6, FC-7, & FC-8) shall be enabled in economizer mode.

iv. Existing (FC-1, FC-2, FC-3, FC-4, FC-5, FC-6, FC-7, & FC-8) Supply fan shall be enabled.

v. Economizer Mode shall be at 55 degrees outside dry bulb temperature (adj.).

b. In the event that (FC-1, FC-2, FC-3, FC-4, FC-5, FC-6, FC-7, & FC-8) has a command to enable either the supply air fan, return & outside air damper positions and is still disabled, an alarm will be displayed on the BMS.

Existing Four-Pipe Ducted Fan Coil Units With Fresh Air-Control Points:

1. Existing Unit Supply Fan Start-DI, DO
2. Existing Unit Supply Fan Stop-DI, DO
3. Existing Unit Supply Fan Alarm-DO
4. Return/Mixed Air Damper Position-AI, AO
5. Outside Air Damper Position-AI, AO
6. Hot Water Control Valve % Open-AI, AO
7. Outside Air Dry Bulb Temperature-AO
8. Outside Air Wet Bulb Temperature-AO
9. Heating Mode-Mixed Air Dry Bulb Temperature-AO
10. Heating Mode-Supply Air Dry Bulb Discharge Temperature-AO
11. Heating Mode-Return Air Dry Bulb Temperature-AO
12. Room Dry Bulb Temperature-AI, AO
13. Room Wet Bulb Temperature-AI, AO
14. Entering Hot Water Temperature-AO
15. Leaving Hot Water Temperature-AO
16. Entering Chilled Water Temperature-AO
17. Leaving Chilled Water Temperature-AO
18. Cooling Mode-Supply Air Discharge Dry Bulb Temperature-AO
19. Cooling Mode-Supply Air Discharge Wet Bulb Temperature-AO
20. Cooling Mode-Mixed Air Dry Bulb Temperature-AO
21. Cooling Mode-Mixed Air Wet Bulb Temperature-AO
22. Cooling Mode-Return Air Dry Bulb Temperature-AO
23. Cooling Mode-Return Air Wet Bulb Temperature-AO

C. Existing Hot Water Fin Tube (FT-1 & FT-2)

1. Occupied Hours (Heating)
    a. During occupied hours, the new (FT-1 & FT-2) shall be enabled:

i. For Existing (FT-1 & FT-2), the existing two-way modulating DDC hot water control valve shall modulate the fin tube element output based on a new DDC room thermostat (72 F adjust)

b. In the event that (FT-1 & FT-2) has a command to enable the hot water control valve and is still disabled, an alarm will be displayed on the BMS.

c. Heating shall be enabled when outside air temperature is 65 deg F (adj) & below.

2. Unoccupied Hours (Heating)
    a. During unoccupied hours, (FT-1 & FT-2) shall be enabled:
        i. Existing 2-way DDC modulating hot water control valve shall modulate the fin tube element output based on a new DDC room thermostat (60 F adjust).

Existing Hot Water Fin Tube -Control Points:

1. Hot Water Control Valve % Open-AI, AO
2. Room Temperature-AI, AO

D. Existing Hot Water Convectors (CV-1, CV-2, CV-3, CV-4, CV-5, CV-6, CV-7, CV-8, CV-9, & CV-10)

1. Occupied Hours (Heating)
    a. During occupied hours, the new (CV-1, CV-2, CV-3, CV-4, CV-5, CV-6, CV-7, CV-8, CV-9, CV-10) shall be enabled:
        i. For Existing (CV-1, CV-2, CV-3, CV-4, CV-5, CV-6, CV-7, CV-8, CV-9, CV-10), the existing two-way modulating DDC hot water control valve shall modulate the fin tube element output based on a new DDC room/space thermostat (72 F adjust)

    b. In the event that (CV-1, CV-2, CV-3, CV-4, CV-5, CV-6, CV-7, CV-8, CV-9, CV-10) has a command to enable the hot water control valve and is still disabled, an alarm will be displayed on the BMS.

    c. Heating shall be enabled when outside air temperature is 65 deg F (adj) & below.
2. Unoccupied Hours (Heating)
    a. During unoccupied hours, (CV-1, CV-2, CV-3, CV-4, CV-5, CV-6, CV-7, CV-8, CV-9, CV-10) shall be enabled:
        i. Existing 2-way DDC modulating hot water control valve shall modulate the fin tube element output based on a new DDC room/space thermostat (60 F adjust).

Existing Hot Water Convector -Control Points:

1. Hot Water Control Valve % Open-AI, AO
2. Room Temperature-AI, AO

E. Existing Unit Ventilators with Heating and Cooling (UV-1 through UV-26)

1. Occupied Hours (Heating)
    a. During occupied hours, the existing (UV-1 through UV-26) be enabled:
        i. For (UV-1 through UV-26), the Outside air damper shall open to minimum outside air position.
        ii. For (UV-1 through UV-26), the Return air damper shall open to a percentage based on (100% open – Minimum Outside Air Damper Position %)
        iii. For (UV-1 through UV-26), Upon proof of fresh air and return air dampers opening to their respective positions, New UV-RMA16 shall be enabled.
        iv. Existing (UV-1 through UV-26) Supply fan shall be enabled.
        v. For existing (UV-1 through UV-26), the face & by-pass damper shall modulate the supply air discharge temperature based on a new DDC room thermostat (72 F adjust)
        vi. Existing Passive Ducted Relief Air System shall be re-used for relief air path/system for associated existing Unit Ventilator in space.
    b. Economizer Mode
        i. When the outside air enthalpy permits, the existing (UV-1 through UV-26) shall go into economizer mode by fully opening the outside air damper to 100% & the return air damper shall be 0% open.
        ii. Upon proof of both dampers in their respective positions, the existing (UV-1 through UV-26) supply air fan shall be enabled to bring in 100% outside air.
        iii. Existing Passive Ducted Relief Air System shall be re-used for relief air path/system for associated existing Unit Ventilator in space.
    c. In the event that (UV-1 through UV-26) has a command to enable either the supply air fan, face-bypass camper, return & outside air damper positions and is still disabled, or freeze stat trips on hot water coil, an alarm will be displayed on the BMS.
    d. Heating shall be enabled when outside air temperature is 65 deg F (adj) & below.
2. Unoccupied Hours (Heating)

a. During unoccupied hours, (UV-1 through UV-26) shall be enabled:
    i. For (UV-1 through UV-26), the Outside air damper shall open to minimum outside air position.
    ii. For (UV-1 through UV-26), the Return air damper shall open to a percentage based on (100% open – Minimum Outside Air Damper Position %)
    iii. For (UV-1 through UV-26), Upon proof of fresh air and return air dampers opening to their respective positions, New UV-RMA16 shall be enabled.
    iv. Existing (UV-1 through UV-26) Supply fan shall be enabled.
    v. For existing (UV-1 through UV-26), the face & by-pass damper shall modulate the supply air discharge temperature based on a new DDC room thermostat (60 F adjust)
    vi. Existing Passive Ducted Relief Air System shall be re-used for relief air path/system for associated existing Unit Ventilator in space.

3. Occupied Hours (Cooling)
    a. During occupied hours, the existing (UV-1 through UV-26) be enabled:
        i. For (UV-1 through UV-26), the Outside air damper shall open to minimum outside air position.
        ii. For (UV-1 through UV-26), the Return air damper shall open to a percentage based on (100% open – Minimum Outside Air Damper Position %)
        iii. For (UV-1 through UV-26), Upon proof of fresh air and return air dampers opening to their respective positions, New UV-RMA16 shall be enabled.
        iv. Existing (UV-1 through UV-26) Supply fan shall be enabled.
        v. For existing (UV-1 through UV-26), the face & by-pass damper shall modulate the supply air discharge temperature based on a new DDC room thermostat (72 F adjust)
        vi. Existing Passive Ducted Relief Air System shall be re-used for relief air path/system for associated existing Unit Ventilator in space.
    b. Economizer Mode
        i. When the outside air enthalpy permits, the existing (UV-1 through UV-26) shall go into economizer mode by fully opening the outside air damper to 100% & the return air damper shall be 0% open.
        ii. Upon proof of both dampers in their respective positions, the existing (UV-1 through UV-26) supply air fan shall be enabled to bring in 100% outside air.

iii. Existing Passive Ducted Relief Air System shall be re-used for relief air path/system for associated existing Unit Ventilator in space.

c. In the event that (UV-1 through UV-26) has a command to enable either the supply air fan, face-bypass camper, return & outside air damper positions and is still disabled, or freeze stat trips on hot water coil, an alarm will be displayed on the BMS.

d. Cooling shall be enabled when outside air temperature is above 65 deg F (adj).

4. Unoccupied Hours (Cooling)

a. During unoccupied hours, (UV-1 through UV-26) shall be disabled:

Control Points:

1. UV Supply Fan Start-DI, DO
2. UV Supply Fan Stop-DI, DO
3. UV Supply Fan Alarm-DO
4. Return/Mixed Air Damper Position-AI, AO
5. Outside Air Damper Position-AI, AO
6. Face and Bypass Damper Position-AI, AO
7. Outside Air Temperature-AO
8. Mixed Air Temperature-AO
9. Lower Limit Supply Air Discharge Temperature Setpoint-AI,AO
10. Higher Limit Supply Air Discharge Temperature Setpoint-AI,AO
11. Heating Mode-Mixed Air Dry Bulb Temperature-AO
12. Heating Mode-Supply Air Dry Bulb Discharge Temperature-AO
13. Heating Mode-Return Air Dry Bulb Temperature-AO
14. Room Dry Bulb Temperature-AI, AO
15. Room Wet Bulb Temperature-AI, AO
16. Entering Hot Water Temperature-AO
17. Leaving Hot Water Temperature-AO
18. Entering Chilled Water Temperature-AO
19. Leaving Chilled Water Temperature-AO
20. Cooling Mode-Supply Air Discharge Dry Bulb Temperature-AO
21. Cooling Mode-Supply Air Discharge Wet Bulb Temperature-AO
22. Cooling Mode-Mixed Air Dry Bulb Temperature-AO
23. Cooling Mode-Mixed Air Wet Bulb Temperature-AO
24. Cooling Mode-Return Air Dry Bulb Temperature-AO
25. Cooling Mode-Return Air Wet Bulb Temperature-AO

F. Existing Electrical Unit Heaters (UH-1, UH-2, & UH-3)

1. Occupied Hours (Heating)

a. During occupied hours, the existing (UH-1, UH-2, UH-3) shall be enabled:

i. Existing (CUH-1, CUH-2, CUH-3) Supply fan shall be enabled.

ii. For Existing (CUH-1, CUH-2, CUH-3), the existing electrical heating coil element shall modulate the supply air discharge temperature based on a existing DDC room thermostat to meet room setpoint (72 F adjust)

b. In the event that existing (UH-1, UH-2, UH-3) has a command to enable either the supply air fan, enable electrical heating coil element, & return air damper positions and is still disabled an alarm will be displayed on the BMS.

c. Heating shall be enabled when outside air temperature is 65 deg F (adj) & below.

2. Unoccupied Hours (Heating)

a. During unoccupied hours, (UH-1, UH-2, UH-3) shall be enabled:

i. Supply fan shall be enabled.

ii. Return air damper shall be 100% open.

iii. Existing electrical heating coil element shall modulate the supply air discharge temperature based on an existing DDC room thermostat to meet room temperature setpoint (60 F adjust).

Existing Electrical Unit Heaters-Control Points:

1. Existing Unit Supply Fan Start-DI, DO
2. Existing Unit Supply Fan Stop-DI, DO
3. Existing Unit Supply Fan Alarm-DO
4. Return Air Damper Position-AI, AO
5. Outside Air Damper Position-AI, AO
6. Electrical Heating Element Enable/Disable-AI, AO
7. Return Air Temperature-AO
8. Supply Air Discharge Temperature-AO

G. Existing Exhaust Fans (EF-1 through EF-22)

1. Occupied Hours

a. During occupied hours, the existing (EF-1 through EF-22) shall be enabled:

i. Existing Relief Air Motorized Damper shall be commanded to be 100% open. Upon proof of Relief Air Damper at 100% open, existing (EF-1 through EF-22) shall be commanded to enable.

ii. Existing (EF-1 through EF-22) exhaust fan shall be enabled.

b. In the event that existing (EF-1 through EF-22) has a command to enable either the exhaust air fan and/or relief air damper position and is still disabled an alarm will be displayed on the BMS.

c. Owner shall have ability to set and modify occupied hours schedules. BMS contractor shall set occupied hours from 6AM to 7PM (adj.)

2. Unoccupied Hours
    a. During unoccupied hours, (EF-1 through EF-22) shall be disabled (off)

Existing Exhaust Fan-Control Points:

1. Exhaust Fan Start-DI, DO
2. Exhaust Fan Stop-DI, DO
3. Exhaust Fan Alarm-DO
4. Relief Air Damper Position-AI, AO

H. Existing Air Handler Unit (AHU-1)

1. Occupied Hours (Heating)
    a. During occupied hours, the existing (AHU-1) be enabled:
        i. For (AHU-1), the Outside air damper shall open to minimum outside air position.
        ii. For (AHU-1), the Return air damper shall open to a percentage based on (100% open – Minimum Outside Air Damper Position %)
        iii. For (AHU-1), Upon proof of fresh air and return air dampers opening to their respective positions, New (AHU-1) shall be enabled.
        iv. Existing (AHU-1) Supply fan & Return Fan shall both be enabled.
        v. For existing (AHU-1), the existing 3-way hot water control valve shall modulate the supply air discharge temperature based on a new DDC room thermostat (72 F adjust)

    b. Economizer Mode
        i. When the outside air enthalpy permits, the existing (AHU-1) shall go into economizer mode by fully opening the outside air damper to 100% & the return air damper shall be 0% open.
        ii. Upon proof of both dampers in their respective positions, the existing (AHU-1) supply air fan shall be enabled to bring in 100% outside air & return air fan shall be off.
    c. In the event that (AHU-1) has a command to enable either the supply air fan, 3-way hot water control valve, return & outside air damper positions and is still disabled, or freeze stat trips on hot water coil, an alarm will be displayed on the BMS.
    d. Heating shall be enabled when outside air temperature is 65 deg F (adj) & below.
2. Unoccupied Hours (Heating)
    e. During unoccupied hours, (AHU-1) shall be enabled:
        i. For (AHU-1), the Outside air damper shall be 0% open.

ii. For (AHU-1), the Return air damper shall open to a percentage based on (100% open – Minimum Outside Air Damper Position %)
iii. For (AHU-1), Upon proof of fresh air and return air dampers opening to their respective positions, existing (AHU-1) shall be enabled in recirculation mode.
iv. Existing (AHU-1) Supply fan & return fan shall both be enabled.
v. For existing (AHU-1), the face & by-pass damper shall modulate the supply air discharge temperature based on a new DDC room thermostat (60 F adjust)

3. Occupied Hours (Cooling)
    a. During occupied hours, the existing (AHU-1) be enabled:
        i. For (AHU-1), the Outside air damper shall open to minimum outside air position.
        ii. For (AHU-1), the Return air damper shall open to a percentage based on (100% open – Minimum Outside Air Damper Position %).
        iii. For (AHU-1), Upon proof of fresh air and return air dampers opening to their respective positions, New (AHU-1) shall be enabled.
        iv. Existing (AHU-1) Supply & Return fans shall be enabled.
        v. For existing (AHU-1), the existing 3-way chilled water control valve shall modulate the supply air discharge temperature based on a new DDC room thermostat (72 F adjust).
    b. Economizer Mode
        i. When the outside air enthalpy permits, the existing (AHU-1) shall go into economizer mode by fully opening the outside air damper to 100% & the return air damper shall be 0% open.
        ii. Upon proof of both dampers in their respective positions, the existing (AHU-1) supply air fan shall be enabled to bring in 100% outside air.
    c. In the event that (AHU-1) has a command to enable either the supply air fan, 3-way chilled water control valve, return & outside air damper positions and is still disabled, or the chilled water coil freezes up, an alarm will be displayed on the BMS.
    d. Cooling shall be enabled when outside air temperature is above 65 deg F (adj).
4. Unoccupied Hours (Cooling)
    a. During unoccupied hours, (AHU-1) shall be disabled:

Control Points:

1. AHU Supply Fan Start-DI, DO

2. AHU Supply Fan Stop-DI, DO
3. AHU Supply Fan Alarm-DO
4. AHU Return Fan Start-DI, DO
5. AHU Return Fan Stop-DI, DO
6. AHU Return Fan Alarm-DO
7. Return/Mixed Air Damper Position-AI, AO
8. Outside Air Damper Position-AI, AO
9. Chilled Water 3-Way Control Valve % Open-AI, AO
10. Hot Water 3-Way Control Valve % Open-AI, AO
11. Outside Air Temperature-AO
12. Mixed Air Temperature-AO
13. Lower Limit Supply Air Discharge Temperature Setpoint-AI,AO
14. Higher Limit Supply Air Discharge Temperature Setpoint-AI,AO
15. Heating Mode-Mixed Air Dry Bulb Temperature-AO
16. Heating Mode-Supply Air Dry Bulb Discharge Temperature-AO
17. Heating Mode-Return Air Dry Bulb Temperature-AO
18. Room Dry Bulb Temperature-AI, AO
19. Room Wet Bulb Temperature-AI, AO
20. Entering Hot Water Temperature-AO
21. Leaving Hot Water Temperature-AO
22. Entering Chilled Water Temperature-AO
23. Leaving Chilled Water Temperature-AO
24. Cooling Mode-Supply Air Discharge Dry Bulb Temperature-AO
25. Cooling Mode-Supply Air Discharge Wet Bulb Temperature-AO
26. Cooling Mode-Mixed Air Dry Bulb Temperature-AO
27. Cooling Mode-Mixed Air Wet Bulb Temperature-AO
28. Cooling Mode-Return Air Dry Bulb Temperature-AO
29. Cooling Mode-Return Air Wet Bulb Temperature-AO

I. Existing Air Handler Unit (AHU-2)

1. Occupied Hours (Heating)
    a. During occupied hours, the existing (AHU-2) be enabled:
        i. For (AHU-2), the Outside air damper shall open to minimum outside air position.
        ii. For (AHU-2), the Return air damper shall open to a percentage based on (100% open – Minimum Outside Air Damper Position %)
        iii. For (AHU-2), Upon proof of fresh air and return air dampers opening to their respective positions, New (AHU-2) shall be enabled.
        iv. Existing (AHU-2) Supply fan & Return Fan shall both be enabled.

v. For existing (AHU-2), the existing 3-way hot water control valve shall modulate the supply air discharge temperature based on a new DDC room thermostat (72 F adjust)

b. Economizer Mode
   i. When the outside air enthalpy permits, the existing (AHU-2) shall go into economizer mode by fully opening the outside air damper to 100% & the return air damper shall be 0% open.
   ii. Upon proof of both dampers in their respective positions, the existing (AHU-2) supply air fan shall be enabled to bring in 100% outside air & return air fan shall be off.

c. In the event that (AHU-2) has a command to enable either the supply air fan, 3-way hot water control valve, return & outside air damper positions and is still disabled, or freeze stat trips on hot water coil, an alarm will be displayed on the BMS.

d. Heating shall be enabled when outside air temperature is 65 deg F (adj) & below.

2. Unoccupied Hours (Heating)
   a. During unoccupied hours, (AHU-2) shall be enabled:
      i. For (AHU-2), the Outside air damper shall be 0% open.
      ii. For (AHU-2), the Return air damper shall open to a percentage based on (100% open – Minimum Outside Air Damper Position %)
      iii. For (AHU-2), Upon proof of fresh air and return air dampers opening to their respective positions, existing (AHU-2) shall be enabled in recirculation mode.
      iv. Existing (AHU-2) Supply fan & return fan shall both be enabled.
      v. For existing (AHU-2), the face & by-pass damper shall modulate the supply air discharge temperature based on a new DDC room thermostat (60 F adjust)

3. Occupied Hours (Cooling)
   a. During occupied hours, the existing (AHU-2) be enabled:
      i. For (AHU-2), the Outside air damper shall open to minimum outside air position.
      ii. For (AHU-2), the Return air damper shall open to a percentage based on (100% open – Minimum Outside Air Damper Position %).
      iii. For (AHU-2, Upon proof of fresh air and return air dampers opening to their respective positions, New (AHU-2) shall be enabled.
      iv. Existing (AHU-2) Supply & Return fans shall be enabled.

v. For existing (AHU-2), the new 3-way chilled water control valve shall modulate the supply air discharge temperature based on a new DDC room thermostat (72 F adjust).

b. Economizer Mode
   i. When the outside air enthalpy permits, the existing (AHU-2) shall go into economizer mode by fully opening the outside air damper to 100% & the return air damper shall be 0% open.
   ii. Upon proof of both dampers in their respective positions, the existing (AHU-2) supply air fan shall be enabled to bring in 100% outside air.

c. In the event that (AHU-2) has a command to enable either the supply air fan, 3-way chilled water control valve, return & outside air damper positions and is still disabled, or the chilled water coil freezes up, an alarm will be displayed on the BMS.

d. Cooling shall be enabled when outside air temperature is above 65 deg F (adj).

4. Unoccupied Hours (Cooling)
   a. During unoccupied hours, (AHU-2) shall be disabled:

Control Points:

1. AHU Supply Fan Start-DI, DO
2. AHU Supply Fan Stop-DI, DO
3. AHU Supply Fan Alarm-DO
4. AHU Return Fan Start-DI, DO
5. AHU Return Fan Stop-DI, DO
6. AHU Return Fan Alarm-DO
7. Return/Mixed Air Damper Position-AI, AO
8. Outside Air Damper Position-AI, AO
9. New Chilled Water 3-Way Control Valve % Open-AI, AO
10. Hot Water 3-Way Control Valve % Open-AI, AO
11. Outside Air Temperature-AO
12. Mixed Air Temperature-AO
13. Lower Limit Supply Air Discharge Temperature Setpoint-AI,AO
14. Higher Limit Supply Air Discharge Temperature Setpoint-AI,AO
15. Heating Mode-Mixed Air Dry Bulb Temperature-AO
16. Heating Mode-Supply Air Dry Bulb Discharge Temperature-AO
17. Heating Mode-Return Air Dry Bulb Temperature-AO
18. Room Dry Bulb Temperature-AI, AO
19. Room Wet Bulb Temperature-AI, AO
20. Entering Hot Water Temperature-AO
21. Leaving Hot Water Temperature-AO
22. Entering Chilled Water Temperature-AO
23. Leaving Chilled Water Temperature-AO
24. Cooling Mode-Supply Air Discharge Dry Bulb Temperature-AO
25. Cooling Mode-Supply Air Discharge Wet Bulb Temperature-AO

26. Cooling Mode-Mixed Air Dry Bulb Temperature-AO
27. Cooling Mode-Mixed Air Wet Bulb Temperature-AO
28. Cooling Mode-Return Air Dry Bulb Temperature-AO
29. Cooling Mode-Return Air Wet Bulb Temperature-AO

J. <u>Existing Air Handler Unit (AHU-3)</u>

1. Occupied Hours (Heating)
    a. During occupied hours, the existing (AHU-3) be enabled:
        i. For (AHU-3), the Outside air damper shall open to minimum outside air position.
        ii. For (AHU-3), the Return air damper shall open to a percentage based on (100% open – Minimum Outside Air Damper Position %)
        iii. For (AHU-3), Upon proof of fresh air and return air dampers opening to their respective positions, New (AHU-3) shall be enabled.
        iv. Existing (AHU-3) Supply fan & Return Fan shall both be enabled.
        v. For existing (AHU-3), the existing 3-way hot water control valve shall modulate the supply air discharge temperature based on a new DDC room thermostat (72 F adjust)

    b. Economizer Mode
        i. When the outside air enthalpy permits, the existing (AHU-3) shall go into economizer mode by fully opening the outside air damper to 100% & the return air damper shall be 0% open.
        ii. Upon proof of both dampers in their respective positions, the existing (AHU-3) supply air fan shall be enabled to bring in 100% outside air & return air fan shall be off.
    c. In the event that (AHU-3) has a command to enable either the supply air fan, 3-way hot water control valve, return & outside air damper positions and is still disabled, or freeze stat trips on hot water coil, an alarm will be displayed on the BMS.
    d. Heating shall be enabled when outside air temperature is 65 deg F (adj) & below.
2. Unoccupied Hours (Heating)
    a. During unoccupied hours, (AHU-3) shall be enabled:
        i. For (AHU-3), the Outside air damper shall be 0% open.
        ii. For (AHU-3), the Return air damper shall open to a percentage based on (100% open – Minimum Outside Air Damper Position %)

iii. For (AHU-3), Upon proof of fresh air and return air dampers opening to their respective positions, existing (AHU-3) shall be enabled in recirculation mode.
iv. Existing (AHU-3) Supply fan & return fan shall both be enabled.
v. For existing (AHU-3), the face & by-pass damper shall modulate the supply air discharge temperature based on a new DDC room thermostat (60 F adjust)

3. Occupied Hours (Cooling)
    a. During occupied hours, the existing (AHU-3) be enabled:
        i. For (AHU-3), the Outside air damper shall open to minimum outside air position.
        ii. For (AHU-3), the Return air damper shall open to a percentage based on (100% open – Minimum Outside Air Damper Position %).
        iii. For (AHU-3), Upon proof of fresh air and return air dampers opening to their respective positions, New (AHU-3) shall be enabled.
        iv. Existing (AHU-3) Supply & Return fans shall be enabled.
        v. For existing (AHU-3), the new 3-way chilled water control valve shall modulate the supply air discharge temperature based on a new DDC room thermostat (72 F adjust).
    b. Economizer Mode
        i. When the outside air enthalpy permits, the existing (AHU-3) shall go into economizer mode by fully opening the outside air damper to 100% & the return air damper shall be 0% open.
        ii. Upon proof of both dampers in their respective positions, the existing (AHU-3) supply air fan shall be enabled to bring in 100% outside air.
    c. In the event that (AHU-3) has a command to enable either the supply air fan, 3-way chilled water control valve, return & outside air damper positions and is still disabled, or the chilled water coil freezes up, an alarm will be displayed on the BMS.
    d. Cooling shall be enabled when outside air temperature is above 65 deg F (adj).
4. Unoccupied Hours (Cooling)
    a. During unoccupied hours, (AHU-3) shall be disabled:

Control Points:

1. AHU Supply Fan Start-DI, DO
2. AHU Supply Fan Stop-DI, DO
3. AHU Supply Fan Alarm-DO
4. AHU Return Fan Start-DI, DO

5. AHU Return Fan Stop-DI, DO
6. AHU Return Fan Alarm-DO
7. Return/Mixed Air Damper Position-AI, AO
8. Outside Air Damper Position-AI, AO
9. New Chilled Water 3-Way Control Valve % Open-AI, AO
10. Hot Water 3-Way Control Valve % Open-AI, AO
11. Outside Air Temperature-AO
12. Mixed Air Temperature-AO
13. Lower Limit Supply Air Discharge Temperature Setpoint-AI,AO
14. Higher Limit Supply Air Discharge Temperature Setpoint-AI,AO
15. Heating Mode-Mixed Air Dry Bulb Temperature-AO
16. Heating Mode-Supply Air Dry Bulb Discharge Temperature-AO
17. Heating Mode-Return Air Dry Bulb Temperature-AO
18. Room Dry Bulb Temperature-AI, AO
19. Room Wet Bulb Temperature-AI, AO
20. Entering Hot Water Temperature-AO
21. Leaving Hot Water Temperature-AO
22. Entering Chilled Water Temperature-AO
23. Leaving Chilled Water Temperature-AO
24. Cooling Mode-Supply Air Discharge Dry Bulb Temperature-AO
25. Cooling Mode-Supply Air Discharge Wet Bulb Temperature-AO
26. Cooling Mode-Mixed Air Dry Bulb Temperature-AO
27. Cooling Mode-Mixed Air Wet Bulb Temperature-AO
28. Cooling Mode-Return Air Dry Bulb Temperature-AO
29. Cooling Mode-Return Air Wet Bulb Temperature-AO

K. <u>Existing Sensible (Non-Condensing) Hot Water Boilers (B-1, B-2)</u>

1. Occupied Hours & Un-Occupied Hours (Heating)
    a. General: The proposed/new building BMS system serves as the front end of the system. The controller monitors outdoor temperature, indoor temperature, occupied and unoccupied times and signals the existing hot water boilers and boiler plant as required for heat operation. The Existing Boiler Master Control Panel is presumed to include the following: A modulating boiler sequencing controller, Automatic fuel changeover system and The life safety interlocks for e-stop and gas detection. The existing master control is started by a signal from the BMS control system, which signals the existing boilers, and existing auxiliary devices to start when the temperature drops below a preset value. The existing controller monitors hot water temperature via a header sensor and signals the respective existing boilers as needed to maintain temperature set point. Each existing boiler / burner unit is presumed to be complete with an individual

burner control panel, that is presumed to perform the flame safeguard, motor controls, safety interlock and fuel train control functions.

b. During occupied hours, the existing boilers (B-1) shall be enabled (Boiler B-1 is a standby boiler)

c. With a "run" signal from the building BMS system, and all switches in the automatic position, the existing boiler controller is ready for operation. Upon a drop or signal for temperature rise, the existing master control panel's lead / lag control will signal the lead boiler to start.

d. The existing lead boiler with all boiler operating and limit controls in the closed position, under the direction of the flame safeguard control will begin the pre-ignition interlock and safety checks.

e. With all safety checks completed, the existing lead burner begins the firing sequence starting with the energizing of the burner blower and boiler induced draft fan, a 90 second open damper pre-purge, a 10 second trail for ignition, a 10 second trail for main flame, and if successful, the burner will be placed in the "run" mode under the direction of the FSG control. When in the "run" mode, fuel firing rate control is permitted.

f. The existing lead burner will continue to operate in the run mode and the boiler's firing rate proportional control signal from the Sync-matic, will modulate the position and fuel flow rate of the burner. The firing rate shall increase for temperature drop and decrease on temperature rise.

g. Upon a further drop in water temperature or if the water temperature is not recovered within a specified period (field programmable) the existing lead lag control will signal the first lag burner to start.

h. The first lag burner will energize repeating the steps as described in paragraphs # d, # e and # f. If the temperature continues to drop, the second lag burner will energize repeating these same steps.

i. As the water temperature rises, the existing lag boiler will de-energize followed by the lead boiler when the final set point is reached. Each burner will have a 15 second post purge period, after which the flame safeguard control will return to the standby mode.

j. Subsequent burner cycles will follow the same sequence as the load demand requires.

k. The existing controller shall include an outdoor air temperature reset option. If enable, the controller will automatic reset the hot water temperature set point in response to the outdoor air temperature. Field selectable reset ratio curves shall be programmed into the control. See the schedule page for set point vs. outdoor air temp set points.

l. Existing Boiler System Annunciation and Alarms:

i. Power On---Lamp or Display, Alarm
ii. Limit Circuit Closed ---Lamp or Display
iii. Pre-Purge--- Lamp or Display
iv. Main Oil--- Lamp or Display
v. Modulation Mode--- Lamp or Display
vi. Flame Failure--- Lamp or Display, Alarm
vii. High Limit--- Lamp or Display, Alarm
viii. Low Water--- Lamp or Display, Alarm
ix. Low Oil Pressure --- Lamp or Display, Alarm
x. High Gas Pressure--- Lamp or Display, Alarm

m. Individual existing burners are presumed to have an alarm bell with an auto reset silencing switch.

L. Existing Hot Water Heating Zone Pumps (P-1, P-2 and P-3, P-4):

1. Winter (Heating) Season
   a. Existing Heating Zone #1 is existing pumps (P-1, P-2). Pump P-2 is standby pump.
   b. Existing Heating Zone #2 is existing pumps (P-3, P-4). Pump P-4 is standby pump.
   c. During Occupied Hours, Existing Zone #1 Heating Pump (P-1) shall enable.
   d. During Occupied Hours, Existing Zone #1 Heating Pump (P-2) shall serve as a standby/backup pump if (P-1) fails or alarms.
   e. During Occupied Hours, when either existing Boilers (B-1 or B-2) are enabled, existing pumps (P-1 & P-3) shall each energize and be enabled for their respective heating zones.
   f. BMS Contractor shall map out & put on the New Proposed Trane Tracer BMS System the following:
      i. Create Existing Boiler Plant Graphics on existing BMS Front End.
      ii. Controls Points:
         1) Zone #1 Hot Water Pump (P-1) Enable-DI, DO
         2) Zone #1 Hot Water Pump (P-1) Disable-DI, DO
         3) Zone #1 Hot Water Pump (P-1) Alarm-DO
         4) Zone #1 Hot Water Pump (P-2) Enable-DI, DO
         5) Zone #1 Hot Water Pump (P-2) Disable-DI, DO
         6) Zone #1 Hot Water Pump (P-2) Alarm-DO
         7) Zone #2 Hot Water Pump (P-3) Enable-DI, DO
         8) Zone #2 Hot Water Pump (P-3) Disable-DI, DO
         9) Zone #2 Hot Water Pump (P-3) Alarm-DO
         10) Zone #2 Hot Water Pump (P-4) Enable-DI, DO
         11) Zone #2 Hot Water Pump (P-4) Disable-DI, DO
         12) Zone #2 Hot Water Pump (P-4) Alarm-DO
         13) Hot Water Return Going Into Existing Boiler #1 (B-1)-DO
         14) Hot Water Return Going Into Boiler #2 (CH-2)-DO
         15) Hot Water Supply Coming Out Of Boiler #1 (CH-1)-DO

16) Hot Water Supply Coming Out Of Boiler #2 (CH-2)-DO
17) Hot Water Supply Temperature Going to Heating Zone #1-DO
18) Hot Water Return Temperature Coming Back from Heating Zone #1-DO
19) Hot Water Supply Temperature Going to Heating Zone #2-DO
20) Hot Water Return Temperature Coming Back from Heating Zone #2-DO

M. Existing Chillers (CH-1, CH-2)-Sequences when Proposed Ice Plant is Off-Line

1. Summer (Cooling) Season

a. During Occupied Hours, Existing Chiller CH-1 shall enable. Chiller CH-1 shall stage (loading/unloading) based on factory-provided sequencing.
b. During Occupied Hours, when Existing Chiller, CH-1 is enabled, if there is a demand for additional cooling based on chilled water return temperature back to new chiller plant, CH-2 shall be enabled. Existing Chiller CH-2 shall stage (loading/unloading) based on factory-provided sequencing.
c. When a Existing Chiller (Either or Both CH-1 or CH-2) is offline, the two-position DDC two-way control valve on the chilled water supply outlet line shall be 0% open.
d. When a Existing Chiller (Either or Both CH-1 or CH-2) is online, the two-position DDC two-way control valve on the chilled water supply outlet line shall be100% open.
e. During Un-Occupied Hours the Existing Chiller Plant (CH-1 and CH-2) shall be offline.
f. BMS Contractor shall map out & put on the Proposed Trane Tracer BMS System the following:
    i. Create Chiller Plant Graphics on existing BMS Front End.
    ii. Controls Points:
        1) Chiller #1 Enable-DI, DO
        2) Chiller #1 Disable-DI, DO
        3) Chiller #1 Alarm-DO
        4) Chiller #1 Compressor #1 Status-DO
        5) Chiller #1 Compressor #1 Alarm-DO
        6) Chiller #1 Compressor #2 Status-DO
        7) Chiller #1 Compressor #2 Alarm-DO
        8) Chiller #1 Compressor #3 Status-DO
        9) Chiller #1 Compressor #3Alarm-DO
        10) Chiller #1 Compressor #4 Status-DO
        11) Chiller #1 Compressor #4 Alarm-DO
        12) Chiller #1 Condenser Fan #1 Status-DO
        13) Chiller #1 Condenser Fan #1 Alarm-DO
        14) Chiller #1 Condenser Fan #2 Status-DO
        15) Chiller #1 Condenser Fan #2 Alarm-DO
        16) Chiller #1 Condenser Fan #3 Status-DO
        17) Chiller #1 Condenser Fan #3 Alarm-DO
        18) Chiller #1 Condenser Fan #4 Status-DO
        19) Chiller #1 Condenser Fan #4 Alarm-DO
        20) Chiller #1 Condenser Fan #5 Status-DO

21) Chiller #1 Condenser Fan #5 Alarm-DO
22) Chiller #1 Condenser Fan #6 Status-DO
23) Chiller #1 Condenser Fan #6 Alarm-DO
24) Chiller #1 Refrigerant Leak Alarm-DO
25) Chiller #2 Enable-DI, DO
26) Chiller #2 Disable-DI, DO
27) Chiller #2 Alarm-DO
28) Chiller #2 Compressor #1 Status-DO
29) Chiller #2 Compressor #1 Alarm-DO
30) Chiller #2 Compressor #2 Status-DO
31) Chiller #2 Compressor #2 Alarm-DO
32) Chiller #2 Compressor #3 Status-DO
33) Chiller #2 Compressor #3Alarm-DO
34) Chiller #2 Compressor #4 Status-DO
35) Chiller #2 Compressor #4 Alarm-DO
36) Chiller #2 Condenser Fan #1 Status-DO
37) Chiller #2 Condenser Fan #1 Alarm-DO
38) Chiller #2 Condenser Fan #2 Status-DO
39) Chiller #2 Condenser Fan #2 Alarm-DO
40) Chiller #2 Condenser Fan #3 Status-DO
41) Chiller #2 Condenser Fan #3 Alarm-DO
42) Chiller #2 Condenser Fan #4 Status-DO
43) Chiller #2 Condenser Fan #4 Alarm-DO
44) Chiller #2 Condenser Fan #5 Status-DO
45) Chiller #2 Condenser Fan #5 Alarm-DO
46) Chiller #2 Condenser Fan #6 Status-DO
47) Chiller #2 Condenser Fan #6 Alarm-DO
48) Chiller #2 Refrigerant Leak Alarm-DO

B. Winter (Heating) Season

1. During Occupied & Un-Occupied Hours, the Existing Chiller Plant (CH-1 and CH-1) shall both be offline.

New Chilled Water Pumps & Piping System Loop (P-5 and P-6):

A. Summer (Cooling) Season

g. During Occupied Hours, Existing Chilled Water Pump (P-5) shall enable.
h. During Occupied Hours, Existing Chilled Water Pump (P-6) shall serve as a standby/backup pump if (P-5) fails or alarms.
i. During Occupied Hours, when either Existing Chiller, CH-1 or CH-2 is enabled, Existing Chilled Water Pump (P-5) shall energize and enable.

j. BMS Contractor shall map out & put on the Proposed Trane Tracer BMS Controls System the following:

i. Create Chiller Plant Graphics on proposed BMS Front End.

ii. Controls Points:

1)Chiller Water Pump (P-5) Enable-DI, DO
2)Chiller Water Pump (P-5) Disable-DI, DO
3)Chiller Water Pump (P-5) Alarm-DO
4)Chiller Water Pump (P-6) Enable-DI, DO
5)Chiller Water Pump (P-6) Disable-DI, DO
6)Chiller Water Pump (P-6) Alarm-DO
7)Chilled Water Return Going Into Existing Chiller #1 (CH-1)-DO
8)Chilled Water Return Going Into Existing Chiller #2 (CH-2)-DO
9)Chilled Water Supply Coming Out Of Existing Chiller #1 (CH-1)-DO
10) Chilled Water Supply Coming Out Of Existing Chiller #2 (CH-2)-DO

END OF SECTION

DIVISION 26 – ELECTRICAL

SECTION 260500 – COMMON WORK RESULTS FOR ELECTRICAL

PART 1 – GENERAL

1.01 SUMMARY

A. This Section includes general, procedural, and administrative requirements, for electrical products, equipment, and installation practices applicable to this Division.

1.02 RELATED DOCUMENTS

A. All Contract drawings, Contract General and Supplementary Conditions, Division 01 Specification Sections, and Bidding Requirements apply to this section.

B. The requirements of this section shall apply to all other sections of Division 26.

C. The general electrical requirements of this division shall also apply to:

1. Division 23 – Heating, Ventilating and Air Conditioning
2. Division 27 – Communications
3. Division 28 – Electronic Safety and Security

1.03 SCOPE OF WORK

A. It is the declared intent of the project drawings and these specifications that the contractor shall provide for the complete installation of operational electrical circuits and systems as outlined in the project documents.

B. The Electrical Contractor shall provide all materials, equipment, labor, transportation, storage, etc., as necessary for, and incidental to, the completion of all electrical work as indicated on the Drawings and in these Specifications.

C. Included in the above is all related electrical demolition activities, temporary electrical facilities to support the work, final testing, adjusting training as applicable.

D. Before submitting his proposal, the Electrical Contractor shall be fully informed to the extent, character, and intent of the work to be done by him. No consideration will be granted for any misunderstanding of the material to be furnished or work to be performed.

1.04 USE AND INTERPRETATION OF DRAWINGS

A. The drawings are intended to be diagrammatic in nature and are for general electrical design and arrangement of circuits and components. Drawings do not detail every component of the electrical work, nor do they detail complete routing paths. Unless otherwise noted, the locations and elevations of electrical system components are approximate. Exact final locations are subject to the approval of the Owner's Representative. Additional minor adjustments may also be required to avoid conflicts with furniture or other obstructions or field condions. Similarly, the routing of services, feeders, branch circuits, system wiring, as indicated on the drawings, is not intended to be the exact routing. Verify routing with Owner’s Representative.

B. Unless specifically noted otherwise, branch circuit designations, i.e. “home run” designations, are for grouping purposes only to indicate the panelboard or interconnection box from which the branch circuit is served. Actual panel pole circuit numbers are to be determined in the field.

C. Drawings do not show all offsets, fittings, supports, pull or splice interferences, and elevation changes. Adjust installation of conduit, equipment location, etc. to accommodate work with the obstacles and interferences. Where a major and important rearrangement is necessary, report same to Architect for review. Obtain written approval for all major changes.

D. Cooperate with all other Contractors and Owners and determine the exact route of all raceways and location of all equipment the Drawings are diagrammatic and indicate the general arrangement of systems and equipment unless indicated otherwise by dimensions or details. Install work substantially as indicated. Exact equipment locations and raceway routing, etc. shall be governed by actual field conditions and/or instructions of the Engineer and/or Owner's Representative.

E. During the course of the work, should any ambiguities or discrepancies be found on the drawings or in the specifications, to which the Contractor has failed call attention before submission of his bid, then the Engineer shall interpret the intent of the drawings and specifications, and the Contractor hereby agrees to abide by the Engineer's interpretation and agrees to carry out the work in accordance with the decision of the Engineer. It is expressly stipulated that neither the drawings nor the specifications shall take precedence, one over the other, with the exception the more stringent requirement shall prevail, and it is further stipulated that the Engineer may interpret or construe the drawings and specifications of the work, and of that question, the Engineer shall be the sole judge.

1.05 COMPLETE SYSTEMS

A. The drawings and specifications are intended to provide for a complete, operational electrical installation. However, both the drawings and specifications are for the Electrical Contractor's guidance and are in no way intended to give every detail of the existing conditions or new installations, nor do they describe every fitting required for the installation of the work. The Electrical Contractor shall furnish, install, and place in workmanlike manner all equipment, accessories, supports, fittings, backboxes and all other material needed for a complete electrical and operational installation. The Electrical Contractor shall make all final connections to equipment. The Electrical Contractor shall prepare such additional drawings as necessary or required for any purpose and shall submit them for the approval of the Engineer.

1.06 APPLICABLE CODES, STANDARDS AND REGULATIONS

A. Comply with NFPA 70 (National Electrical Code (NEC)), version currently adopted by the Authority Having Jurisdiction (AHJ). Comply with NECA (National Electrical Contractor's Association) Standards for minimum professional installation methods and practices. Comply with all applicable federal, state and local laws, ordinances, codes, rules and regulations. Where the Contract Documents exceed these requirements, the Contract Documents shall govern. In no case shall work be installed contrary to or below minimum legal standards. Comply with local authorities having jurisdiction (AHJ) and resolve any conflicts. Where conflicts between codes and standards arise, the more stringent requirements shall be adhered to.

B. The current applicable rules, restrictions and requirements of the utility companies providing service to the project site/facilities shall be adhered to. Provide all required coordination.

C. Should any materials installed, or work performed, be found to be not in compliance with any of the listed codes and regulations, provide all materials, labor, and pay all costs necessary to correct the deficiencies at no additional cost.

1.07 REFERENCE CODES & STANDARDS

A. All work shall be in accordance with:

1. New York State Uniform Fire and Prevention Codes and Supplements (latest editions in effect at time of bid):

   a. New York State Building Code
   b. New York State Existing Building Code
   c. New York State Energy Conservation Code
   d. New York State Fire Code

2. The latest editions at time of bid (unless otherwise noted) of the below standards of the following:

a.	ADA	Americans with Disabilities Act
b.	ASA	American Standards Association
c.	ASTM	American Society for Testing Materials
d.	ETL	Electrical Testing Laboratories, Inc
e.	IES	Illuminating Engineering Society of North America.
f.	IEEE	Institute of Electrical and Electronic Engineers
g.	IPCEA	Insulated Power Cable for Engineers Association
h.	OSHA	Occupational Safety and Health Act
i.	NEC	National Electric Code (2017)
j.	NECA	National Electrical Contractor's Association
k.	NEMA	National Electrical Manufacturers Association
l.	NESC	National Electrical Safety Code
m.	NFPA	National Fire Protection Association
n.	UL	Underwiter's Laboratories

3. Listings: All equipment, materials and devices shall be listed and labelled by a Nationally recognized Testing Laboratory (NRTL), such as Underwriters Laboratories, Inc (UL) for the intended use and shall bear its label.

4. The Rules and Regulations of the local utilities providing service to the project location.

5. The Rules and Regulations of the local Authority Having Jurisdiction (AHJ).

6. The Directives of the Owner of the Facility where the work is being performed.

B. Before submitting his bid, the Electrical Contractor shall be familiar with the rules of the aforementioned Boards, Departments, Agencies, etc. having jurisdiction, applicable Codes. and shall notify the Engineer with his bid, if in his opinion any work or materials specified is contrary to any such rules. Otherwise, the Electrical Contractor shall be responsible for the approval of all work or materials and in case the use of any material specified is not permitted, a substitute approved by the authorities and by the Engineer shall be furnished and installed without additional cost to the Owner.

1.08 DEFINITIONS

As Specified	All materials, equipment including the execution thereof as called for/shown in the Contract Documents.
Code Requirements	Minimum requirements necessary for compliance with applicable codes.
Concealed	Work not readily visible, including, but not limited to that which is inside walls, above ceilings, below or within slabs, below grade, within pipe and duct shafts chases or recesses.
Exposed	Work readily visible, including, but not limited to, that which is installed on wall/ceiling surfaces, below ceilings, etc. or otherwise not concealed.

Acceptance	Owner acceptance of the project from Contractor upon certification by Owner's Representative.
Furnished by Others	Materials, equipment provided by others received and/or installed by the Electrical Contractor. It includes receiving delivery at job site.
Inspection	Visual observations by Owner, his Site Representative, Architect/Engineer, or another Agency.
Install	All labor and materials necessary, and incidental to, the mount or place equipment, etc., completely connect and make operational.
Labeled	Classification by a standards agency.
Provide	Furnish and install complete and operational.
Relocate	Disconnect, disassemble, and transport equipment to new locations, then clean, install and test and make ready for use. All necessary wiring and raceway extensions shall be considered incidental to the relocation process.
Remove	Disconnect, disassemble, dismount and dispose of off-site, including all associated appurtenances, wiring and raceway rendered unnecessary by the removal.
Reinstall	All labor and materials necessary, and incidental to, mount or place previously removed equipment at or near its pre-existing location. Clean completely connect and make operational. Includes minor wiring rework necessary.
Remove	Disconnect, disassemble and dispose. Includes demolition of associated wiring and conduit rendered unnecessary by removal of subject item.
Replace	Remove and provide new item.
Review	A general contractual conformance check of specified products.
Roughing	Conduit, backboxes etc. pursuant to equipment layout and installation.
Safe Off	De-energize, disconnect and make safe for removal or other work in the area by the Electrical Contractor or by Others.
Satisfactory	In conformance with and as specified in Contract Documents.
Site Representative	Owner’s designated Construction Manager or Inspector at the work site.

1.09 EXISTING CONDITIONS

A. The Electrical Contractor, before submitting his bid, shall examine the site to which this work is in any way dependent upon according to the intent of these specifications and accompanying drawings. He shall report to the Architect/Engineer, in writing, prior to bid, any conditions which prevent him from performing his work. No “Waiver of Responsibility” for inadequate, incomplete, or defective work will be considered by the Engineer unless written notice had been filed by the Electrical Contractor with his bid.

B. Where existing electrical systems of any voltage or purpose, or portions thereof, are to be re-used or modified, the Electrical Contractor shall test the affected portions for the purpose of identifying

pre-existing operational deficiencies. This shall include, but is not limited to, fire alarm, public address, security, CCTV, etc. Report any deficiencies, in writing, to the Owner or his designated representative. Deficiencies occurring after testing, not previously identified, shall be considered as a result of Contractor activities and shall be restored to working condition at no additional cost. If the Owner requests any of the pre-existing deficiencies be corrected by the Contractor, these shall be addressed at additional contract cost.

1.10 PERMITS, INSPECTIONS AND CERTIFICATES

A. The Electrical Contractor shall procure and pay for all necessary drawings, permits, inspections and certificates required by the various governing agencies, etc. having jurisdiction or utilities providing service as part of the bid and shall turn over to the Engineer all permits for construction before starting work and certificates of test, inspection, and approval before requesting payment.

B. Included in the above, the Electrical Contractor shall obtain a Certificate of Electrical Inspection for completed work from an approved third-party electrical inspection agency serving the project locale.

1.11 QUALITY ASSURANCE

A. The Electrical Contractor shall be regularly engaged in the production or installation of specified products, and systems for not less than three years.

B. All work under this Division shall be performed by a licensed electrician or done so under his direct supervision.

C. All painting, patching, concrete work, carpentry, welding, core drilling, etc. incidental to the completion of Division 26 work shall be performed by skilled tradespersons appropriate to the work.

1.12 SUBMITTALS

A. Within 30 days of the signing of the contract, prepare and submit for approval, per the procedures set forth in Division 01, all submittals required by Division 01, this Division and by all other Contract Documents.

B. Required submittals may include, but not be limited to: Schedule of Values; Subcontractor List(s); Product Data; Shop Drawings; Test Reports; Calculations, Photometric Analysis, Certifications; Warranties; Operation & Maintenance Manuals; Record Drawings and various administrative submittals. Provide samples or mock-ups upon request at no additional cost.

C. The number of copies submitted shall be as indicated in Division 01, or elsewhere in the Specifications or Contract Drawings. Electronic (.pdf or similar) may be submitted in lieu of hardcopies where permitted. Generally, all equipment and materials of the same classification, type or kind shall be submitted at one time.

D. For materials, devices, equipment, etc. to be installed, as required in subsequent individual Division 26 sections, submit product data consisting of manufacturer's standard catalog cuts, descriptive literature and/or diagrams, etc. Submittals shall be provided in sufficient detail so as to clearly indicate compliance with all specified requirements and standards. Documents shall be clearly marked to indicate proposed product, selected options, selected accessories, selected finishes, etc. Please clearly indicate any equipment tags for each item as indicated on Drawings for correlation.

E. For systems and equipment, as required in subsequent individual Divisions 26 sections provide project specific Shop Drawings which shall include all information listed in the Shop Drawings submittal requirements in the respective specification section. Include all pertinent information including, but not limited to, equipment/system identification, manufacturer/model, nameplate data,

dimensions, sizes, capacities, types, material, accessories and options, etc. Include any relevant performance data, system risers, wiring diagrams, etc. The documents provided shall be in sufficient detail so as to clearly indicate compliance with all project requirements and standards.

F. Any construction delays caused by failure to submit shop drawings on time or in the proper format shall be the responsibility of the Electrical Contractor.

G. Substitutions: Where products or materials are specified hereinafter by manufacturer's name and/or model number, they shall be considered as the standard and as most satisfactory for their purpose of use on the site or in the building. Another manufacturer's product other than those indicated may be submitted in lieu of the specified product with the understanding that the Engineer shall be the sole judge as to the equality to the specified item and acceptability of the submitted items. In addition, furnish to the Engineer or Owner upon request, and within 14 days of such a request, samples of any Base Bid and/or corresponding Alternate Bid item and/or intended substitute equipment, fixtures, etc. for their comparison and selection. Furnish any additional requested product information, calculations, etc. at no additional cost. Submission of substituted items is with the understanding that neither the Engineer nor the Owner is responsible for any delays or additional costs arising from review, acceptance, denial of said substituted item. Furthermore, any additional costs in material, labor, etc. or delays relating to the installation of substituted item shall be at no additional cost to the Engineer or Owner.

1.13 GUARANTEE

A. For guarantee requirements, refer to the applicable section of the Conditions of the Contract.

PART 2 – PRODUCTS

2.01 GENERAL

A. Except where existing materials and equipment are called for to be reused, all materials and equipment furnished and installed under Division 26 shall be new, of standard first grade quality, undamaged, defect-free, and correctly designed for their specific purpose. All new materials and equipment shall conform to the standards of and be listed/labeled by a Nationally Recognized Testing Laboratory (NRTL) such as Underwriters Laboratories (UL) and shall be approved for use by all local authorities having jurisdiction.

B. All equipment and material furnished shall be the manufacturer's standard item of production unless specifically specified or required to be modified to suit job conditions. Size, material; finish dimensions, and the capacities for the specified application shall be published in catalogs for national distribution by the manufacturer. Ratings and capacities shall be certified by a nationally recognized rating bureau.

C. Where specific devices, equipment, systems (or portions thereof) are indicated to be re-used, the Electrical Contractor, in the presence the Owner or his representative, shall verify proper operation of same prior to commencing work. Report any pre-existing defects or non-functioning items to the Engineer/Architect. The Electrical Contractor shall be held responsible for correcting and/or replacing any unreported items found to be defective up until Owner Acceptance at no additional cost.

D. Equipment and material fabricated specifically for use on this project shall be in strict accordance with the Drawings and Specifications and shall conform to the latest standards of the National Electric Manufacturer's Association.

E. All materials and equipment of one and the same kind, type, or classification and used for identical purpose shall be made by the same manufacturer.

2.02 NEW CIRCUIT BREAKERS INSTALLED IN EXISTING PANELBOARDS

A. New circuit breakers installed in existing panelboards shall be listed for use in the intended panelboard.

B. The new circuit breaker's interrupting rating shall meet or exceed the interrupting rating of the intended panelboard.

PART 3 – EXECUTION

3.01 GENERAL

A. The electrical installation work shall be in accordance with the intent of the Contract Documents, and applicable Codes and Standards, and manufacturer' as determined by the Engineer.

B. All materials and equipment shall be installed as in accordance with manufacturer's instructions, by mechanics experienced and skilled in their trade, in a neat and professional manner, in accordance with trade standards, and so as not to void any warranty or UL listing.

C. Any workmanship considered by the Architect/Engineer as being faulty or substandard shall be removed and replaced by the Contractor to the satisfaction of the Architect/Engineer at no additional cost to the Owner.

D. All work under the electrical contract shall be performed under the Contractor's direct supervision. Provide sufficient and qualified personnel necessary to complete the work in accordance with the Contract Documents and in accordance with the project schedule.

E. Prior to installation, examine the areas and conditions under which the work is to be performed. Identify any conditions which will impact the proper and timely completion of the work. Do not proceed until the impacting conditions have been corrected.

F. Install electrical raceways, wiring and systems parallel and perpendicular to building surfaces and components to the extent possible. Equipment, boxes, etc. shall be installed level and plumb.

G. In general, run branch circuits in concealed above dropped ceilings, in furred walls, in voids and chases. All devices, conduits, wiring and conduits shall be recessed in new construction. In existing unfinished areas, such as mechanical spaces and storage areas wiring may be run exposed. In existing finished and public spaces where wiring cannot be practically concealed, such as block surfaces, wiring may be run in finished surface raceways secured using mechanically fastened clips.

H. Unless otherwise indicated, provide final connections to all equipment, in accordance with manufacturer's instructions.

3.02 SAFE WORK PRACTICES

A. To the greatest extent possible, all electrical work shall be performed on de-energized material and equipment using appropriate lock-out/tag-out procedures per OSHA requirements.

B. Work on energized systems shall be approved by the Owner's representative. All persons working on energized equipment shall wear appropriate personal protective equipment (PPE) following safe work practices and the latest version of NFPA 70E. A minimum of two people is required to be working to ensure the safety of each.

3.03 DELIVERY, STORAGE AND HANDLING OF MATERIALS

A. Comply with Division 01 requirements.

B. The Contractor shall arrange with the Owner for storage of delivered materials related to the work. Where the Owner cannot provide safe, adequate, or sufficient space, provide off-site storage or, with owner approval, arrange and pay for sufficient secure on-site storage container(s). Locations of storage containers shall be coordinated with the Owner.

C. The Electrical Contractor shall be responsible for coordinating, off-loading, receiving and storing all deliveries related to the work. Coordinate all haul routes and schedules with the Owner or Construction Manager.

D. Products shall be delivered in manufacturer's original unopened packaging, with manufacturer's identification and product labelling.

E. Products shall be stored in a manner which shall protect them from theft, damage, weather and entry of debris. Comply with all manufacturer's written storage recommendations.

F. Promptly inspect delivered goods for damage and deficiencies. Arrange for their prompt replacement or removal from the site. Do not install damaged products.

3.04 COORDINATION AND COOPERATION

A. The work called for in the Contract Drawings Specifications shall be carried on in conjunction with the continued operation of the building. The work shall be arranged such that its installation and operation will conform with and facilitate the early installation of the work.

B. The Electrical Contractor shall bear the expense required to revise his work due to any failure to coordinate the installation of his work with that of the building's operation.

C. Unless otherwise stated in the Contract Drawings, all outages to building systems will occur when the building is not in use. The Electrical Contractor shall include all premium time charges in the bid.

D. The Electrical Contractor shall be responsible for the distribution and information concerning his work as required for the prompt installation. The Electrical Contractor will be held fully responsible for any delay in the work resulting from failure to distribute any information, etc. regarding his work as required. See also the applicable sections of the Conditions of the Contract.

E. The Electrical Contractor shall coordinate and cooperate with the Contractors of other trades, Subcontractors, outside agencies, and with the Owner regarding placement, anchorage and accomplishment of the work. Resolve interferences between work of other disciplines or Contractors, prior to commencing installation.

F. Coordinate with other trades for all demolition activities. Provide mark-outs for items to be demolished by others. De-energize and safe off circuits in demolition areas as required for a safe work area.

G. Coordinate with other trades and with Owner for chases, slots and openings during the project as required to complete the installation of the electrical work in timely manner.

H. Coordinate with other trades in scheduling all installation activities with the overall goal of completion of the project in a timely manner.

I. Coordinate the installation of required supporting devices and sleeves to be set in poured-in-place concrete and other structural components, as they are constructed.

J. During the installation of equipment and raceways, provide any offsets, fittings, boxes, accessories to achieve changes in elevation or location as necessary to avoid obstacles and interferences, per actual field conditions.

K. Piping or other systems which are dependent upon slope have the right of way.

L. Provide temporary dust caps on smoke detectors in the work area as necessary to prevent false alarms. Remove when no longer required.

3.05 SHUTDOWNS

A. In accordance with the General Conditions, all shutdowns to existing electrical services are to be scheduled and approved, in advance, in writing, by the Owner. Unless otherwise noted, assume all temporary shutdowns to be performed while the building is not in operation. Include all premium time in bid. Include any applicable utility shutdown fees in bid.

3.06 DIMENSIONING

A. Refer to architectural or other dimensioned drawings. However, field measurements take precedence over dimensioned drawings. Do not scale drawings.

3.07 PROTECTION OF THE WORK

A. The Electrical Contractor shall effectively protect, at his expense, all materials and equipment, including his employees and building occupants, during the period of construction and shall be held responsible for all damage done to his work, until the same is fully accepted by the Architect. See also the applicable sections of the Conditions of the Contractor. Protect all electrical materials, equipment and work from the vandalism, weather elements, theft, paint overspray, concrete and mortar, construction debris and damage, etc. until acceptance by the Owner. Repair, replace and clean all electrical work so affected at no additional cost to the Contract.

3.08 CUTTING AND PATCHING

A. All cutting, core drilling, etc. required to facilitate the proper installation of all work to be installed under Electrical ids the responsibility of the Electrical Contractor, unless indicated otherwise. All cutting shall be done in the manner specified and/or directed and approved by the Engineer and only after permission of the Engineer is obtained. The installation of sleeves, chases, etc. in concrete walls, floors, ceilings, and roofs as well as the cutting of existing concrete walls, floors, ceilings, and roofs shall be done by core drilling. All patching will be the responsibility of this Contractor.

B. All penetrations to exterior walls and below grade foundations shall be made through sleeves provided by the Electrical Contractor and thoroughly sealed and caulked airtight and watertight.

C. Roof penetrations shall be performed via approved roof curbs, pitch pockets, pipe portals etc. Unless otherwise indicated, provide all required materials and labor to perform the penetration and subsequent repair. All penetrations shall be repaired and sealed airtight and watertight in accordance with existing roof warrantees and roof manufacturer directions. In no case shall any roof penetration or repairs violate existing warrantees.

D. Provide all new patching work to match existing conditions.

3.09 WATERPROOFING

A. Wherever any of the work of Division 26 must pierce any waterproofing, this work shall be done by the Electrical Contractor with care. After the part of these systems have been put in place through this waterproofing, the opening made by same shall be waterproofed and made absolutely water-tight as approved by the Architect and/or as hereinafter specified.

B. Conduits piercing the cement waterproofing of walls and floors shall be provided with waterproof conduit entrance seal sleeves around same. These sleeves shall be Type “WSK” (walls) or “FSK” (floors) as manufactured by O-Z or other approved.

C. Conduit sleeves through non-waterproofed, non-fire-rated walls and floors shall be grouted, caulked with oakum, and sealed with approved semi-plastic mastic compound on both sides of the wall.

D. All roof penetrations shall be performed in a manner to obtain watertight seal and in conformance with existing roof warrantees. Unless provided by others, provide pitch pockets, pipe portals or other means consistent with existing roof warrantees for any roof penetrations. Coordinate penetrations for rooftop HVAC equipment with the Mechanical Contractor.

3.10 FIRESTOPPING

A. Provide and apply listed firestopping materials to penetrations of fire-rated floor and wall assemblies for electrical installation. Firestopping shall restore original fire-resistance rating of assembly or better. Firestopping materials and installation requirements are specified in Section 078413 – Penetration Firestopping.

3.11 CEILING REMOVALS

A. Unless otherwise noted in the contract Documents, existing ceilings which must be removed for the Electrical Contractor’s installation or demolition work shall be done by the Electrical Contractor. No ceiling shall be removed without prior approval of the Owner. When directed by the Owner or Owner’s Representative, removed ceilings shall restored at the end of each working day. Ceilings which must be removed shall be restored to their original condition as soon as practical and prior to final payment.

B. Store any removed ceiling tiles either in the ceiling space or at a designated space in the building until re-installation.

C. Take all necessary precautions to prevent damage to the existing ceilings.

D. Replace Contractor damaged ceiling tiles with new ceiling construction to match the existing and to the Owner’s satisfaction.

E. Coordinate with other trades when ceiling related work must be performed in common work areas.

F. In areas with pre-existing ceiling damage, coordinate with the Owner’s representative to document said damage, and determine if the Owner wishes to provide replacement ceiling materials for re-installation.

3.12 PHASE ROTATIONS

A. The Electrical contractor is responsible to verify and maintain facility phase rotations throughout.

3.13 PAINTING AND FINISHING

A. Where final painting and finishes are not being provided by other trades, provide all priming and painting to cuts and patches performed under this Contract in finished areas to match existing conditions.

B. Provide matching painting and patching for surfaces in finished areas at locations of Electrical demolition and/or removals.

C. Provide matching painting and patching to building surfaces damaged as result of Electrical installation work.

D. Provide touch up painting to equipment furnished under this contract.

E. All painting materials shall conform to paint specifications elsewhere in the Contract Documents, or in the absence of same, shall be suitable for the surfaces and environments used. In no case shall lead based paints be used.

3.14 CHECKOUT, TESTING AND ADJUSTING

A. Provide all required programming, integration and adjustments, tune-ups. etc. as required to bring the equipment or system up to fully operational condition.

B. All tests required by the National Electrical Code, approved Electrical Inspection Agencies, State and Local Authorities, the servicing Utility Company, and the Engineer shall be executed by or paid for by the Electrical Contractor. Furnish all labor, material, and instruments for each test. All major tests shall be witnessed by the Engineer. Owner's representative and/or the Authority having jurisdiction, all of whom shall be given a minimum of one week's written notice prior to such tests.

C. Tests shall be scheduled at least one week in advance and at a time so as not to disrupt building operation, and to allow Engineer and Owner representative(s) the opportunity to witness the test, unless directed otherwise. Tests shall not be scheduled until the system installation is complete and fully operational, unless indicated or otherwise directed.

D. Where required by subsequent specification sections or by the manufacturer, arrange for and pay all costs for manufacturer's authorized representative(s) to be present at time of system or equipment start-up. The manufacturer's representative shall provide system integration and programming, start-up supervision, conduct and/or certify all required testing and adjusting, and provide any required training to the end user.

E. Coordinate with the Owner or his designated representative where Owner preferences or input is required for system setup.

F. Submit test reports neatly typewritten on 8-1/2 x 11" sheets indicating system or equipment being tested, date, and time of test, testing methodology, witnesses, testing results and any other pertinent information. Within five (5) days of test completion, submit written or electronic (PDF) copy of test reports for Engineer review, and include a copy with the appropriate operation and maintenance data.

G. At no additional cost, the Electrical Contractor shall correct any deficiencies found, and replace any defective materials and equipment or unable to perform at design or rated capacity. Repeat testing without additional cost to the Owner or Contract until satisfactory results are achieved. Submit final report indicating any corrective measures taken and satisfactory test results.

3.15 FINAL INSPECTIONS

A. Coordinate and obtain all final inspections as required by these specifications and as required by the Authority Having Jurisdiction. Obtain electrical inspection certificate from an authorized Electrical Inspection Agency. Include all costs in bid. Provide all inspection reports and Inspection certificates as part of closeout documents.

3.16 SYSTEMS DEMONSTRATION

A. The Electrical Contractor shall be fully responsible for instructing the Owner's designated personnel in the operation and maintenance of all equipment and systems furnished under the Contract. All costs required for such instruction and demonstration shall be paid for by the Electrical Contractor. Such instruction shall take place in the presence of the Owner's representative upon completion of the work. The Owner reserve the right to record any training sessions. Furnish for Owner use, Engineer approved, printed and bound copies of all operation and maintenance construction manuals. Included in these manuals shall be one (1) copy of all previously submitted and Engineer "Approved" or "Approved as Noted" shop drawings ("Approved as Noted" shop drawings must first be permanently corrected). Informal or non-Engineer witnessed instructions or instructions to non-designed Owner personnel shall not be recognized as fulfilling these requirements.

3.17 CLEANING

A. Perform cleaning in accordance with Division 01.

B. Maintain a clean work site. Remove from the premises, all packaging / shipping materials, waste, rubbish and construction debris. The premises shall be left clean and free of any debris and unused construction materials prior to final acceptance. Leave the area broom clean.

C. Clean all electrical equipment enclosures of dirt, dust, wire cuttings and other foreign materials.

D. Clean all light fixtures, lenses, reflectors and lamps of dirt, dust, fingermarks etc. Adjust lenses for proper fit.

E. Remove all temporary dust caps from fire alarm devices.

F. Provide touch-up painting to restore and refinish to match original condition surfaces of electrical equipment scratched, marred during shipping, handling or installation. Remove any rust and prime and paint as recommended by manufacturer. Pay particular attention to equipment installed outdoors in areas of harsh environment.

3.18 RECORD DOCUMENTS

A. Prior to final payment, submit Close Out Documentation in accordance with Division 01.

B. As-Built record drawings shall document installed locations of equipment, panelboards, disconnect switches and control devices. Document the approximate as-built routing of major feeders and underground conduit runs.

END OF SECTION

DIVISION 26 – ELECTRICAL

SECTION 260526 – GROUNDING AND BONDING

PART 1 – GENERAL

1.01 SUMMARY

A. This Section includes grounding of electrical systems and equipment. Grounding requirements specified in this Section may be supplemented by special requirements of systems described in other Sections.

1.02 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.03 SUBMITTALS

A. Product Data: Manufacturer's standard catalog cuts for each type of product indicated.

B. Product Data: For the following:

1. Ground rods.
2. Grounding clamps & connectors

C. Qualification Data: For firms and persons specified in "Quality Assurance" Article.

D. Field Test Reports: Submit written test reports to include the following:

1. Test procedures used.
2. Test results that comply with requirements.
3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

1.04 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a Nationally Recognized Testing Agency (NRTL) acceptable to authorities having jurisdiction and marked for intended use.

1. Comply with UL 467.

2. Comply with NFPA 70.

3. For overhead-line construction and medium-voltage underground construction, comply with IEEE C2.

4. Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system.

PART 2 - PRODUCTS

2.01 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. Burndy Corp.
2. Cadweld Div.; Erico Product, Inc.
3. Erico International Corporation
4. ILSCO
5. Joslyn Corp.
6. OZ Gedney Div.; General Signal Corp.
7. Thomas and Betts Corp.
8. Thompson Lightning Protection Corp.

2.02 GROUNDING CONDUCTORS

A. Insulated conductors, comply with Section 260519.

B. Material: Aluminum, copper-clad aluminum, and copper.

C. Equipment Grounding Conductors: Insulated with green-colored insulation.

D. Grounding Electrode Conductors: Stranded cable.

E. Underground Conductors: Bare, tinned, stranded, unless otherwise indicated.

F. Bare Copper Conductors: Comply with the following:

1. Solid Conductors: ASTM B 3.
2. Assembly of Stranded Conductors: ASTM B 8.
3. Tinned Conductors: ASTM B 33.

G. Grounding Bus: Bare, annealed copper bars of rectangular cross section, with insulators.

2.03 CONNECTOR PRODUCTS

A. Comply with IEEE 837 and UL 467; listed for use for specific types, sizes, and combinations of conductors and connected items.

B. Bolted Connectors: Bolted-pressure-type connectors, or compression type.

C. Welded Connectors: Exothermic-welded type, in kit form, and selected per manufacturer's written instructions.

2.04 GROUNDING ELECTRODES

A. Ground Rods: Pointed, Copper-clad steel.

1. Size: 3/4 x 120 inches

B. Test Wells: Where indicated, provide handhole as specified in Division 2 Section "Underground Ducts and Utility Structures."

PART 3 - EXECUTION

3.01 APPLICATION

A. In raceways, use insulated equipment grounding conductors.

B. Exothermic-Welded Connections: Use for connections to structural steel and for underground connections, except those at test wells.

C. Equipment Grounding Conductor Terminations: Use bolted pressure clamps.

D. Ground Rod Clamps at Test Wells: Use bolted pressure clamps with at least two bolts.

E. Underground Grounding Conductors: Use copper conductor, No. 2/0 AWG minimum. Bury at least 24 inches (600 mm) below grade or bury 12 inches (300 mm) above duct bank when installed as part of the duct bank.

3.02 SERVICE GROUNDING

A. Provide a grounding electrode conductor, sized in accordance with the drawings or NFPA 70, connected to the neutral bus at the service disconnecting means and the opposite end connected to a listed grounding electrode.

B. Equipment grounding conductors shall be connected to the ground bus at the service disconnecting means.

C. Comply with NEC and local utility grounding requirements.

3.03 SEPARATELY DERIVED SYSTEM GROUNDING

A. Separately derived systems shall include, but are not limited to:

1. Transformers (exception: autotransformers)
2. Generators (where neutral is switched)
3. UPS systems when so configured.

B. Comply with NFPA 70.

C. A grounding electrode conductor, sized per the drawings or NFPA 70, shall be provided between the separately derived system grounded conductor and grounded metal frame or metal structural member. This connection shall be made at the source grounded conductor bus or at the first disconnecting means subject to the provisions of NFPA 70.

D. Provides system bonding jumper, sized per drawings or NFPA 70 between the system grounded conductor bus and the equipment ground bus.

E. There shall be no further connections between the grounded conductor and equipment ground downstream (load side) of the connection.

3.04 EQUIPMENT GROUNDING CONDUCTORS

A. Comply with NFPA 70, Article 250, for types, sizes, and quantities of equipment grounding conductors, unless specific types, larger sizes, or more conductors than required by NFPA 70 are indicated.

B. Install equipment grounding conductors in all new feeders and branch circuits. Reliance solely on metallic raceways for equipment grounding means is NOT permitted.

C. Computer Outlet Circuits: Install insulated equipment grounding conductor in branch-circuit runs from computer-area power panels or power-distribution units.

D. Air-Duct Equipment Circuits: Install an equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners and heaters. Bond conductor to each unit and to air duct.

E. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate equipment grounding conductor to each electric water heater, heat-tracing, and antifrost heating cable. Bond conductor to heater units, piping, connected equipment, and components.

F. Signal and Communication Systems: For telephone, alarm, voice and data, and other communication systems, provide No. 4 AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location.

1. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a 1/4-by-2-by-12-inch (6.4- by-50-by-300-mm) grounding bus.

2. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.

G. Metal Poles Supporting Outdoor Lighting Fixtures: Provide a grounding electrode in addition to installing a separate equipment grounding conductor with supply branch-circuit conductors.

3.05 INSTALLATION

A. Ground Rods: Install ground rods per NEC and utility requirements.

1. Drive ground rods until tops are 2 inches (50 mm) below finished floor or final grade, unless otherwise indicated.

2. Interconnect ground rods with grounding electrode conductors. Use exothermic welds. Make connections without exposing steel or damaging copper coating.

3. Ground rods shall be installed in undisturbed earth.

B. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

C. Bonding Straps and Jumpers: Install so vibration by equipment mounted on vibration isolation hangers and supports is not transmitted to rigidly mounted equipment. Use exothermic-welded connectors for outdoor locations, unless a disconnect-type connection is required; then, use a bolted clamp. Bond straps directly to the basic structure taking care not to penetrate any adjacent parts. Install straps only in locations accessible for maintenance.

D. Metal Water Service Pipe: Provide 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 by grounding clamp connectors. Where a dielectric main water fitting is installed, connect grounding conductor to street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.

E. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with grounding clamp connectors.

F. Bond interior metal piping systems and metal air ducts to equipment grounding conductors of associated pumps, fans, blowers, electric heaters, and air cleaners. Use braided-type bonding straps.

G. Bond each aboveground portion of gas piping system upstream from equipment shutoff valve.

H. Install one test well for each service at the ground rod electrically closest to the service entrance. Set top of well flush with finished grade or floor.

3.06 CONNECTIONS

A. General: Make connections so galvanic action or electrolysis possibility is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.

1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer to order of galvanic series.

2. Make connections with clean, bare metal at points of contact.

3. Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.

4. Make aluminum-to-galvanized steel connections with tin-plated copper jumpers and mechanical clamps.

5. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.

B. Exothermic-Welded Connections: Comply with manufacturer's written instructions. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable.

C. Equipment Grounding Conductor Terminations: For No. 8 AWG and larger, use pressure-type grounding lugs. No. 10 AWG and smaller grounding conductors may be terminated with winged pressure-type connectors.

D. Noncontact Metal Raceway Terminations: If metallic raceways terminate at metal housings without mechanical and electrical connection to housing, terminate each conduit with a grounding bushing. Connect grounding bushings with a bare grounding conductor to grounding bus or terminal in housing. Bond electrically noncontinuous conduits at entrances and exits with grounding bushings and bare grounding conductors, unless otherwise indicated.

E. Connections at Test Wells: Use compression-type connectors on conductors and make bolted- and clamped-type connections between conductors and ground rods.

F. Compression-Type Connections: Use hydraulic compression tools to provide correct circumferential pressure for compression connectors. Use tools and dies recommended by connector manufacturer. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on grounding conductor.

G. Moisture Protection: If insulated grounding conductors are connected to ground rods or grounding buses, insulate entire area of connection and seal against moisture penetration of insulation and cable.

3.07 GRADING AND PLANTING

A. Restore surface features, including vegetation, at areas disturbed by Work of this Section. Reestablish original grades, unless otherwise indicated. If sod has been removed, replace it as soon as possible after backfilling is completed. Restore areas disturbed by trenching, storing of dirt, cable laying, and other activities to their original condition. Include application of topsoil, fertilizer, lime, seed, sod, sprig, and mulch. Comply with Section 310000. Maintain restored surfaces. Restore disturbed paving as indicated.

END OF SECTION

DIVISION 26 – ELECTRICAL

SECTION 260532 – RACEWAYS, FITTINGS AND ACCESSORIES

PART 1 – GENERAL

1.01 REFERENCES

A. NFPA, NEMA, ANSI, and UL.

1.02 SUBMITTALS

A. Product Data: Manufacturer's standard catalog sheets, specifications and installation instructions.

1.03 QUALITY ASSURANCE

A. Electrical components, conductors, devices and accessories described herein shall be listed and labeled as defined by NFPA 70 by a Nationally Recognized Testing Laboratory (NRTL), such as Underwriters Laboratories (UL), for the intended use and shall bear its label.

PART 2 - PRODUCTS

2.01 RACEWAYS

A. Rigid Ferrous Metal Conduit (a/ka Galvanized Rigid Conduit (GRC)):

1. Comply with UL 6 and ANSI C80.1.

2. Minimum trade size – 3/4".

3. Provide steel, hot dipped galvanized on the outside and inside, UL categorized as Rigid Ferrous Metal Conduit (identified on UL Listing Mark as Rigid Metal Conduit - Steel or Rigid Steel Conduit), by Allied Tube & Conduit Corp., Republic Conduit, or Wheatland Tube Co or approved equal.

B. Electrical Metallic Tubing (EMT):

1. Comply with UL 797 and ANSI C80.6.

2. Minimum trade size - 3/4".

3. Provide steel, galvanized on the outside and enameled on the inside, UL categorized as Electrical Metallic Tubing (identified on UL Listing Mark as Electrical Metallic Tubing), by Allied Tube & Conduit Corp Republic Conduit, or Wheatland Tube Co. or approved equal.

C. Flexible Metal Conduit (FMC):

1. Comply with UL 1.

2. Galvanized steel strip shaped into interlocking convolutions, UL categorized as Flexible Metal Conduit (identified on UL Listing Mark as Flexible Steel Conduit or Flexible Steel Conduit Type RW), by AFC Cable Systems Inc., Anamet Electrical Inc., Electri-Flex Co., or International Metal Hose Co. or approved equal.

D. Liquid-tight Flexible Metal Conduit (LFMC):

1. Comply with UL 360.

2. UL categorized as liquid-tight flexible metal conduit (identified on UL Listing Mark as Liquid-Tight Flexible Metal Conduit, also specifically marked with temperature and environment application data), by AFC Cable Systems Inc., Anamet Electrical Inc., Electri-Flex Co., or Universal Metal Hose Co. or approved equal.

E. Rigid Nonmetallic PVC Conduit (RNC), Fittings, and Accessories:

1. Comply with Nema TC2 and UL 651.

2. Minimum trade size – 3/4".

3. UL categorized as Rigid Nonmetallic, Schedule 40 and Schedule 80 PVC conduit (identified on UL Listing Mark as Rigid Nonmetallic Conduit Aboveground and Underground Schedule 40; Rigid Nonmetallic Conduit Aboveground and Underground Extra Heavy Wall Schedule 80), by Beck Mfg./Picoma Industries, Cantex Inc., Carlon/Div. Of Lamson and Sessions, Ipex Inc., National Pipe & Plastics Inc., or Queen City Plastics Inc or approved equal.

F. Surface Metal Raceway, Fittings and Accessories:

1. Comply with UL 5. By Thomas & Betts Corp., Mono-Systems Inc. or Wiremold Co.

2. Provide ivory color unless otherwise noted.

3. Provide minimum Wiremold 700 or equal for single power or data drops. Refer to Division 27 for wireway containing power and technology conductors. Follow manufacturer's recommended raceway capacity for all types and sizes of conductors.

2.02 FITTINGS AND ACCESSORIES

A. Insulated Bushings:

1. Threaded, malleable iron/zinc electroplate with 105 degrees C minimum plastic insulated throat; Appleton Electric Co.'s BU50I Series, Cooper/Crouse-Hinds' 1031 Series, OZ/Gedney Co.'s IBC-50 Series, Raco Inc.'s 1132 Series, Steel City/T & B Corp.'s BI-901 Series, or Thomas & Betts Corp.'s 1222 Series or approved equal.

2. Threaded malleable iron with 150 degrees C plastic throat; Appleton Electric Co.'s BU501 Series, Cooper/Crouse-Hinds' H1031 Series, or OZ/Gedney Co.'s IBC-50 Series.

B. Plastic Bushings for 3/4 Inch Conduit:

1. 105 degrees C minimum temperature rating; Appleton Electric Co.'s BBU50, BBU75, Blackburn (T & B Corp.'s) 50 BB, 75 BB, Cooper/Crouse-Hinds' 931,932, or OZ/Gedney Co.'s IB-50, IB-75, Raco Inc.'s 1402, 1403, Steel City/T & B Corp.'s BU-501, BU-502, or Thomas & Betts Corp.'s 222, 223 or approved equal.

2. 150 degrees C temperature rating; Appleton Electric Co.'s BBU50H, BBU75H, Cooper/Crouse-Hinds' H-931, H-932, or OZ/Gedney Co.'s A-50, A-75 or approved equal.

C. Insulated Grounding Bushings:

1. Threaded, malleable iron/zinc electroplate with 105 degrees C minimum plastic insulated liner, and ground lug; Appleton Electric Co.'s GIB-50 Series, Cooper/Crouse-Hinds' GLL Series, OZ/Gedney Co.'s IBC-50L Series, Raco Inc.'s 1212 Series, Steel City/T & B Corp.'s BG-801 (1/2 to 2") Series, or Thomas & Betts Corp.'s 3870 or approved equal.

2. Threaded malleable iron/zinc electroplate with 150 degrees C plastic insulated liner, and ground lug; Appleton Electric Co.'s GIB Series, Cooper/Crouse-Hinds' HGLL Series, or OZ/Gedney Co.'s IBC-50L Series, or Thomas & Betts Corp.'s 3870or approved equal.

D. Connectors and Couplings:

1. Locknuts: UL, steel/zinc electroplate; Appleton Electric Co.'s BL-50 Series, Cooper/Crouse-Hinds' 11 Series, OZ/Gedney Co.'s 1-50S Series, Raco Inc.'s 1002 Series, Steel City/T&B Corp.'s LN-101 Series, or Thomas & Betts Corp.'s 141 Series or approved equal.

2. Grounding Wedge: Thomas & Betts Corp.'s 3650 Series or approved equal.

3. Couplings For Rigid Metal and IMC Conduit: Standard galvanized threaded couplings as furnished by conduit manufacturer, Allied Tube & Conduit Corp.'s Kwik-Couple, or Thomas & Betts Corp.'s Shamrock.

4. Three Piece Conduit Coupling For Rigid Metal and IMC Conduit: Steel, malleable iron, zinc electroplate; Allied Tube & Conduit Corp.'s Kwik-Couple, Appleton Electric Co.'s EC-50 Series, Cooper/Crouse-Hinds' 190M Series, OZ/Gedney Co.'s 4-50 Series, Raco Inc.'s 1502 Series, Steel City/T & B Corp.s EK-401 Series, or Thomas & Betts Corp.'s 675 Series.

5. Electrical Metallic Tubing Couplings and Insulated Connectors: Set screw type fittings are not permitted. Provide Compression type, steel/zinc electroplate; Appleton Electric Co.'s TW-50CS1, TWC-50CS Series, Cooper/Crouse-Hinds' 1650, 660S Series, Raco Inc.'s 2912, 2922 Series, Steel City/T & B Corp.'s TC-711 Series, or Thomas & Betts Corp.'s 5120, 5123 Series or approved equal.

6. Flexible Metal Conduit Connectors: Arlington Industries Inc.'s Saddle-Grip, OZ/Gedney Co.'s C-8T, 24-34T, ACV-50T Series, or Thomas & Betts Corp.'s Nylon Insulated Tite-Bite Series or approved equal.

7. Liquid-tight Flexible Metal Conduit Connectors: Steel, malleable iron, zinc electroplate, insulated throat; Appleton Electric Co.'s STB Series, Cooper/Crouse-Hinds' LTB Series, OZ/Gedney Co.'s 4Q-50T Series, Raco Inc.'s 3512 Series, Steel City/T & B Corp.'s LT-701 Series, or Thomas & Betts Corp.'s 5332 Series or approved equal.

E. Conduit Bodies (Threaded):

1. Malleable Iron/Zinc Electroplate: Zinc electroplate malleable iron or cast iron alloy bodies with zinc electroplate steel covers; Appleton Electric Co.'s Unilets, Cooper/Crouse-Hinds' Condulets, OZ/Gedney Co.'s Conduit Bodies, or Thomas & Betts Corp.'s Conduit Bodies. Or approved equal.

F. Expansion Fittings:

1. Malleable Iron, Zinc Electroplate Finish: Appleton Electric Co.'s XJ or OZ/Gedney Co.'s AX (TX for EMT), with external bonding jumper or approved equal.

2. Electrogalvanized Steel: Cooper/Crouse-Hinds' XJG (XJG-EMT for EMT), or Thomas & Betts Corp.'s XJG, with internal grounding or approved equal.

G. Deflection Fittings: Appleton Electric Co.'s DF, Cooper/Crouse-Hinds' XD, or OZ/Gedney Co.'s Type DX or approved equal.

H. Surface Metal Raceways: Use manufacturers approved fittings: couplings, ells, offsets, boxes etc. listed for use with ther raceway system. Match raceway finish.

I. Sealant for Raceways Exposed to Different Temperatures: Sealing compounds and accessories to suit installation; Appleton Electric Co.'s DUC, or Kwiko Sealing Compound with fiber filler, Cooper/Crouse-Hinds' Chico A Sealing Compound with Chico X fiber, Electrical Products Division 3M Scotch products, OZ Gedney Co.'s DUX or EYC sealing compound with EYF damming fiber, or Thomas & Betts Corp.'s Blackburn DX.

J. Vertical Conductor Supports: Kellems/Hubbell Inc.'s Conduit Riser Grips, or OZ/Gedney Co.'s Type M, Type R.

K. Pulling-In-Line For Installation in Spare and Empty Raceways: Polypropylene monofilament utility line; Greenlee Textron Inc.'s Poly Line 430, 431, or Ideal Industries Powr-Fish Pull-Line 31-340 Series.

PART 3 - EXECUTION

3.01 RACEWAY INSTALLATION - GENERAL

A. Install an equipment grounding conductor in all raceways. Raceway shall NOT be relied upon as an equipment ground conductor.

B. For New Work: Number of Raceways: Do not change number of raceways to less than the number indicated on the drawings.

1. Each raceway shall enclose one circuit unless otherwise indicated on the drawings.

C. For Rehab work. Number of Raceways: Do not change number of raceways to less than the number indicated on the drawings except when appropriate for advantageous reuse of existing exposed and concealed raceways (the contract documents do not indicate location, number, size or condition of existing raceways). Existing raceways may be reused if the following conditions are met:

1. The existing raceway must be of adequate size for the new conductors to be installed as per NFPA 70 Chapter 9, Tables 1, 4, & 5; Annex C, Tables C1-C12a. More circuits may be enclosed by existing raceways than the circuiting shown on the drawings provided conductor sizes are increased to compensate for derating (adjustment factors) and other considerations required by NFPA 70 Article 310-15.

2. Remove existing conductors.

3. Demonstrate to the Owner's Representative that the existing raceway is clear of obstructions and in good condition.

4. Check ground continuity. When ground continuity of existing raceway is inadequate install insulated grounding bushings, grounding wedges, bonding straps, grounding jumpers or equipment grounding conductors to establish effective path to ground.

5. Install insulated bushings to replace damaged or missing bushings. Replace non-insulated bushings with insulated bushings on raceway sizes 1 inch and larger.

6. Install vertical conductor supports to replace existing or missing vertical conductor supports.

7. Install extension rings on existing boxes when the number of new conductors installed therein exceeds NFPA 70 requirements.
8. Furnish the Owner's Representative with marked up drawings showing size and routing of existing raceways with number and size of new conductors installed therein. The drawings will be forwarded to the design engineer for verification of NFPA 70 compliance.

D. Raceways for Future Use (Spare Raceways and Empty Raceways): Draw fish tape through raceways in the presence of the Director's Representative to show that the raceway is clear of obstructions.

1. Leave a pulling-in line in each spare and empty raceway.

E. Conduit Installed Concealed:

1. Install conduit concealed unless otherwise indicated on the drawings.

2. Existing Construction:

a. Run conduit in existing chases and hung ceilings.
b. If conduit cannot be installed concealed due to conditions encountered in the building, report such conditions and await approval in writing before proceeding.

3. New Construction:

a. Run conduit in the ceilings, walls, and partitions.
b. Conduit may not be installed in concrete floor slab unless otherwise indicated on the plans. (concrete slabs that are both ceilings and floors shall be treated as floor slabs).
c. Where indicated on the drawings, install conduit in concrete slabs, under slabs on grade, or under slabs above finished ceilings where indicated on the drawings. Concrete slabs that are both ceilings and floors shall be treated as floor slabs.

1) Conduit in Slab: Run 3/4-inch conduit in the slab where placement of reinforcement and slab thickness is sufficient to allow 1-1/2 inches of concrete cover over conduit, otherwise run conduit under slab. Run conduit one inch and larger in the slab in the specific location(s) where it is indicated on the drawing to be run in the slab, otherwise run conduit under slab.

a) Run conduit under reinforcement where reinforcement is in upper portion or middle of slab.
b) Run conduit over reinforcement where reinforcement is in lower portion of slab.
c) Run conduit between reinforcement where reinforcement is in upper and lower portions of slab.
d) Separate parallel conduits minimum of 2 inches so that each conduit will be enveloped in concrete.
e) Pass conduit over steel beams, if any, parallel with the reinforcement.
f) Tie down conduit to avoid movement during placement of concrete.
g) Demonstrate to the Owner's Representative that conduit has been placed to allow minimum of 1-1/2 inches of concrete cover.

2) Conduit Under Slab on Grade:

a) Run conduit under vapor barrier, if any.
b) Install equipment grounding conductor in each conduit. Bond at boxes and equipment to which conduit is connected.

3) Conduit Under Slab, Above Finished Ceiling:

a) Attach conduit to bottom of slab or structure supporting the slab.
b) Firestop through-penetrations of the slab.

4. If any portions of the conduit system cannot be installed concealed due to conditions encountered in the building, report such conditions and await approval in writing before proceeding.

F. Conduits Penetrating Concrete Floor Slabs (Concrete slabs that are both ceilings and floors shall be treated as floor slabs):

1. Provide a minimum of 2 inches between conduits that vertically penetrate elevated concrete slabs.

2. Provide firestopping and spray on fireproofing at locations where conduits penetrate surface of floor slab and slab is part of fire rating required for construction.

G. Conduit Installed Exposed:

1. Install conduit exposed where indicated on the drawings.

2. Install surface metal raceway on existing block wall construction in finished areas.

3. Install conduit tight to the surface of the building construction unless otherwise indicated or directed.

4. Install vertical runs perpendicular to the floor.

5. Install runs on the ceiling perpendicular or parallel to the walls.

6. Install horizontal runs parallel to the floor.

7. Do not run conduits near heating pipes.

8. Installation of conduit directly on the floor will not be permitted.

9. Exposed conduits installed in finished area shall be painted by the Electrical Contractor to match surrounding areas. Exception – where general painting will be provided by other trades.

H. Conduit Size: **Not smaller than 3/4-inch electrical trade size**. Where type FEP, THHN, THWN, THWN-2, XHH, XHHW, or XHHW-2 conductors are specified for use under Section 260519, the minimum allowable conduit size for new Work shall be based on Type THW conductors.

I. Conduit Bends: For 3/4-inch conduits, bends may be made with manual benders. For all conduit sizes larger than 3/4 inch, manufactured or field fabricated offsets or bends may be used. Make field fabricated offsets or bends with an approved hydraulic bender.

3.02 RACEWAY INSTALLATION - SPECIAL AREAS

A. Raceways Exposed to Different Temperatures: Where portions of an interior raceway system are exposed to widely different temperatures, seal interior and exterior of raceway to prevent circulation of air from a warmer to a colder section through the raceway installation.

1. Refrigerated Rooms: Install conduit body or junction box in the raceway system on warm side of refrigerated room. After conductors are installed, seal interior of the raceway at the conduit body or junction box.

2. Heated Areas to Unheated Areas: After conductors are installed, seal interior of the raceway at the nearest conduit body, outlet or junction box in the heated area adjoining the unheated area.

B. Conduit for Prefabricated Walk-In Refrigeration Boxes:

1. Install box wiring in conduit. Run conduit exposed on exterior of box unless project conditions require conduit to be run exposed on interior of box.

   a. Install rigid ferrous metal conduit and galvanized fittings where the metal surfaces are galvanized steel.

2. Create a thermal break where penetrating the box by installing maximum of 12 inches of Schedule 40 high density polyethylene conduit within the conduit run at the penetration. Seal the penetration.

3. Install equipment grounding conductor in each conduit.

4. Seal raceway as specified for raceways exposed to different temperatures.

C. Conduits in Heating Tunnels: Install rigid ferrous metal conduit exposed in the tunnel and run conduit to avoid manhole entrances and other obstructions. Install equipment grounding conductor in each conduit.

D. Conduit in Waterproofed Floors: Install conduit runs in waterproof floors to avoid penetrating the waterproofing. Avoid penetration of waterproofing with conduit risers so far as practicable.

1. Where it is necessary to puncture the waterproofing for a conduit riser, install a standard weight steel pipe sleeve extending one inch above the finished floor level. Flash the steel pipe sleeve to the waterproofing with 16-ounce copper. Construct the flashing with a copper tube extending the full height of the sleeve, soldered to a copper base extending 6 inches in all directions from the sleeve.

2. The flashing will be integrated into the waterproofing by the Construction Contractor. Provide solid cast brass floor plates with chromium finish where pipe sleeves are exposed in rooms.

3.03 RACEWAY SCHEDULE

A. Rigid Ferrous Metal Conduit: Install in all locations unless otherwise specified or indicated on the drawings.

B. Electrical Metallic Tubing:

1. May be installed concealed as feeder or branch circuit conduits above suspended ceilings where conduit does not support fixtures or other equipment.

2. May be installed concealed as feeder or branch circuit conduits in hollow areas in dry locations, including:

   a. Hollow concrete masonry units, except where cores are to be filled.
   b. Drywall construction with sheet metal studs, except where studs are less than 3-1/2 inches deep.

3. May be installed exposed as feeder or branch circuit conduits in dry, unfinished, non-hazardous locations.

C. Flexible Metal Conduit: Install equipment grounding conductor in the flexible metal conduit and bond at each box or equipment to which conduit is connected:

1. Use for final conduit connection to recessed lighting fixtures in suspended ceilings. Use 4 to 6 feet of flexible metal conduit, minimum size 1/2 inch, between junction box and fixture. Locate junction box at least 1 foot from fixture and accessible if the fixture is removed.

2. Use 1 to 3 feet of flexible metal conduit for final conduit connection to:

   a. Emergency lighting units.
   b. Dry type transformers.
   c. Motors with open, drip-proof or splash-proof housings.
   d. Equipment subject to vibration (dry locations).
   e. Equipment requiring flexible connection for adjustment or alignment (dry locations).

3. Use for concealed branch circuit conduits above existing non-removable suspended ceilings where rigid type raceways cannot be installed due to inaccessibility of space above ceiling.

4. May be installed concealed as branch circuit conduits in drywall construction with sheet metal studs, except where studs are less than 3-1/2 inches deep.

D. Liquid-tight Flexible Metal Conduit: Install equipment grounding conductor in liquid-tight flexible metal conduit and bond at each box or equipment to which conduit is connected:

1. Use 1 to 3 feet of liquid-tight flexible metal conduit (UL listed and marked suitable for the installation's temperature and environmental conditions) for final conduit connection to:

   a. Motors with weather-protected or totally enclosed housings.
   b. Equipment subject to vibration (damp and wet locations).
   c. Equipment requiring flexible connection for adjustment or alignment (damp and wet locations).

E. Rigid Nonmetallic PVC Conduit:

1. Schedule 40 or Schedule 80 as indicated on the drawings.

   a. Use for protection of primary feeders within transformer vaults.
   b. Use for exterior branch circuits or feeders.
   c. Use underground or under slab feeders or branch circuits.

F. Surface Metal Raceway: Use as exposed raceway system in finished spaces with existing CM U or concrete construction or at locations indicated on the drawings.

1. Use surface metal raceway system of size required for number of wires to be installed therein. Use specific size when indicated on the drawings.

2. Do not run raceway through walls that have a plaster finish nor through masonry walls or floors. Install a pipe sleeve, or a short length of conduit with junction boxes or adapter fittings for raceway runs through such areas. Run raceway along top of baseboards, care being taken to avoid telephone and other signal wiring. Where raceway crosses chair railing or picture molding, cut the chair railing or picture molding to permit the raceway to lie flat against the wall.

Run raceway around door frames and other openings. Run raceway on ceiling or walls perpendicular to or parallel with walls and floors.

3. Secure raceway at intervals not exceeding 36 inches.

4. Install separate equipment grounding conductor for grounding of equipment. The raceway alone will not be considered suitable for use as an effective path to ground.

5. Outlet box covers for pendant mounted fluorescent fixtures may be omitted if the fixture canopy is notched to receive the raceway and the canopy fits snugly against the ceiling.

6. Where equipment is mounted on an outlet box and the equipment base is larger than the outlet box, provide finishing collar around equipment base and outlet box or provide finishing collar/outlet box:

   a. Finishing Collar: Same finish and peripheral dimensions as the equipment base, including provisions for mounting, slots to fit over raceway and of depth to cover outlet box and extend back to ceiling or wall.
   b. Combination Finishing Collar/Outlet Box: Same finish and peripheral dimensions as the equipment base to be mounted thereon, gage or thickness of metal as required by NFPA 70, including provision for mounting and knockouts for entrance of raceway.

G. Wireways: May be used indoors in dry locations for exposed raceway between grouped, wall mounted equipment.

3.04 FITTINGS AND ACCESSORIES SCHEDULE

A. General:

1. Use fittings and accessories that have a temperature rating equal to, or higher than the temperature rating of the conductors to be installed within the raceway.

2. Use zinc electroplate or hot dipped galvanized steel/malleable iron or cast iron alloy fittings and accessories in conjunction with ferrous raceways in dry and damp locations unless otherwise specified or indicated on the drawings.

3. Use insulated grounding bushings or grounding wedges on ends of conduit for terminating and bonding equipment grounding conductors, when required, if cabinet or boxes are not equipped with grounding/bonding screws or lugs.

4. Use caps or plugs to seal ends of conduits until wiring is installed to exclude foreign material.

5. Use insulated grounding bushings on the ends of conduits that are not directly connected to the enclosure, such as stub-ups under equipment, etc., and bond between bushings and enclosure with equipment grounding conductor.

6. Use expansion fittings where raceways cross expansion joints (exposed, concealed, buried).

7. Use deflection fittings where raceways cross expansion joints that move in more than one plane.

8. Use 2 locknuts and an insulated bushing on end of each conduit entering sheet metal cabinet or box in dry or damp locations.

   a. Plastic bushing may be used on 3/4 inch conduit in lieu of insulated bushing.
   b. Terminate conduit ends within cabinet/box at the same level.

B. For Rigid Metal Conduit: Use threaded fittings and accessories. Use 3 piece conduit coupling where neither piece of conduit can be rotated.

C. For Electrical Metallic Tubing: Use compression type connectors and couplings.
D. For Flexible Metal Conduit: Use flexible metal conduit connectors.

E. For Liquid-tight Flexible Metal Conduit: Use liquid-tight connectors.

F. For Rigid Nonmetallic PVC Conduit:

1. Use conduit manufacturer's standard fittings and accessories.

2. Provide expansion fittings for exterior conduits as required by NFPA 70.

G. For Surface Metal Raceway: Use raceway manufacturer's standard fittings and accessories. Match raceway finish color.

H. For Wireways: Use wireway manufacturer's standard fittings and accessories.

END OF SECTION

DIVISION 26 – ELECTRICAL

SECTION 260534 – OUTLET JUNCTION AND PULL BOXES

PART 1 – GENERAL

1.01 REFERENCES

A. NEMA, and UL.

1.02 SUBMITTALS

A. Product Data: Manufacturer's standard catalog sheets, specifications and installation instructions.

1.03 QUALITY ASSURANCE

A. Electrical components, conductors, devices and accessories described herein shall be listed and labeled as defined by NFPA 70 by a Nationally Recognized Testing Laboratory (NRTL), such as Underwriters Laboratories (UL), for the intended use and shall bear its label.

PART 2 - PRODUCTS

2.01 GALVANIZED STEEL OUTLET BOXES

A. Provide standard galvanized steel boxes and device covers in compliance with NEMA OS1 And UL 514A by Appleton Electric Co., Beck Mfg./Picoma Industries, Cooper/Crouse-Hinds, Raco/Div. of Hubbell, or Steel City/T & B Corp or approved equal.

2.02 GALVANIZED STEEL JUNCTION AND PULL BOXES

A. Provide code gage, galvanized steel screw cover boxes in compliance with NEMA OS1 by Delta Metal Products Inc., Hoffman Enclosures Inc., Hubbell Wiegmann, Lee Products Co., or Rittal/Electromate or approved equal.

2.03 THREADED TYPE BOXES

A. Outlet Boxes:

1. For Dry, Damp Locations: Provide zinc electroplate malleable iron or cast iron alloy boxes by Appleton Electric Co., Cooper/Crouse-Hinds Co., or OZ/ Gedney Co.,or approved equal, with zinc electroplate steel covers to suit application.

2. For Wet Locations: Provide malleable iron or cast iron alloy boxes with hot dipped galvanized or other specified corrosion resistant finish in compliance with NEMA FB1 as produced by Cooper/Crouse-Hinds (hot dipped galvanized or Corro-free epoxy powder coat), or OZ/Gedney Co. (hot dipped galvanized), with stainless steel cover screws, and malleable iron covers gasketed to suit application.

B. Junction And Pull Boxes:

1. For Dry, Damp Locations: Provide zinc electroplate cast iron boxes by Appleton Electric Co., Cooper/Crouse-Hinds, or OZ/Gedney Co., or approved equal with zinc electroplate steel or cast iron cover.

2. For Wet Locations: Provide cast iron boxes in compliance with NEMA FB1 and UL 1773 by Cooper/Crouse-Hinds' (hot dipped galvanized or Corro-free epoxy powder coat), or OZ/Gedney Co. (hot dipped galvanized), or approved equal, with stainless steel cover screws and cast iron cover gasketed to suit application.

C. Conduit Bodies, Threaded (Provided with a Volume Marking):

1. For Dry, Damp Location: Provide zinc electroplate malleable iron or cast iron alloy bodies with zinc electroplate steel covers; Appleton Electric Co.'s Unilets, Cooper/Crouse-Hinds' Condulets, or OZ/Gedney Co.'s Conduit Bodies or approved equal.

2. For Wet Locations: Provide malleable iron or cast-iron alloy bodies with hot dipped galvanized or other specified corrosion resistant finish; Cooper/Crouse-Hinds' Condulets (hot dipped galvanized or Corro-free epoxy power coat), or OZ/Gedney Co.'s Conduit Bodies (hot dipped galvanized) or approved equal, with stainless steel cover screws and malleable iron covers gasketed to suit application.

2.04 CORROSION RESISTANT BOXES

A. Plastic Coated Outlet and Junction Boxes: Provide threaded type malleable iron boxes coated with 40 mils thick polyvinylchloride coating; Ocal/T&B Corp.'s Ocal-Blue System, PCD Inc.'s KorKap, KorKap XL, or Robroy Industries' Plastibond or Perma-Cote System or approved equal.

B. Non-Metallic Junction and Pullboxes: Glass fiber reinforced polyester; Carlon/Div. of Lamon and Sessions' Himeline Series, Cooper/Crouse-Hinds' Krydon Products, or Robroy Industries' Stahlin Enclosures or approved equal.

2.05 SPECIFIC PURPOSE OUTLET BOXES

A. As fabricated by manufacturers for mounting their equipment.

2.06 FINISHING COLLAR OR COMBINATION FINISHING COLLAR/OUTLET BOX (SURFACE MOUNTED EQUIPMENT USED WITH EXPOSED RACEWAY)

A. Finishing Collar: Same finish and peripheral dimensions as the equipment base, including provisions for mounting, slots to fit over raceway and of depth to cover outlet box and extend back to ceiling or wall.

B. Combination Finishing Collar/Outlet Box: Same finish and peripheral dimensions as the equipment base, gage or thickness of metal as required by National Electrical Code, including provisions for mounting, and knockouts or threaded bosses for entrance of raceway.

2.07 FLOOR OUTLETS

A. For combination power and technology floor boxes and outlets – refer to Division 27.

B. Floor Outlet for Cast-In-Place Concrete Construction; Hubbell's Floor Boxes, Raco Inc.'s Tilt Top, or Steel City/T & B Corp.'s Floor Boxes:

1. Concrete tight galvanized steel boxes (for installation above grade).

2. Watertight cast iron boxes (for installation on or below grade).

3. Fully adjustable top (including 10-degree angular adjustment) before and after installation.

4. Service Fittings:

a. Above Floor: Aluminum, doghouse style, to suit power, service.
b. Flush Floor: Flush round cover with hinged lid (and carpet flanges for carpeted areas) to suit power service, finish to match hardware in area where installed.

2.08 OUTLET BOXES AND RELATED PRODUCTS FOR FIRE RATED CONSTRUCTION

A. For combination power and technology floor boxes and outlets – refer to Division 27.

B. Parameters For Use of Listed Metallic Outlet or Switch Boxes: UL Electrical Construction Equipment Directory - Metallic Outlet Boxes (QCIT).

C. Wall Opening Protective Materials: As listed in UL Fire Resistance Directory - Wall Opening Protective Materials (CLIV), or UL Electrical Construction Equipment Directory - Wall Opening Protective Materials (QCSN).

D. Floor Outlet Boxes:

1. Poke-Through System: As listed in UL Fire Resistance Directory - Outlet Boxes and Fittings Classified for Fire Resistance (CEYY), or UL Electrical Construction Equipment Directory - Outlet Boxes and Fittings Classified for Fire Resistance (QBWY).

2. Service Fittings:

a. Above Floor: Aluminum, doghouse style, to suit power service.
b. Flush Floor: Metallic flush round cover with hinged lid (and carpet flanges for carpeted areas) to suit power service, finish to match hardware in area where more installed.

PART 3 - EXECUTION

3.01 GENERAL

A. Provide all boxes required to complete the raceway system, regardless of whether indicated or not on the drawings.

B. Provide boxes in sizes as required by Code.

C. Provide dividers in boxes where difference in insulation rating exceeds 300V.

3.02 PREPARATION

A. Before proceeding with the installation of junction and pull boxes, check the locations with the Owner’s Representative and have same approved.

3.03 INSTALLATION

A. Mounting Position of Wall Outlets for Wiring Devices: Unless otherwise indicated, install boxes so that the long axis of each wiring device will be vertical.

B. Height of Wall Outlets: Unless otherwise indicated, locate outlet boxes with their center lines at the following elevations above finished floor:

Lighting Fixtures	6’-0”
Lighting Fixtures in Stairway	7’-6”

Exit Lights	8’-0” where ceiling height allows a minimum of 6 inch clearance between ceiling and top of exit light. Otherwise mount exit light so that it’s top is 6 inches below finished ceiling. Adjust height and clearances as required to suit installation over doors.
Night Lights	2’-0”
Hose Cabinet Lights	1’-0” above top of cabinet
Switches	4’-0”
Single & Duplex Receptacles	1’-6”*
Water Cooler Receptacles	2’-0”
Clock Receptacles	7’-6”
Range Receptacle	1’-6”
Special Purpose Receptacles	4’-0”
Thermostats	5’-0”
Manual Fire Alarm Boxes	4’-0”
Audible Notification Appliances	8’-0” where ceiling height allows a minimum of 6 inch clearance between ceiling and top of appliance. Otherwise mount appliance so that it’s top is 6 inches below finished ceiling.
Visible Notification Appliances	Install outlet so that the bottom of the visible lens will be 6’-8” AFF.
Combination Audible/Visible Notification Appliances	Install outlet so that the bottom of the visual lens will be 6’-8” AFF, and the audible section will be above the visible section.
Radio	2’-0”
Television	2’-0”
Telecommunications	2’-0”
Telephone	2’-0”
Wall Handset Telephone.	Install outlet so that the highest operable part of the wall mounted telephone will not be more than 4’-0” AFF.

*In areas containing heating convectors, install outlets above convectors at height indicated on drawings.

C. Supplementary Junction and Pull Boxes: In addition to junction and pull boxes indicated on the drawings and required by NFPA 70, provide supplementary junction and pull boxes as follows:

1. When required to facilitate installation of wiring.
2. At every third 90 degree turn in conjunction with raceway sizes over 1 inch.
3. At intervals not exceeding 100 feet in conjunction with raceway sizes over 1 inch.

3.04 OUTLET, JUNCTION, AND PULL BOX SCHEDULE

A. Boxes For Concealed Conduit System:

1. Non-Fire Rated Construction:

a. Depth: To suit job conditions and comply with NFPA 70 Article 370.
b. For Lighting Fixtures: Use galvanized steel outlet boxes designed for the purpose.

1) For Fixtures Weighing 50 lbs. or Less: Box marked “FOR FIXTURE SUPPORT”.
2) For Fixtures More Than 50 lbs: Box listed and marked with the weight of the fixture to be supported (or support fixture independent of the box).

c. For Ceiling Suspended Fans:

1) For Fans Weighing 35 lbs or Less: Marked “Acceptable for Fan Support.”
2) For Fans Weighing More Than 35 lbs, up to 70 lbs: Marked “Acceptable for Fan Support up to 70 lbs (or support fan independent of the box).”

d. For Junction and Pull Boxes: Use galvanized steel boxes with flush covers.
e. For Switches, Receptacles, Etc:

1) Plaster or Cast-In-Place Concrete Walls: Use 4 inch or 4-11/16 inch galvanized steel boxes with device covers.
2) Walls Other Than Plaster or Cast-In-Place Concrete: Use type of galvanized steel box which will allow wall plate to cover the opening made for the installation of the box.

2. Recessed Boxes in Fire Rated (2 hour maximum) Bearing and Nonbearing Wood or Steel Stud Walls (Gypsum Wallboard Facings):

a. Use listed single and double gang metallic outlet and switch boxes. The surface area of individual outlet or switch boxes shall not exceed 16 square inches.
b. The aggregate surface area of the boxes shall not exceed 100 square inches per 100 square feet of wall surface.
c. Securely fasten boxes to the studs. Verify that the opening in the wallboard facing is cut so that the clearance between the box and the wallboard does not exceed 1/8 inch.
d. Separate boxes located on opposite sides of walls or partitions by a minimum horizontal distance of 24 inches. This minimum separation distance may be reduced when wall opening protective materials are installed according to the requirements of their classification.
e. Use wall opening protective material in conjunction with boxes installed on opposite sides of walls or partitions of staggered stud construction in accordance with the classification requirements for the protective material.

3. Other Fire Rated Construction: Use materials and methods to comply with the listing requirements for the classified construction.

B. Boxes For Exposed Conduit System:

1. Dry and Damp Locations: Use zinc electroplate or hot dipped galvanized threaded type malleable iron or cast-iron alloy outlet, junction, and pull boxes or conduit bodies provided with a volume marking in conjunction with ferrous raceways unless otherwise specified or indicated on the drawings.

a. Galvanized steel boxes may be used in conjunction with conduit sizes over 1 inch in non-hazardous dry and damp locations.
b. Galvanized steel boxes may be used in conjunction with electrical metallic tubing where it is allowed (specified) to be installed exposed as branch circuit conduits at elevations over 10’-0” above finished floor.

2. Wet Locations: Use threaded type malleable iron or cast iron alloy outlet junction, and pull boxes or conduit bodies (provided with a volume marking) with hot dipped galvanized or other specified corrosion resistant coating in conjunction with ferrous raceways unless otherwise specified or indicated on the drawings.

a. Use corrosion resistant boxes in conjunction with plastic coated rigid ferrous metal conduit.

3. Finishing Collar or Combination Finishing Collar/Outlet Box (Surface Mounted Equipment Used With Exposed Raceway):

a. Use finishing collar where surface mounted equipment is installed on an exposed raceway outlet box and the equipment base is larger than the outlet box.
b. Use combination finishing collar/outlet box where surface mounted equipment is not indicated to be installed on an exposed raceway outlet box, but raceway cannot be run directly into equipment body due to equipment design.

C. Specific Purpose Outlet Boxes: Use to mount equipment when available and suitable for job conditions. Unless otherwise specified, use threaded type boxes with finish as specified for exposed conduit system, manufacturer's standard steel (painted) boxes for surface metal raceway system and galvanized steel for recessed installations.

D. Stencil cover of pull boxes used on systems over 600 V, in white lettering minimum 1/2 inches high, the words "DANGER HIGH VOLTAGE - KEEP OUT".

END OF SECTION

DIVISION 26 – ELECTRICAL

SECTION 260553 – IDENTIFICATION FOR ELECTRICAL 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.

B. All sections of the project manual are directly applicable to this specification section. Should a conflict arise between specification sections or between specifications and drawings and/or code requirements, the contractor shall notify the Architect/Engineer of the conflict in writing. If direction is not provided prior to the submission of the bid, the contractor shall price the more extensive system.

1.02 SUMMARY

A. Clearly and properly identify the complete electrical system to indicate the loads served or the function of each item of equipment connected under this work.

PART 2 – PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Comply with NFPA 70.

B. Comply with 29 CFR 1910.144 and 29 CFR 1910.145 for danger, caution or safety instruction signs.

C. Comply with ANSI Z535.4 for safety signs and labels.

D. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

2.02 LABELS

A. Pre-Printed: Permanent material pre-printed with black on white, with adhesive backing. Brady, 3M, or equal.

B. Laminated Plastic: 3-ply laminated plastic, color as indicated, with 1/2-inch high white letters for low voltage. Lamicoid, or equal.

C. Identification Plates: Engraved Phenolic/Lamacoid plastic, 1/16” thick, ASTMD 709 Type 1, black with white letters or white with black letters.

D. Plastic Tape: Black or red with white letters, adhesive backing, field-printed with proper tool. Dymo-tape, or equal.

E. Marker Tape: Clear adhesive-backed tape with black letters, for device plates. Kroy, or equal.

F. Wire Markers: White with black numbers, adhesive-backed tape on dispenser roll. Brady, 3M, or equal.

G. Marker Pen: Black permanent marker suitable for writing on metallic surfaces.

2.03 SIGNS

A. Baked-Enamel Signs:

1. Preprinted aluminum signs 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 inches.

4. 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. Carlton Industries, LP
   b. Champion America
   c. Marking Services, Inc.
   d. Approved Equal.

B. Laminated Acrylic or Melamine Plastic Signs:

1. Engraved legend.

2. Thickness:

   a. For signs up to 20 sq. inches, minimum 1/16-inch-.
   b. For signs larger than 20 sq. inches, 1/8 inch thick.
   c. Engraved legend with colors as indicated below by type of service:

      1) Normal Power – Black background with white letters.
      2) Standby Power- Blue background with white letters.
      3) Emergency/Life Safety Power- Red background with white letters.
      4) UPS/Clean Power – Gray background with white letters to read “UPS POWER” or “CLEAN POWER.”

   d. Punched or drilled for mechanical fasteners.
   e. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

3. 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. Brady Corporation
   b. Carlton Industries, LP
   c. Marking Services, Inc.
   d. Approved Equal

2.04 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. 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).

B. Fasteners for Labels and Signs: Self-tapping, #404 stainless-steel screws.

PART 2 – EXECUTION

3.01 GENERAL

A. Prior to applying adhesive identification products, clean and prepare surfaces as recommended by manufacturer of identification product.

B. Verify each item to be identified prior to application. Verify and coordinate all labelling information, colors etc. with the Drawings, Shop Drawings, manufacturer's wiring diagrams and manuals etc. and any special Owner labelling requirements. Labelling shall be consistent throughout Project.

C. Install any labelling prior to installing acoustical ceilings or other concealment.

D. Apply identification devices to surfaces that require finish after completion of finish work.

E. Identification materials and devices shall not interfere with operation and maintenance of equipment.

F. Attach signs and plastic labels that are not self-adhesive type with stainless steel mechanical fasteners appropriate to the location and substrate.

G. Wraparound Marker Labels and Metal Tags shall be secured tight to surface of conductor or cable at a location with high visibility and accessibility.

H. Labeling Instructions:

1. Indoor Equipment: Non-ferrous metal or rigid plastic, stamped, embossed or engraved identification plates shall have white letters on black face or vice versa. Unless otherwise indicated, provide a single line of text with 1/8-inch- high letters on 1-1/2-inch- high label; where multiple lines of text are required, increase height accordingly.

2. Outdoor Equipment: Engraved, laminated acrylic or melamine label.

3. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.

4. Labels not using self-adhesive attachment, shall be fastened using appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.

3.02 IDENTIFICATION SCHEDULE

A. General

1. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Baked-enamel warning signs.

   a. Comply with 29 CFR 1910.145.
   b. Identify system voltage with black letters on an orange background.
   c. Apply to exterior of door, cover, or other access.
   d. For equipment with multiple power or control sources, apply to door or cover of equipment, including, but not limited to, the following:

      1) Power-transfer switches.
      2) Controls with external control power connections.

2. Operating Instruction Signs: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.
3. Emergency Operating Instruction Signs: Install instruction signs with white legend on a red background with minimum 3/8-inch- high letters for emergency instructions at equipment used for power transfer.

B. Low Voltage Switchgear

1. Label each switchgear section with laminated plastic label indicating switchgear name and section per the drawings / shop drawings, ampere rating, voltage. Indicate source from switch switchboard is fed and feeder size on incoming feeder section.

2. Label all protective devices with laminated plastic labels indicating the function or the load served.

3. Provide laminated plastic labels for all bussed spaces indicating the maximum ampere rating or size of future breaker or switch that may be installed in the space reserved.

C. Branch Circuit and Power Distribution Panelboards:

1. Provide laminated plastic labels on panel exterior which indicate panel name per the drawings, voltage, source, from which the panel is fed with laminated plastic labels attached to face trim. Indicate feeder source, feeder wire size, and feeder breaker or fuse size with marker tape or marker pen on the inside of the panel door.

2. For new or modified panelboards, provide typewritten or software generated panel directories, with protective, clear transparent covers, accurately accounting for every breaker installed, including spares. Schedules shall use the actual loads and room designations assigned by name or number near completion of the work. Do not use the designations from the drawings.

3. For power distribution panelboards, where no directory is present, label each protective device with laminated plastic labels indicating load served. Marker pen is permitted where space does not permit laminated plastic labels.

D. Motor Control Centers:

1. Label all motor control centers with laminated plastic labels indicating control center name per the drawings.

2. Label all starters and breakers with factory-provided labels or laminated plastic labels indicating the function or the load served and location.

3. Provide pre-printed labels for all spaces.

E. Transformers:

1. Label all transformers with identification plate indicating equipment label per the drawings, KVA, primary and secondary voltages, source, and load served.

F. Disconnect Switches

1. Label All Disconnect Switches with laminated plastic labels indicating device name per the drawings, and with permanent marker, the source, load served, and internal fuse size, if applicable.

G. Miscellaneous Equipment

1. Label all motor start switches, individual circuit breakers, relays, contactors, time switches, and indicating equipment with marker tape or laminated plastic labels indicating equipment number, source, and circuit number.

2. Where the controlling device is remote mounted from the serving panel, include the serving panel designation and circuit number with additional plastic tape labels.

H. Receptacles

1. All receptacle plates shall be marked in marker tape on the face of the plate, with the receptacles panel and branch circuit designation. The identification shall be made with clear self-adhesive tape with black 10-point letters. Apply the tape at the top of the device plate.

2. Receptacles connected to a GFCI-protected circuit downstream from the protecting device shall be labeled “GFCI Protected.”

I. Outlet, Pull, And Junction Boxes

1. For exposed and those above suspended ceilings, label covers of power junction boxes neatly by hand using permanent marker, indicating source and circuit number.

2. For exposed ceilings in occupied public spaces, where conduits, junction boxes, etc. are to painted to blend into the ceiling, provide aforementioned labelling on the inside cover of the junction box.

J. Conduits

1. Label all exposed conduit runs in non-public spaces or accessible ceiling spaces with source panel and circuit number using neatly written using permanent marker. Include destination in labelling for all feeder conduits Space labels a maximum of 50 feet apart and at least one per room. Label conduits at entrances of all “J” boxes, distribution panels, MCC, panelboards, etc.

2. Omit labelling exposed conduits in occupied public spaces.

K. Emergency Lighting Fixtures:

1. Ceiling mounted and wall mounted emergency light which are equipped with integral emergency back-up battery or are tied into an emergency power system (emergency generator, remote inverter, etc.), shall be readily identified with a ¾” dia. red circular adhesive label either on the fixture or on the ceiling grid surrounding the fixture.

2. Exceptions:

   a. Twin head battery pack emergency unit fixtures and
   b. Fixtures equipped with integral emergency battery with an indicator LED clearly visible without removing any lensing.

L. Special Systems (Fire Alarm, Security, Pa, Etc.): subject to the provisions of the respective specification section for each system:

1. Equipment Cabinets, Terminal Cabinets, Power Supply Cabinets, Control Panels, Patch Panels, Racks:

   a. Provide identification plates with equipment identification as indicated on the drawings.

b. Label termination blocks and ports.

2. Pullboxes, Enclosures, Junction Boxes:

   a. Provide identification plate including system type and location designation, if any, per the Drawings or Shop Drawings on cover.
   b. Indicate equipment and location(s) from which enclosed cables originate.

3. Fire Alarm:

   a. Fire alarm junction boxes shall be red unless another standard is used be owner.
   b. Initiation Devices, Notification Appliances, Fire Alarm Relays – Provide zone or address identification label, clear Marker Tape, red or black letters.
   c. Remote Smoke Detector Lamps and Test Stations – Provide label indicating the location of the connected device.

END OF SECTION

DIVISION 26 – ELECTRICAL

SECTION 262213 – DRY-TYPE DISTRIBUTION TRANSFORMERS

PART 1 – GENERAL

1.01 SCOPE

A. The Contractor shall furnish and install single-phase and three-phase general purpose individually mounted dry-type transformers of the two-windings type, self-cooled as specified herein, and as shown on the contract drawings.

1.02 RELATED SECTIONS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections apply to this Section.

1.03 REFERENCES

A. The transformers and all components shall be designed, manufactured and tested in accordance with the latest applicable standards of ANSI, NEMA and UL.

B. Transformers shall meet the requirements of the most current version of Federal Law 10 CFR Part 431 "Energy Efficiency Program for Certain Commercial and Industrial Equipment".

1.04 SUBMITTALS – FOR REVIEW / APPROVAL

A. The following information shall be submitted to the Engineer:

1. Outline dimensions and weights

2. Transformer ratings including:

a. kVA
b. Primary and secondary voltage
c. Taps
d. Basic impulse level (BIL) for equipment over 600 volts
e. Design impedance
f. Insulation class and temperature rise
g. Sound level.
h. Product data sheets

1.05 SUBMITTALS – FOR CONSTRUCTION

A. The following information shall be submitted for record purposes.

1. Final as-built drawings and information for items listed in Paragraph 1.04 and shall incorporate all changes made during the manufacturing process.
2. Connection diagrams.

3. Installation information.

4. Seismic certification and equipment anchorage details as specified.

1.06 QUALIFICATIONS

A. The manufacturer of the dry-type distribution transformers shall be the same as the manufacturer of the other major electrical distribution equipment on the project.

B. For the equipment specified herein, the manufacturer shall be ISO 9001 or 9002 certified.

C. The manufacturer shall be a participant in the UL Data Acceptance Program (DAP) under the Client Test Data Program (CTDP) certification to ensure UL test methodologies and record traceability complies with the requirements of ISO 17025.

D. Transformer must bear the UL Energy Efficiency Verification Mark to confirm that the unit meets the requirements of 10 CFR Part 431.

E. The manufacturer of this equipment shall have produced similar electrical equipment for a minimum period of five (5) years.

F. The transformers shall be suitable for and certified to meet all applicable seismic requirements of Uniform Building Code (UBC) for Zone 0 application for Long Island locations and Zone 2A application for other areas in eastern New York State. Guidelines for the installation consistent with these requirements shall be provided with the transformer and be based upon testing of representative equipment.

1.07 REGULATORY REQUIREMENTS

A. All transformers shall be UL listed and bear the UL label.

1.08 DELIVERY, STORAGE AND HANDLING

A. Equipment shall be handled and stored in accordance with manufacturer's instructions. One (1) copy of these instructions shall be included with the equipment at time of shipment.

1.09 OPERATION AND MAINTENANCE MANUAL

A. Equipment operation and maintenance manuals shall be provided with each assembly shipped and shall include instruction leaflets and instruction bulletins for the complete assembly and each major component.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Eaton

B. General Electric

C. Square D

D. Approved Equal

2.02 RATINGS

A. The kVA and voltage ratings shall be as indicated on the drawings.

B. Transformers shall be designed for continuous operation at rated kVA, for 24 hours a day, 365 days a year operation, with normal life expectancy as defined in ANSI C57.96.

C. Transformers shall meet the requirements of the most current version of federal law 10 CFR Part 431 "Energy Efficiency Program for Certain Commercial and Industrial Equipment".

D. Transformers efficiency shall be measured according to federal law 10 CFR Part 431.

E. Transformer sound levels shall not exceed the following ANSI and NEMA levels for self-cooled ratings:

	Self Cooled Ventilated		Self Cooled Sealed
Equivalent Winding kVA Range	K-Factor=1 K-Factor=4 K-Factor=9	K-Factor=13 K-Factor=20	
3.00 and below	40	40	45
3.01 to 9.00	40	40	45
9.01 to 15.00	45	45	50
15.01 to 30.00	45	45	50
30.01 to 50.00	45	48	50
50.01 to 75.00	50	53	55
75.01 to 112.50	50	53	55
112.51 to 150.00	50	53	55
150.01 to 225.00	55	58	57
225.01 to 300.00	55	58	57
300.01 to 500.00	60	63	59
500.01 to 700.00	62	65	61
700.01 to 1000.00	64	67	63
Greater than 1000	Consult Factory	Consult Factory	Consult Factory

F. Where K-factor transformers are indicated on the drawings, the transformers shall be specifically designed to supply circuits with a harmonic profile equal to or less than a K-factor of 4 without exceeding 150 degrees C temperature rise.

2.03 CONSTRUCTION – GENERAL PURPOSE TRANSFORMERS

A. Insulation Systems

1. Transformer insulation system shall be as follows:

   a. Less than 15 kVA: 180 degrees C insulation system with 115 degree C rise, encapsulated design; 15 kVA and above: minimum of 220 degree C insulation system with 150 degree C rise, ventilated design.

2. Required performance shall be obtained without exceeding the above indicated temperature rise in a 40 degrees C maximum ambient, and a 24-hour average ambient of 30 degrees C.

3. All insulation materials shall be flame-retardant and shall not support combustion as defined in ASTM Standard Test Method D635.

B. Core and Coil Assemblies

1. Transformer core shall be constructed with high-grade, non-aging, silicon steel with high magnetic permeability, and low hysteresis and eddy current losses. Maximum magnetic flux densities shall be substantially below the saturation point. The transformer core volume shall allow efficient transformer operation at 10% above the nominal tap voltage. The core laminations shall be tightly clamped and compressed. Coils shall be wound of electrical grade aluminum with continuous wound construction.

2. On three-phase units rated 9 kVA and below and single-phase units rated 10 kVA and below the core and coil assembly shall be completely encapsulated in a proportioned mixture of epoxy or resin and aggregate to provide a moisture proof, shock-resistant seal. The core and coil encapsulation system shall minimize the sound level.

3. On three-phase units rated 15 kVA and above and single-phase units rated 15 kVA and above the coils assembly shall be impregnated with non-hydroscopic, thermosetting varnish and cured to reduce hot spots and seal out moisture; the core shall be coated with HAPs (Hazardous Air Pollutants) free water reducible electrical varnish to give good corrosion resistance. The assembly shall be installed on vibration-absorbing pads.

4. Terminals shall be welded to the leads of the coils for better conductivity, less maintenance, and lower risk of hot spots. Terminals shall not be spot welded or bolted to the coil leads.

C. Taps

1. Three-phase transformers rated 15 through 225 kVA shall be provided with six 2-1/2% taps, two above and four below rated primary voltage. Three-phase transformers rated greater than 225 kVA shall be provided with manufacturer's standard taps for that rating.

2. All single-phase transformers, and three-phase transformers rated below 15 kVA and above 500 kVA, shall be provided with the manufacturer's standard tap configuration.

D. Electrostatic Shielding

1. Where shown on the drawings, provide shielded isolation transformers with an electrostatic shield consisting of a single turn of aluminum placed between the primary and secondary winding and grounded to the housing of the transformer.

    a. Electrostatic shield shall provide primary to secondary winding capacitance between 24 and 18 picofarads over the range of 100 Hz to 20 kHz.
    b. Electrostatic shielding shall provide the following minimum attenuation when tested per MIL-Std-220A, Method of Insertion Loss Measurement, with matched impedance no load technique:

        1) Common mode noise attenuation: Minus 80 dBA minimum at 0.1 kHz to 1.5 kHz; minus 55 dBA minimum at 1.51 kHz to 100 kHz. Normal mode (Transverse mode) noise attenuation: Minus 35dBA minimum at 1.5 kHz to 10 kHz.

E. Motor Drive Isolation

1. Where shown on the drawings, provide motor drive isolation transformers.

2. Motor drive isolation transformers shall be designed for use with three-phase ac adjustable frequency drives 600 volts and below to provide isolation between the incoming line and drive circuitry. These drives minimize the line disturbances caused by SCR firing within the drive unit. Thermoguards shall be included in all motor drive isolation transformers to provide

additional protection for the transformer from increased heating due to the non-sinusoidal characteristics of drive currents. The transformer shall provide reduced short-circuit currents and voltage line transients. The transformer shall be specifically sized to the drive kVA requirements dictated by the horsepower of the motor and, as such, will be mechanically braced to withstand the stress of current reversals and short-circuit currents associated with the specific drive kVA rating.

2.04 CONSTRUCTION – K-FACTOR TRANSFORMERS

A. Insulation Systems

1. Transformers shall be insulated with a UL recognized minimum 200 degrees C insulation system.

2. Required performance shall be obtained without exceeding the above indicated temperature rise in a 40 degrees C maximum ambient and a 24-hour average ambient of 30 degrees C.

3. All insulation materials shall be flame-retardant and shall not support combustion as defined in ASTM Standard Test Method D635.

B. Core and Coil Assemblies

1. Transformer core shall be constructed with high-grade, non-aging, silicon steel with high magnetic permeability, and low hysteresis and eddy current losses. Maximum magnetic flux densities shall be substantially below the saturation point. The transformer core volume shall allow efficient transformer operation at 10% above the nominal tap voltage. The core laminations shall be tightly clamped and compressed. Coils shall be wound of electrical grade aluminum with continuous wound construction. The core shall provide reduced induced currents in the steel caused by the high ratios of peak-to-rms currents and voltages found in harmonic loads.

2. The neutral bus shall be configured to accommodate 200% of the rated current.

3. The coils assembly shall be impregnated with non-hydroscopic, thermosetting varnish and cured to reduce hot spots and seal out moisture; the core shall be coated with HAPs (Hazardous Air Pollutants) free water reducible electrical varnish to give good corrosion resistance. The assembly shall be installed on vibration-absorbing pads.

C. Taps

1. Three-phase K-factor rated transformers through 225 kVA shall be provided with six 2-1/2% taps, two above and four below rated primary voltage. Three-phase transformers rated greater than 225 kVA shall be provided with the manufacturer’s standard taps for that rating.

2. Single-phase K-factor rated transformers shall be provided with manufacturer’s standard tap configuration.

D. Electrostatic Shielding

1. Provide K-rated transformers with electrostatic shielding consisting of a single turn of aluminum placed between the primary and secondary winding and grounded to the housing of the transformer.

   a. Electrostatic shield shall provide primary to secondary winding capacitance between 24 and 18 picofarads over the range of 100 Hz to 20 kHz.

b. Electrostatic shielding shall provide the following minimum attenuation when tested per MIL-Std-220A, Method of Insertion Loss Measurement, with matched impedance no load technique:
c. Common mode noise attenuation: Minus 80 dBA minimum at 0.1 kHz to 1.5 kHz; minus 55 dBA minimum at 1.51 kHz to 100 kHz. Normal mode (Transverse mode) noise attenuation: Minus 35dBA minimum at 1.5 kHz to 10 kHz.

2.05 CONSTRUCTION – HARMONIC MITIGATING TRANSFORMERS

A. Core and Coil Assemblies

1. Transformer core shall be constructed with high-grade, non-aging electrical steel with high magnetic permeability, and low hysteresis and eddy current losses. Maximum magnetic flux densities shall be substantially below the saturation point. The transformer core volume shall allow efficient transformer operation at 10% above the nominal tap voltage. The core laminations shall be tightly clamped and compressed.

2. The coils assembly shall be impregnated with non-hydroscopic, thermosetting varnish and cured to reduce hot spots and seal out moisture; the core shall be coated with HAPs (Hazardous Air Pollutants) free water reducible electrical varnish to give good corrosion resistance. The internal core and coil assembly shall be installed on vibration-absorbing pads.

3. Transformers shall be of two-winding construction. The primary winding shall be a delta, three-wire connection and the secondary winding shall be wye-zigzag with a wye field connection.

4. Primary and secondary windings shall be wound of electrical grade aluminum with continuous wound construction. All terminals and bussing shall be aluminum.

5. Transformers shall be insulated with a UL recognized minimum 200 degrees C insulation system. Winding temperature rise shall not exceed 150 degrees C.

6. Required performance shall be obtained without exceeding the above indicated temperature rise in a 40 degrees C maximum ambient, and a 24-hour average ambient of 30 degrees C.

7. All insulation materials shall be flame-retardant and shall not support combustion as defined in ASTM Standard Test Method D635.

8. Neutral conductor shall be aluminum and rated to carry 200% of normal phase current.

9. Windings shall have a BIL of 10 KV.

B. Taps

1. Three-phase harmonic mitigating transformers rated 15 through 225 kVA shall be provided with six 2-1/2% taps, two above and four below rated primary voltage. Three-phase transformers rated greater than 225 kVA shall be provided with manufacturer's standard taps for that rating.

C. Electrostatic Shielding

1. Harmonic mitigating transformers shall be provided with an independent, single, full-width electrostatic shield consisting of a single turn of □[aluminum][copper] placed between each primary and secondary winding and grounded. [Option: double-shielding available]

   a. Electrostatic shield shall provide primary to secondary winding capacitance between 24 and 18 picofarads over the range of 100 Hz to 20 kHz.

b. Electrostatic shielding shall provide the following minimum attenuation when tested per MIL-Std-220A, Method of Insertion Loss Measurement, with matched impedance no load technique:
c. Common mode noise attenuation: Minus 80 dBA minimum at 0.1 kHz to 1.5 kHz; minus 55 dBA minimum at 1.51 kHz to 100 kHz. Normal mode (Transverse mode) noise attenuation: Minus 35dBA minimum at 1.5 kHz to 10 kHz.

2.06 HARMONIC TREATMENT

A. Harmonic Mitigating Transformers (HMTs) shall have a low Positive/Negative sequence impedance (between 4.6% and 7.2%) and low Zero-Sequence impedance/reactance (less than 0.55% and 0.47% respectively).

B. Triplen harmonics shall be treated in the secondary windings through flux cancellation and not coupled into the primary delta winding.

C. 5^{th} and 7^{th} harmonic currents shall be treated through the pairing of phase-shifted transformers such that these harmonic currents subtract at the common bus feeding the transformers with harmonics produced by other similar sources.

D. Each of the transformers used to treat 5^{th} and 7^{th} harmonic currents shall also treat triplen harmonics in the secondary windings of each transformer.

E. Fundamental current imbalance shall be reduced on the primary when compared to the secondary load measurements.

F. Harmonic treatment shall be through electromagnetic means; filters, capacitors, power electronic circuitry or other such devices shall not be used to treat harmonics.

G. Thermal Sensors

1. When required, provide transformers with a thermal sensor set at 190 degrees C. Provide a second thermal sensor set at 175 degrees C when required. Thermal sensor(s) shall be factory-installed in the center coil of the transformer and factory-wired to a terminal strip. Thermal sensors shall consist of a set of dry contacts.

2.07 WIRING / TERMINATIONS

A. Recommended external cable shall be rated 90 degrees C (sized at 75 degrees C ampacity) for encapsulated and 75 degrees C for ventilated designs. Connectors should be selected on the basis of the type and cable size used to wire the specific transformer.

2.08 ENCLOSURE

A. The enclosure shall be made of heavy-gauge steel. All transformers shall be equipped with a wiring compartment suitable for conduit entry and large enough to allow convenient wiring. The maximum temperature of the enclosure shall not exceed 90 degrees C per UL requirement. The core of the transformer shall be grounded to the enclosure.

B. On three-phase units rated 9 kVA and below and single-phase units rated 10 kVA and below the enclosure construction shall be encapsulated, totally enclosed, non-ventilated, NEMA 3R, with lifting provisions.

C. On three-phase units rated 15 kVA and above and single-phase units rated 15 kVA and above the enclosure construction shall be ventilated, NEMA 2, drip-proof, with lifting provisions. All ventilation

openings shall be protected against falling dirt. On outdoor units, provide weathershields over ventilated openings.

D. Ventilated type transformers that meet 10 CFR Part 431 efficiency requirements, with a core size of 150 kVA or less, shall be suitable for installation with 2-inch clearance from a wall or other obstruction behind the transformer enclosure.

2.09 FINISH

A. Steel enclosures shall be finished with ANSI 61 color, weather-resistant enamel. Stainless steel enclosures shall not be painted.

2.10 OPTIONAL ACCESSORIES

A. On ventilated outdoor units provide suitable weathershields over ventilation openings.

PART 3 – EXECUTION

3.01 FACTORY TESTING

A. The following standard factory tests shall be performed on the equipment provided under this section. All tests shall be in accordance with the latest version of ANSI and NEMA standards.

1. Ratio tests at the rated voltage connection and at all tap connections.
2. Polarity and phase relation tests on the rated voltage connection.
3. Applied potential tests.
4. Induced potential test.
5. No-load and excitation current at rated voltage on the rated voltage connection.

3.02 INSTALLATION

A. The Contractors shall install all equipment per the manufacturer's recommendations and the contract drawings.

3.03 FIELD ADJUSTMENTS

A. Adjust taps to deliver appropriate secondary voltage.

3.04 FIELD TESTING

A. Measure primary and secondary voltages for proper tap settings.

END OF SECTION

DIVISION 26 – ELECTRICAL

SECTION 262416 – PANELBOARDS

PART 1 – GENERAL

1.01 SCOPE

A. The Contractor shall furnish and install the panelboards as specified and as shown on the contract drawings.

1.02 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Section 260500 – Common Work Results for Electrical
C. Section 260553 – Identification for Electrical Systems

1.03 REFERENCES

A. The panelboards and all components shall be designed, manufactured and tested in accordance with the latest applicable standards of NEMA and UL as follows:

1. UL 67 – Panelboards
2. UL 50 – Cabinets and boxes
3. NEMA PB1
4. Fed. Spec. W-P-115C
5. UL98 – Fusible Switches

1.04 SUBMITTALS – FOR REVIEW / APPROVAL

A. The following information shall be submitted to the Engineer for each panelboard:

1. Breaker layout drawing with dimensions indicated and nameplate designation.
2. Component list
3. Conduit entry/exit locations
4. Assembly ratings including:

    a. Short-circuit rating
    b. Voltage
    c. Continuous current

5. Cable terminal sizes
6. Product data sheets

1.05 SUBMITTALS – FOR CONSTRUCTION

A. The following information shall be submitted for record purposes:

B. Final as-built drawings and information for items listed in Paragraph 1.04, and shall incorporate all changes made during the manufacturing process.

C. Installation information

1.06 QUALIFICATIONS

A. The manufacturer of the assembly shall be the manufacturer of the major components within the assembly.

B. For the equipment specified herein, the manufacturer shall be ISO 9001 or 9002 certified.

C. The manufacturer of this equipment shall have produced similar electrical equipment for a minimum period of five (5) years. When requested by the Engineer, an acceptable list of installations with similar equipment shall be provided demonstrating compliance with this requirement.

1.07 REGULATORY REQUIREMENTS

A. Panelboard overcurrent protective devices shall be selectively coordinated with all supply side overcurrent protective devices as required for this project by the National Electrical Code/NFPA 70 Articles 645.27, 700.27, 701.27 and 708.54.

B. The panelboards and components shall be UL labeled.

1.08 DELIVERY, STORAGE AND HANDLING

A. Equipment shall be handled and stored in accordance with manufacturer's instructions. One (1) copy of these instructions shall be included with the equipment at time of shipment.

1.09 OPERATION AND MAINTENANCE MANUAL

A. Equipment operation and maintenance manuals shall be provided with each assembly shipped and shall include instruction leaflets, instruction bulletins and renewal parts lists where applicable, for the complete assembly and each major component.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Subject to requirements, provide product by one of the following:

1. Eaton
2. Siemens
3. General Electric
4. Square D
5. Approved Equal

    a. The listing of specific manufacturers above does not imply acceptance of their products that do not meet the specified ratings, features and functions. Manufacturers listed above are not relieved from meeting these specifications in their entirety. Ratings.

B. Panelboards rated 240 Vac or less shall have short-circuit ratings as shown on the drawings or panelboard schedules, but not less than 22,000 amperes RMS symmetrical.

C. Panelboards rated 480 Vac shall have short-circuit ratings as shown on the drawings or panelboard schedules, but not less than 14,000 amperes RMS symmetrical.

D. Panelboards shall be labeled with a UL short-circuit rating. Series rated panelboards shall be provided with a label or manual stating the conditions of the UL series ratings. Information in the manual shall include, at minimum:

1. Size and type of upstream device
2. Branch devices that can be used
3. UL tested and listed series short-circuit rating.

2.02 CONSTRUCTION

A. Interiors shall be completely factory assembled. They shall be designed such that switching and protective devices can be replaced without disturbing adjacent units and without removing the main bus connectors.

B. Trims for branch circuit panelboards shall be supplied with a hinged door over all circuit breaker handles. Doors in panelboard trims shall not uncover any live parts. Doors shall have a semi flush cylinder lock and catch assembly. Door-in-door trim shall be provided. Both hinged trim and trim door shall utilize three-point latching. No tools shall be required to install or remove trim. Trim shall be equipped with a door-actuated trim locking tab. Equip locking tab with provision for a screw such that removal of trim requires a tool, at the owner's option. Installation shall be tamper resistant with no exposed hardware on the panelboard trim.

C. Distribution panelboard trims shall cover all live parts. Switching device handles shall be accessible.

D. Surface trims shall be same height and width as box. Flush trims shall overlap the box by 3/4 of an inch on all sides.

E. A directory card with a clear plastic cover shall be supplied and mounted on the inside of each door.

F. All locks shall be keyed alike.

2.03 BUS

A. Main bus bars shall be tin-plated copper sized in accordance with UL standards to limit temperature rise on any current carrying part to a maximum of 65 degrees C above an ambient of 40 degrees C maximum.

B. A system ground bus shall be included in all panels.

C. Full-size (100%-rated) insulated stand-off neutral bars shall be included for panelboards shown with neutral. Bus bar taps for panels with single-pole branches shall be arranged for sequence phasing of the branch circuit devices. Neutral busing shall have a suitable lug for each outgoing feeder requiring a neutral connection. 200%-rated neutrals shall be supplied for panels designated on drawings with oversized neutral conductors.

2.04 BRANCH CIRCUIT PANELBOARDS – CIRCUIT BREAKER

A. The minimum short-circuit rating for branch circuit panelboards shall be 10,000 amperes symmetrical at 240 volts, and 14,000 amperes symmetrical at 480 volts, or as indicated on the drawings. Panelboards shall be fully rated. Panelboards shall be Eaton type Pow-R-Line 1a, Pow-R-Line 2a or Pow-R-Line 3a or approved equal.

B. Bolt-on type, heavy-duty, quick-make, quick-break, single- and multi-pole circuit breakers of the types specified herein, shall be provided for each circuit with toggle handles that indicate when unit has tripped.

C. All circuit breakers shall be thermal-magnetic type with common handle for all multiple pole circuit breakers. Circuit breakers shall be minimum 100-ampere frame. Ratings through 100-ampere trip shall take up the same pole spacing. Circuit breakers shall be UL listed as type SWD for lighting circuits.

D. Circuit breaker handle locks (ON position) shall be provided for all circuits that supply exit signs, emergency lights, energy management, and control system (EMCS) panels and fire alarm panels.

2.05 BRANCH CIRCUIT PANELBOARDS – FUSIBLE

A. The minimum short-circuit rating for branch circuit panelboards shall be as specified herein or as indicated on the drawings. Panelboards shall be fully rated. Panelboards shall be Eaton type Pow-R-Line 3FQS, Bussman Type QSCP, or engineer approved equal.

B. Panelboard shall have an integrated spare fuse compartment for up to (6) spare CUBE fuses as standard.

C. Branch circuit disconnecting means shall be bolt-on Bussmann Type CCPB with Bussmann Low-Peak CUBE fuses or approved equal utilized for overcurrent protection. Ratings shall be available from 15-100A with minimum interrupting rating of 300kA symmetrical and 200kA short circuit current assembly rating.

D. Branch circuit devices shall include a non-defeatable interlock to prevent removal of fuse under load. Provide a fuse ampacity rejection feature to prevent over fusing of branch disconnect. Fuses shall be indicating type with permanently installed neon indicating light. Branch devices shall be finger-safe when panelboard trim is removed. Provide lockout/tagout provision for each branch circuit position.

2.06 DISTRIBUTION PANELBOARDS – CIRCUIT BREAKER TYPE

A. Distribution panelboards equipped with bolt-on devices shall have interrupting ratings as indicated on the drawings. Panelboards shall be fully rated. Panelboards shall be Eaton type Pow-R-Line 3a or Pow-R-Line 4B or approved equal. Panelboards shall have molded case circuit breakers as indicated below.

B. Where indicated, provide circuit breakers UL listed for application at 100% of their continuous ampere rating in their intended enclosure.

C. Main breakers, if furnished, shall be equipped with microprocessor-based trip units that have integral Arc Flash Reduction trip feature. The use of zone selective interlocking to emulate this function does not meet the intent of this specification and will not be allowed.

D. Distribution circuit breakers shall be fixed mounted type and equipped with either microprocessor-based trip units or thermal magnetic trip units as scheduled on the contract drawings.

E. Provide shunt trips, bell alarms, and auxiliary switches as shown on the contract drawings.

2.07 DISTRIBUTION PANELBOARDS – FUSIBLE SWITCH TYPE

A. Distribution panelboards shall be equipped with main and branch fusible switches and include fuses with ratings indicated on the drawings. Fusible distribution panelboards shall be Eaton type Pow-R-Line 4F or approved equal.

2.08 PANELBOARD SUBMETERING

A. Where shown on the drawings, supply a UL listed microprocessor-based Multi-Point Metering System (MPM), Eaton type PX Multipoint Meter or approved equal having the specified features.

B. MPM shall have 60 channels for current sensor input. Meter shall auto-detect sensor rating and have standard tamper detection.

C. MPM shall calculate power and energy consumption in accordance with ANSI C12.20 (0.5%) metering specification and store metered data in nonvolatile memory.

D. MPM shall store the following per phase and system total for each metering point.

1. Voltage, Current, and Frequency (system total only)
2. Watts, VAR, VA, and power factor
3. Watt hours including forward and reverse.

E. MPM shall store energy profile information for each metering point in non-volatile memory. The demand profile time period shall be adjustable from 1, 5, 15, 30 and 60 minutes for fixed method and 1, 5, and 15 minutes for sliding method. The MPM shall have the ability to sync with external input to the on-board demand input. The MPM shall be able to save a minimum of 1 year of load profile data for all 60 meter points on a 15 minutes basis.

F. MPM shall be provided with multiple communications ports and protocols, including the following capability:

1. RS-485 remote display port
2. RS-485 Modbus RTU
3. USB Local Configuration Port
4. HTML web pages
5. File transfer protocol (ftp)
6. RJ-45 10/100Base-T Ethernet network port
7. Modbus TCP
8. BACnet/IP
9. SMTP(Simple Mail Transfer Protocol) for email support
10. SNMP(Simple Network Management Protocol) MIB support
11. Ethernet TCP/IP
12. NTP(Network Time Protocol) support

2.09 SURGE PROTECTION DEVICES

A. SPD shall comply with ANSI/UL 1449 4th Edition or later listing by Underwriters Laboratories (UL).

B. SPD shall be factory installed integral to the panelboard by the original equipment manufacturer and shall be a product of the same manufacturer as the panelboard and breakers.

C. The SPD shall be maintenance free and shall not require any user intervention throughout its life. SPDs containing items such as replaceable single-mode modules, replaceable fuses, or replaceable batteries shall not be accepted. SPDs requiring any maintenance of any sort such as periodic tightening of connections shall not be accepted. SPDs requiring user intervention to test the unit via a diagnostic test kit or similar device shall not be accepted.

D. Electrical Requirements:

1. Unit Operating Voltage – Refer to drawings for operating voltage and unit configuration.

2. Maximum Continuous Operating Voltage (MCOV) – The MCOV shall not be less than 115% of the nominal system operating voltage.

3. The suppression system shall incorporate thermally protected metal-oxide varistors (MOVs) as the core surge suppression component for the service entrance and all other distribution levels. The system shall not utilize silicon avalanche diodes, selenium cells, air gaps, or other components that may crowbar the system voltage leading to system upset or create any

environmental hazards. End of life mode to be open circuit. Unit with end of life short-circuit mode are not acceptable.

4. Unit shall operate without the need for an external overcurrent protection device (OCPD) and be listed by UL as such. Unit must not require external OCPD or replaceable internal OCPD for the UL Listing.

5. Protection Modes – The SPD must protect all modes of the electrical system being utilized. The required protection modes are indicated by bullets in the following table:

	Protection Modes			
Configuration	L-N	L-G	L-L	N-G
Wye	●	●	●	●
Delta	N/A	●	●	N/A
Single Split Phase	●	●	●	●
High Leg Delta	●	●	●	●

6. Nominal Discharge Current (In) – All SPDs applied to the distribution system shall have a 20kA In rating regardless of their SPD Type (includes Types 1 and 2) or operating voltage. SPDs having an In less than 20kA shall be rejected.

7. ANSI/UL 1449 4th Edition Voltage Protection Rating (VPR) – The maximum ANSI/UL 1449 4th Edition VPR for the device shall not exceed the following:

Modes	208Y/120	480Y/277	600Y/347
L-N; L-G; N-G	700	1200	1500
L-L	1200	2000	3000

2.10 ENCLOSURE

A. Enclosures shall be at least 20 inches wide made from galvanized steel. Provide minimum gutter space in accordance with the National Electrical Code. Where feeder cables supplying the mains of a panel are carried through its box to supply other electrical equipment, the box shall be sized to include the additional required wiring space. At least four interior mounting studs with adjustable nuts shall be provided.

B. Enclosures shall be provided with blank ends.

C. Where indicated on the drawings, branch circuit panelboards shall be column width type.

2.11 NAMEPLATES

A. Provide an engraved nameplate for each panel section as per Specification Section 260553.

2.12 FINISH

A. Surfaces of the trim assembly shall be properly cleaned, primed, and a finish coat of gray ANSI 61 paint applied.

PART 3 – EXECUTION

3.01 INSTALLATION

A. The Contractors shall install all equipment per the manufacturer's recommendations and the contract drawings.

B. Provide typed directory for each panelboard.

END OF SECTION

DIVISION 26 – ELECTRICAL

SECTION 262726 – WIRING DEVICES

PART 1 – GENERAL

1.01 SCOPE

A. The Contractor shall furnish and install, where indicated, wiring devices, complete with backboxes and wallplates as specified herein, and as shown on the contract drawings.

1.02 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Section 260500 – Basic Electrical Requirements
C. Section 260532 – Interior Raceways Fittings and Accessories
D. Section 260534 – Outlet, Junction and Pull Boxes

1.03 SUMMARY

A. Section Includes:

1. Receptacles, receptacles with integral GFCI, and associated device plates.
2. Receptacles with integral USB charger.
3. Receptacles with integral Arc Fault Circuit Interrupter, AFCI.
4. Plugload Control Receptacles.
5. Twist-locking receptacles.
6. Receptacles with integral surge-suppression units.
7. Isolated-ground receptacles.
8. Hospital-grade receptacles.
9. Tamper-resistant receptacles.
10. Weather-resistant receptacles.
11. Snap switches and wall-box dimmers.
12. Wall-switch and exterior occupancy sensors.
13. Communications outlets.
14. Pendant cord-connector devices.
15. Cord and plug sets.
16. Floor service outlets, poke-through assemblies, service poles, and multioutlet assemblies.

1.04 DEFINITIONS

A. AFCI: Arc fault circuit interrupter.
B. EMI: Electromagnetic interference.
C. GFCI: Ground-fault circuit interrupter.
D. Pigtail: Short lead used to connect a device to a branch-circuit conductor.
E. Plugload Control Receptacle: Automatically occupancy switched receptacle.
F. RFI: Radio-frequency interference.
G. TVSS: Transient voltage surge suppressor.
H. UTP: Unshielded twisted pair.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Receptacles for Owner-Furnished Equipment: Match plug configurations.
2. Cord and Plug Sets: Match equipment requirements.

1.06 ACTION SUBMITTALS

A. Product Data: Manufacturer's standard catalog cut, highlighted for each type of product used.

B. Samples: One for each type of device and wall plate specified, in each color specified when so indicated on the drawings or requested by the Architect/Engineer.

1.07 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing-label warnings and instruction manuals that include labeling conditions.

1.08 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. None unless otherwise specified on the drawings.

1.09 QUALITY ASSURANCE

A. Electrical components, conductors, devices and accessories described herein shall be listed and labeled as defined by NFPA 70 by a Nationally Recognized Testing Laboratory (NRTL), such as Underwriters Laboratories (UL), for the intended use and shall bear its label.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Hubbell Incorporated; Wiring Device-Kellems; Wiring Device-Kellems (Hubbell) or a comparable product by one of the following:

1. Arrowhart Wiring Devices, Inc.; Division of Eaton.
2. Leviton Manufacturing Co., Inc.
3. Pass & Seymour/Legrand (Pass & Seymour).
4. Approved equal.

B. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

2.02 GENERAL WIRING-DEVICE REQUIREMENTS

A. Wiring Devices, Components, 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 NFPA 70.

C. Devices that are manufactured for use with modular plug-in connectors shall NOT be used unless otherwise specifically indicated in the drawings.

2.03 STRAIGHT-BLADE RECEPTACLES

A. Convenience Receptacles:

1. Requirements: Heavy Duty 125 V, 20A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.

2. Subject to compliance with requirements, provide product by one of the following:

   a. Hubbell Incorporated; Wiring Device-Kellems; HBL5361 (single), HBL5362 (duplex) (Design Basis)
   b. Arrow Hart Wiring Devices, Inc.; Division of Eaton; 5361 (single), AH 5362 (duplex).
   c. Leviton Manufacturing Co., Inc.; 5361 (single), 5362 (duplex).
   d. Pass & Seymour/Legrand (Pass & Seymour); 5361 (single), 5362 (duplex).
   e. Approved Equal.

B. USB Charging Convenience Receptacles:

1. Requirements: Tamper Resistant, 125 V, 20A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, UL 1310, and FS W-C-596. Compatible with USB 1.1/2.0/3/0 devices, including Apple products.

2. Subject to compliance with requirements, provide duplex receptacle with 2 USB charging Ports or a comparable product by one of the following:

   a. Hubbell Incorporated; Wiring Device-Kellems; USB 20X2 (design basis)
   b. Arrow Hart Wiring Devices, Inc.; Division of Eaton, TR7756.
   c. Leviton Manufacturing Co., Inc. T5832
   d. Pass & Seymour/Legrand (Pass & Seymour) TR5362USB.
   e. Approved Equal

C. Arc Fault Convenience Receptacles:

1. Requirements: 125 V, 20A: tamper resistant. Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.

2. Subject to compliance with requirements, provide product by one of the following:

   a. Hubbell Incorporated; Wiring Device-Kellems; AFR20TR (design basis)
   b. Arrow Hart Wiring Devices, Inc.; Division of Eaton. TRAFCI20
   c. Leviton Manufacturing Co., Inc. AGTR2
   d. Pass & Seymour/Legrand (Pass & Seymour), AFR202
   e. Approved Equal

D. Arc Fault / Ground Fault Dual Function Convenience Receptacles:

1. Requirements: 125 V, 20A, tamper resistant, Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 943, UL 498, and FS W-C-596.

2. Subject to compliance with requirements, provide product by one of the following:

   a. Hubbell Incorporated; Wiring Device-Kellems; AFGF20TR (design basis)
   b. Arrow Hart Wiring Devices, Inc.; Division of Eaton. TRAFCI20
   c. Leviton Manufacturing Co., Inc. AFTR2
   d. Pass & Seymour/Legrand (Pass & Seymour), AFGFR202TR
   e. Approved Equal

E. Plugload Controlled Convenience Receptacles:

1. Requirements: 125 V, 20A, permanent controlled face marking: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.

2. Subject to compliance with requirements, provide product by one of the following:

a. Hubbell Incorporated; Wiring Device-Kellems; one controlled face BR20C1, or two controlled faces, BR20C2 (design basis)
b. Arrow Hart Wiring Devices, Inc.; Division of Eaton, 5362CH (one face), 5362CD (2-faces)
c. Leviton Manufacturing Co., Inc. 5362-S1(one face) or 5362-S2 (two faces)
d. Pass & Seymour/Legrand (Pass & Seymour).5362CH (1-face) or 5362CD (2-faces)
e. Approved Equal.

F. Isolated-Ground, Duplex Convenience Receptacles:

1. Description: Straight blade; equipment grounding contacts shall be connected only to the green grounding screw terminal of the device and with inherent electrical isolation from mounting strap. Isolation shall be integral to receptacle construction and not dependent on removable parts.

2. Requirements: 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.

3. Subject to compliance with requirements, provide or a comparable product by one of the following:

a. Hubbell Incorporated; Wiring Device-Kellems; IG5362 (design basis)
b. Arrow Hart Wiring Devices, Inc.; Division of Eaton; IG 5362.
c. Leviton Manufacturing Co., Inc.; 5362IG.
d. Pass & Seymour/Legrand (Pass & Seymour); IG5362.
e. Approved Equal.

G. Tamper-Resistant Convenience Receptacles:

1. Requirements: 125 V, 20 A: Comply with NEMA WD1, NEMA WD6 Configuration 5-20R, UL 498 Supplements, and FSW-C-596.

2. Basis-of-Design Product: Subject to compliance with requirements, provide product by one of the following:

a. Hubbell Wiring Device - Kellems; HBL5362TR (design basis)
b. Arrow Hart Wiring Devices, Inc.; Division of Eaton; TRBR20.
c. Leviton Manufacturing Co., Inc.; TBR20.
d. Pass & Seymour/Legrand (Pass & Seymour); TR63.
e. Approved equal.

2.04 GFCI RECEPTACLES

A. Description:

1. Straight blade, non-feed-through type unless otherwise specified in the drawings.
2. Comply with NEMA WD 1, NEMA WD 6, UL 498, UL 943 Class A, and FS W-C-596.

3. Self-test function, line / load reversal protection.

4. Include indicator light that shows when the GFCI has malfunctioned and no longer provides proper GFCI protection.

5. Extra heavy duty, weather and tamper resistant.

6. Duplex GFCI Convenience Receptacles, 125 V, 20 A:

7. Subject to compliance with requirements, provide product by one of the following:

    a. Hubbell Incorporated; Wiring Device-Kellems; GFR5632TR (design basis).
    b. Cooper Wiring Devices, Inc.; Division of Eaton; VGF20.
    c. Leviton Manufacturing Co., Inc.; 7899.
    d. Pass & Seymour/Legrand (Pass & Seymour); 2099.
    e. Approved Equal

2.05 RETRACTABLE CORD REELS

A. General Requirements:

1. Comply with NEMA WD 1, UL 20, and FS W-S-896.
2. Switches, 120/277 V, 20 A, 1HP @ 120V, 2HP @ 240V:

B. Description:

1. Steel construction including mounting base, 20A, 125VAC, NEMA 2 positive latching mechanism, minimum 5’ long input power cord and plug, adjustable guide arm, 25’L minimum 12/3 power cord.

2. UL 355 listed / certified.

3. Provide with double duplex GFCI straight blade receptacles on the payout end. Exception – Integral GFCI protection not required where upstream GFCI protection is provided by a GFCI branch circuit breaker or other device.

4. Unless otherwise noted in the drawings provide safety yellow color when used in shop classrooms, white when used in Science lab or Family/Consumer Science classrooms.

5. Provide with swivel base.

6. Subject to compliance with requirements, provide product by one of the following:

    a. Hubbell Incorporated; Wiring Device-Kellems; HBL45123 Series (design basis)
    b. KH Industries RTB3L Series.
    c. Approved equal.

2.06 CORD AND PLUG SETS

A. Description:

1. Match voltage and current ratings and number of conductors to requirements of equipment being connected.

2. Cord: Rubber-insulated, stranded-copper conductors, with Type SOW-A jacket; with green-insulated grounding conductor and ampacity of at least 130 percent of the equipment rating.

3. Plug: Nylon body and integral cable-clamping jaws. Match cord and receptacle type for connection.

2.07 TOGGLE SWITCHES

A. General Requirements:

1. Comply with NEMA WD 1, UL 20, and FS W-S-896.
2. Switches, 120/277 V, 20 A, 1HP @ 120V, 2HP @ 240V:

B. Single Pole:

1. Subject to compliance with requirements, provide product by one of the following:

a. Hubbell Incorporated; Wiring Device-Kellems; 1221 (design basis)
b. Arrow Hart Wiring Devices, Inc.; Division of Eaton, Inc.; AH 1221.
c. Leviton Manufacturing Co., Inc.; 1221-2.
d. Pass & Seymour/Legrand (Pass & Seymour); PS20AC1.
e. Approved equal.

C. Double Pole:

1. Subject to compliance with requirements, provide or a comparable product by one of the following:

a. Hubbell Incorporated; Wiring Device-Kellems; 1222 (design basis)
b. Arrow Hart Wiring Devices, Inc.; Division of Eaton, Inc.; AH1222.
c. Leviton Manufacturing Co., Inc.; 1222-2.
d. Pass & Seymour/Legrand (Pass & Seymour); PS20AC2.
e. Approved equal.

D. Three Way:

1. Subject to compliance with requirements, provide or a comparable product by one of the following:

a. Hubbell Incorporated; Wiring Device-Kellems; 1223 (design basis)
b. Arrow Hart Devices, Inc.; Division of Eaton.; AH1223.
c. Leviton Manufacturing Co., Inc.; 1223-2.
d. Pass & Seymour/Legrand (Pass & Seymour); PS20AC3.
e. Approved equal.

E. Four Way:

1. Subject to compliance with requirements, provide product by one of the following:

a. Hubbell Incorporated; Wiring Device-Kellems; 1224 (design basis)
b. Arrow Hart Wiring Devices, Inc.; Division of Easton.; AH1224.
c. Leviton Manufacturing Co., Inc.; 1224-2.
d. Pass & Seymour/Legrand (Pass & Seymour); PS20AC4.
e. Approved equal.

F. Pilot-Light Switches:

1. Description: Single pole, with neon-lighted handle, illuminated when switch is "off.

2. Subject to compliance with requirements, provide product by one of the following:

    a. Hubbell Incorporated; Wiring Device-Kellems; 1221-PL for 120 and 277 V
    b. Arrow Hart Wiring Devices, Inc.; Division of Eaton.; AH1221-PL (120 ad 277 V).
    c. Leviton Manufacturing Co., Inc.; 1221-PLR (120V) or 1221-7PLR (277V).
    d. Pass & Seymour/Legrand (Pass & Seymour); PS20AC1RPL (120V) or PS20AC1RPL7 (277V).
    e. Approved equal.

G. Single-Pole, Double-Throw, Momentary-Contact, Center-off Switches: 120/277 V, 20 A; for use with mechanically held lighting contactors.

1. Subject to compliance with requirements, provide product by one of the following:

    a. Hubbell Incorporated; Wiring Device-Kellems; HBL1557 (design basis)
    b. Arrow Hart Devices, Inc.; Division of Eaton.; 1995.
    c. Leviton Manufacturing Co., Inc.; 1257.
    d. Pass & Seymour/Legrand (Pass & Seymour); 1251.
    e. Approved equal.

2.08 KEY-OPERATED SWITCHES, 120/277 V, 20 A

A. General Requirements:

1. Comply with NEMA WD 1, UL 20, and FS W-S-896.

2. Switches, 120/277 V, 20 A, 1HP @ 120V, 2HP @ 240V.

3. Single Pole, with factory-supplied key in lieu of switch handle.

B. Single Pole:

1. Subject to compliance with requirements, provide product by one of the following:

    a. Hubbell Incorporated; Wiring Device-Kellems; 1221L (design basis)
    b. Cooper Wiring Devices, Inc.; Division of Cooper Industries, Inc.; AH1221L.
    c. Leviton Manufacturing Co., Inc.; 1221-2L.
    d. Pass & Seymour/Legrand (Pass & Seymour); PS20AC1-L.
    e. Approved equal.

C. Key-Operated, Single-Pole, Double-Throw, Momentary-Contact, Center-off Switches: 120/277 V, 20 A; for use with mechanically held lighting contactors, with factory-supplied key in lieu of switch handle.

1. Subject to compliance with requirements, provide product by one of the following:

    a. Hubbell Incorporated; Wiring Device-Kellems; HBL1557L (design basis)
    b. Arrow Hart Wiring Devices, Inc.; Division of Eaton.; 1995L.
    c. Leviton Manufacturing Co., Inc.; 1257L.
    d. Pass & Seymour/Legrand (Pass & Seymour); 1251L.
    e. Approved equal.

2.09 WALL-BOX DIMMERS

A. Shall be compatible with lighting type used. Coordinate with drawings and lighting specification divisions.

2.10 WALL PLATES

A. Single and combination types shall match corresponding wiring device style. Multi-gang installations shall be installed under a single piece wall plate.

1. Plate-Securing Screws: Metal with head color to match plate finish.

2. Material for Finished Spaces: Type 302 stainless steel, 0.04-inch thick, brushed brass with factory polymer finish.

3. Material for Unfinished Spaces: Galvanized steel.

4. Material for Damp Locations: Cast aluminum with spring-loaded lift cover, listed and labeled for use in wet and damp locations.

5. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant, die-cast aluminum with lockable cover.

2.11 FLOOR SERVICE FITTINGS

A. Floor Service assemblies specified herein shall be for power use only. For assemblies containing data communications or combination power and data communications refer to technology drawings and specification sections for applicable products.

B. Type: Modular, flush-type, flap-type, above-floor, single-service units suitable for wiring method used as indicated in the drawings.

C. Compartments: Barrier separates power from voice and data communication cabling.

D. Service Plate: Rectangular or Round as indicated, finish die-cast aluminum finish with satin finish, unless otherwise indicated.

E. Power Receptacle: NEMA WD 6 Configuration 5-20R, gray finish, unless otherwise indicated.

2.12 POKE-THROUGH ASSEMBLIES

A. Poke–Through assemblies specified herein shall be for power use only. For assemblies containing data communications or combination power and data communications refer to technology drawings and specification sections for applicable products.

B. Where not otherwise indicated on the drawings, subject to compliance with requirements, provide Hubbell Incorporated; Wiring Device-Kellems; products named below or a comparable product by one of the following:

1. FSR.
2. Wiremold / Legrand.
3. Approved equal.

C. Activation Type:

1. Recessed Activation.

a. Hubbell System One - Recessed Activation or approved equal.

1) S1R4PT: 4-inch core with two 1/2 inch and one 3/4 inch feed conduits.
2) Outlets: S1R4PTQUAD: Power only, with four power outlets.

b. Provide with appropriate subplate for device mounting and cover, finish chosen by Architect.

1) Cover Flange: 0.12 inch thick, ADA compliant.
2) Finish: As specified by Architect.

D. Surface Activation.

1. Hubbell System One - Surface Activation or approved equal:

a. S1PT4X4FIT with two 3/4 inch conduits for low voltage, one 3/4 inch for power.

2. Provide with appropriate subplate for device mounting and cover, finish chosen by Architect.

3. Cover Flange: ADA compliant appropriate for use in the floor finish installed.

4. Furniture Feed Cover: S1PFFT for tile applications or S1PFF for carpet applications as appropriate with one 3/4 inch connection for power and one 1-1/2 inch connection for low voltage.

a. Finish: As specified by Architect.

E. Pedestal Activation.

1. PT7XC, 2-inch poke through insert with a RX80 series pedestal, size as required or approved equal.

F. Description:

1. Factory-fabricated and -wired assembly of below-floor junction box with multi-channeled, through-floor raceway/firestop unit and detachable matching floor service-outlet assembly.

2. Comply with UL 514 scrub water exclusion requirements.

3. Service-Outlet Assembly: As indicated on the plans."

4. Size: Selected to fit cored holes in floor and matched to floor thickness.

5. Fire Rating: Unit is listed and labeled for fire rating of floor-ceiling assembly.

6. Closure Plug: Arranged to close unused cored openings and reestablish fire rating of floor.

7. Wiring Raceways and Compartments: For a minimum of four No. 12 AWG conductors

2.13 PREFABRICATED MULTIOUTLET ASSEMBLIES

A. Unless otherwise noted in the drawings, Subject to compliance with requirements, provide 20A, 120V by one of the following:

a. Hubbell Incorporated; Wiring Device-Kellems; Plug TrakHBL24 series steel.
b. Wiremold / Legrand.
c. Approved equal.

B. Two-piece surface painted steel brushed aluminum or PVC raceway, with factory-wired multi-outlet harness.

C. Components shall be products from single manufacturer designed for use as a complete, matching assembly of raceways and receptacles.

D. Raceway Material: Painted Metal for general use. PVC where subject to corrosive conditions.

E. Multi-outlet Harness:

1. Receptacles: 20 A, 125-V, NEMA WD 6 Configuration 5-20R receptacles complying with NEMA WD 1, UL 498, and FS W-C-596.

2. Receptacle Spacing: 12 inches, unless otherwise indicated.

3. Wiring: No. 12 AWG solid, Type THHN copper, single circuit.

2.14 SERVICE POLES

A. Subject to compliance with requirements, provide service poles or comparable product by one of the following:

1. Hubbell Wiring Device Kellems; HBL PP series (design basis)._
2. MonoSystems.
3. Legrand / Wiremold.
4. Approved equal.

B. Description:

1. Factory-assembled and -wired units to extend power and voice and data communication from distribution wiring concealed in ceiling to devices or outlets in pole near floor.

2. Poles: Nominal 2.5-inch- square cross section, with height adequate to extend from floor to at least 6 inches above ceiling, and with separate channels for power wiring and voice and data communication cabling.

3. Mounting: Ceiling trim flange with concealed bracing arranged for positive connection to ceiling supports; with pole foot and carpet pad attachment.

4. Material and Finish: Painted steel.

5. Wiring: Sized for minimum of five No. 12 AWG power and ground conductors and a minimum of four, four-pair, Category 3 or Category 5 voice and data communication cables.

6. Power Receptacles: Two duplex, 20-A, straight-blade receptacles complying with requirements in this Section.

7. Voice and Data Communication Outlets: complying with requirements in Division 27.

2.15 FINISHES

A. Device Color:

1. Wiring Devices Connected to Normal Power System: Brown unless otherwise indicated or required by NFPA 70 or device listing. Exceptions – a) In offices, Libraries, Cafeterias, etc., color as specified by Architect, b) In partially renovated rooms - match existing devices to remain.

2. Wiring Devices Connected to Emergency / Standby Power System: Red.

3. TVSS Devices: Blue.

4. Isolated-Ground Receptacles: White, with orange triangle on face.

5. Controlled Receptacles – Green (where available) or where not available, other color differing from general use receptacles in the area.

B. Wall Plate Color: See “Wallplates” above. For plastic covers, match device color.

PART 3 – EXECUTION

3.01 INSTALLATION

A. See plans for device mounting heights. Otherwise, comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.

B. Coordination with Other Trades:

1. Protect installed devices and their boxes. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of boxes.

2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.

3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.

4. Install wiring devices after all wall preparation, including painting, is complete.

C. Conductors:

1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.

2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.

3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.

4. Existing Conductors:

a. Cut back and pigtail or replace all damaged conductors.
b. Straighten conductors that remain and remove corrosion and foreign matter.
c. Pigtailing existing conductors is permitted, provided the outlet box is large enough.

D. Device Installation:

1. Install devices flush and level.

2. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.

3. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.

4. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.

5. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.

6. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
7. Use a torque screwdriver when a torque is recommended or required by manufacturer.

8. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.

9. Tighten unused terminal screws on the device.

10. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.

11. Receptacles shall have a bonding conductor from the grounding terminal to the metal conduit system. Self-grounding receptacles using mounting screws as bonding means are not acceptable.

E. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles down, and on horizontally mounted receptacles to left.

F. Wall Switches:

1. Install wall switches with OFF position down.

G. Device Plates:

1. Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

2. Install device plates flush and level.

H. Dimmers:

1. Install dimmers within terms of their listing.

2. Verify that dimmers used for fan speed control are listed for that application.

3. Install unshared neutral conductors on line and load side of dimmers according to manufacturers' device listing conditions in the written instructions.

4. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on bottom. Group adjacent switches under single, multi-gang wall plates.

5. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.

3.02 GFCI RECEPTACLES

A. Install non-feed-through-type GFCI receptacles where protection of downstream receptacles is not required.

3.03 IDENTIFICATION

A. Comply with Section 260553 – Identification for Electrical Systems.

B. Identify each receptacle with panelboard identification and circuit number. Use hot, stamped, or engraved machine printing with black-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

3.04 FIELD QUALITY CONTROL

A. Tests for Wiring Devices:

1. Inspect each wiring device for defects.

2. Verify each receptacle device is energized. Acceptable line voltage range is 105 to 132 V.

3. Test each receptacle for proper polarity. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is unacceptable.

4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.

5. Using the test plug, verify that the device and its outlet box are securely mounted.

6. Operate each wall switch and wall dimmer with circuit energized and verify proper operation.

7. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.

B. Wiring device will be considered defective if it does not pass tests and inspections.

END OF SECTION

DIVISION 26 – ELECTRICAL

SECTION 262816 – HEAVY DUTY SAFETY SWITCHES

PART 1 – GENERAL

1.01 SCOPE

A. The Contractor shall furnish and install the low-voltage fused and non-fused switches as specified herein and as shown on the contract drawings.

1.02 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Section 260500 – Common Work Results for Electrical
C. Section 260553 – Identification for Electrical Systems

1.03 REFERENCES

A. The switches and all components shall be designed, manufactured, and tested in accordance with the latest applicable standards:

1. NEMA KS-1
2. UL 98

1.04 SUBMITTALS – FOR REVIEW / APPROVAL

A. The following information shall be submitted to the Engineer:

1. Dimensioned outline drawing
2. Conduit entry/exit locations
3. Switch ratings including:

    a. Short-circuit rating
    b. Voltage
    c. Continuous current

4. Fuse ratings and type
5. Cable terminal sizes
6. Product data sheets

1.05 SUBMITTALS – FOR CONSTRUCTION

A. The following information shall be submitted for record purposes:

1. Final as-built drawings and information for items listed in Paragraph 1.04, and shall incorporate all changes made during the manufacturing process.

1.06 QUALIFICATIONS

A. The manufacturer of the assembly shall be the manufacturer of the major components within the assembly.

B. For the equipment specified herein, the manufacturer shall be ISO 9001 or 9002 certified.

C. The manufacturer of this equipment shall have produced similar electrical equipment for a minimum period of five (5) years. When requested by the Engineer, an acceptable list of installations with similar equipment shall be provided demonstrating compliance with this requirement.

1.07 REGULATORY REQUIREMENTS

A. The safety switches shall bear a UL label.

1.08 DELIVERY, STORAGE AND HANDLING

A. Equipment shall be handled and stored in accordance with manufacturer's instructions. One (1) copy of these instructions shall be included with the equipment at time of shipment.

1.09 QUALITY ASSURANCE

A. Electrical components, conductors, devices and accessories described herein shall be listed and labeled as defined by NFPA 70 by a Nationally Recognized Testing Laboratory (NRTL), such as Underwriters Laboratories (UL), for the intended use and shall bear its label.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Subject to the requirements listed herein, provide product by one of the following:

1. Eaton
2. Siemens
3. General Electric
4. Square D
5. Approved Equal

B. The listing of specific manufacturers above does not imply acceptance of their products that do not meet the specified ratings, features and functions. Manufacturers listed above are not relieved from meeting these specifications in their entirety.

2.02 HEAVY-DUTY SAFETY SWITCHES

A. Provide switches as shown on drawings, with the following ratings:

1. 30 to 1200 amperes
2. 240 volts ac; 600 volts ac
3. 2 and 3 poles
4. Fusible and non-fusible
5. Mechanical lugs suitable for aluminum or copper conductors.

B. Construction

1. Switch blades and jaws shall be visible and plated copper.
2. Switches shall have a red handle that is easily pad-lockable with three 3/8-inch shank locks in the OFF position.
3. Switches shall have defeatable door interlocks that prevent the door from opening when the handle is in the ON position (except for double-throw switches). Defeater mechanism shall be front accessible.

4. Switches shall have deionizing arc chutes.
5. Switch assembly and operating handle shall be an integral part of the enclosure base.
6. Switches rated 30 A to 600 A shall have reinforced fuse clips.
7. Switch blades shall be readily visible in the “ON” and “OFF” position.
8. Switch operating mechanism shall be non-teasable, positive quick-make/quick-break type. Bail type mechanisms are not acceptable.
9. Fusible switches shall be suitable for service entrance equipment (except for 4-pole switches and 1200 A when used on 480Y/277 or 600Y/347 grounded WYE systems)
10. Switches shall have line terminal shields (except for non-fusible double throw switches)
11. Switches shall be suitable for systems capable of 200 kA at 480 V with Class J, L, R, or T fusing as applicable for single-throw switches; Embossed or engraved ON-OFF indication shall be provided.
12. Double-make, double-break switch blade feature shall be provided.
13. Fuse pullers shall be provided on all NEMA 4X and 12 switches through 200 A
14. Renewal parts data shall be shown on the inside of the door.

C. Enclosures

1. All enclosures shall be NEMA 1 general purpose, for indoor use, unless otherwise noted.
2. Enclosures shall be NEMA 3R, rainproof, for outdoor or wet location use, unless otherwise noted,

    a. Enclosures shall NEMA 4X watertight corrosion-resistant; either 304 or 316 stainless steels, or fiberglass where and as indicated in the drawings.
    b. 30 A to 100 A NEMA 4X, and 12/3R enclosures shall be provided with draw-pull latches.

D. The following factory modifications are to be included:

1. Phenolic nameplates
2. Fungus proofing
3. Lock ON provisions
4. Factory installed neutral assemblies.
5. Class R fuse clips factory installed (30A - 600A)
6. Factory installed ground lug kits.

E. Provide fused switches with:

1. (1) complete set of fuses installed.
2. (1) complete set of fuses as spares.
3. (1) Fuse puller

2.03 SOLAR DISCONNECT SWITCHES

A. Provide 30- to 600-ampere switches as shown on the drawings for solar installations with the following ratings and characteristics:

1. Switches shall be UL listed for 600 VDC and shall be wired according to the listing instructions. Switches shall be wired with one circuit per switch. Multiple circuits shall not be permitted to be switched with a single mechanism.

2. NEMA enclosure shall be NEMA 3R, 12 or 4X as shown on the drawings.

3. Switches shall be listed as “Suitable for NEC Article 690 Applications” and shall be labeled with the maximum solar string as per NEC calculations.

4. Switches that can be energized from both the line and load side shall be marked:

WARNING
ELECTRIC SHOCK HAZARD
DO NOT TOUCH TERMINALS
TERMINALS ON BOTH THE LINE
AND LOAD SIDES MAY BE ENERGIZED
IN THE OPEN POSITION

5. Switches shall be supplied with a clear, factory-installed dead-front shield to guard against accidental contact with line or load terminals.

6. Switches shall have a factory-installed neutral block for terminating grounded conductors, and switches shall have a separate lug for equipment grounding conductors.

7. Fusible switches shall be equipped with Class R fuse clips as standard.

8. Fusible switches shall be supplied with one set of fuse clips only, and fuse holders must be isolated from any potential source when the handle is in the “off” position.

2.04 NAMEPLATES

A. Nameplate shall be front cover mounted, containing a permanent record of switch type, ampere rating, and maximum voltage rating.

B. Provide identification plate as indicated in Section 260553 – Identification for Electrical Systems.

PART 3 – EXECUTION

3.01 FACTORY TESTING

A. Standard factory tests shall be performed on the equipment provided under this section. All tests shall be in accordance with the latest version of UL and NEMA standards.

3.02 INSTALLATION

A. The equipment shall be installed per the manufacturer’s recommendations and all NEC and local code requirements.

B. Install fuses such that fuse rating information can be read without removing fuse.

3.03 TOUCH-UP PAINTING

A. Provide touch-up painting to restore and refinish to match original condition surfaces of electrical equipment scratched, marred during shipping, handling or installation. Remove any rust and prime and paint as recommended by manufacturer.

END OF SECTION

DIVISION 26 – ELECTRICAL

SECTION 265100 – INTERIOR LIGHTING

PART 1 – GENERAL

1.01 SCOPE

A. This section includes furnishing, installing and connecting interior lighting systems.

1.02 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, Standard General and Supplementary General Conditions, Division 01 Specification Sections, and other applicable Specification Sections, the Related Sections listed below, apply to this Section.

B. Related Sections:

1. Section 260500 – Common Work Results for Electrical
2. Section 260519 – Low-Voltage Electrical Power Conductors & Cables
3. Section 260526 – Grounding and Bonding

1.03 DEFINITIONS

A. Lighting Fixture: An electrical device that contains one or more lighting elements which provide illumination. The terms “lighting fixture”, “fixture” “luminaire” carry the same meaning.

B. Night Lights: Light fixtures that are wired to the unswitched leg of the circuit. Night lights are not to be confused with emergency lights, which have a second source of power and may be switched.

1.04 SUBMITTALS

A. Product Data: Arrange in order of luminaire designation. The submittals shall include data on features, ratings, listings, certifications, accessories, finishes, dimensions, emergency components, photometric data, and luminaire efficiency data.

B. Manufacturer standard cut sheets fully highlighted or red-lined with selected features and options.

C. Closeout Submittal: Installation, Operation, and Maintenance Manuals.

D. Substitutions and/or equivalents: Where substitute or equivalent fixtures are proposed for use by the Contractor, and upon request of the Engineer or Architect, provide complete site-specific point by point photometric analysis of the proposed fixtures. The analysis shall be provided at no additional cost. Floor plan backgrounds will be provided by the Engineer /Architect upon request. Results shall include for each space:

1. Average illumination levels (in footcandles.)
2. Max/min ratios
3. Power density (Watts/sq.ft.)
4. Legend and schedule of proposed fixtures which includes lumen output per fixture, watts per fixture.
5. Fixture mounting heights (ft.).
6. Any de-rating factors applied.
7. Point by point plot of illumination levels at not more than 2’ x 2’ spacing.

1.05 QUALITY ASSURANCE

A. Lighting fixtures shall be of specification grade and listed or labeled by Underwriters Laboratories (UL) or an approved Nationally Recognized Testing Laboratory (NRTL).

B. LED fixtures shall comply with the following:

1. UL Standard 8750 “Light Emitting Diode Equipment for Use in Lighting Products”, IES Standard LM-79 “Electrical and Photometric Measurements of Solid-State Lighting Products”, IES Standard LM-80 “Measuring Lumen Maintenance of LED Light Sources”, and IES Standard TM-21 “Projecting Long Term Lumen Maintenance of LED Light Sources”.

2. ANSI C78.377 “Specifications for the Chromaticity of Solid State Lighting Products” with LEDs binned within a maximum three-step MacAdam Ellipse to ensure color consistency amongst luminaries of the same type.

1.06 WARRANTY

A. For non-LED lighting fixtures and components, provide a complete warranty for parts and labor for a minimum of one year from the date of Substantial Completion.

B. For LED fixtures, lamps, drivers, and components, provide a complete warranty for parts and labor for a minimum of five years from the date of Substantial Completion.

PART 2 - PRODUCTS

2.01 LIGHTING FIXTURES

A. Provide lighting fixtures in accordance with the Fixture Schedule.

1. Provide only LED fixtures with a Design Lights Consortium (DLC) listing, a U.S. Department of Energy (DOE) “LED Lighting Facts” label, or a U.S. Environmental Protection Agency (EPA) ENERGY STAR label, which have demonstrated third-party testing verification.

B. Unless otherwise specified, LED fixtures shall have a color temperature of 3500 degrees K, a CRI of 80 minimum, and a lumen maintenance L70 rating of 50,000 hours minimum.

C. Recessed lighting fixtures shall be thermally protected.

D. LED fixtures shall be modular and allow for separate replacement of LED light elements and drivers. User serviceable LED light elements and drivers shall be replaceable from the room side.

E. Dimmable LED fixtures shall have either a 0-10 volt, 3-wire dimming driver, or a two-step (50%-100%) line voltage, two switch controlled dimming driver, as shown on the drawings.

2.02 LAMPS

A. Unless otherwise specified, LED lamps shall have a color temperature of 3500 degrees K, a CRI of 80 minimum, and a lumen maintenance L70 rating of 50,000 hours minimum.

B. Retrofit LED lamps shall comply with NEMA SSL 4 “SSL Retrofit Lamps: Suggested Minimum Performance Requirements”.

2.03 BALLASTS AND DRIVERS

A. LED drivers shall be electronic type, labeled as compliant with radio frequency interference (RFI) requirements of FCC Title 47 Part 15, and comply with NEMA SSL 1 “Electronic Drivers for LED Devices, Arrays, or Systems”. LED drivers shall have a sound rating of “A”, have a minimum efficiency of 85%, and be rated for a THD of less than 20 percent at all input voltages.

B. Dimmable LED drivers shall be 0-10V type, unless otherwise noted. Dimmable LED drivers shall be capable of dimming without LED strobing or flicker across their full dimming range.

C. Ballasts and drivers shall be rated for the ambient temperatures in which they are located. Outdoor fixtures shall be equipped with ballasts or drivers rated for reliable starting to -20 degrees F. Indoor fixtures located in areas with direct sunlight or above normal ambient temperatures shall have ballasts or drivers rated at 65 degrees C minimum.

D. Individually fused ballasts and drivers shall have their fuses accessible from outside of the fixture chassis.

2.04 EMERGENCY LIGHTING

A. Emergency lighting shall consist of normal lighting fixtures with generator or battery-inverter system backup, emergency lighting fixtures with individual battery backup, or sealed beam emergency lighting units in accordance with the Fixture Schedule.

B. Emergency lighting fixtures shall be capable of providing the listed emergency illumination for not less than 90-minutes after loss of normal power.

1. Battery-backed LED emergency lighting fixtures shall consist of a normal LED fixture with some or all the LEDs connected to a UL 924 Listed battery and charger. The battery shall be nickel cadmium and sized for a minimum of 90 minutes of fixture operation. The charger shall be solid-state and provide overload, short circuit, brownout and low battery voltage protection. The battery and charger shall include self-diagnostic and self-exercising circuitry to exercise and test itself for 5 minutes every month and for 30 minutes every 6 months. The fixture shall include a test/monitor module with LED status indicating lights mounted to be visible to the public. The fixture shall not contain an audible alarm.

2. Sealed beam emergency lighting units shall be UL 924 Listed, dual voltage 120/277V input, and shall consist of sealed beam LED lamps connected to an internally mounted battery and charger. The battery shall be nickel cadmium and sized for a minimum of 90 minutes of battery operation. The charger shall be solid-state and provide overload, short circuit, brownout and low battery voltage protection. The unit shall be suitable for wall or ceiling mounting as required. It shall include self-diagnostic and self-exercising circuitry to exercise and test itself for 5 minutes every month and for 30 minutes every 6 months. The unit shall include a test/monitor module with LED status indicating lights mounted to be visible to the public. The unit shall not contain an audible alarm.

2.05 EXIT SIGNS

A. Exit signs shall be of the LED type. Fluorescent, electro luminescent light panel, or self-powered luminous signs shall not be used. Subject to requirements, provide product from Chloride, Dual-Lite, Emergi-Lite, Exide Lightguard, Lightalarms, Lithonia, LSI Industries, Morelite, Prescolite, or Sure-Lites or approved equal.

1. Dual Voltage Input 120/277V, 60Hz., UL 924 Listed, UL Damp Location Listed.

2. LED’s shall be wired in parallel to prevent multi-lamp failure and shall be concealed within the sign by a clear panel and red optical diffuser. Power consumption shall not exceed 2 watts per face.

3. Exit signs shall have white die-cast aluminum or polycarbonate housings with universal mounting brackets; brushed aluminum stencil faces with red or green letters and multi-directional knockout arrows.

4. Exit signs shall be provided with extra faceplate for field conversion from single to double face.

5. Exit signs shall be provided with UL 924 Listed, 90-minute emergency battery packs and battery chargers when required. Batteries shall be maintenance-free nickel-cadmium and shall be mounted within the signs.

6. Shall include integral test switch and power indicator light.

7. New exit signs in installed existing buildings shall match the existing exit sign color scheme (red or green)

2.06 COMBINATION EMERGENCY / EXIT SIGNS

A. Combination emergency / exit signs shall be subject to the requirements outlined for sealed beam emergency lights and exit lights as described above. Subject to requirements, provide product from Chloride, Dual-Lite, Emergi-Lite, Exide Lightguard, Lightalarms, Lithonia, LSI Industries, Morelite, Prescolite, or Sure-Lites or approved equal.

2.07 LOW VOLTAGE LIGHTING CONTROL WIRING

A. 0-10VDC Dimming Control Wiring:

1. UL TYPE CMP/CL3P/FPLP plenum rated cable, 300V, 75CC
2. 16AWG or 18AWG stranded copper conductors,
3. White outer jacket, (2) conductors - violet and pink
4. Southwire Spec #70194 or equal

PART 3 - EXECUTION

3.01 INSTALLATION REQUIREMENTS

A. Comply with NFPA 72, NECA 1 and manufacturer’s installation instructions.

B. Support recessed troffers independently of the ceiling grid system by using two safety wires minimum on diagonally opposite corners of the fixtures. Support recessed downlights by using safety wires or by rigidly attaching the fixtures to the building structure or ceiling grid system. Removable T-bar clips shall not solely be used to attach fixtures to the ceiling grid system.

C. Install fixtures level, with no gaps between adjacent fixtures or between fixtures and surrounding surfaces. Lenses, reflectors, and trims of fixtures shall be properly and uniformly aligned.

D. Where fixtures are shown with dual switches, control all inner lamps with one switch and all outer lamps with the other switch. Where dimming or occupancy sensor-controlled fixtures are shown, control the fixtures in accordance with the appropriate wiring diagram or manufacturer's instructions.

E. Connect night light fixtures and emergency lighting fixtures to the hot (unswitched) side of the area lighting circuits.

F. Provide an individual feed with ground conductor from a junction box to each lighting fixture. Lighting fixtures shall not be daisy chained.

G. Drops to recessed fixtures may be flexible metallic conduit, or manufactured wiring systems may be used where accessible. Fixtures shall be provided with sufficient length to permit removal and lowering of the fixtures 12” below the ceiling.

H. Provide green grounding conductors back to the panel ground for lighting circuits. Raceways shall not be used as grounding conductors.

I. Fixtures shall have their exterior labels removed and shall be thoroughly cleaned. Burned out lamps or arrays shall be replaced. Cracked or damaged lenses shall be replaced.

J. Locate emergency lighting remote battery packs and remote test/monitor modules identically so their status indicating lights are visible to the public and they form a straight line when viewed from the end of the corridor or room. Where a suspended ceiling exists, center the status indicating lights in adjacent ceiling tiles.

K. Mount sealed beam emergency lighting units where shown and aim their lamps to light the egress path as uniformly as possible.

L. When emergency lighting fixtures contain audible alarms, disable the alarms in accordance with manufacturer's instructions.

M. Sealed beam emergency lighting unit fixtures and the emergency supply of emergency battery/inverter fixtures shall be wired to the area lighting circuit ahead of any switching controls. Exception, when three or more normal lighting circuits supply a separate and uninterrupted area, that may be supplied from a separate dedicated circuit from the same panel and provided with a lock-on circuit breaker.

N. Clean all fixtures of construction dust and fingermarks prior to final inspection.

3.02 FIELD QUALITY CONTROL

A. A visual inspection shall be performed to verify cleanliness and alignment of the fixtures. Misalignment and light leaks shall be corrected and rattles due to ventilation system vibration shall be eliminated. Damaged or broken lenses shall be replaced.

B. Perform an operational test to verify that all fixtures illuminate properly, dimming systems dim properly (i.e. no flicker), and lighting zones are switched according to the drawings.

C. Test all emergency and exit lighting by interrupting the normal lighting supply to verify proper operation. Verify proper re-transfer to normal operation upon restoration of normal power.

END OF SECTION

DIVISION 31 – EARTHWORK

SECTION 310000 – EARTHWORK

PART 1 - GENERAL

1.01 GENERAL

A. Applicable provisions of the "Conditions of the Contract" shall govern all work under this section.

B. Contractor must observe and adhere to New York Code, 6 NYCRR, Chapter IV and all applicable Subchapters and Parts for the receipt of, or removal, transport, tracking and disposal of all soils and construction waste and debris, as enforced by the New York State Department of Environmental Conservation. All fees associated with testing of materials and debris either at the point of origin (site) or point of termination, are to be borne by the Contractor.

C. Related Documents:

1. Documents affecting work of this section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and sections in Division 01 of these Specifications.
2. Section 033000 – Cast-In-Place Concrete
3. Section 310001 – Site Work General Provisions
4. Section 312500 – Erosion and Sediment Controls
5. Section 320117 – Pavement Repair and Resurfacing
6. Section 321216 – Asphalt Paving
7. Section 321216.11 – Asphalt Overlay
8. Section 334000 – Storm Drainage Utilities
9. Other Division 31, 32 & 33 Sections related to the work of the Contract as applicable.

1.02 SCOPE/SUMMARY

A. Provide all labor, materials, equipment, and services and perform all operations required to complete the installation of all work of this section and related work as indicated on the drawings and specified herein, including, but not limited to, the following:

1. Erect and maintain barriers in accordance with all local municipal and state requirements.

2. Remove all obstructions in the way of new construction work which may be required in addition to clearing and removal work specified under Section 310001 – Site Work General Provisions.

3. Excavation and preparation of sub grade for building slabs, floor slabs, depressions and pits, foundations, interior and exterior column footings, walks, stairs, ramps, and pavements. All other excavation which may be required to complete the work and is not specified under other sections.

4. Shoring, sheathing, and pumping.

5. Backfilling all work within building lines to the required grades.

6. Granular fill course for support building slabs is included as part of this work.

7. Excavating and backfilling of trenches within building lines.

8. Excavating and backfilling for underground mechanical and electrical utilities and buried mechanical and electrical appurtenances, transformer pads, and conduits for same, underfloor

utility lines, etc. inside or outside of the building footprint.

9. Filling and grading.

10. Finish grading of sub grade.

11. Finished grades.

B. Final grading, together with placement and preparation of topsoil for lawns and planting, is specified elsewhere in Division 32 - Exterior Improvements.

1.03 DEFINITIONS

A. Excavation consists of removal of material encountered to subgrade elevations indicated or required by the work and subsequent disposal of materials removed. Materials to be excavated shall be non-classified and shall include all rock, earth, or other materials encountered in excavating and grading operations for building or site work. The contract price covers the removal of all such materials to the depth and extent indicated on the drawings specified herein or as required to perform the work.

B. Unauthorized excavation consists of removal of materials beyond required sub grade elevations or dimensions without specific direction of the Soils Engineer. Unauthorized excavation, as well as remedial work directed by the Soils Engineer, shall be at the Contractor's expense.

1. Under footings, foundation bases, or retaining walls, fill unauthorized excavation with compacted controlled structural fill material or by extending the indicated bottom elevation of the footing or base to the excavation bottom, without altering the required top elevation.

2. In locations other that those above, backfill and compact unauthorized excavations as specified for authorized excavations of same classification, unless otherwise directed by Construction Manager (when applicable), Architect or the Soils Engineer.

C. Additional Excavation: When excavation has reached required subgrade elevations, notify the Architect/Engineer, who will make an inspection of conditions. If Architect/Engineer (based upon Soils Engineer's reports) determines that bearing materials at required subgrade elevations are unsuitable, continue excavation until suitable bearing materials are encountered and replace excavated material as directed by the Soils Engineer.

1. Removal of unidentified unsuitable materials and its replacement beyond the limits required for the construction work as directed will be paid on basis of Conditions of the Contract relative to changes in the work.

D. Sub grade: The undisturbed earth or the compacted soil layer immediately below granular subbase, drainage fill, or topsoil materials.

E. Fill is that material removed from excavations or imported from off site borrow areas, predominantly granular, non-expansive soils free from roots and other deleterious matter. Fill material is subject to approval.

F. Structure: Buildings, foundations, slabs, tanks, curbs, or other man-made stationary features occurring above or below ground surface.

1.04 SUBMITTALS

A. Test Reports: The Contractor shall submit the following reports directly to the Construction Manager (if applicable), the Owner, and the Architect:

1. Test reports on borrow material.

2. Verification of suitability of each footing subgrade material, in accordance with specified requirements including substantiation of and structural capacity of existing rock on which new footings are to bear.

3. Field reports; in-place soil density tests.

4. One optimum moisture-maximum density curve for each type of soil encountered.

5. Report of actual unconfined compressive strength and/or results of bearing tests of each strata tested.

1.05 QUALITY ASSURANCE

A. Codes and Standards: Perform excavation work in compliance with applicable requirements of authorities having jurisdiction.

B. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this section.

C. Use equipment adequate in size, capacity, and numbers to accomplish the work of this section in a timely manner.

D. Engineering, Testing, and Inspection Services: The Contractor shall make arrangements for and the Owner shall pay for a qualified independent geotechnical testing laboratory and associated soil engineer (acceptable to the Owner) to perform soil survey and soil testing service for sampling and testing of materials proposed to be used as well as substantiation and verification of existing subsurface conditions when desired depths of excavation are reached. The Contractor will be responsible for all costs associated with failed tests resulting from their work.

E. Testing Laboratory Qualifications: To qualify for acceptance, the geotechnical testing laboratory and associated soils engineer must demonstrate to the Owner's satisfaction, based on evaluation of laboratory-submitted criteria conforming to ASTM E 699, that it has the experience and capability to conduct required field and laboratory geotechnical testing without delaying the progress of the work.

1.06 SOILS ENGINEER (SERVICES AS EMPLOYED AND PAID BY THE OWNER)

A. For site conditions without complex soil problems, a registered soils engineer shall be engaged to perform the following minimum services:

1. Examine on-site materials to determine suitability for use.

2. Recommend locations for placing on-site materials.

3. Recommendations for compacting on-site materials.

4. Determine suitability of soil under footings, foundations.

5. Perform compaction tests and supervise filling operations.

B. Soils engineer's services for problem site conditions shall include the above and the following additional work at minimum:

1. Determine extent of unsuitable material removal.

2. Testing of materials proposed for use from off-site and on-site sources.

3. Dewatering recommendations.

4. Supervising the placing and compacting of approved materials and under footings, foundations, slabs, utility lines, and paved areas.

5. Supervising environmental protection procedures as required by Federal, State, and Municipal Agencies.

   NOTE: Copies of soils reports prepared by soils engineer are to be sent to the Owner, the Architect, and Construction Manager (if applicable).

1.07 PROJECT CONDITIONS

A. Site Information: Data in subsurface investigation reports were used for the basis of the design and are available to the Contractor for information only. Conditions are not intended as representations or warranties of accuracy or continuity between soil borings. The Construction Manager, The Architect, and the Owner will not be responsible for interpretations or conclusions drawn from these data by the Contractor.

   1. Additional test borings and other exploratory operations may be performed by the Contractor, at the Contractor's option; however, no change in the Contract Sum will be authorized for such additional exploration.

B. Examine the areas and conditions under which the work of this section will be performed. Correct conditions detrimental to timely and proper completion of the work. Do not proceed until unsatisfactory conditions are corrected.

C. Set all lines, elevations, and grades for utility and drainage system work and control system for duration of work, including careful maintenance of bench marks, property corners, monuments, or other reference points.

D. Existing Utilities: Locate existing underground utilities in areas of excavation work. This work to be substantiated and paid by this Contractor. If utilities are indicated to remain in place, provide adequate means of support and protection during earthwork operations. If damaged, repair or replace at no additional cost to the Owner.

   1. Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, consult utility owner immediately for directions. Cooperate with the Owner, the Construction Manager (if applicable) and utility companies in keeping respective services and facilities in operation. Repair damaged utilities to satisfaction of utility owner.

   2. Do not interrupt existing utilities service facilities occupied by the School or others, during occupied hours, except when permitted in writing by Architect/Engineer and then only after acceptable temporary utility services have been provided.

   3. Provide minimum 48-hour notice to the Construction Manager (when applicable), Architect, and Owner, and receive written notice to proceed before interrupting any utility.

   4. If service is interrupted as a result of work under this section, immediately restore service by repairing the damaged utility at no additional cost to the Owner.

5. If existing utilities are found to interfere with the permanent facilities being constructed under this section, immediately notify the Architect and secure his instructions.

6. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies for shutoff of services if lines are active.

E. Use of Explosives: Use of explosives is permitted for certain types of rock removal only but that use must be substantiated with the Owner, Architect/Engineer, State, and Local Agencies prior to bidding and again prior to commencement of work.

1. The use of explosives is only permitted when the Owner has been notified of same by written notice of the Contractor through Architect/Engineer, thereby permitting the Owner and its surrounding neighbors the required legal notices to vacate and/or protect their properties, buildings, homes, or premises as needed.

F. Protection of Persons and Property: Barricade open excavations occurring as part of this work and post with warning lights.

1. Operate warning lights as recommended by authorities having jurisdiction.

2. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

3. Provide all protective measures necessary for the safety of workmen. The above shall be carried out in accordance with and in compliance with regulations of local, county, federal, and OSHA authorities having jurisdiction over same. Protection is entirely the responsibility of the Contractor.

4. The work shall be executed so that no damage or injury will occur to the Owner's property or building, to public and adjoining or adjacent structures, streets, paving, sewers, gas, water, electric, or any other pipes. Should any damage or injury caused by the Contractor or anyone in his employ, or by the work under this Contract occur, the Contractor shall, at his expense, make good such damage and assume all responsibility for such injury.

5. The above shall also include the protection of all existing sewers and drainage systems to remain in use within the area affected by the work of this project.

6. Monuments, benchmarks, and other reference features on streets bounding this project shall be protected. Should these be disturbed in any manner, the Contractor shall have them replaced.

7. Use every means necessary to prevent dust from becoming a nuisance to the public, to neighbors, and to other work being performed on or near the site.

8. Maintain access to adjacent areas at all times.

G. The Contractor is to acquaint himself with the existence and location of all surface and subsurface structures and utilities within the project area. He is not to damage any of those that are to remain, and he is to leave them accessible and make the necessary provisions by sheeting, hanging, supporting, or other means necessary to obtain this result, subject to the approval of Architect/Engineer, the local municipality, the utility company involved, and any other agencies having jurisdiction over this project.

H. Prior to entering his bid, the Contractor shall visit the site and familiarize himself with all existing conditions. All nearby existing buildings and utilities shall be inspected by the Contractor prior to

entering his bid.

I. Borings were prepared by others, and provided by the Owner. The Geotechnical Report contained herein shall be reviewed prior to bid. The documents are for information only. Contractor shall interpret for themselves the soil condition underlying the surface of the ground.

J. Perform excavation by hand within dripline of large trees to remain. Protect root systems from damage or dryout to the greatest extent possible. Maintain moist condition for root system and cover exposed roots with moistened burlap.

PART 2 - PRODUCTS

2.01 SOIL MATERIALS

A. Satisfactory soil materials are defined as those complying with ASTM D2487 soil classification groups GW, GP, GM, SM, SW, and SP.

B. Unsatisfactory soil materials are defined as those complying with ASTM D2487 soil classification groups CG, SC, ML, MH, CL, CH, OL, OH, and PT.

C. Granular Fill: Naturally or artificially graded mixture or natural or crushed gravel, crushed stone, crushed slag, and natural or crushed sand meeting requirements for New York State Department of Transportation Standard Specification 304.2.02, Type 4 unless otherwise indicated.

D. Subbase Material: Graded mixture of crushed rock, with 100 percent passing a 2-inch sieve and meeting requirements for New York State Department of Transportation Standard Specification 3.04-2.02, Type 2, unless otherwise indicated.

E. Backfill and Fill Materials: Satisfactory non-expansive soil materials free of organic material, roots, other deleterious substances, clay, rock or gravel larger than 2 inches in any dimension, debris, waste and frozen materials.

2.02 CONTROLLED STRUCTURAL FILL OR MATERIAL

A. Imported controlled structural fill shall consist of inert material that is hard, durable stone and coarse sand, practically free from silts, clay, frozen sections, and foreign substances. It may consist of either natural or washed soil and must be free of organics. The material shall be a well graded mixture, shall have no material larger than 4", and must have the following gradations by weight:

Maximum retained on 3/4-inch sieve:	30%.
Maximum retained on No. 4 sieve:	50%.
Maximum passing 100 sieve:	25%.
Maximum passing 200 sieve:	5%.

This grading shall be determined in accordance with ASTM Standard Specification C117 and C136.

2.03 SUB BASE FILL OR MATERIAL

A. Sub base fill shall consist of inert material that is clean, hard, durable stone, sand, and non-plastic silt completely free from clays, frozen sections, and foreign substances. It may consist of either natural or washed soil and must be free of organics. The sub base fill shall be a well graded mixture, shall have material not larger than 2 inches, and must comply with the following grain size gradation by weight:

Maximum passing No. 100 sieve: 35%.
Maximum passing No. 200 sieve: 25%.

This grading shall be determined in accordance with ASTM Standard Specification C117 and C136.

2.04 WEED KILLER

A. Provide a dry, free-flowing, dust-free chemical compound, soluble in water, capable of inhibiting growth of vegetation, and approved for use on this work by governmental agencies having jurisdiction.

2.05 TOPSOIL

A. Where and if shown on the drawings or otherwise required, provide topsoil consisting of friable, fertile soil of loamy character, containing an amount of organic matter normal to the region, capable of sustaining healthy plant life, and reasonably free from subsoil, roots, heavy or stiff clay, stones, noxious weeds, sticks, brush, litter, and other deleterious matter.

B. Obtain topsoil from sources within the project limits, or provide imported topsoil obtained from sources outside the project limits, or from both sources. Stockpiled topsoil may be used, provided it meets the requirements of these specifications. Additional topsoil from certified off-site sources shall be used, provided it meets the requirements of these specifications. Topsoil for lawn and planting operations shall be fertile, friable, natural loam containing a liberal amount of humus. It shall be free of admixtures and subsoil and shall be reasonably free of noxious weed, seed, lumps, plants, or their roots, and completely free of stones, sticks, and other extraneous matter, and shall not be used for planting operations while in a frozen or muddy condition. After spreading to a uniform depth of 6” minimum, all topsoil shall be raked to remove all extraneous matter. Raked topsoil shall conform to the mechanical analysis specified below and shall be free of stones, lumps, plants or their roots, sticks and similar debris, or any other undesirable material. Topsoil shall not be used in a muddy or frozen condition.

1. All topsoil to be furnished shall be subject to the approval of the Architect. Furnish a certified analysis, made by a recognized authority, of any topsoil that may have to be furnished to complete the work of this section. Test reports shall match the format listed below.

2. Topsoil shall have an acidity range of pH 5.0 to 7.0 and shall contain not less than 6 percent organic matter as determined by loss on ignition of moisture-free samples dried at 100 degrees centigrade. The mechanical analysis of the soil shall be as follows:

Passing	Retained On	Percentage
1" screen		100%
1" screen	¼" screen (gravel)	Not more than 3%
¼" screen	No. 100 USS mesh sieve (sand)	40%-60%
#100 USS	(Very fine sand, silt & clay)	40%-60%

3. Topsoil in which more than 60 percent of the material passing the USS No. 100 mesh sieve consists of clay as determined by the hydrometer or by the decantation method, shall not be used. All percentages are to be based on dry weight samples. The chemical and mechanical analysis shall state the above items in correct quantities.

4. The Architect reserves the right to take samples of the topsoil from time to time, whether delivered to or stored at the site. These samples will be analyzed for comparison with the Specifications. Should tests show that topsoil does not comply with the Specifications, the material may be rejected or such other remedy made as approved by the Architect in the form of the addition of humus or other supplemental materials.

5. The topsoil mixture materials shall be thoroughly mixed by hand or by rotary mixer to the satisfaction of the Architect.

2.06 OTHER MATERIALS

A. Provide other materials, not specifically described, but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect.

PART 3 - EXECUTION

3.01 EXCAVATION

A. Excavation Classifications: The following classifications of excavation will be made when rock is encountered:

1. Earth Excavation includes excavation of pavements and other obstructions visible on surface; underground structures, utilities, and other items indicated to be demolished and removed; together with earth and other materials encountered that are not classified as rock or unauthorized excavation.

2. Rock excavation for trenches and pits includes removal and disposal of materials and obstructions encountered that cannot be excavated with a track-mounted power excavator, equivalent to Caterpillar Model No. 215C LC, and rated at not less than 115 HP flywheel power and 32,000-pound drawbar pull and equipped with a short stick and a 42-inch wide, short tip radius rock bucket rated at 0.81 cubic yard (heaped) capacity.

3. Trenches in excess of 10 feet in width and pits in excess of 30 feet in either length or width are classified as open excavation.

4. Rock excavation in open excavations includes removal and disposal of materials and obstructions encountered that cannot be dislodged and excavated with modern, track-mounted, heavy-duty excavating equipment without drilling, blasting, or ripping. Rock excavation equipment is defined as Caterpillar Model No. 973 or equivalent track-mounted loader, rated at not less than 210 HP flywheel power and developing minimum of 45,000 pound breakout force (measured in accordance with SAE J732).

   a. Typical materials classified as rock are boulders 1/2 cu. yd. or more in volume, solid rock, rock in ledges, and rock-hard cementitious aggregate deposits.
   b. Intermittent drilling, blasting, or ripping performed to increase production and not necessary to permit excavation of material encountered will be classified as earth excavation.

5. Rock Excavation:

   a. In the event that rock is encountered and is of a type that cannot be broken up and excavated by machine or moved into deep fill areas, blast as necessary, and remove and dispose of same off site.

   b. Rock that can be broken up, excavated by machine, and/or moved into deep fill areas shall be reduced to a size not exceeding 6" prior to depositing in deep fill areas.

   c. Definition: Whenever the word "removal" is used in connection with rock, it is to be construed to mean "blasting, excavating, and the removal of rock that cannot be broken up by machine and removed", as defined previously.

      1) As this facility is in session daily Monday through Friday and its surrounding neighbors

are contiguous, the preferred methodology of excavation and removal of rock is to be construed as "passive" in nature--meaning "drilling or any other passive means". The excavation contractor shall coordinate his/her work with the Owner's representative so as to perform that work with the least disruption to the Owner and the Owner's neighbors and with maximum intent to the safety of same. The preferred time of rock removal work shall take place when the Owner's facilities are vacated, thereby meaning after the close of school each day or on weekends, as long as these times are permitted by all State and Local Ordinances and are acceptable and coordinated with the School and its neighbors.

d. Blasting shall conform strictly to all local and state laws, rules, and regulations applying thereto, and shall avoid excess noise and vibration. Steel mats shall be provided where necessary to prevent damage from flying fragments. Drill holes shall not be carried any further than necessary to remove the rock desired. The care, handling, and storing of explosives shall conform strictly to all local and state laws, rules, and regulations applying thereto. After concrete is set in place, no blasting shall be done except with the written permission of the Owner, and Architect.

e. The Contractor may consider the utilization of "Super Bristar 2000", a non-explosive demolition agent as a means of rock removal for this project.

f. General:

    1) Blasting shall be done as necessary for breaking rock for removal to depths, limits, and extent required for the construction of the building, site grading, and utility lines.

    2) Blasting shall be performed only by experienced, competent, licensed personnel under the direct supervision of an experienced, competent, licensed foreman.

g. Precautions:

    1) Blasting shall be permitted only when proper and adequate precautions have been taken for the protection of personnel, work, and property.

    2) Caps, fuses, and other exploders shall in no case be stored in the same place in which explosives are stored.

    3) All operations involving delivery, handling, storage, and the use of explosives shall be conducted in accordance with applicable laws, statutes, and regulations of the State, Municipal, or other governing bodies having jurisdiction. Likewise, the blasting contractor shall secure and pay for all necessary permits on behalf of the excavation contractor/contractor and shall provide same to the Owner, and Architect prior to scheduling the work. Open rock and rock in trenches shall be removed to a depth of 8" below required grades.

h. Do not perform rock excavation work until material to be excavated has been cross sectioned and classified by the Contractor's qualified independent geotechnical testing laboratory and associated soils engineer (employed and paid by the Contractor), and as approved by Architect/Engineer.

i. Rock payment lines are limited to the following:

    1) Three feet outside of concrete work for which forms are required, except footings.

    2) Two feet outside perimeter of footings.

3) In pipe trenches, 6 inches below invert elevation of pipe and 2 feet wider than inside diameter of pipe, but not less than 3 feet minimum trench width.

4) Outside dimensions of concrete work where no forms are required.

5) To bottom of all footings which, as designed, are minimum 1'-8" below finished floor and are to bear on undisturbed rock of 8 T.S.F. bearing capacity minimum. This capacity to be verified by Contractor's geotechnical testing laboratory and associated soils engineer.

6) Under slabs on grade, 6 inches below bottom of concrete slab.

7) Work indicated herein under these rock payment lines is part of this Contractor's base bid.

3.02 STABILITY OF EXCAVATIONS

A. General: Comply with local codes, ordinances, and requirements of agencies having jurisdiction.

B. The Contractor shall safely support and maintain adjacent and abutting property and structures and shall maintain the work safe to life, limb, and property.

C. Barriers, sheet piling, bracing, and the like shall be installed where required to maintain the excavation and the banks in a safe and stable condition.

D. Provide sheeting and bracing, when necessary, in trenches and other excavations where protection of workmen is required. Sheeting may be removed after sufficient backfilling to protect against damaging or injurious caving.

E. Slope sides of excavations to 1:1 or flatter or to comply with local codes, ordinances, and requirements of agencies having jurisdiction. Shore and brace where sloping is not possible because of space restrictions or stability of material excavated. Maintain sides and slopes of excavations in safe condition until completion of backfilling.

F. Shoring and bracing: Provide materials for shoring and bracing, such as sheet piling, uprights, stringers, and cross braces, in good serviceable condition. Maintain shoring and bracing in excavations regardless of time period excavations will be open. Extend shoring and bracing as excavation progresses.

G. All temporary sheet piling, bracing, shoring, and other protective work shall be removed after the necessity for same ceases to exist, in the opinion of the Architect, and before backfilling.

H. All work removed or damaged through the installation or removal of the temporary protective work or through improper protection work shall be replaced or repaired in an approved manner at no cost to the Owner.

I. Maintain excavations free from detrimental quantities of leaves, sticks, trash, and other debris until completion of the work.

3.03 DEWATERING

A. Prevent surface water and subsurface or groundwater from flowing into excavations and from flooding project site and surrounding area.

1. Do not allow water to accumulate in excavations. Remove water to prevent softening of foundation bottoms, undercutting footings, and soil changes detrimental to stability of subgrades and foundations. Provide and maintain pumps, well points, sumps, suction and

discharge lines, and other dewatering system components necessary to convey water away from excavations.

2. Establish and maintain temporary drainage ditches and other diversions outside excavation limits to convey rainwater and water removed from excavations to collecting or runoff areas. Do not use trench excavations as temporary drainage ditches.

B. Surrounding soil shall not be disturbed or removed during pumping operations.

C. Water shall be disposed of by pumping to a point directed by the Architect without damage to adjacent property.

D. The Contractor shall provide, operate, and maintain adequate equipment to keep the excavations free from water so that the excavating, concrete work, membrane waterproofing, and all other work in the excavations will be performed in the dry.

E. Excavate and backfill in a manner and sequence that will provide proper drainage at all times.

3.04 STORAGE OF EXCAVATED MATERIALS

A. Stockpile excavated materials acceptable for backfill and fill where directed. Place, grade, and shape stockpiles for proper drainage.

1. Locate and retain soil materials away from edge of excavations. Do not store within drip line of trees indicated to remain.

2. Dispose of excess excavated soil material and materials not acceptable for use as backfill or fill.

3.05 EXCAVATION FOR STRUCTURES

A. Conform to elevations and dimensions shown within a tolerance of plus or minus 0.10 foot, and extending a sufficient distance from footings and foundations to permit placing and removal of concrete formwork, installation of services, and other construction and for inspection.

B. Contractor shall prepare building and sidewalk areas to underside of floor slab plus or minus 1/2". Under no circumstances shall any material other than approved on-site material, or specified imported controlled structural fill be used for filling within a depth of 10" inches below building and sidewalk slabs on grade or within a depth of 12" beneath all column or wall support footings. Imported controlled structural fill shall also be utilized in all areas supporting earthen or other load carrying structures where organic soil materials are encountered subsequent to the removal of said organic soil materials.

C. Excavations for footings and foundations: Take care not to disturb bottom of excavation. Excavate by hand to final grade just before concrete reinforcement is placed. Trim bottoms to required lines and grades to leave solid base to receive other work. Piers, concrete slabs, and footings shall be benched a minimum of 2" into rock at sloping rock conditions as indicated on the drawings where no excavation is required.

D. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Structures: Conform to elevations and dimensions indicated within a tolerance of plus or minus 0.10 foot; plus a sufficient distance to permit placing and removal of concrete formwork, installation of services, and other construction, and for inspection. Do not disturb bottom of excavations intended for bearing surface.

E. Unsuitable Material: All unsuitable material below the grading plane shall be excavated and removed and the space filled with granular material as specified herein.

1. Unsuitable materials are those soils that exhibit characteristics that make them unsuitable for the direct support of the pavement structure, such as organic silt, elastic clays and silts, topsoil, frost susceptible soils, etc. Unsuitable materials shall be removed to the depth directed by the Soils Engineer and the Construction Manager when applicable.

2. The excavation and disposal of unidentified unsuitable material below the grading plane shall be paid on the basis of the Conditions of the Contract relative to Changes in the Work.

3. The granular fill material will be used in the fill sections within the paving area. No additional payment will be made for placing this material in the fill areas.

F. Unsuitable material will be legally disposed of off site.

3.06 EXCAVATION FOR PAVEMENTS, SLOPES, DITCHES, ETC.

A. The work under this item shall consist of the following in accordance with the plans, specifications, addenda, bid proposal, and requirements herein: excavating for pavement, slopes, ditches, and all other work incidental to the excavation for the pavement, including disposing of unsuitable and surplus material, preparing the subgrade, compaction, grading, slopes and shoulders, and all other work needed to complete the item.

B. Cut surface under pavements to comply with cross sections, elevations, and grades as indicated.

C. Drainage and Site Maintenance: During construction, the site shall be maintained in such condition that it will be adequately drained at all times.

D. Unsuitable Material: All unsuitable material below the grading plane shall be excavated and removed and the space filled with granular material as specified herein.

1. Unsuitable materials are those soils that exhibit characteristics that make them unsuitable for the direct support of the pavement structure, such as organic silt, elastic clays and silts, topsoil, frost susceptible soils, etc. Unsuitable materials shall be removed to the depth directed by the Soils Engineer and the Construction Manager when applicable.

2. The excavation and disposal of unidentified unsuitable material below the grading plane shall be paid on the basis of the Conditions of the Contract relative to Changes in the Work.

3. The granular fill material will be used in the fill sections within the paving area. No additional payment will be made for placing this material in the fill areas.

E. Unsuitable material will be legally disposed of off site.

F. The Contractor shall store topsoil, embankment soils, and other materials, and/or to excavate beyond the limits of the contract and slope easements. The cost of stockpiling and rehandling shall be included in his base bid price.

G. All soils that are classed as suitable for the direct support of the pavement (non-organic and non-frost susceptible soils) shall be scarified to a loose depth of ten (10) inches and recompacted to 95% of the maximum density at the optimum moisture content of the soils determined by ASTM D-1557. The moisture content at the time of compaction shall not be greater than one (1) percent nor less than two (2) percent by weight of dry soil of the optimum moisture content. Dry soils shall be moistened and thoroughly mixed to the required moisture content. Wet soils shall be dried by aerating the required moisture content.

1. The cost of adding moisture, drying, and compaction shall be included in the Contractor's base

bid price.

H. Subgrade in excavated areas for new pavement shall be compacted to the density specified below. Soils not conforming to this density shall be scarified or loosened to a depth of ten (10) inches, water added in the amount necessary, and the material recompacted to provide the required density.

1. Compaction control will be provided as follows: The subgrade in excavated areas shall be compacted to at least ninety-five (95) percent of the maximum density as determined by the "Test for Moisture Density Relations of Soils using a 10 lb. Rammer and 18 inch Drop", ASTM D-1557 as currently revised. Samples of subgrade materials for testing purposed shall be taken at frequent intervals daily. From these tests, corrections and changes in moisture content will be made and compaction continued until required densities are achieved.

I. The Contractor shall check the work under this Item with templates, slope boards, or other devices satisfactory to the Soils Engineer. The completed work shall conform to the plans within the following tolerances.

J. For pavement subgrade, the surface shall vary no more than three-quarter (¾) inch from a ten (10) foot straight edge applied to the surface, and the actual grade of the subgrade shall not vary more than one (1) inch from plan elevation.

3.07 TRENCH EXCAVATION FOR PIPES AND CONDUIT

A. Excavate trenches to uniform width, sufficient wide to provide ample working room and a minimum of 6 to 9 inches of clearance on both side of pipe or conduit.

B. Accurately cut trenches for pipe or conduit that is to be installed to designed elevations and grades to line and grade from 4" below bottom of pipe and to width as specified. Place 4" of bedding material, compact in bottom of trench, and accurately shape to conform to lower portion of pipe barrel. After pipe installation, place select backfill and compact in maximum 6" layers measured loose to the top of the trench.

C. Excavate trenches and conduit to a depth indicated or required to establish indicated slope and invert elevations and to support bottom of pipe or conduit on undisturbed soil. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost lines.

1. Where rock is encountered, carry excavation 6" below required elevation and backfill with a 6" layer of crushed stone or gravel prior to installation of pipe.

2. For pipes or conduit less than 6" in nominal size, and for flat-bottomed, multiple-duct conduit units, do not excavate beyond indicated depths. Hand-excavate bottom cut to accurate elevations and support pipe or conduit on undisturbed soil.

3. For pipes and equipment 6 inches or larger in nominal size, shape bottom of trench to fit bottom of pipe for 90° (bottom 1/4 of the circumference). Fill depressions with tamped sand backfill. At each pipe joint, dig bell holes to relieve pipe bell of loads ensuring continuous bearing of pipe barrel on bearing surface.

4. Where it becomes necessary to excavate beyond the limits of normal excavation lines in order to remove boulders or other interfering objects, backfill the voids remaining after removal of the objects.

5. When the void is below the sub-grade for the utility bedding, use suitable earth materials and compact to the relative density of 95 percent (in accordance with ASTM D698).

6. When the void is in the side of the utility trench or open cut, use suitable earth or sand compacted or consolidated to a relative density of 92 percent (in accordance with ASTM D1557).

7. Remove boulders and other interfering objects, and backfill voids left by such removals, at no additional cost to the Owner.

D. The local utility companies shall be contacted before excavation shall begin. Dig trench at proper width and depth for laying pipe, conduit, or cable. Cut trench banks as nearly vertical as practical and remove stones as necessary to avoid point-bearing. Over excavate wet or unstable soil, if encountered, from trench bottom as necessary to provide suitable base for continuous uniform bedding.

E. All trench excavation side walls greater than 5 feet in depth shall be sloped, shored, sheeted, braced, or otherwise supported by means of the sufficient strength to protect the workmen within them in accordance with the applicable rules and regulations established for construction by the Department of Labor, Occupational Safety and Health Administration (OSHA), and by local ordinances. Lateral travel distance to an exit ladder or steps shall not be greater than 25 feet in trenches 4 feet or deeper.

F. Accurately grade trench bottom to provide uniform bearing and support for each section of pipe on bedding material at every point along entire length, except where necessary to excavate for bell holes, proper sealing of pipe joints, or other required connections. Dig bell holes and depressions for joints after trench bottom has been graded. Dig no deeper, longer, or wider than needed to make joint connection properly.

G. Trench width requirements below the top of the pipe shall not be less than 12" nor more than 18" wider than outside surface of any pipe or conduit that is to be installed to designated elevations and grades. All other trench width requirements for pipe, conduit, or cable shall be at least practical width that will allow for proper compaction of trench backfill.

H. Trench depth requirements measured from finished grade or paved surface shall meet the following requirements or applicable codes and ordinances:

1. Water mains: 50" to top of pipe barrel.

2. Sanitary Sewer: Elevations and grades as indicated on drawings (48" minimum cover).

3. Storm Sewer: Depths, elevations, and grades as shown on drawings.

4. Electrical Conduits: 30" minimum to top of conduit or as required by NEC 300-5, NEC 710-36 codes, or the local utility company requirements, whichever is deeper.

5. TV Conduits: 18" minimum to top of conduit or as required by the local utility company, whichever is deeper.

6. Telephone Conduits: 30" minimum to top of conduit, or as required by the local utility company, whichever is deeper.

7. Gas Mains and Service: 30" minimum to top of pipe, or as required by the local utility company, whichever is deeper.

8. Where utilities are under a concrete structure slab or pavement, the minimum depth need only be sufficient to completely encase the conduit or pipe sleeve, and electrical long-radius rigid metal conduit riser, provided it will not interfere with the structural integrity of the slab or pavement.

9. Where the minimum cover is not provided, encase the pipes in concrete as indicated. Provide concrete with a minimum 28-day compressive strength of 2,500 psi.

I. Excavating for Appurtenances:

1. Excavate for manholes and similar structures to a distance sufficient to leave at least 12" clear between outer surfaces and the embankment or shoring that may be used to hold and protect the banks.

2. Over-depth excavation beyond such appurtenances that has not been directed will be considered unauthorized. Fill with sand, gravel, or lean concrete at no additional cost to the Owner.

3. Dig bell holes and depressions for joints after the trench has been graded. Provide uniform bearing for the pipe on prepared bottom of the trench.

3.08 COLD WEATHER PROTECTION

A. Protect excavation bottoms against freezing when atmospheric temperature is less than 35°F.

3.09 BACKFILL AND FILL

A. All excavations shall be backfilled as promptly as the work permits but not before concrete has attained its full design strength and not until completion of the following:

1. Acceptance of construction below finish grade, including, where applicable, damp-proofing and water-proofing.

2. Inspecting, testing, approving, and recording locations of underground utilities.

3. Removing concrete formwork.

4. Removing shoring and bracing, and backfilling of voids with satisfactory materials.

5. Removing trash and debris within excavated areas.

6. Placement of horizontal bracing on horizontally supported walls.

B. No frozen material shall be used. Backfill shall be placed in uniform horizontal layers of approximately 8" in depth. Each layer shall be moistened during compaction. Compaction shall be done in a manner approved by the Architect and shall be continued until fill is solid and no settlement will occur.

C. When sheeting, shoring, and bracing is removed, all voids shall be filled with sound materials and thoroughly tamped.

D. Backfill operations shall be made to the new surface grades as shown on the drawings.

E. No backfill shall be placed covering other work until after such work has been inspected and approved. Any backfilling placed on earth that has caved in and covered other work before same has been inspected and approved shall be removed when so directed.

F. Excess material, if any, and all rubbish shall be removed from the site or otherwise disposed of as may be directed by the Architect.

G. General: Place soil material in layers to required subgrade elevations, for each area classification

listed below, using materials specified herein.

1. Under grassed areas, use satisfactory excavated or borrow material.

2. Under walk sand pavements, use subbase material.

3. Under steps, use subbase material.

4. Under foundations, use controlled structural fill material.

5. Under building slabs, use granular material or on site sub grade material if determined acceptable by the Architect or Soils Engineer.

6. Under piping, conduit, and equipment, use subbase materials where required over rock bearing surface unless otherwise indicated. Shape excavation bottom to fit bottom 90° of cylinder.

3.10 CONTROLLED STRUCTURAL FILL OR MATERIAL

A. Location: Imported controlled structural fill shall be used when necessary to provide proper soil bearing capacity:

1. Under all proposed buildings and sidewalks and at least 5 feet beyond the limits of the proposed buildings to a depth as required by foundation design where sidewalks are not part of the scope of building work.

2. Under all footings (continuous or spread) to a depth of at least 12 inches, or as required by foundation design.

3. For all load carrying structures which are situated in areas of soft organic soil deposits subsequent to the removal of said soft organic soil deposits.

4. Sand shall be used as bedding for all drainage and sewerage utilities, unless groundwater problems are encountered or anticipated that may require the use of crushed stone.

3.11 SUB BASE FILL OR MATERIAL

A. Location: The subbase fill may be used in all fill areas where controlled structural fills specified for buildings are not required due to soil conditions, as long as the requirements listed in Section 2.03A are met. Under no circumstances shall subbase material be in directed contact with structural support component, or in support of any of the proposed utilities.

B. Backfill trenches with concrete where trench excavations pass with 18" of column or wall footings and that are carried below bottom of such footings or that pass under wall footings. Place concrete to level of bottom of adjacent footing.

1. Concrete is specified in Division 03.

2. Do not backfill trenches until test and inspections have been made and backfilling is authorized by Contracting Officer. Use care in backfilling to avoid damage or displacement of pipe systems.

C. Provide 4" thick concrete base slab support for piping or conduit less than 2'-6" below surface of roadways. After installation and testing of piping or conduit, provide minimum 4" thick encasement (sides and top) of concrete prior to backfilling or placement of roadway subbase.

D. Backfill excavations as promptly as work permits, but not until completion of the following:

1. Acceptance of construction below finish grade including, where applicable, dampproofing, waterproofing, and perimeter insulation.

2. Inspection testing, approval, and recording locations of underground utilities have been performed and recorded.

3. Removal of concrete formwork.

4. Removal of shoring and bracing and backfilling of voids with satisfactory materials. Cut off temporary sheet piling driven below bottom of structures and remove in manner to prevent settlement of the structure or utilities or leave in place if required.

5. Removal of trash and debris from excavation.

6. Permanent or temporary horizontal bracing is in place on horizontally supported walls.

3.12 PLACEMENT AND COMPACTION

A. Ground Surface Preparation: Remove vegetation, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface prior to placement of fills. Plow, strip, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so that fill material will bond with existing surface.

1. When existing ground surface has a density less than that specified under "Compaction" for particular area classification, break up ground surface, pulverize, moisture-condition to optimum moisture content, and compact to required depth and percentage of maximum density.

B. Place backfill and fill materials in layers not more than 8" in loose depth for material compacted by heavy compaction equipment, and not more than 4" in loose depth for material compacted by hand operated tampers.

C. Before compaction, moisten or aerate each layer as necessary to provide optimum moisture content. Compact each layer to required percentage of maximum dry density or relative dry density for each area classification. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.

D. Place backfill and fill materials evenly adjacent to structure, piping or conduit to required elevations. Prevent wedging action of backfill against structures or displacement of piping or conduit by carrying material uniformly around structure, piping, or conduit to approximately same elevation in each lift.

E. Where the construction includes basement or other underground walls having structural floors over them, do not backfill such walls until the structural floors are in place and have attained sufficient strength to support the walls.

F. Control soil and fill compaction, providing minimum percentage of density specified for each area classification indicated below. Correct improperly compacted areas or lifts as directed if soil density test indicate inadequate compaction.

1. Percentage of Maximum Dry Density Requirements: Compact soil to not less than the following percentages of maximum dry density, in accordance with ASTM D 1557 (Modified Proctor):

a. Under footings, compact subgrade and subbase material to at least 95% maximum dry density.

b. Under structures, building slabs and steps, and pavements, compact top 12” of subgrade and each layer of backfill or fill material to at least 95% maximum dry density.

c. Under lawn or unpaved areas, compact top 6" of subgrade and each layer of backfill or fill material to a MAXIMUM of 85% maximum dry density.

d. Under synthetic turf, compact top 6" of subgrade and each layer of backfill or fill material to at least 90% maximum dry density.

e. Under walkways, compact top 6" of subgrade and each layer of backfill or fill material to at least 95% maximum dry density.

G. Moisture Control:

1. Where subgrade or layer of soil material must be moisture-conditioned before compacting, uniformly apply water to surface during or subsequent to compacting operations.

2. Remove and replace, or scarify and air dry, soil material that is too wet to permit compacting to the specified density.

3. Soil material that has been removed because it is too wet to permit compacting may be stockpiled or spread and allowed to dry. Assist drying by discing, harrowing, or pulverizing until moisture content is reduced to a satisfactory value as determined by moisture-density relation tests.

3.13 FILLING AND BACKFILLING

A. Filling and backfilling work shall include, but is not limited to, the following:

1. Contractor shall place and compact bank-run sand and gravel from approved imported sources consisting of clean bank-run gravel or sandy gravel, free from organic material, loam, wood, trash, snow, ice, and other objectionable material, well graded within the following limits:

Maximum retained on 3/4" sieve:	30%.
Maximum retained on No. 4 sieve:	50%.
Maximum passing 100 sieve:	25-30%.
Maximum passing 200 sieve:	5%.

No material larger than 2-1/2" to 4" sieve size by weight. When available, on-site material may be used in place of imported controlled structural fill with the Soils Engineer's approval.

2. Compaction of bank-run gravel under footings, foundation, under slabs on grade, and in building areas shall be to 95% of maximum density in accordance with ASTM Test Designation D1557.

3. Granular material where required under footings and foundations shall conform to material and gradations previously specified and shall be determined in accordance with ASTM Standard Specifications C117 and C136.

4. Filling--Imported Controlled Structural Fill: Compaction of the controlled imported structural fill shall be performed at a moisture content 3% drier than optimum as determined in the lab. It shall be placed in uniform layers not exceeding 10 and/or 12 inches thick after compaction. Each lift shall be compacted to not less than 95% of the maximum dry density determined within the lab as modified proctor density and shall be monitored by the soils engineer using the applicable ASTM standard for testing. Each lift shall have a minimum of 2 feet density test per 500 square yards, one located in the area of the propose column and the second located

under a continuous wall footing. More frequent testing may be required at the discretion of the Soils Engineer based on the extent of filling on any given day or should any area become suspect.

5. Filling--Subbase Fill: Compaction of all subbase fill, either imported or on-site, shall be compacted at a moisture content 1-1.5% drier than optimum as determined in the lab. The subbase fill shall be placed in uniform layers not exceeding 8 inches in depth when uncompacted. Each lift shall be compacted to not less than 95% of its maximum dry density determined in the lab as modified standard for testing. At least two field density test shall be performed per lift within the area being filled on any given day beneath buildings provided the lift areas do not exceed 500 square yards.

3.14 TRENCH BACKFILLING

A. Criteria: Trenches shall not be backfilled until required tests are performed and the utility systems comply with and are accepted by applicable governing authorities. Backfill trenches as specified. If improperly backfilled, reopen to depth required to obtain proper compaction. Backfill and compact, as specified, to properly correct condition in an acceptable manner.

B. Backfilling: After pipe or conduit has been installed, bedded, and tested as specified, backfill trench or structure excavation with specified material placed in 8" maximum loose lifts. Compact to minimum density of 95 percent of optimum density in accordance with ASTM D698 (or 92 percent of optimum density in accordance with ASTM D1557).

C. Compaction: Exercise proper caution when compacting immediately over top of pipes or conduits. Water jetting or flooding is not permitted as method of compaction.

D. Compaction Testing: Independent testing laboratory shall perform test at intervals not exceeding 200'-0" of trench for the first and every other 8" lift of compacted trench backfill and furnish copies of test results as specified.

3.15 MATERIALS FOR FILL UNDER CONCRETE SLABS ON GRADE

A. Contractor is to establish building pad at underside of floor slab, plus or minus 1/2".

B. Prior to placing fill fine grading materials on building pad, existing pad fill shall be leveled and recompacted.

C. Fill materials under concrete slabs on-grade in building areas, under sidewalks, pads, concrete aprons, etc., are to be the sieve analysis previously shown for controlled structural fill.

D. Compaction of fill shall be as previously set forth. When compacting fill with mechanical compactor against foundation walls, pits, loading dock, etc., Contractor shall provide complete protection against damage to said installations.

E. There is to be a layer of no less than 6" of clean suitable bank run sand fill below all slabs on grade. On site material may be acceptable and its usability is to be verified via soils reports. The Contractor’s bid is to be based on the use of on site material for use under slabs unless indicated otherwise within the Construction Documents.

F. Moisture Control: Where subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply water to surface of subgrade or layer of soil material. Apply water in minimum, quantity as necessary to prevent free water from appearing on surface during or subsequent to compaction operations.

1. Remove and replace, or scarify and air dry, soil material that is too wet to permit compaction

to specified density.

2. Stockpile or spread soil material that has been removed because it is too wet to permit compaction. Assist drying by discing, harrowing, or pulverizing until moisture content is reduced to a satisfactory value.

3.16 GRADING

A. General: Uniformly grade areas within limits of grading under this section, including adjacent transition areas. Smooth finished surface within specified tolerances, compact with uniform levels or slopes between points where elevations are indicated or between such points and existing grades.

B. Grading Outside Building Lines: Grade areas adjacent to building lines to drain away from structures and to prevent ponding. Finish surfaces free from irregular surface changes and as follows:

1. Lawn or Unpaved Areas: Finish areas to receive topsoil to within not more than 0.10 foot above or below required subgrade elevations.

2. Walks: Shape surface of areas under walks to line, grade, and cross section, with finish surface not more than 1/2" above or below required subgrade elevation.

3. Shape the surface or areas scheduled to be under pavement to line, grade, and cross section, with finished surface not more than 0.05 feet above or below the required subgrade elevation.

C. Grading Surface or Fill under Building Slabs: Grade smooth and even, free of voids, compacted as specified, and to required elevation. Provide final grades within a tolerance of 1/2" when tested with a 10-foot straight edge.

D. Compaction: After grading, compact subgrade surfaces to the depth and indicated percentage of maximum or relative density for each area classification.

3.17 PAVEMENT SUB BASE COURSE

A. General: Subbase course consist of placing subbase material, in layers of specified thickness, over subgrade surface to support a pavement base course.

1. Refer to other Division 32 sections for paving specifications.

B. Grade Control: During construction, maintain lines and grades including crown and cross-slope of subbase course.

C. Shoulders: Place shoulders along edges of subbase course to prevent lateral movement. Construct shoulders of acceptable soil materials, placed in such quantity to compact to thickness of each subbase course layer. Compact and roll at least a 12-inch width of shoulder simultaneously with the compaction and rolling of each layer of subbase course.

D. Placing: Place sub base course material on prepared subgrade in layers of uniform thickness, conforming to indicated cross-section and thickness. Maintain optimum moisture content for compacting subbase material during placement operations.

1. When a compacted subbase course is indicated to be 6" thick or less, place material in a single layer. When indicated to be more than 6" thick, place material in equal layers, except no single layer more than 6" or less than 3" in thickness when compacted.

3.18 FOOTING AND BUILDING SLAB SUB BASE COURSE

A. General: Subbase course consists of placement of subbase material, in layers of indicated thickness, over subgrade surface and/or granular fill to support concrete building slabs as indicated on drawings.

B. Placing: Place material on prepared subgrade in layers of uniform thickness, conforming to indicated cross-section and thickness. Maintain optimum moisture content for compacting material during placement operations.

1. When a compacted subbase course is indicated to be 6" thick or less, place material in a single layer. When indicated to be more than 6" thick, place material in equal layers, except no single layer more than 6" or less than 3" in thickness when compacted.

3.19 FIELD QUALITY CONTROL

A. Quality Control Testing During Construction: Allow testing service and the Construction Manager (when applicable) to inspect and approve each subgrade and fill layer before further backfill and construction work is performed.

1. Perform field density tests in accordance with ASTM D 1556 (sand cone method) or ATM D 2167 (rubber balloon method), as applicable.

2. Field density tests may also be performed by the nuclear method in accordance with ASTM D 2922, providing that calibration curves are periodically checked and adjusted to correlate to tests performed using ASTM D 1556. In conjunction with each density calibration check, check the calibration curves furnished with the moisture gauges in accordance with ASTM D3017.

    a. If field tests are performed using nuclear methods, make calibration checks of both density and moisture gauges at beginning of work, on each different type of material encountered, and at intervals as directed by the Contracting Officer.

3. Footing Subgrade: Per each stratum of soil on which footings will be placed, perform at least one test to verify required design bearing capacities. Subsequent verification and approval of each footing subgrade may be based on a visual comparison of each subgrade with related tested stratum when acceptable to the Construction Manager (if applicable) and the Architect.

4. Paved Areas and Building Slab Subgrade: Perform at least one field density test of subgrade for every 2,000 sq. ft. of paved area or building slab, but in no case fewer than three tests. In each compacted fill layer, perform one field density test for every 2,000 sq. ft. of overlaying building slab or paved area, but in no case fewer than three tests.

5. Foundation Wall Backfill: Perform at least two field density tests at locations and elevations as directed.

6. If it is determined by the Construction Manager (if applicable), the Architect, the Owner, and/or Independent geotechnical testing laboratory and associated soils engineer, based on testing service reports and inspection, subgrade or fills that have been placed are below specified density, perform additional compaction and testing until specified density is obtained.

3.20 EROSION CONTROL

A. Provide erosion control methods in accordance with requirements of authorities having jurisdiction or if the project is of sufficient size to require one, refer to the Storm Water Prevention and Protection Plan included elsewhere herein.

3.21 MAINTENANCE

A. Protection of Graded Areas: Protect newly graded areas from traffic and erosion. Keep free of trash and debris.

B. Repair and reestablish grades in settled, eroded, and rutted areas to specified tolerances.

C. Reconditioning Compacted Areas: Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, reshape, and compact to required density prior to further construction.

D. Settling: Where settling is measurable or observable at excavated areas during general project warranty period, remove surface (pavement, lawn, or other finish), add backfill material, compact, and replace surface treatment. Restore appearance, quality, and condition of surface or finish to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.22 CERTIFICATION

A. Upon completion of this portion of the work, and as a condition of its acceptance, deliver to the Architect a written report from a soil engineer certifying that the compaction requirements have been obtained and the type or classification of fill material placed.

3.23 DISPOSAL OF EXCESS AND WASTE MATERIALS

A. All rubbish and other excavated material, which in the opinion of the Architect is not suitable for fill or grading, shall be removed and legally disposed of away from the premises.

B. Approved excavated material shall be spread on the site in locations as directed by the Architect.

C. Excavated material in excess of that required for all filling, backfilling, and rough grading shall become the property of the Contractor and shall be removed from the premises and legally disposed of.

D. Removal from the School's Property: Remove waste materials, including unacceptable excavated material, trash, and debris, and dispose of it off the School's property.

END OF SECTION

DIVISION 31 – EARTHWORK

SECTION 310001 – SITE WORK GENERAL PROVISIONS

PART 1 - GENERAL

1.01 GENERAL:

A. Applicable provisions of the “Conditions of the Contract” shall govern the work of this section and under Division 31, 32 & 33.

1.02 SCOPE/SUMMARY:

A. The Drawings and Specifications are intended to provide for a complete and ready for operation installation. However, both the Drawings and Specifications are for the Contractor's guidance and are not intended to give every detail of the existing conditions or new installations nor do they describe every fitting required for the installation of the work. The Contractor shall furnish, install, and place in workmanlike manner all equipment, accessories, supports, fittings, and all other material needed for the complete installation.

B. Before submitting his proposal, the Contractor shall be fully informed to the extent, character and intent of the work to be done by him. No consideration will be granted for any misunderstanding of the material to be furnished or work to be performed.

C. The site work scope shall include providing all plant facilities, labor, materials, tools, equipment, appliances and supervision necessary or incidental to complete site work, including, but not limited to, the following:

1. Surveying and layout work
2. Preliminary work
3. Demolition
4. Clearing and grubbing
5. Striping and stockpiling existing topsoil
6. Protection
7. Removal and disposal
8. Rough grading, excavating, filling, backfilling and dewatering
9. Excavating, trenching, and backfilling for utility systems including gas, water, electric, telephone, storm and sanitary lines.
10. Sediment and erosion control procedures as may be required.
11. Storm water drainage systems, catch basins and manholes
12. Site improvements, including but not limited to, fencing, curbing, striping, signage, guardrails, paving, lighting, retaining walls and miscellaneous related work.
13. Landscape work
14. Finish grading and paving
15. Site work water mains, electric and gas services
16. Sanitary sewer systems, including manholes and exterior grease traps
17. Concrete work in connection with site preparation and development

D. Perform all work in accordance with all applicable local, state, and federal codes, laws, and ordinances.

E. Sediment and erosion control procedures shall be performed as required and in conformance with Specification Section 312500; and for LEED Certified projects, in accordance with the requirements of LEED SS Prerequisite 1

F. If the project is of a size and scope that requires a Storm Water Pollution Prevention Plan (SWPPP) refer to additional documentation provided elsewhere herein and conform to its requirements in conjunction with and as related to this section.

1.03 GENERAL PROVISIONS:

A. Verifying Existing Conditions:

1. The Contractor, before submitting his bid, shall examine the site to which this work is in any way dependent upon according to the intent of these Specifications and accompanying Drawings. He shall report to the Architect, in writing, prior to his bid any conditions which prevent him from performing his work. No "Waiver of Responsibility" for inadequate, incomplete, or defective work will be considered by the Architect unless written notice has been filed by the Contractor.

a. Cooperation:

1) When a project involves construction on an existing occupied site, the work called for in this Specification and indicated on the accompanying Drawings shall be carried on in conjunction with the continued operation of the existing building and shall be so arranged that its installation and operation will conform with and facilitate the early installation of work.

2) The Contractor shall bear the expense required to revise his work due to any failure to coordinate the installation of his work with that of the building's operation.

3) The Contractor shall be responsible for the distribution and information concerning his work as required for the prompt installation and coordination with other trades.

b. Accessibility and Clearances:

1) The Contractor shall inform himself fully regarding peculiarities and limitations of space for the installation of the materials and equipment under Division 31, 32 & 33. He shall verify all dimensions and conditions in the field. No extra compensation will be allowed because of differences between actual dimensions and the sizes shown on the Drawings.

2) The Contractor shall see that equipment and apparatus necessary to be reached from time to time for operation and maintenance are made easily accessible.

3) Although the location of items may be shown on the Drawings in a specific place, the construction may disclose the fact that the location for this work does not make its position easily and quickly accessible. In such case, the Contractor shall call the Architect's attention to same before installing the work and shall be guided by the Architect's instruction.

1.04 PRELIMINARY WORK:

A. Before starting the work, make a thorough inspection of the work area to determine the physical condition of natural features and adjacent improvements to remain.

B. Provide complete mark out/tone out of existing utilities for coordination of proposed work. Repair any damage that occurs to existing utilities to remain at no additional cost to the owner.

C. Notify all authorities owning utility lines running to or on the property. Protect and maintain all utility lines that are to remain on the property and cap those that are not required in accordance with the

instructions of the utility companies or local authorities having jurisdiction over them.

PART 2 - PRODUCTS

This part not used.

PART 3 – EXECUTION

3.01 PROTECTION:

A. The Contractor shall effectively protect, at his expense, all materials and equipment, including his employees, during the period of construction, and he shall be held responsible for all damage done to his work, until the same is fully accepted by the Architect.

B. Provide protection necessary to prevent damage to existing building(s), concrete, pavement, utilities or vegetation indicated on the Contract Documents to remain. Box or otherwise protect from damage all trees, shrubs, lawns, etc. which are to be preserved. Trees shall be kept free from guy lines. Remove all protection when work is completed and when authorized to do so by the Architect.

C. Protect improvements on adjoining properties and on Owner's property.

D. Restore damaged improvements to original condition as acceptable to Architect and/or Owner.

E. Protect the property, adjoining properties, wetlands, etc. from damage by soil erosion by installing silt fences and hay bales or as indicated in the projects Storm Water Pollution Prevention Plan, if one is applicable.

F. Conduct site operations to ensure minimum interference with parking lots, roads, streets, walks, and other adjacent occupied or used facilities. Do not close or obstruct parking lots, streets, walks, or other occupied or used facilities without permission from the Owner and/or authorities having jurisdiction.

G. Provide traffic control as required, in accordance with the New York State Department of Transportation "Manual of Uniform Traffic Control Devices" and the local jurisdiction traffic safety requirements.

H. Streets, roadways, parking lots, etc. shall be thoroughly cleaned and/or swept on a daily basis.

3.02 CLEARING and GRUBBING:

A. Clear and grub in the areas of the proposed building, paved areas and/or site improvements in preparation for rough grading and new construction.

B. Completely remove all trees, shrubs, stumps, roots, vegetation, growth, paving, boulders, rocks, rubbish, and all other material interfering with the installation of new construction or not suitable for rough or finished grading, except trees or shrubs directed or indicated to remain.

C. Remove all roots 1" in diameter or larger. Remove all boulders and rocks larger than 3" in largest dimension.

D. Remove all topsoil, peat, and soils containing a high degree of organic matter. (Coordinate with Item 3.03 below)

E. Remove all soft clay soils and rubbish fills.

F. Excavation resulting from the removal of trees, roots, and the like shall be filled with suitable on-site material or imported fill as approved by the Architect/Engineer. Place fill material in horizontal layers not exceeding 8" loose depth, and thoroughly compacted per fill requirements.

3.03 STRIPPING and STOCKPILING EXISTING TOPSOIL:

A. Existing topsoil and sod on the site within area designated on the drawings shall be stripped to whatever depths encountered to prevent intermingling with underlying subsoil or other objectionable material. Cut heavy growths of grass from areas before stripping.

B. Free the topsoil of stones, roots, brush, rubbish, clay or other unsuitable materials/objects over 2” in diameter and remove the latter from the premises before stockpiling the topsoil.

C. Care shall be taken not to contaminate the topsoil with clay or other unsuitable materials and remove the latter from the premises before stockpiling the topsoil.

D. Stockpile topsoil in storage piles where indicated or permissible within site staging perimeter (coordinate with Architect and/or Construction Manager). Construct storage piles to freely drain surface water. Cover storage piles as required to prevent windblown dust. Excess topsoil shall be removed from the site by the Contractor unless specifically noted otherwise on the drawings.

E. Refer to soil erosion and sediment control drawing, if included, for additional details.

3.04 DEMOLITION:

A. Existing structures (where indicated), concrete and paving on the site (where indicated), including all existing/discovered inactive cesspools, cisterns, wells, foundation materials shall be completely demolished and all debris removed from the site. Excavation resulting from the removal sub-surface structures, foundations/footings shall be filled with suitable on-site material or imported fill as approved by the Architect/Engineer. Place fill material in horizontal layers not exceeding 8" loose depth, and thoroughly compacted per fill requirements.

B. Remove existing above grade and below grade improvements and abandoned underground piping or conduit as shown on the drawings or necessary to permit construction and other work.

C. All work shall be executed in such a manner as not to endanger the safety of the workmen or the public. All barriers and precautionary measures shall be erected as required.

3.05 REMOVAL and DISPOSAL:

A. Dispose of all debris resulting from the work of this section. Haul off site and dispose of legally.

B. Do not burn rubbish, organic matter, etc. on the site.

C. Do not bury concrete, rock, stumps/roots, etc. on the site.

END OF SECTION

DIVISION 31 – EARTHWORK

SECTION 312317 – TRENCHING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions in the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section includes:

1. Excavating trenches for utilities and utility structures.
2. Bedding.
3. Backfilling and compacting to subgrade elevations.
4. Sheeting and Shoring.
5. Dewatering.
6. Compacting backfill material.

B. Related Sections include the following:

1. Section 310000 – Earthwork
2. Section 312500 – Erosion and Sediment Controls
3. Section 312318 – Rock Removal
4. Section 331000 – Water Systems
5. Section 333000 – Sanitary Sewerage
6. Section 334000 – Storm Drainage Utilities

1.03 REFERENCES

A. American Association of State Highway and Transportation Officials:

1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

B. ASTM International:

1. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
2. ASTM D1556 - Standard Test Method for Density of Soil in Place by the Sand- Cone Method.
3. ASTM D1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (6,000 ft-lbf/ft3 (2,700 kN-m/m3)).
4. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
5. ASTM D2487 – Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System).
6. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
7. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

1.04 DEFINITIONS

A. Utility: Any buried pipe, duct, conduit, or cable.

B. Utility Structures: Manholes, catch basins, inlets, valve vaults, hand holes, and other utility access structures as indicated on Drawings.

C. Trench Terminology:

1. Foundation: Area under bottom of trench supporting bedding.
2. Bedding: Fill placed under utility pipe.
3. Haunching: Fill placed from bedding to center line of pipe.
4. Initial Backfill: Fill place from center line to 6 to 12 inches above top of pipe.
5. Final Backfill: Fill placed from initial backfill to subgrade.

1.05 SUBMITTALS

A. Submissions shall be in accordance with Section 013300 – Submittal Procedures and as modified below.

B. Excavation Protection Plan: Describe sheeting, shoring, and bracing materials and installation required to protect excavations and adjacent structures and property; include structural calculations to support plan. Prepare excavation protection plan under direct supervision of Professional Engineer experienced in design of this Work and licensed in State of New York.

C. Dewatering Plan if required: Describe methods of dewatering and disposal of water.

D. Product Data: Submit data for geotextile fabric indicating fabric and construction.

E. Samples: Submit to testing laboratory, in air-tight containers, 10-pound sample of each type of fill.

F. Materials Source: Submit name of imported fill material suppliers.

G. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.06 QUALITY ASSURANCE

A. Perform Work in accordance with Section 014523 – Tests, Inspections and Special Inspections.

1.07 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.08 COORDINATION

A. Section 013000 – Special Procedures and Provisions: Coordination and project conditions.

B. Verify Work associated with lower elevation utilities is complete before placing higher elevation utilities.

PART 2 - PRODUCTS

2.01 BACKFILL MATERIALS

A. Subsoil Fill: Clean natural soil with a plasticity index of 15 or less that is free of clay, rock, or gravel

lumps larger than 2 inches in any dimension; debris; waste; frozen material; and any other deleterious material that might cause settlement. Suitable material excavated from the site may be used as subsoil fill under optimum moisture conditions.

B. Granular Fill: Clean sand, slightly silty sand, or slightly clayey sand having a Unified Soil Classification of SW, SP, SP-SM or SP-SC.

C. Foundation Stone: Clean course aggregate Gradation No. 57.

D. Bedding and Haunching Material.

1. Rigid Pipe: Granular Fill.
2. Flexible Pipe: Foundation Stone.

E. Bedding for Structures: Foundation Stone.

F. Initial Backfill to 6 inches Minimum Above Utility:

1. Rigid Pipe: Subsoil Fill.
2. Flexible Pipe: Foundation Stone.

G. Final Backfill to Subgrade:

1. Under Pavement: Granular Fill.
2. Under Landscape: Subsoil Fill.

2.02 ACCESSORIES

A. Geotextile Fabric: Non-woven, non-biodegradable.

B. Concrete: Concrete conforming to Section 033000 – Cast-In-place Concrete Work.

1. Compressive strength of 3,000 psi at 28 days.
2. Air entrained.
3. Water cement ratio of 0.488 with rounded aggregate and 0.532 with angular aggregate.
4. Maximum slump of 3.5 inches for vibrated concrete and 4 inches for non-vibrated concrete.
5. Minimum cement content of 564 lbs per cubic yard for vibrated and 602 lbs. per cubic yard for non-vibrated concrete.

PART 3 - EXECUTION

3.01 PREPARATION

A. Call local utility line information service indicated on Drawings not less than three working days before performing Work.

1. Request underground utilities to be located and marked within and surrounding construction areas.

B. Identify required lines, levels, contours, and datum locations.

C. Protect plant life, lawns, rock outcropping, and other features remaining as portion of final landscaping.

D. Protect bench marks, existing structures, fences, sidewalks, paving, and curbs from excavating

equipment and vehicular traffic.

E. Maintain and protect above and below grade utilities indicated to remain.

F. Establish temporary traffic control and detours when trenching is performed in public right-of-way. Relocate controls and reroute traffic as required during progress of Work.

3.02 LINES AND GRADES

A. Excavate to lines and grades indicated on Drawings.

1. Owner reserves right to make changes in lines, grades, and depths of utilities when changes are required for Project conditions.

B. Use laser-beam instrument with qualified operator to establish lines and grades.

3.03 TRENCHING

A. Excavate subsoil required for utilities.

B. Remove lumped subsoil, boulders, and rock up of 1/3 cubic yard, measured by volume. Remove larger material as specified in Section 31 23 18.

C. Perform excavation within 48 inches of existing utility service in accordance with utility's requirements.

D. Do not advance open trench more than 200 feet ahead of installed pipe.

E. Remove water or materials that interfere with Work.

F. Trench Width: Excavate bottom of trenches maximum 16 inches wider than outside diameter of pipe or as indicated on Drawings.

G. Excavate trenches to depth indicated on Drawings. Provide uniform and continuous bearing and support for bedding material and pipe.

H. Maintain vertical faces to an elevation equal to 12 inches above top of pipe.

1. When Project conditions permit, side walls may be sloped or benched above this elevation.
2. When side walls cannot be sloped, provide sheeting and shoring to protect excavation as specified in this Section.

I. Support Utilities and Structures:

1. Keep trench width at top of trench to practical minimum to protect adjacent or crossing utility lines
2. Support utilities crossing trench by means acceptable to utility company.
3. Do not interfere with 45-degree bearing splay of foundations.
4. Provide temporary support for structures above and below ground.

J. When subsurface materials at bottom of trench are loose or soft, excavate to firm subgrade or to depth directed by Engineer.

1. Cut out soft areas of subgrade not capable of compaction in place.
2. Backfill with foundation stone and compact to density equal to or greater than requirements for subsequent backfill material.

K. Trim Excavation: Hand trim for bell and spigot pipe joints where required. Remove loose matter.

L. Correct areas over excavated areas with compacted backfill as specified for authorized excavation or replace with fill concrete as directed by Engineer.

M. Place geotextile fabric over trench foundation stone prior to placing subsequent bedding materials.

3.04 SHEETING AND SHORING

A. Sheet, shore, and brace excavations to prevent danger to persons, structures, and adjacent properties and to prevent caving, erosion, and loss of surrounding subsoil.

B. Support trenches more than 5 feet deep excavated through unstable, loose, or soft material. Provide sheeting, shoring, bracing, or other protection to maintain stability of excavation.

C. Design sheeting and shoring to be removed at completion of excavation work unless approved by Engineer.

D. Repair damage caused by failure of the sheeting, shoring, or bracing and for settlement of filled excavations or adjacent soil.

E. Repair damage to new and existing Work from settlement, water, or earth pressure or other causes resulting from inadequate sheeting, shoring, or bracing.

3.05 SURFACE WATER CONTROL

A. Control and remove unanticipated water seepage into excavation.

B. Provide ditches, berms, and other devices to divert and drain surface water from excavation area as specified in Section 312500 – Erosion and Sediment Controls.

C. Divert surface water and seepage water within excavation areas into sumps or settling basins prior to pumping water into drainage channels and storm drains.

3.06 DEWATERING

A. Design and provide dewatering system to permit Work to be completed on dry and stable subgrade.

B. Operate dewatering system continuously until backfill is minimum 2 feet above normal ground water table elevation.

C. When dewatering system cannot control water within excavation, notify Engineer and stop excavation work.

1. Supplement or modify dewatering system and provide other remedial measures to control water within excavation.
2. Demonstrate dewatering system operation complies with performance requirements before resuming excavation operations.

D. Modify dewatering systems when operation causes or threatens to cause damage to new construction, existing site improvements, adjacent property, or adjacent water wells.

E. Discharge ground water and seepage water within excavation areas through filter bags or into settling basins prior to pumping water into drainage channels and storm drains.

F. Remove dewatering and surface water control systems after dewatering operations are

discontinued.

3.07 BEDDING, HAUNCHING AND INITIAL BACKFILL

A. Place bedding full width of trench to the depth indicated on Drawings and compact to 95 percent maximum density. Excavate for pipe bells.

B. Install utility pipe and conduit in accordance with the respective utility section.

C. Support pipe uniformly along entire length of pipe.

D. Carefully place haunching material to center of pipe, rod and tamp material to fill voids and provide uniform support of pipe haunches. Compact to 90 percent maximum density.

E. Carefully place initial backfill to 6 inches above top of pipe or to depth indicated on Drawings. Compact to 95 percent maximum density.

3.08 FINAL BACKFILLING TO SUBGRADE

A. Backfill trenches to contours and elevations with unfrozen fill materials.

B. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen, or spongy subgrade surfaces.

C. Place fill material in continuous layers and compact in accordance with schedule at end of this Section.

D. Employ placement method that does not disturb or damage utilities in trench or foundation perimeter drainage.

E. Maintain optimum moisture content of fill materials to attain required compaction density.

F. Do not leave more than 50 feet of trench open at end of working day.

G. Protect open trench to prevent danger to the public.

3.09 DISPOSAL OF EXCESS MATERIAL

A. Dispose of excess material offsite and legally.

B. Furnish Engineer with certificate of disposal site or agreement from private property owner.

3.11 FIELD QUALITY CONTROL

A. Section 014523 – Tests, Inspections and Special Inspections: Field inspecting, testing, adjusting, and balancing.

B. Perform laboratory material tests in accordance with ASTM D1557 or AASHTO T180.

C. Perform in place compaction tests in accordance with the following:

1. Density Tests: ASTM D1556, ASTM D2167, or ASTM D2922.
2. Moisture Tests: ASTM D3017.

D. When tests indicate Work does not meet specified requirements, remove Work, replace, compact, and retest.

E. Frequency of Tests: Two tests per lift for every 1000 feet of trench.

3.12 PROTECTION OF FINISHED WORK

A. Section 017000 – Contract Closeout: Protecting finished work.

B. Reshape and re-compact fills subjected to vehicular traffic during construction.

3.13 SCHEDULE OF COMPACTION

A. Under Pavement and Slabs:

1. Granular Fill in maximum 8-inch loose lifts.
2. Compact to minimum 95 percent maximum density except the top 12 inches.
3. Compact top 12 inches to minimum 95 percent maximum density.

B. Under Landscape Areas:

1. Subsoil Fill in maximum 8-inch loose lifts.
2. Compact to minimum 90 percent maximum density.

C. In Unstable or Unsuitable Trench Foundation Areas:

1. Foundation Stone in maximum 12-inch loose lifts.
2. Compact to 98 percent maximum density.

END OF SECTION

DIVISION 31 – EARTHWORK

SECTION 312318 – ROCK REMOVAL

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions in the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section includes:

1. Removing identified and discovered rock during excavation.
2. Expansive tools to assist rock removal.
3. Explosive tools to assist rock removal.

B. Related Sections include the following:

1. Section 310000 – Earthwork

1.03 REFERENCES

A. National Fire Protection Association:

1. NFPA 495 - Explosive Materials Code.

1.04 DEFINITIONS

A. Rock: Solid mineral material with volume in excess of 1/3 cubic yard or solid material that cannot be removed with 3/4 cubic yard capacity excavator without drilling or blasting.

1.05 SUBMITTALS

A. Submissions shall be in accordance with Section 013300 – Submittal Procedures and as modified below.

B. Shop Drawings: Indicate proposed method of blasting, delay pattern, explosive types, and type of blasting mat or cover. Indicate intended rock removal method.

C. Survey Report: Submit survey report on conditions of buildings near locations of rock removal.

1.06 QUALITY ASSURANCE

A. Perform work in accordance with NFPA 495.

B. Seismic Survey Firm: Licensed company specializing in seismic surveys with five years documented experience.

C. Explosives Firm: Company specializing in explosives for disintegration of rock with five years documented experience.

1.07 PROJECT CONDITIONS FOR USE OF EXPLOSIVES

A. Conduct survey and document conditions of buildings near locations of rock removal prior to blasting; photograph existing conditions identifying existing irregularities.

B. Advise owners of adjacent buildings or structures, in writing, prior to executing seismographic survey. Explain planned blasting and seismic operations.

C. Obtain seismic survey prior to rock excavation to determine maximum charges that can be used at different locations in area of excavation without damaging adjacent properties or other work.

1.08 SCHEDULING

A. Schedule Work to avoid disruption to occupied buildings nearby and conform to local laws and regulations pertaining to blasting times.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Conform to NFPA 495.

B. Explosives, Delay Devices, and Blast Mat Materials: Type recommended by explosive firm following seismic survey and required by authorities having jurisdiction.

C. Mechanical Disintegration Compound: Grout mix of materials that expand on curing.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Section 013000 – Special Procedures and Provisions: Coordination and project conditions.

B. Verify site conditions and note subsurface irregularities affecting Work of this Section.

3.02 PREPARATION

A. Identify required lines, levels, contours, and datum.

3.03 ROCK REMOVAL BY MECHANICAL METHOD

A. Excavate and remove rock by mechanical method.

1. Drill holes and use expansive tools, wedges, and mechanical disintegration compound to fracture rock.

B. Cut away rock at bottom of excavation to form level bearing.

C. Remove shaled layers to provide sound and unshattered base for footings and foundations.

D. In utility trenches, excavate to 6 inches below invert elevation of pipe and 16 inches wider than pipe diameter.

E. Remove excavated materials from site.

F. Correct unauthorized rock removal in accordance with backfilling and compacting requirements of Section 310000 – Earthwork.

3.04 ROCK REMOVAL BY EXPLOSIVE METHODS

A. When rock is uncovered requiring explosives method for rock disintegration, notify Architect/Engineer prior to executing as follows.

1. Provide seismographic monitoring during progress of blasting operations.
2. Drill blasting holes within 12 feet of finished slope.
3. Disintegrate rock and remove from excavation.
4. Remove rock at excavation bottom to form level bearing.
5. Remove shaled layers to provide sound and unshattered base for footings and foundations.
6. In utility trenches, excavate to 6 inches below invert elevation of pipe and 16 inches wider than pipe diameter.
7. Remove excavated material from site.
8. Correct unauthorized rock removal in accordance with backfilling and compacting requirements of Section 310000 – Earthwork.

B. Notify affected parties 72 hours in advance of using explosives including:

1. Home owners.
2. Schools
3. Fire department.
4. Rescue.
5. Emergency management.
6. Local Law Enforcement department.
7. Department of Transportation.
8. Railroads

3.05 FIELD QUALITY CONTROL

A. Section 014523 – Tests, Inspections and Special Inspections: Field inspecting, testing, adjusting, and balancing.

B. Request visual inspection of foundation bearing surfaces by Architect/Engineer and inspection agency before installing subsequent work.

END OF SECTION

DIVISION 32 – EXTERIOR IMPROVEMENTS

SECTION 321216 – ASPHALT PAVING

PART 1 – GENERAL

1.01 GENERAL

A. GC shall be responsible for all work to be provided in conformance with sections referred to herein.

B. Drawings and General Provisions of the Contract and Supplementary conditions and Division 01 specification sections, apply to the work of this section.

1.02 SCOPE

A. The work of this section applies to all recycled concrete aggregate (RCA) sub-base and hot mix asphalt items in the contract. The work shall consist of preparing the existing subgrade material to receive the new RCA sub-base, as well as furnishing, mixing, spreading and compacting the RCA sub-base, dense asphalt binder course and the asphalt top course to the lines, grades, and dimensions shown on the plans and as specified herein.

B. Unless shown otherwise indicated on plans the new pavement system for roads and parking lots shall be as follows:

1. Recycled concrete aggregate sub-base course shall be 6” thick (compacted)

2. Dense asphalt binder course shall be 3 ½ inches (compacted), Type 3.

3. Asphalt top course shall be 1 ½ inches thick, Type 6F3.

C. Unless otherwise indicated on plans the pavement systems for tracks and tennis courts shall be as follows:

1. Tracks:

   a. Recycled concrete aggregate sub-base course shall be 6” thick (compacted).

   b. Dense asphalt binder course shall be 2 ½ inches (compacted) thick, Type 3.

   c. Asphalt top course shall be 1 ½ inches thick, Type 7.

2. Tennis Courts:

   a. Recycled concrete aggregate sub-base course shall be 6” thick (compacted), Type 1.

   b. Dense asphalt binder course shall be 2 ½ inches (compacted) thick, Type 3.

   c. Asphalt top course shall be 1 ½ inches thick, Type 7.

D. Unless otherwise indicated on plans, asphalt play surfaces and walks shall be 2” Type 7 asphalt over 6” RCA.

1.03 RELATED SECTIONS

A. Section 014523 – Tests, Inspections, and Special Inspections Quality Assurance Plan

B. Section 033000 – Cast-In-Place Concrete
C. Section 310000 – Earthwork
D. Section 310001 – Site Work General Provisions
E. Section 310002 – Stakeout
F. Section 312500 – Erosion and Sediment Controls
G. Section 320117 – Pavement Repair and Resurfacing
H. Section 321216.11 – Asphalt Overlay
I. Section 321723 – Pavement Markings
J. Section 334000 – Storm Drainage Utilities

1.04 SUBMISSIONS

A. All submissions shall be made in accordance with Section 013300 – Submittal Procedures.

B. For the recycled concrete aggregate (RCA) the Contractor shall submit a sieve gradation for approval by the architect. Along with sieve, the Contractor shall submit documentation that the material to be provided will be obtained from a N.Y.S.D.E.C. registered or permitted construction and demolition (C & D) debris processing facility as specified in Section 360-16.1 of 6NYCRR Part 360 “Solid Waste Management Facilities.” If blast furnace slag is to be used, provide beneficial use determination (BUD) prior to its use as specified in the 6NYCRR par 360-1.15, “Solid Waste Management Facilities.”

C. For the asphalt binder and top course, the Contractor shall submit to the Architect for approval, the job mix formula with current date, job location, asphalt plant, and contractor name. The type of asphalt and course shall also be stated. The job mix formula sheet shall indicate the gradations of the aggregates to be used in the mix along with the PGB content.

D. It shall be the Contractors responsibility upon the initial delivery of the materials and during subsequent deliveries, to take samples for testing as described In Section 1.06 Quality Assurance. If for any reason the Owner or Architect shall request the material be tested, the Contractor shall provide the samples free of charge. If requested the Contractor shall also perform, free of charge, core samples of the constructed work for testing. All test results will be copied to the Contractor for their record.

E. Contractor shall provide written certification on their company letterhead that all installed asphalt was produced and installed in accordance with these specifications and guarantee work against structural and material defects for a period of one year from completion date.

F. Interim and final as-built surveys; reference Quality Assurance section below and Specification Section 017839.

1.05 QUALITY ASSURANCE (RCA SUB-BASE)

A. The Contractor is responsible to establish and maintain required design, grades, lines and elevations including crown and cross-slope of sub base course.

B. An independent testing laboratory, selected and paid for by the Owner shall be retained to perform construction testing of the in place sub-base course, for compliance with the Contract Documents. The Contractor shall arrange for and schedule the testing. The sub-base course shall be checked for thickness and tolerance by rod and level readings on a 50 ft. grid or as directed by the Architect. Readings shall be to +0.05’ of design elevation that allow for asphalt thickness as shown on the Contract Documents. The Contractor shall at no cost to the Owner provide instruments personal and a suitable benchmark. Any deficiencies shall be corrected prior to proceeding with paving operations.
   1. Prior to paving parking lots or plaza areas greater than 10,000 sf, the contractor shall provide an interim topographical survey of the RCA Sub-base in the datum of the Construction

Documents for review for conformance by the Architect. Said survey is required to be performed a licensed land surveyor. Spot elevations on said survey shall be in complimentary locations to the Construction Drawings.

C. The following tests shall be performed on the sub-base material ASTM 1557 or ASTM D698 compaction test to determine % of compaction and molding water content needed to achieve the required engineering properties of the sub-base.

D. The following test shall be performed on the sub-base material ASTM D4318 determination of the liquid limit, plastic limit, and the plasticity index of soils.

E. In place sub-base material shall be tested in accordance with ASTM D1556 to determine the in place density and unit weight of soils using a sand cone apparatus, or ASTM D2167 to determine the in place density and unit weight of the compacted sub-base.

F. The sub-base material shall be compacted to not less than 98% of optimum density as determined by ASTM D698 or 95% as determined by ASTM D1557, unless otherwise indicated on the drawings.

G. The in place sub-base material shall be tested for thickness and compaction for each 5,000 square feet for jobs up to 20,000 s.f. and for each 10,000 s.f. for jobs larger than 20,000 s.f.

H. The independent testing laboratory shall prepare test reports that indicate test location, elevation data from a construction site benchmark, and test results. The Owner, Architect and Contractor shall all be provided with copies of reports within 96 hours of the time the test was performed. In the event that any test performed fails to meet these specifications, the Owner and the Contractor shall be notified immediately by the testing laboratory. It shall be the Contractor's responsibility to correct any non-conforming work at no additional cost to the Owner and pay for all additional testing by the independent testing laboratory to prove corrective work is in conformance with these specifications.

1.06 QUALITY ASSURANCE FOR HOT MIX ASPHALT (HMA)

A. All materials for hot mix asphalt (HMA) production, such as, aggregates, PG binder, reclaimed asphalt pavement (RAP), mineral filler, or any other materials shall meet the requirements of Section 2.

B. The Contractor shall be responsible for quality control (QC). QC is defined as all activities required to produce HMA that meets all specification requirements. The Contractor shall provide HMA and assume all responsibilities for all QC activities at the production facilities.

C. Methods of Sampling and Testing

1. All HMA material shall be sampled and the properties enumerated in these specifications shall be determined in accordance with the following methods, as currently revised.
   a. Sampling mineral aggregates ASTM: D-75
   b. Sampling bituminous mixtures ASTM: D-979
   c. Sieve analysis of aggregates ASTM: C-136
   d. Determination of bitumen content ASTM: D-1097
   e. Specific gravity of coarse aggregate ASTM: C-127
   f. Specific gravity of fine aggregate ASTM: C-128
   g. Sieve analysis of mineral filler ASTM: D-546
   h. Sampling bituminous materials ASTM: D-140
   i. Liquid limit, plastic limit & plasticity index ASTM: D-4318
   Or current applicable methods recommended by the American Association of State Highway Officials, and/or The Asphalt Institute.

D. The PG binder will be accepted on the basis of PG binder suppliers certification. The Contractor shall provide a copy to the Architect.

PART 2 – MATERIALS

2.01 COMPOSITION OF MIXTURES (RCA)

A. Recycled concrete aggregate sub-base.

1. Provide RCA which meets the specification material requirements and is within the Contractors capabilities to place and fine grade to the required tolerances.

2. Furnish materials of at least 95%, by weight, of recycled portland cement concrete aggregate (RCA), and free from organic and other deleterious material. This material may contain up to 5% by weight asphalt and/or brick.

3. Gradation for RCA shall conform to the following:

Sieve Size Designation	Percent Passing by Weight
4 inch	-
3 inch	100
2 inch	90 – 100
¼ inch	30 – 65
No. 40	5 – 40
No. 200	0 -10

4. Material will be accepted on the basis of magnesium sulfate soundness loss after four cycles of 20% or less. The required plasticity index of the material passing the No. 40 sieve is 5.0 or less.

5. A flat or elongated particle is defined herein as one which has its greatest dimension more than three times its least dimension. Provide material consisting of particles where not more than 30% by weight, of the particles retained on a ½ inch sieve are flat or elongated. Material with a percentage greater than 30 will be rejected.

2.02 COMPOSITION OF MIXTURES (HMA)

A. The HMA plant mix will generally be composed of a mixture of aggregate and reclaimed asphalt pavement (RAP), filler if required, and PG binder. For any HMA required by the plans, formulate a job mix formula that satisfies the general limits of Table 1. A copy of this table can be found at the end of this section. See section 1.02B for system components. For type 6F3 mixture, determine the optimum asphalt content for the proposed gradation using the Marshall mix design method (50 blows). The resultant mixture shall meet the following Marshall properties.

Mix Property	Type 6F3
Air Voids %	3.0 – 5.0
Voids in Mineral Aggregate	14
Voids filled with Binder VFB, %	65 - 78

Contractor shall produce, deliver to the work site, and incorporate the mixture into the work within the mixing and placing temperature range imposed by Table 1 Composition of Marshall designed plant mixtures. The plant mixed material will be accepted after blending and mixing at the plant. The pavement courses will be accepted after all paving operations are completed and certified by the Contractor.

B. Fine aggregate may consist of screenings, free from deleterious materials and manufactured from sources of stone, gravel, or slag.

C. Coarse aggregate will consist of crushed stone, crushed gravel or crushed slag.

D. When aggregates from approved natural fine sand sources are combined with coarse aggregates in the mixture, aggregate particles will meet additional requirements as follows:

   1. Particles in the No. 1A and No. 1 primary sizes will have a minimum of 85% by weight, of the particles with at least two fractured faces.

   2. Particles in the No. 2, No. 3 and No. 3A primary sizes will have a minimum of 75%, by weight, of the particles with at least one fractured face.

E. Coarse aggregate type 6F3 conditions:

   1. Limestone or a blend of limestone and dolomite having an acid-insoluble residue content of not less than 20%

   2. Dolomite

   3. Sandstone, granite, chert, traprock, ore tailings, slag or other similar non-carbonate materials.

   4. Gravel, or a natural or manufactured blend of the following types of materials: limestone, dolomite, gravel, sandstone, granite, chert, traprock, ore trailings, slag or other similar materials meeting the following requirements:

      a. (Type 6F3 Mixes) non-carbonate plus 1/8-inch particles must comprise a minimum of 10.0% of the total aggregate (by weight with adjustments to equivalent volumes of materials of different specific gravities). Additionally, a minimum of 20% plus ¼ inch particles must be non-carbonate.

      b. When coarse aggregate for these mixes are from more than one source or of more than one type of material, proportion and blend them to provide a uniform mixture.

F. Performance Graded Binder. Unless the type of PG Binder is specified in the Contract Documents, use PG 64-22.

G. Reclaimed asphalt pavement (RAP) shall meet the requirements of a superpave hot mix asphalt mixture design and mixture verification procedures.

TABLE 1 COMPOSITION OF HOT MIX ASPHALT MIXTURES												
Mixture	**Base**				**Binder**		**Shim**		**Top3,4**			
Require-ments[1]	**Type 1**		**Type 2**		**Type 3**		**Type 5**		**Type 6, 6F2, 6F3**		**Type 7, 7F2, 7F3**	
Screen Sizes	**General limits % Passing**	**Job Mix Tol. %**	**General limits % Passing**	**Job Mix Tol. %**	**General limits % Passing**	**Job Mix Tol. %**	**General limits % Passing**	**Job Mix Tol. %**	**General limits % Passing**	**Job Mix Tol. %**	**General limits % Passing**	**Job Mix Tol. %**
2 in	100	-	100	-	-		-	-	-	-	-	-
1 ½ in	90-100	-	75-100	±7	100	-	-	-	-	-	-	-
1 in	78-95	±5	55-80	±8	95-100	-	-	-	100	-	-	-
½ in	57-84	±6	23-42	±7	70-90	±6	-	-	95-100	-	100	-
¼ in	40-72	±7	5-20	±6	48-74	±7	100	-	65-85	±7	90-100	
1/8 in	26-57	±7	2-15	±4	32-62	±7	80-100	±6	36-65	±7	45-70	±6
No. 20	12-36	±7	-	-	15-39	±7	32-72	±7	15-39	±7	15-40	±7
No. 40	8-25	±7	-	-	8-27	±7	18-52	±7	8-27	±7	8-27	±7
No. 80	4-16	±4	-	-	4-16	±4	7-26	±4	4-16	±4	4-16	±4
No. 200	2-8	±2	-	-	2-8	±2	2-12	±2	2-6	±2	2-6	±2
PGB Content %[2]	4.0-6.0	0.4	2.5-4.5	0.4	4.5-6.5	0.4	7.0-9.5	0.4	5.4-7.0	NA	5.7-8.0	NA
Mixing &5 Placing Temp. Range, ºF	250-325		225-300		250-325		250-325		250-325		250-325	
Description and Typical Uses	Dense Base: For general use		Open Base: For permeable base layer		Dense Binder: Intermediate layer for general use		Shim: Fine HMA mixture for shimming ruts and leveling		Top Course: Dense course for single course resurfacing of rural, suburban, and urban roadways			

1. All aggregate percentages are based on the total weight of the aggregate.
2. The asphalt content is based on the total weight of the mix. When using slag aggregates in the mix, increase the PGB content accordingly, a minimum of 25% for an all slag mix.
3. 6F2, 6F3, 7F2, 7F3 mix types require friction coarse aggregates, and are required for mainline driving surface courses.
4. For Type 6 and Type 7 (F9) aggregate requirements, Marshall design will not be required. These mix types are suitable where the State's requirements for f9 aggregate apply.
5. Introduce the PG Binder into the pug mill between 225ºF and 350ºF, or as recommended by the PG Binder supplier.

2.03 TACK COAT

A. Tack coat shall meet the requirements of Tabe 2.

TABLE 2 – TACK COAT		
Test Requirements	Min	Max
Sieve Test, %	-	0.10
Residue by Distillation %	38	45
Oil Distillate, volume of total emulsion %	-	2
Test on Residue Distillation: penetration, 77ºF (25ºC), 100g, 5 second	40	90
Suggested spraying temp, ºF	75	150

B. Application of Emulsion Material

1. The asphalt emulsion contained in the distributor tank shall be homogenous. Emulsified asphalts held in storage tanks, drums, or distributors for long periods are subject to settlement. The asphalt emulsion shall be sufficiently agitated or circulated to ensure a homogenous emulsion prior to sampling or application.

PART 3 – EXECUTION

3.01 PREPARATION OF SUBGRADE

A. The subgrade surface is the surface of the pavement section upon which the select materials and/or sub-base are placed. The Contractor shall be responsible to cut and fill subgrade as required to achieve design grades. The subgrade area shall be prepared in conformance with Section 310000. It shall be the Contractor's responsibility to properly place and compact all materials in the road section and to correct any deficiencies resulting from insufficient or improper compaction of such materials throughout the Contract period. The Contractor shall determine the type, size and weight of the compactor best suited to the work at hand, select and control the lift (layer) thickness, exert control over the moisture content of the material, and other details necessary to obtain satisfactory results. The subgrade shall be compacted to density in accordance with section 310000 – Earthwork, but not less than 95% of modified proctor maximum dry density.

3.02 RCA SUBBASE

A. RCA subbase course shall be placed in conformance with Section 310000.

B. Contractor shall place RCA in a single layer with a minimum compacted layer thickness of 6 inches.

C. When the moisture content is within the limits for proper compaction, compact the material in accordance with the requirements of Section 310000.

D. If the subbase course is disturbed by frost action prior to paving, re-compact the subbase.

E. If, in the opinion of the Architect, the subbase is damaged or mixed with the subgrade or any other material due to the Contractor's operation the Contractor shall remove such material and replace it with the appropriate subbase at no additional cost to the Owner.

F. Place subbase so that after compaction the top surface of the course does not extend more than ¼" above nor more than ¼" below true grade for the course at any location.

3.03 CONDITIONS FOR PLACEMENT OF ASPHALTIC MATERIALS

A. Weather – Seasonal Limitations

1. The mixing and place of hot-mix asphalt shall be performed only when weather conditions are suitable. When pools of water are observed on the base, mixing and placing of hot-mix asphalt shall not be permitted. The temperature of the surface on which hot-mix asphalt is placed shall be as per Table 3.

2. Bituminous concrete pavement placed between November 30th and April 1st shall be subject to the following conditions and regulations:

    a. Approval of the Engineer.
    b. Compliance with Table 3 below.
    c. Acceptance of full responsibility by the Contractor for all work so placed.
    d. Providing for such guarantees and deposits as are required by Town regulations.
    e. Guarantee of all work so placed for a period extending up to one year. A notification from the Engineer before the end of the last month of the calendar year following shall be deemed to be within the period of guarantee.

TABLE 3 TEMPERATURE AND SEASONAL REQUIREMENTS		
Nominal Compacted Lift Thickness	**Surface Temperature (Minimum (Note 1)**	**Seasonal Limits**
≤ 1 in.	50ºF	(Notes 2 & 3)
1 in.<Thickness ≤ 3 in.	45ºF	(Notes 2 & 3)
>3 in.	40ºF	None

NOTES:
1. Measure all temperatures on the surface where the mixture is to be placed and the controlling temperature will be the average of three temperature readings taken at locations a minimum of 25 ft apart.
2. Unless otherwise authorized place Top Course only during the period of April 1st up to and including November 30th in the counties of Dutchess, Orange, Rockland, Putnam, Westchester, Nassau, Suffolk, and the City of New York.
3. Unless otherwise authorized place Top Course only during the period of April 15th up to and including October 31st in all counties except as required in Note 2.

3.04 TACK COAT

A. Apply a thin, uniform tack coat to surfaces of existing asphalt, Portland cement concrete layers including such areas as adjacent pavement edges, curbing, gutters, manholes, and other structures, immediately prior to place the HMA mixture against them.

B. Apply tack coat on the contact surfaces between all HMA pavement lifts prior to placing HMA mixture regardless of time period between lifts. The only exception to this is the surface of permeable base courses. Paving over a tack coat should not commence until the emulsion has broken (goes from brown to black) or is tacky when touched.

C. The tack coat shall be applied to a prepared clean pavement and in a manner to offer the least inconvenience to traffic and to reduce pickup or tracking of the bituminous material. Upon application the material shall be as uniformly spread across the width of the designated area.

D. The tack coat shall not be applied on a wet pavement surface or when the pavement surface temperature is below the temperature requirements outlined in Table 3 Temperature and Seasonal Requirements. To avoid “boil-off” of the water, the asphalt emulsion shall not be heated above 195ºF. The application rate shall be as determined in Table 4.

TABLE 4 TACK COAT APPLICATION RATES	
Surface Type	**Application Rate (gallons per square yard)**
New Hot Mix Asphalt	0.03 – 0.04
Milled Surfaces	0.05 – 0.06
Portland Cement Concrete	0.05 – 0.06
Vertical Surfaces (curbs, drainage structures, and appurtenances)	0.06-0.07

3.05 SPREADING AND FINISHING OF HMA

A. Lay the mixture upon an approved clean, tack coated surface. The only exception to this is the surface of permeable base courses. Spread and strike off to the established grade and elevation. Use HMA paver(s) to distribute the mixture either over the entire width or over such partial width as may be practicable. Upon arrival at the site, the trucks will dump the mixture into the paver. Immediately spread and strike off to the required width and appropriate loose depth to obtain the required compacted thickness at completion of the work.

B. When the initial pavement course is laid with automatic HMA pavers, guide the paver by a taut reference line positioned at or near the pavement centerline or edge. Erect and maintain the reference line. Support the reference line at approximately 25 foot intervals on tangent sections and at closer intervals on curves. Tension the line sufficiently to remove any sags. A moving reference of at least 30 ft. in length in lieu of a reference line may be used. The moving reference may be a floating beam, ski, or other suitable type such that the resulting pavement layer surface is sufficiently even. A short ski or shoe may also be used for the initial course if a satisfactory fixed reference such as a curb, gutter, or other fixed reference is adjacent to the pavement. When the proposed floating beam or the short ski does not produce the results similar to those obtained using a taut reference line, do not use these devices.

C. Place subsequent pavement courses over the initial course using one of the above methods. In addition, any course in an adjacent lane may be used as the reference for the use of a short ski.

D. The automatic screed controls will not be required where existing grades at roadway intersection or drainage structure must be met, for shoulders, temporary detours, behind curbs, or in other areas where its use is impractical.

E. If there are less than 1500 square yards in the Contract, or the areas to be paved are small and scattered, the HMA mixture may be spread by hand methods. For these areas, dump and spread the mixture such that the compacted thickness meets the specified thickness in the plans.

F. Prior to the beginning of rolling, check the loose mat, adjust any irregularities, and remove and replace all unsatisfactory material.

3.06 COMPACTION OF HMA

A. Immediately after the HMA mixture has been spread, struck off and surface irregularities adjusted, thoroughly and uniformly compact it by rolling. Roll the surface when the mixture is in the proper condition and when the rolling does not cause undue displacement, cracking or shoving. Initially roll all courses with the roller traveling parallel to the centerline of the pavement beginning at each edge and working toward the center. Roll banked curves starting at the low side edge and working toward the super elevated edge.

B. Correct at once any displacement occurring as a result of reversing the direction of the roller, or from other causes, by the use of rakes and addition of fresh mixture as required. Exercise care in rolling so as not to displace the line and grade of the edges of the HMA mixture. To prevent adhesion of the mixture to the drum(s) and pneumatic tires, keep the drum(s) and the pneumatic tires properly moistened with water or water mixed with small quantities of detergent or other approved material. Any petroleum products or solvents having an adverse effect upon the HMA pavement will not be permitted for use.

C. There shall be no visible defects, such as shallow ruts, ridges, roller marks, cracking, tearing, segregation, or any other irregularities as determined by the Architect, in the pavement when the rolling operation is complete. If these defects are present, correct these defects to the satisfaction of the Architect or remove & replace the pavement at no additional cost.

D. Along forms, curbs, headers, walls and other areas not accessible to the rollers, thoroughly compact the mixture with mechanical tampers. On depressed areas, use a trench roller or a small vibratory roller. Cleated compression strips may also be used under the roller to transmit compression to the depressed area.

E. Remove and replace any mixture that becomes loose and broken, mixed with dirt, or is in any way defective with fresh HMA mixture which shall be compacted to conform with the surrounding area. Correct any area showing an excess or deficiency of HMA material to the satisfaction of the Architect.

F. Compaction shall be per Three Roller Compaction Train

1. Initially roll all HMA mixtures with an approved steel-wheel roller operating in a static mode. Overlap the previous roller passes by one-half the width of the roller.
2. Immediately following the initial rolling, roll the mat with an approved pneumatic rubber-tired roller. A minimum of 3 passes of the rubber-tired roller will be required. One pass is defined as one movement of the roller over any point of the pavement in either direction.
3. Immediately following the intermediate rolling, finish roll the mat with a steel-wheel roller to remove all shallow ruts, ridges, roller marks and other irregularities from the surface.
4. Use this compaction method only when the compacted thickness of the finished mat is 4 inches or less. Unless approved by the Architect, the roller speeds shall not exceed 3 mph. when paving multiple lanes simultaneously; increase the required number of rollers proportionately for each additional full lane width unless otherwise permitted by the Architect.

G. The required number of passes listed in Table 5, Number of Passes, is recommended and may be increased as necessary to achieve adequate density.

TABLE 5 NUMBER OF PASSES

Pavement Courses	Three Roller Train (Static)	
	Steel Wheel Roller	Pneumatic Roller
Base (Open Graded Each Lift)	4	3
Base (Dense-Graded)	4	3
Binder (Dense-Graded)	2	3
Top (Dense-Graded All Types)	2	3

END OF SECTION

DIVISION 32 – EXTERIOR IMPROVEMENTS

SECTION 329200 – TURF AND GRASSES

PART 1 - GENERAL

1.01 DESCRIPTION

A. The work of this section is subject to all applicable provisions of the "General Conditions" and "Supplementary General Conditions", which form a part hereof whether attached hereto or not.

B. Under this item, the Contractor shall furnish and install topsoil, lawns and grasses in accordance with the plans, specifications, and as ordered by the Architect. This Contract includes all work of this Trade for a complete coordinated job, in order to provide an acceptable stand of turf by creating a rootzone mixture with seed or sod, including **decompaction of existing 12" of existing play field surfaces**, grading, topdressing, placing topsoil, soil amendments and sod, in accordance with the drawings as specified. The Contractor recognizes that the Plans and Specifications which form a part of this Contract reflect the overall intention and functional purpose, but that in all aspects the detailed Plans and Specifications might not be complete, but the Contractor does include as part of this work any and all provisions whether or not shown, to make his work under this Contract complete in every respect and to make any and all systems that he is responsible for complete system and to be in accordance with all authorities having jurisdiction.

C. Furnish all labor, material and appurtenance required for the installation of Topsoil and Seed as shown on the drawings and/or as herein specified. In general the work shall include but not necessarily be limited to the following:

1. Decompaction of existing 12" of existing play field surfaces, and placing (fine-grading) of topsoil as required for seeding.

2. Seeding, sodding and establishing permanent grass lawns or swale areas.

3. All other work required to complete the work of seeding, sodding and related items as shown on the drawings and as herein specified.

4. Establishment, protection, maintenance, clean-up and replacement of lawns as required under the specified guarantee.

D. The work must comply with the requirements of the following related specifications sections:

1. Section 013563 "LEED Requirements" for additional LEED requirements (For LEED Certified Projects)
2. Section 017419 "Construction Waste Management" for recycling construction waste (For LEED Certified Projects)

E. Section 310000 – Earthwork

F. Section 312500 – Erosion and Sediment Controls

1.02 SHOP DRAWINGS, SUBMISSIONS AND APPROVALS

A. All submissions shall be in accordance with Section 013300 submission requirements.

B. Submit manufacturer's product data for each material or accessory to be utilized in association with the work of this section. Include MSDS sheets for all fertilizers and limestone.

C. Submit topsoil certifications and test reports.

D. Within seven (7) calendar days after awarding of the Contract, submit the following:

E. List of all materials, equipment, and manufacturers proposed to be furnished. Shop drawings will not be reviewed prior to approval of the list of manufacturers.

F. List of name of any subcontractors to be used for approval.

G. Interim and final as-built surveys; reference Quality Assurance section below and Specification Section 017839.

H. **LEED Submittals: For LEED Certified Projects: Submit recycled content and regional materials documentation for each type of product provided under work of this Section in accordance with Section 013563 "LEED Requirements".**

1.03 REQUIREMENTS / QUALITY ASSURANCE

A. The Contractor shall provide his own Engineer and/or Licensed Surveyor for establishing all topsoil and seed limits in the field and grades as required to meet the requirements of the Contract Documents.

1. For athletic fields: Upon completion of subgrade, prior to laying topsoil, the contractor shall provide an interim topographical survey in the datum of the Construction Documents for review for conformance by the Architect. Spot elevations on said survey shall be in complimentary locations to the Construction Drawings.

B. Notice of Sources: Within 10 days following award of Contract, the Contractor shall notify the Architect of the sources of the materials required; they may be inspected and tested if desired by the Architect.

C. Topsoil Testing: The Contractor shall take samples of the topsoil and have tests made to determine the appropriate proportions of supplements necessary for properly conditioned material (such as "Quick Test" to determine if lime should be used). Methods used shall be as approved by the Association of Agricultural Chemists or the State Agricultural Experiment Station. Preparation work necessary to bring the topsoil into proper condition to receive seeding shall be made in accordance with said tests at no additional cost to the Owner. Copies of said tests and recommendations are to be submitted to the Architect for approval prior to starting the Work of this Section.

D. Fertilizer Application: The following shall apply to all of the work included in this specification section;

"Under New York State Law", phosphorus-containing fertilizer may only be applied to lawn or non-agricultural turf when:

- A soil test indicates that additional phosphorus is needed for growth of that lawn or non-agricultural turf; or

- The fertilizer is used for newly established lawn or non-agricultural turf during the first growing season."

Application Restrictions (all fertilizers)

New York State – no application between December 1 and April 1.
Nassau County – no application between November 15 and April 1.
Suffolk County – no application between November 1 and April 1.

E. Seeds: Packages of seed shall bear official State or Federal stamps and certificates indicating the type, quality, and content of the seed packages. Deliver packages unopened.

1.04 VERIFYING CONDITIONS

A. The Contractor shall examine all drawings which may affect the work of this section or require coordination by same.

B. Before starting any work, examine existing conditions and thoroughly check all drawings, specifications, adjoining or underlying conditions in which the work of this section is to be performed, and all dimensions.

C. Report in writing to the Architect any and all conditions which may interfere with or otherwise affect work of this section.

D. Seeding operations shall be conducted under favorable conditions during the next season or seasons which are normal for such work as determined by accepted practice in the locality of the Project.

1.05 PROTECTION OF WORK

A. Landscaped areas shall be protected by the Contractor against traffic damage, erosion, or other use by erecting barricades or temporary fencing immediately after seeding is completed and by placing warning signs of a type approved by the Architect on various areas. These barricades, or temporary fencing, and signs shall be maintained until the lawns are well established.

B. The Contractor shall maintain all seeded areas without additional payment until the expiration of the maintenance period. Any areas that fail to show a uniform stand of grass will be reseeded and re-fertilized at the Contractor's expense, until an acceptable stand of grass is established.

C. Upon final acceptance of the work specified herein, the Contractor shall remove all barricades or temporary fences.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Topsoil: Stockpiled topsoil may be used, provided it meets the requirements of these specifications. Additional topsoil from certified off-site sources shall be used, provided it meets the requirements of these specifications. Topsoil for lawn and planting operations shall be fertile, friable, natural loam containing a liberal amount of humus. It shall be free of admixtures and subsoil and shall be reasonably free of noxious weed, seed, lumps, plants, or their roots, and completely free of stones, sticks, and other extraneous matter, and shall not be used for planting operations while in a frozen or muddy condition. After spreading to a uniform depth of 6" minimum, all topsoil shall be raked to remove all extraneous matter. Raked topsoil shall conform to the mechanical analysis specified below and shall be free of stones, lumps, plants or their roots, sticks and similar debris, or any other undesirable material. Topsoil shall not be used in a muddy or frozen condition.

1. All topsoil to be furnished shall be subject to the approval of the Architect. Furnish a certified analysis, made by a recognized authority, of any topsoil that may have to be furnished to complete the work of this section. Test reports shall match the format listed below.

2. Topsoil shall have an acidity range of pH 5.0 to 7.0 and shall contain not less than 6 percent organic matter as determined by loss on ignition of moisture-free samples dried at 100 degrees centigrade. The mechanical analysis of the soil shall be as follows:

Passing	Retained On	Percentage
1" screen		100%
1" screen	¼" screen (gravel)	Not more than 3%
¼" screen	No. 100 USS mesh sieve (sand)	40%-60%
#100 USS	(Very fine sand, silt & clay)	40%-60%

3. Topsoil in which more than 60 percent of the material passing the USS No. 100 mesh sieve consists of clay as determined by the Pouyoucous hydrometer or by the decantation method, shall not be used. All percentages are to be based on dry weight samples. The chemical and mechanical analysis shall state the above items in correct quantities.

4. The Architect reserves the right to take samples of the topsoil from time to time, whether delivered to or stored at the site. These samples will be analyzed for comparison with the Specifications. Should tests show that topsoil does not comply with the Specifications, the material may be rejected or such other remedy made as approved by the Architect in the form of the addition of humus or other supplemental materials.

5. The topsoil mixture materials shall be thoroughly mixed by hand or by rotary mixer to the satisfaction of the Architect.

B. Sand: Sand shall be ASTM C-33 concrete sand. The sand shall have a fineness modulus of 2.5-3.2 and a coefficient of uniformity of less than 4.

C. Ground Limestone: Ground Limestone (calcium carbonate) shall have the following analysis: at least fifty (50) percent shall pass a 200 mesh sieve; at least ninety (90) percent shall pass a 100 mesh sieve; and one hundred (100) percent shall pass a 10 mesh sieve. Total carbonate shall not be less than eighty-five (85) percent for purposes of calculation, total carbonate shall be considered as calcium carbonate.

D. Organic Fertilizer: Organic fertilizer shall be used for surface application after grass has germinated. Organic activated fertilizer shall contain the following percentage by weight: 5% minimum of nitrogen, 45% phosphoric acid, and other nutritious basic elements.

E. Chemical Fertilizer: Commercial fertilizer shall be used for initial preparation and shall conform to the applicable state fertilizer laws. Commercial fertilizer shall be a complete fertilizer and shall be an organic based product suitable for the establishment of the turf and grass species described herein and/or as noted on the Contract Plans. Examples of acceptable products and Suppliers/Manufacturers are: *PRO-GRO* by *North Country Organics* of Bradford VT., Ph. (802) 222-9661; *LAWN BOOSTER* by *Organica Inc*. of Norristown PA., Ph. 1-888-24GREEN, or locally at (631) 544-0348.

1. Application rate, sequence, and methods shall be as recommended by the manufacturer based on soil conditions of the areas of installation as tested by the Contractor, and on the intended grass stand character (i.e. turf area). The Contractor shall coordinate the review of the recommendations between the Architect, the Manufacturer, and the Contractor's Installer. Commercial fertilizer application shall be properly coordinated with the application of any other soil amendments that may be necessary.

F. Humus / Compost: Humus shall be of native type and consist of reed peat or sedge peat, but not peat moss, and of such physical condition that it can be readily incorporated with topsoil. It shall be free from sticks, stones, weedy roots, glass or toxic substances or other foreign matter. When delivered from stock piles, humus shall contain between 35 percent and 50 percent moisture. Use only natural domestic humus suitable for soil mulch and of such composition as to furnish ample water holding capacity and retention of plant food. Humus shall be dark brown to black in color, granulated, free of weed seed and lumps and show analysis as follows:

1. 25 percent - 45 percent moisture by weight as delivered from stockpile.
2. 5.0 - 7.5 pH (acidity).
3. Minimum 300 percent water absorbing ability (oven dried at 100 C.).
4. 85 percent minimum organic matter on dry basis (samples dried at 65 C.).
5. Low in content of wood material, suphur, iron, or other heavy metals.
6. Ash, on dry basis: not more than 10 percent.
7. Soluable salts less than 4.0.
8. Solvita Maturity number between 6 and 8.
9. Carbon / Nitrogen ratio - greater than 30:1.
10. Particle size shall pass a ¼" screen.
11. Low phosphorous and nitrogen content.

Humus shall be obtained from fresh water site, conditioned in storage piles after excavation for at least 6 months, including one freezing, thawing period.

Certification and Testing: The Contractor shall submit a certificate of materials regarding the composition of the compost from a certified Seal of Testing Assurance Program, Compost Testing Program Laboratory. The test shall be for the actual material to be used on the project, from the stock piles. Stock piles of this material shall be visited by the Landscape Architect, with all expenses paid for by the Contractor.

One such laboratory is located on Long Island:

SOIL FOODWEB NEW YORK, INC.
555-7 Hallock Avenue
Port Jefferson Station, NY 11776
Phone: (631) 474-8848
Fax: (631) 474-8847
info@soilfoodwebnewyork.com

G. Mulch: Weyerhauser "Silva-Fiber", or equal, available from American Excelsior Corporation, Chicago, Illinois.

H. Erosion Control Blanket: Use "Ero-Mat, standard", as manufactured by Verdyol and distributed by Erosion Control Systems, Inc., Tuscaloosa, Alabama; (1-800-942-1986). Install with 11 gauge or heavier steel wire staples with 6 inch long legs and a 1 inch crown. Note: "Ero-Mat, High Velocity" for use on slopes greater than 3:1 and 60 ft. long; or in areas where a high velocity of water is expected - duration is 4-1/2 to 5 feet/second range (in swales).

I. Water for Turf Establishment: Water suitable for turf establishment will be available on-site to the Contractor as coordinated with the Owner. The Contractor shall provide all devices required for the distribution of water (provided by Owner) until turf is fully established. If an irrigation system has been installed or is already in place, this shall serve for distribution. The proper amount and frequency of watering will be the responsibility of the Contractor. In general terms, during dry weather, grassed areas shall be watered daily with sprinklers until grass is firmly rooted.

J. Grass Seed: The Contractor shall furnish and place all materials required for seeding in all topsoiled areas. The seed used shall be fresh, re-cleaned seed of the latest crop, mixed in the following proportions by weight, and meeting the following standards of pure live seed content. The tolerance for PLS (purity x germination) shall be those called official and tabulated on page 5, US Department of Agriculture Bulletin No. 480.

Grass seed mixes shall be as noted below. Submit mix percentages for approval. Percent pure live seed (PLS) shall be 95% minimum. Maximum percent weed seed shall be .50%. Germination shall be 85% or better.

All seed shall be delivered in the original packages, unopened, which shall include a guaranteed analysis by the vendor. The seeds shall be pre-mixed prior to delivery to the job site, or as otherwise directed by the Architect. The grass seed shall be of the latest crop, mixed in the following proportions by weight:

70% - Tall Fescue
20% - Turftype Ryegrass
10% - Kentucky Bluegrass

All seed shall exhibit minimum 98% Purity and minimum germination of 90%.

Unless specifically indicated otherwise above, the following varieties of turfgrasses shall include:

Tall Fescue: *Rebel, Falcon, Mustang, Jaguar, Houndog.*
Turftype Ryegrass: *Manhattan II, Prelude, Palmer, Omega, Regal*.
Kentucky Bluegrass: *Eclipse, Adelphi, Glade, Sydsport, Baron*.

The rate of seeding shall be as recommended by the supplier/manufacturer for the type of seeds used in the mix and the intended purpose of the planted area. The intent of the Restored Lawn Area seeding is to provide turf lawn to blend in with the areas adjacent to the disturbed area being planted. Supplier shall coordinate the final rate with the Architect, who shall have final authority for approval. Grass seed shall be sown in the fall from August 25 to October 1, or in the spring, between March 15 and May 1. Seeding shall be done in dry or moderately dry soil, and at times when the wind velocity does not exceed 5 mph.

Sowing of Seed: Immediately before any seed is to be sown, the ground shall be scarified as necessary and shall be raked until the surface is smooth, friable and of uniformly-fine texture. Lawn areas shall be seeded evenly with a mechanical spreader, at a rate of 10.0 pounds to 1,000 sq.ft. of ara, lightly raked, rolled with a 200 pound roller and watered with a fine spray. The method of seeding may be varied at the discretion of the Contractor to establish a smooth, uniform turf composed of the grasses specified. Re-seeding shall be done in accordance with this procedure.

Grass seed shall be sown in three different passes by approved machine in such a manner that a uniform stand will result. After seeding, the surface shall be evenly raked with a fine toothed rake and rolled with an approved roller, as directed by the Architect. Seeding by hydraulic means may be used if approval is obtained from the Architect.

K. Sod: Sod shall be provided where specified within the contract drawings and may be used as an alternative to seed to establish turf in the areas called out for seeding (at no additional cost to the Owner). The Contractor shall request the alternative if it is needed to complete the project in weather not conducive to turf establishment by seeding, or as specified on the drawings. The Architect shall approve the use of the alternative. All sod shall be grown and cut from a sand-based field. Approved sod is superior sod grown from high-quality seed of known origin. Seed is to be inspected by Certification Agency to assure satisfactory genetic identity and purity, overall high quality and free from noxious weeds at time of harvest.

1. The sod shall be of the highest quality, strongly rooted, free from noxious weeds and grubs, mowed to a height not to exceed 3” prior to lifting, cut in minimum 18" wide x 5' lengths (7-1/2 sq.ft.) to a depth of 1" minimum, or in rolls 4’ wide x 50’ long (200 sq.ft.) and shall be at least one year old. Measurement for thickness shall exclude top growth thatch. It shall be harvested from one field to ensure a uniform color and texture. Sod shall be machine cut. Standard sections of sod shall be strong enough to support their own weight and retain their size and shape when suspended vertically. Sod shall not be harvested or transplanted when moisture content may adversely affect its survival.

2. The mixture of grass seed from which the sod was grown shall consist of approximately the following mixture of permanent grasses: 70% Tall Fescue, 20% Turftype Ryegrass, 10% Kentucky Bluegrass - or - 50% shade tolerant Kentucky Blue Grass - 20% Manhattan II Rye Grass - 30% Pennlawn Fine Fescue (blend as selected by the Architect). All sod shall be inspected prior to delivery.

3. Sod shall be harvested, delivered and transplanted within a period of 36 hours. Before cutting, sod shall be mowed uniformly at a height of 1-1/2 inches.

4. Strength of Sod Sections: Standard size sections of sod shall be strong enough to support their own weight and retain their size and shape when suspended vertically from a firm grasp on the upper 10% of the section.

5. Moisture Content: Sod shall not be harvested or transplanted when moisture content (excessively dry or wet) may adversely affect its survival.

6. Thatch: Sod shall be relatively free of thatch up top ¼ inch allowable (uncompressed).

7. Diseases, Nematodes and Insects: Sod shall be reasonably free of diseases, nematodes and soil-borne insects.

8. Weeds: Sod shall be free of objectionable grassy and broad leaf weeds. Sod shall be considered free of such weeds if less than two (2) such plants are found per 200 s.f. of area. Sod will not be acceptable if it contains any of the following weeds: common Bermuda grass (wire-grass), quackgrass, johnsongrass, poison ivy, nutsedge, niblewill, Canada thistle, bindweed, bentgrass, wild garlic, ground ivy, perennial sorrel and bromegrass.

9. Architect/Engineer may inspect the sod before it is harvested, but reserves the right to reject, on or after delivery, any sod which in his opinion does not meet with the specification requirements.

L. Rootzone Mix Ratio: The rootzone mix shall utilize all existing topsoil stockpiled and shall incorporate an additional 3” of sand and 1” of compost at no additional cost to contract.

M. Topdressing: The entire portion of the field not being repaired for low spot filling shall receive a full ½” of topdressing using organic matter which shall be a mature, stable compost with an organic matter content of 6-8% and be free of glass or toxic substances. This material is available from *Agresource*, called *Agresoil Compost*, and is made from bio solids, not leaf mold. Contact number: 1-800-313-3320.

N. Overseeding: Overseeding shall be accomplished by a drill seeder in three different passes using the following seed mixture:

Percent	Turfgrass Species / Variety	Min. Purity %	Germ. %
70%	Tall Fescue	98%	90%
20%	Turftype Ryegrass	98%	90%
10%	Kentucky Bluegrass	98%	90%

Acceptable varieties of each turfgrass shall include:

Tall Fescue: *Rebel, Falcon, Mustang, Jaguar, Houndog*.
Turftype Ryegrass: *Manhattan II, Prelude, Palmer, Omega and Regal*.
Kentucky Bluegrass: *Eclipse, Adelphi, Glade, Sydsport and Baron.*

Rate of seeding shall be 10 lbs. per 1,000 sq.ft. pf pure live seed (pls.).

PART 3 – EXECUTION

3.01 STRIPPING TOPSOIL

A. All topsoil shall be stripped as described and stockpiled for reuse. No topsoil is to be removed from the site.

3.02 GRADING AND SUBGRADE PREPARATION

A. Perform grading operations to bring subgrade to levels required and to contour indicated on the drawings.

B. Completed subgrade shall be approved by the Architect/Engineer before topsoil and sodding.

C. The approved subgrade shall be scarified to a depth of 2 inches to permit mixing with rootzone material.

D. Where work involved is not in an area designated for regarding, the existing grade shall be rototilled to a depth of 8 inches. The area shall then be leveled and stones raked out.

3.03 ROOTZONE / SEED BED PREPARATION

A. Seasonal and Weather Limitations – All operations including seedbed preparation shall be performed only when the soil is in proper condition to permit satisfactory work. Continuation of work at other than specified times or conditions shall proceed only with consent of the Architect/Engineer.

B. Leveling – Any undulations or irregularities in the surface resulting from tillage or any other causes shall be leveled prior to placing sod. Flooded, washed out or otherwise damaged areas shall be reconstructed and all grades reestablished in conformance with the drawings and specifications.

C. Before any soil is placed, the subgrade shall be graded to a smooth, uniform surface, parallel to and below finished grade. The subgrade surface shall be compacted with an approved roller weighing approximately five hundred (500) pounds, then scarified to a depth of 3” for proper mix of rootzone material. Hollows, depressions and gullies shall be filled with acceptable material free from stones over two inches (2”) in diameter, cinders, rubbish and other unsuitable material.

D. **New rootzone shall be decompacted to a depth of 12”** prior to seeding or sodding utilizing a ‘BLEC’ Ground Breaker Machine, VertiDrain or equal; on 10” centers, using 5/8” wide slits, **12” deep** to provide compaction relief. Rototilling the fields is specifically excluded.

E. Cleanup – Prior to placing sod, the surface shall be cleared of all trash, debris and stones larger than two inch (2”) diameter, and of all roots, brush, wire, grade stakes and other objects that could be a hindrance to maintenance operations and use.

F. Commercial Fertilizer:

1. Fertilizer for Rootzone Mix: Commercial fertilizer (14-28-15) shall have the following composition by weight: Nitrogen 14%; Phosphorous 28%; Potash 14%; as manufactured by Jonathan Green “New Seeding Lawn Fertilizer”.

2. Fertilizer for Post Seeding/Sodding: 50% slow release commercial fertilizer (28-3-5) shall have the following composition by weight: Nitrogen 28%; Phosphorous 3%; Potash 5%. The guaranteed analysis shall have a minimum 50% of the total nitrogen as a “slow-release” type.

    a. Contractor shall at the direction and discretion of the Architect/Engineer furnished a certified report of an approved analytical chemist, showing the analysis of representative

samples of the commercial fertilizer which he proposes to use. All samples are to be taken by the Architect/Engineer, and delivered to the laboratory; the price bid shall include inspection and laboratory charges. No commercial fertilizer shall be delivered until the approval of samples by the Architect/Engineer, but such approval does not constitute final acceptance. The Architect/Engineer reserves the right to reject on or after delivery any material which does not, in his opinion, meet these specifications.

b. Apply new seeding lawn fertilizer at the full rate recommended by the manufacturer for new lawns, using a mechanical spreader, not by hand; Fertilizer shall then be worked lightly into the top 3" of the rootzone material.

c. Apply 50% slow-release type fertilizer as soon as sod has been installed. The first application shall be made at ½ the manufacturer's recommended rate for new lawns. A second application shall be made at ½ the manufacturer's rate for new lawns six (6) weeks after the first application of same.

G. Topsoil Placement and Finish Grading:

1. Topsoil shall be spread on the previously prepared subgrade or surface of select granular fill, scarified to permit proper bonding with the topsoil. The topsoil shall be placed on all specified areas within the Limit Lines shown on the drawings, all areas disturbed by the work of this contract, and as directed by the Architect.

2. Topsoil shall be raked, properly set and compacted to establish uniform lawn/grass growth, and otherwise manipulated to form, after settlement, smooth draining grades as shown on the drawings. The depth of the topsoil for lawn areas after compaction shall be six inches.

3. The Contractor shall provide, at his own expense, protection for all topsoil areas against trespassing and damage at all times. Damaged areas shall be treated or replaced as directed by Owner's Representative.

H. Install irrigation system components for initial turf establishment only in accordance with the system manufacturer's instructions, as noted on the Contract Drawings, and as required by local jurisdictional regulations, to provide a fully operational system. In all cases, minimize the disturbance of previously placed materials and repair any damaged sections.

I. If a temporary irrigation system is indicated within the Contract Drawings, it's installation shall be properly coordinated by the Contractor so as not to affect the seeding process. Temporary systems shall remain until required stand of grass and percentage germination has been established and maintained for a minimum of two (2) weeks from initial germination.

3.04 SEEDING OPERATIONS:

A. General:

1. Furnish all materials required for seeding lawn areas in topsoiled areas.

2. Prior to seeding operations, all areas to be seeded shall be thoroughly disked or otherwise loosened to a depth of 4 inches and shall be carefully raked to true lines free from all unsightly variations, bumps, ridges or depressions, brought to finished grade elevations as shown on the drawings. All sticks, stones, roots or other objectionable material which might interfere with the formation of a finely pulverized seed bed shall be removed from the soil. Two pounds of 15-20-10 formula commercial fertilizer per cu.yd. shall be thoroughly mixed with the topsoil or not less than 10 lbs. per 1,000 sq.ft. of lawn surface, whichever is the greater.

3. Seeding:

a. Purpose: To provide permanent vegetative cover and to control storm water run-off and erosion.

b. Where Applicable: All areas not covered by buildings and pavement within the limit lines as shown on the contract plans, and all other existing lawn areas disturbed or damaged by the work of this contract.

4. All areas to be seeded in lawn shall be thoroughly disked or otherwise loosened to a depth of four (4) inches and shall be raked to true lines, free from all unsightly variations, bumps, ridges or depressions. As specified, all sticks, stones, roots or other objectionable material that might interfere with the formation of a finely pulverized seed bed shall be removed from the soil. Ground limestone, humus and commercial fertilizer shall be applied as specified:

5. Apply ground limestone uniformly at a minimum rate of 100 pounds per 2,000 square feet, or as determined by analysis. The ground limestone shall be distributed evenly, by machine, over all areas to be seeded. It shall be worked lightly into the top three (3) inches of the soil, at least five (5) days before applying fertilizer.

6. Apply fertilizer uniformly at a minimum rate of 10 pounds per 1,000 square feet. Fertilizer to be 10-10-10. Apply humus at the rate of 3-1/3 cubic yards per 1,000 square feet. Note: Application rate, sequence, and methods shall be as recommended by the manufacturer based on soil conditions of the areas of installation as tested by the Contractor, and on the intended grass stand character (i.e. turf area). The Contractor shall coordinate the review of the recommendations between the Architect, the Manufacturer, and the Contractor’s Installer. Commercial fertilizer application shall be properly coordinated with the application of any other soil amendments that may be necessary.

7. Work lime, fertilizer and humus into soil to a minimum depth of 3 inches using any suitable equipment.

8. The soil shall then be raked to a smooth, even draining surface and properly set and compacted to establish uniform lawn/grass growth with an approved roller or as otherwise directed by the Architect. Manipulate to form, after settlement, smooth draining grades as shown on the drawings. Any depressions which occur shall be re-graded and re-rolled until a satisfactory grade is obtained.

9. Time of Seeding: Grass seed shall be sown preferably in the fall between August 15th and October 1st or in the spring between April 1st and May 15th, or at such other times as are approved by Owner's Representative. All seeding is to be done in dry, or moderately dry soil and at times when the wind does not exceed a velocity of five miles per hour.

10. Seed shall be sown at the rate as recommended by the supplier/manufacturer for the type of seeds used in the mix and the intended purpose of the planted area. The intent of the Restored Lawn Area seeding is to provide turf lawn to blend in with the areas adjacent to the disturbed area being planted. Supplier shall coordinate the final rate with the Architect, who shall have final authority for approval. Grass seed shall be sown in the fall from August to October, or in the spring, between March and May. Seeding shall be done in dry or moderately dry soil, and at times when the wind velocity does not exceed 5 mph. Grass seed shall be sown by approved machine in such a manner that a uniform stand will result. After seeding, the surface shall be evenly raked with a fine toothed rake and rolled with an approved roller, as directed by the Architect. Seeding by hydraulic means may be used if approval is obtained from the Architect.

B. Hydroseeding Option: The Contractor may utilize a hydroseeding option, as indicated above. If hydroseeding shall be supplied as a zero-cost option to the Owner, the Contractor shall supply the name, address and contact information of his hydroseeding subcontractor to the Architect for contact and discussion. The hydroseed blend to be submitted by the Contractor shall be equal and

comparable to the standard seed blend(s) indicated within this specification section for the intended turf establishment. The blend shall be submitted to the Architect in advance as a part of the shop drawings submittal process.

3.05 MULCHING:

A. All seeded areas shall be covered with approved mulch not later than 3 days following seeding. Ground surfaces shall be completely covered at the rate of at least 2 tons an acre. The Contractor shall utilize a Bowie Hydromulcher or equal to apply all mulch.

B. All areas to receive permanent seeding shall be mulched as described in the specifications and as noted herein.

C. On slopes 4 horizontal to 1 vertical, or greater, and in drainage swales, mulch shall be anchored using erosion control blanket or other approved netting properly fastened in place. Install rolls in proper direction with overlap and staple pattern set in accordance with the manufacturer's requirements.

D. In any event, the Contractor is responsible for mulch remaining intact until grass has germinated and has reached a minimum height of one inch.

3.06 SODDING:

A. The Contractor shall furnish and place all materials required for sod in all topsoiled areas. The sod may be installed at any time between August 15th and June 1st when the ground is not frozen. Sod shall be placed only when weather and soil conditions are suitable for proper knitting and development of sod. Sod shall not be placed on a muddy rootzone or during periods of extreme heat. No sod shall be installed without approval of the Architect. All areas to receive sod shall be thoroughly disked or otherwise loosened to a depth of 4 inches and shall be raked to true lines free from all unsightly variations, bumps, ridges, or depressions. All sticks, stones, roots or other objectionable material which might interfere with the formation of a finely pulverized seed bed shall be removed from the soil.

B. The sod shall be placed on a minimum of 4" of properly compacted topsoil. The sub grade of topsoil shall be graded so that after the sod is placed, the finished grade shall meet existing grades specified by the Architect. The soil shall be raked to a smooth, even-draining surface, and compacted with an approved roller as directed by the Architect/Engineer. Any depressions which occur shall be re-graded and re-rolled until a satisfactory grade is obtained.

C. Before the sod is placed, an application of super-phosphate shall be applied to the sub-grade topsoil at the rate of 20 pounds per 1,000 square feet and raked into a depth of 1 inch.

D. Starter Strip; The first row of sod should, if possible, be laid in a straight line with subsequent rows placed parallel and tightly against one another. Lateral joints shall be staggered to promote a more uniform growth and strength. Care shall be exercised to ensure that the sod is not stretched or overlapped and that all joints are butted tight in order to prevent voids which would permit air drying of the roots. The sod shall be placed in 18" x 5' lengths and rolled with at least a 200-pound roller; as the sod is completed in any one section, the entire area shall be rolled. After rolling, the finished grade shall conform evenly to the grades on the plan or according to given grades by the Architect. The sod shall then be thoroughly watered to a depth sufficient that the underside of the new sod pad and soil immediately below are thoroughly wet.

E. Watering During Installation: During periods of high temperature, the sod shall be lightly watered to prevent wilting during the progress of the work; as sod is completed in any one section, the entire section shall be thoroughly irrigated to a depth of 5 inches or more. In general, the sod shall be thoroughly watered until the root system has become sufficiently knit, at which time the Contractor

will be relieved of his responsibility for maintenance and watering. Watering apparatus shall then be removed by the Contractor.

F. Joint Dressing: As soon as practical following the initial watering, but in every case prior to the second watering, the entire area shall be examined for open joints or other signs of surface imperfections. Any open joint or other voids shall be carefully filled with sand to prevent air drying of the roots and to eliminate undulations in the surface.

G. The first mowing shall not be attempted until the sod is firmly rooted and secure in place. Not more than 40% of the grass leaf shall be removed by mowing. Grass height shall be maintained between 1-1/2" and 2-1/2" until final acceptance and completion of the whole work under this contract. Any unsatisfactory sod shall be removed and replaced at the Contractor's expense.

3.07 RECONDITIONED LAWNS

A. Recondition existing lawn areas damaged by the Contractor’s operations, including storage of materials or equipment and movement of vehicles. Also, recondition lawn areas where settlement or washouts occur or where minor regrading is required.

1. Recondition other existing lawn areas.

B. Remove sod and vegetation from diseased or unsatisfactory lawn areas; do not bury into soil. Remove topsoil containing foreign materials resulting from the Contractor’s operations, including oil drippings, fuel spills, stone, gravel and other construction materials, and replace with new topsoil.

C. Where substantial lawn remains, mow de-thatch, core aerate and rake. Remove weeds before seeding. Where weeds are extensive, apply selective herbicides as required. DO not use pre-emergent herbicides.

D. Remove waste and foreign materials, including weeds, soil cores, grass, vegetation and turf, and legally dispose of it off the Owner’s property.

E. Till stripped, bare and compacted areas thoroughly to a depth of 6 inches.

F. Apply required soil amendments and initial fertilizers and mix thoroughly into top 4 inches of soil. Provide new planting soil as required to fill low spots and meet new finish grades.

G. Apply seed and protect with straw mulch as required for new lawns.

H. Water newly-planted areas and keep uniformly moist until new grass is established.

3.08 WATERING

A. The Contractor shall be responsible for the proper watering for all sodded areas until Substantial Completion of the work as hereinafter specified. The proper amount and frequency of watering will be the sole responsibility of the Contractor.

B. In the absence of adequate rainfall, watering shall be performed daily during the first week, and shall be sufficient to maintain moist soils to a depth of at least 5 inches. Water should be applied immediately if at any time the sod shows indications of wilting.

C. Subsequent Watering: Sod shall be watered as required to maintain adequate moisture in the upper 5 inches of soil. In the absence of rainfall, sod shall be watered at frequencies dictated by need.

3.09 CLEAN-UP

A. Soil, manure, peat or similar material which has been brought onto paved areas by hauling operations or otherwise shall be removed promptly, keeping these areas clean. Upon completion of the planting, excess stones and debris, which has not been previously cleaned up, shall be removed from the site or disposed of as required by the Architect, except topsoil shall be spread or piled on the site as directed by the Architect. Lawns and planting areas shall be prepared for final approval.

3.10 MAINTENANCE, REPLACEMENT, GUARANTEE AND FINAL INSPECTION:

A. Maintenance operations shall begin immediately after the seed is sown/sod installed and shall be continued as required until Substantial Completion. Grass shall be kept in healthy growing condition by mowing, watering, weeding, cultivating, disposal of waste vegetation, fertilizing, spraying or spreading of approved materials to prevent or treat infestations of insects or disease and all other operations required to produce and maintain a strong, vigorous and healthy stand of grass. Lawn areas shall be mowed to a height of 2 inches whenever the average height of grass is over 3 inches. When the amount of cut grass is heavy, it shall be removed to prevent the destruction of the underlying turf.

B. Seeded or sodded areas that are determined to be dead within warranty period, or in the opinion of the Architect, in an unhealthy, unsightly, or badly impaired condition, shall be replaced by the Contractor as soon as reasonably possible after the unsatisfactory condition has been evident. No replacement shall be made in any season definitely unfavorable for seeding or sodding. Such replacements shall be made in the same manner as specified for the original seeding or sodding.

C. Seeded Lawns: Seeded lawns shall be protected and maintained by watering, mowing and replacing for 60 days or as long as may be necessary to produce a uniform stand of grass. After grass is up, it shall be top-dressed with organic lawn fertilizer. Maintenance shall continue until a uniform turf is established. For the purpose of establishing an acceptable standard, scattered bare spots, none of which is larger than one square foot, will be allowed up to a maximum of 3 percent of the lawn area. Areas not meeting this requirement will be reseeded.

D. Sodded Lawns: Sodded lawns shall be protected and maintained for 30 days or as long as necessary for the roots to be firmly established.

E. Surface Application of Fertilizer: Spread a second application of organic lawn fertilizer at the end of the maintenance period for both seeded and sodded lawns. Spreading rate shall be as recommended by the manufacturer.

    1. Sodded Areas: Use 18-5-9 or 12-4-8.
    2. Seeded Areas: Use 18-5-9 or 24-6-8.

        a. The second application of fertilizer shall be witnessed by the Owner or his representative, and a signed document shall be submitted to the Architect certifying the Work has been performed. The document shall be signed by the installer and the Owner's or Architect's witness.

F. Provide labor and equipment for maintenance, including the necessary watering and mowing equipment to meet the requirements herein established.

    1. The Owner will furnish the water used to maintain the lawns as specified.

G. Turf must have had a minimum of three (3) mowings before a request for acceptance can be considered.

H. Initial inspection of the seed or sod work to determine Substantial Completion of the work will be made by the Architect upon written notice requesting such inspection submitted by the Contractor at least 10 days prior to the anticipated date of inspection. Request may be made subsequent to the third mowing of the turf.

I. Acceptance: After inspection, the Contractor will be notified in writing by the Architect/Engineer of Substantial Completion of all work, or, if there are any deficiencies, of the requirements for completion of the work. Work remaining to be done or redone will be subject to re-inspection before Substantial Completion is given.

J. All seeded and sodded areas shall be guaranteed for a period of one full year / one complete growing season, commencing with the date of Substantial Completion.

K. Upon Substantial Completion, the Owner will assume general responsibility for maintenance of the lawn areas. The Contractor shall, however, make monthly visits to the site during the guarantee period to advise the Owner of proper maintenance procedures. No additional payment shall be made for visits. Price bid for the work of this trade shall include costs of visits.

L. Failure of the Contractor to notify the Architect/Engineer, in writing, of inadequate maintenance by the Owner of the lawn areas installed under this contract shall constitute acceptance of the Owner's maintenance operations by the Contractor. The Contractor shall not, therefore, use the Owner's alleged lack of proper maintenance as a basis for voiding his responsibilities under the guarantee herein specified.

M. At the expiration of the guarantee period, upon written request of the Contractor, inspection for Final Acceptance will be made by the Architect/Engineer. All remedial work to turf areas by the Contractor shall be completed prior to the request for Final Acceptance.

3.11 GUARANTEE / REPLACEMENT

A. The Contractor guarantees, by acceptance of the Contract that all work installed will be free from any and all defects in workmanship and/or materials and that all apparatus will develop capacities and characteristics specified. If, during the period of one (1) year, or as otherwise specified, from date of the certificate of completion and acceptance of the work, should any defects in workmanship, material or performance appear, he will, without cost to the Owner remedy such defects within a reasonable time to be specified in writing by the Architect. In default thereof, the Owner may have such work done and charge cost to the Contractor.

B. The Contractor shall provide the Architect a written guarantee covering fully the one (1) year guarantee period. Lawns shall be warranted for the minimum duration of one full year, to include one full growing season after seeding and sodding, and shall be alive and in satisfactory growth at the end of the warranty period. The growing season is defined as beginning May 1 and ending October 1.

C. At the expiration of the guarantee period, upon written request by the Contractor, inspection for Final Inspection will be made by the Architect. All remedial work to seeding by the Contractor shall be completed prior to the request for final inspection. If lawns do not show a healthy, uniform stand of grass, those areas shall be re-seeded or re-sodded as soon as conditions permit, but during the spring or fall seeding periods.

D. Owner's Responsibility: If an area of seeding or sodding during the warranty and replacement period is found to be damaged or destroyed due to vandalism, malicious mischief, vehicle ruts and tracks, or acts of God such as flooding, storm debris, etc., then the Owner shall have the responsibility of replacing those lawn areas without cost or responsibility to the Contractor.

END OF SECTION