PROJECT MANUAL

PRE-BID SITE VISIT SCHEDULED

ON SEPTEMBER 10, 2026
SEE ADVERTISEMENT FOR BIDS INSIDE

PROJECT NO. 47477-H

HVAC WORK

RENOVATE ARMORY
STATE ARMORY
2 QUINCY PLACE
YONKERS, NY

JULY 20, 2026

KATHY HOCHUL
Governor

JEANETTE M. MOY
Commissioner

NEW YORK STATE | Office of General Services

PROJECT NO. 47477-H

HVAC WORK

RENOVATE ARMORY
STATE ARMORY
2 QUINCY PLACE
YONKERS, NY

JULY 20, 2026

CLIENT: DIVISION OF MILITARY AND NAVAL AFFAIRS

PROJECT TEAM LEADER: KEVIN RENAGHAN, RA, LEED AP, PMP

PREPARED BY
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PREPARED FOR
State of New York
Office of General Services
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Affix Seal	Affix Seal	Affix Seal
		
09/30/2026		
Registration Expiration Date	Registration Expiration Date	Registration Expiration Date

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B. The drawings for related contracts are listed on the Title Sheet for reference only. Examine the drawings for related contracts to ascertain the relationship of the Work to the related contracts.

END OF LIST

ADVERTISEMENT FOR BIDS

Sealed bids for Project Nos. 47477-C, 47477-H, 47477-P and 47477-E, comprising separate contracts for Construction Work, HVAC Work, Plumbing Work, and Electrical Work, Renovate Armory, State Armory, 2 Quincy Place, Yonkers (Westchester County), NY, will be received by the Office of General Services (OGS), Design & Construction Group (D&C), Division of Contract Management, 35th Fl., Corning Tower, Empire State Plaza, Albany, NY 12242, on behalf of the Division of Military and Naval Affairs, until 2:00 p.m. on Wednesday, September 23, 2026, when they will be publicly opened and read. Each bid must be prepared and submitted in accordance with the Instructions to Bidders and must be accompanied by a bid security (i.e. certified check, bank check, or bid bond in the amount of $270,900 for C, $80,600 for H, $53,400 for P, and $81,600 for E).

All successful bidders will be required to furnish a Performance Bond and a Labor and Material Bond pursuant to Sections 136 and 137 of the State Finance Law, each for 100% of the amount of the Contract estimated to be between $10,000,000 and $15,000,000 for C, between $2,000,000 and $3,000,000 for H, between $1,000,000 and $2,000,000 for P, and between $2,000,000 and $3,000,000 for E.

Pursuant to State Finance Law §§139-j and 139-k, this solicitation includes and imposes certain restrictions on communications between OGS D&C and a bidder during the procurement process. A bidder is restricted from making contacts from the earliest posting on the OGS website, in a newspaper of general circulation, or in the Contract Reporter, of written notice, advertisement or solicitation of offers, through final award and approval of the contract by OGS D&C and the Office of the State Comptroller ("Restricted Period") to other than designated staff, unless it is a contact that is included among certain statutory exceptions set forth in State Finance Law §139-j(3)(a). Designated staff are Megan Whaley, Catherine Skaczkowski, Jessica Hoffman, and Pierre Alric in the Division of Contract Management, telephone (518) 474-0203, fax (518) 473-7862. For inquires related specifically to Minority and Women-Owned Business Enterprises (MWBE) and to Service-Disabled Veteran Owned Businesses (SDVOB) provisions of this procurement, the designated contact is Tryphina Ramsey, telephone (518) 486-9284 or email **OGS.sm.MWBE@ogs.ny.gov**. OGS D&C employees are also required to obtain certain information when contacted during the restricted period and to make a determination of the responsibility of the bidder pursuant to these two statutes. Certain findings of non-responsibility can result in rejection for contract award and in the event of two findings within a four-year period, the bidder is debarred from obtaining governmental Procurement Contracts. Bidders responding to this Advertisement must familiarize themselves with the State Finance Law requirements and will be expected to affirm that they understand and agree to comply on the bid form. Further information about these requirements can be found within the project manual or at: **https://ogs.ny.gov/ACPL/**

Pursuant to Public Buildings Law § 8(6), effective January 11, 2020, for any projects where the project design commenced on or after January 1, 2020 and for any contracts over $5,000 for the work of construction, reconstruction, alteration, repair, or improvement of any State building, a responsible and reliable NYS-certified Minority or Women-Owned Business Enterprise that submits a bid within ten percent of the lowest bid will be deemed the apparent low bidder provided that the bid is $1,737,918 or less, adjusted annually for inflation as of March 1, 2026. If more than one responsible and reliable MWBE firm meets these requirements, the MWBE firm with the lowest bid will be deemed the apparent low bidder.

___Project commenced design before January 1, 2020. Not subject to provision.
XX Project commenced design on or after January 1, 2020. Subject to provision.

The substantial completion date for this project is 631 days after the Agreement is approved by the Comptroller.

As a condition of award, within five (5) days of receipt of the proposed Contract Agreement from the State, the apparent low bidder shall return the Contract Agreement to the State, properly executed, along with the Bonds if required by said Agreement. Low bidders who cannot meet these provisions may be subject to disqualification and forfeiture of the bid security.

The only time prospective bidders will be allowed to visit the job site to take field measurements and examine existing conditions of the project area will be at 10:00 a.m. on September 10, 2026, at State Armory, 2 Quincy Place, Yonkers, NY. Prospective bidders are urged, but not mandated, to visit the site at this time. Prospective bidders or their representatives attending the pre-bid site visit will not be admitted on facility grounds without proper photo identification. Note that parking restrictions and security provisions will apply, and all vehicles will be subject to search. Refer to Document 002218 for any additional requirements for attendance at the pre-bid site visit.

Phone the office of Allison Krebs-Fogel, (914-941-1122) a minimum of 24 hours in advance of the date to provide the names of those who will attend the pre-bid site visit. Only contractors that schedule a visit at least 24 hours in advance will be allowed to participate in the pre-bid site visit.

Pursuant to New York State Executive Law Article 15-A and the rules and regulations promulgated thereunder, OGS is required to promote opportunities for the maximum feasible participation of New York State-certified Minority and Women-owned Business Enterprises ("MWBEs") and the employment of minority group members and women in the performance of OGS contracts. All bidders are expected to cooperate in implementing this policy. OGS hereby establishes an overall goal of 30% for MWBE participation, 15% for Minority-Owned Business Enterprises ("MBE") participation and 15% for Women-Owned Business Enterprises ("WBE") participation (based on the current availability of qualified MBEs and WBEs). The total contract goal can be obtained by utilizing any combination of MBE and /or WBE participation for subcontracting and supplies acquired under this Contract. Trades with 0% goals are encouraged to make "good faith efforts" to promote and assist in the participation of MWBEs on the Contract for the provision of services and materials.

Article 3 of the Veteran's Services Law provides for more meaningful participation in public procurement by certified Service-Disabled Veteran-Owned Businesses ("SDVOBs"). Bidders are expected to consider SDVOBs in the fulfillment of the requirements of the Contract. Such participation may be as subcontractors or suppliers, as protégés, or in other partnering or supporting roles. OGS hereby establishes overall goals for SDVOBs' participation under this contract as follows: 6% for the C trade contractor, 3% for the E trade contractor, 3% for the H trade contractor, and 3% for the P trade contractor, based on the current availability of qualified SDVOBs. Trades with 0% goals are encouraged to make "good faith efforts" to promote and assist in the participation of SDVOBs on the Contract for the provision of services and materials.

The Office of General Services reserves the right to reject any or all bids.

Downloading Bidding and Contract Documents for this project, along with the submission of Bidder Questions and Electronic Bidding are available through OGS Design & Construction's electronic bidding service, Bid Express at the following link: **http://www.bidexpress.com**

For questions about registration or Bid Express technical issues, e-mail **support@bidexpress.com**, or call Bid Express support (888) 352-2439.

For all other questions, email **DCPlans@ogs.ny.gov**, or call (518) 474-0203.

For additional information on this project, use the link below and then click on the project number:

https://online.ogs.ny.gov/dnc/contractorConsultant/esb/ESBPlansAvailableIndex.asp.

OGS Design & Construction Group
END OF INFORMATION

DOCUMENT 002113

INSTRUCTIONS TO BIDDERS

1. EXAMINATION OF DOCUMENTS

1.1. Carefully examine and be familiar with the Bidding and Contract Documents.

1.2. Examine information concerning subsurface or other latent physical conditions. It is presented in good faith but is not intended as a substitute for personal investigation, interpretations, or judgment of the Contractor.

2. VISIT TO THE SITE

2.1. For projects that include Document 002218, visit the Site of the Work prior to submitting your bid. Refer to the Advertisement for Bids for any special instructions.

2.2. Become familiar with restrictions and regulations established by the facility. Existing restrictions and regulations will not be considered as grounds for any additional cost over the Contract sum.

2.3. Assume the risk of encountering any subsurface or other latent physical condition that can be reasonably anticipated on the basis of documentary information provided by the State and from inspection and examination of the Site.

2.4. Interpretations of contract documents by facility personnel are not binding.

3. DESIGNATED, PERMISSIBLE, IMPERMISSIBLE CONTACTS AND QUESTIONS

3.1. The designated contacts during the restricted period for this procurement will be:

- Megan Whaley, Contract Awards Unit, telephone – (518) 474-0203, fax – (518) 473-7862
- Catherine Skaczkowski, Contract Awards Unit, telephone – (518) 474-0203, fax – (518) 473-7862
- Jessica Hoffman, Assistant Director, Contract Management, telephone – (518) 474-0203
- Pierre Alric, Director, Contract Management, telephone – (518) 474-0201
- For inquires related specifically to Minority and Women-Owned Business Enterprises (MWBE) and to Service-Disabled Veteran Owned Businesses (SDVOB) provisions of this procurement, the designated contact is Tryphina Ramsey, telephone (518) 486-9284 or email **OGS.sm.MWBE@ogs.ny.gov**.

3.2. State Finance Law §139-j recognizes a series of permissible contacts that can go to other than the designated contacts, as follows:

3.2.1. The submission of written proposals in response to a request for proposals, invitation for bids or any other method for soliciting a response from offerers intending to result in a procurement contract.

3.2.2. The submission of written questions to a designated contact set forth in a request for proposals, or invitation for bids, or any other method for soliciting a response from offerers intending to result in a procurement contract, when all written questions and responses are to be disseminated to all offerers who have expressed an interest in the request for proposals, or invitation for bids, or any other method for soliciting a response from offerers intending to result in a procurement contract.

3.2.3. Participation in a conference provided for in a request for proposals, invitation for bids, or any other method for soliciting a response from offerers intending to result in the procurement contract.

3.2.4. Complaints by an offerer regarding the failure of the person or persons designated by the procuring governmental entity pursuant to this section to respond in a timely manner to authorized offerer contacts made in writing to the office of general counsel of the procuring governmental entity, provided that any such written complaints shall become a part of the procurement record.

3.2.5. Offerers who have been tentatively awarded a contract and are engaged in communication with a governmental entity solely for the purpose of negotiating the terms of the procurement contract after being notified of tentative award.

3.2.6. Contacts between designated governmental staff of the procuring governmental entity and an offerer to request the review of a procurement contract award.

3.2.7. Contacts by offerers in protests, appeals or other review proceedings (including the apparent successful bidder or proposer and his or her representatives) before the governmental entity conducting the procurement seeking a final administrative determination, or in a subsequent judicial proceeding.

3.2.8. Complaints of alleged improper conduct in a governmental procurement to the attorney general, inspector general, district attorney, or court of competent jurisdiction.

3.2.9. Written protests, appeals, or complaints to the New York State Office of the State Comptroller (OSC) during the process of contract approval, where OSC's approval is required by law, and where such communications and any response thereto are made in writing and shall be entered in the procurement record pursuant to §163 of the State Finance Law.

3.2.10. Complaints of alleged improper conduct in a governmental procurement conducted by a municipal agency or local legislative body to OSC's office.

3.2.11. Permissible Contacts are only with the procuring agency unless specifically excepted.

3.3. Impermissible contacts include those that a reasonable person would infer are intended to influence a governmental procurement and occur during the restricted period of a governmental procurement between the offerer and any member, officer or employee of any governmental entity; provided, however, that nothing in this section shall be deemed to prohibit an offerer from communicating with a member of the state legislature or legislative staff about a governmental procurement. Contacting a person or entity other than the designated contact person during the restricted period, when such contact does not fall within one of the exemptions, is also an impermissible contact.

Direct all questions regarding the intent or meaning of the drawings or specifications to the Office of General Services (OGS) through OGS Design & Construction's Electronic Document and Bidding service, Bid Express®. Registration along with downloading and electronic bidding can be accessed at the following website: **http://www.bidexpress.com.**

Click on "User Login" and enter your username and password or "Sign Up" if you do not have an account. After logging in, select "Solicitations" then enter the project number or the name of the project. Scroll down to the "Q & A" section and select "Ask a Question".

All responses to appropriate pre-bid inquiries will be communicated via the OGS website and Bid Express. Those inquiries resulting in clarification and or changes to the bid documents will be communicated by Addenda to all persons who have obtained drawings and specifications.

3.4. Pre-bid inquiries answered by means other than Addenda will not be binding.

4. PREPARATION OF BIDS

4.1. **For electronic bids**: Prepare and submit bid using Bid Express®.

4.1.1. Prepare each bid on the official form furnished by the State within the Bid Express® website. Fill in all blank spaces. An incomplete entry may disqualify the bid in its entirety. No post bid meetings will be afforded to any bidder to explain or clarify an incomplete bid or entry omission(s).

4.1.2. Bidders must be registered with Bid Express® in advance. Bidders not previously registered with Bid Express® must complete a one-time registration for a user account. There is no cost to register, to view/download bid documents, or to submit a bid. Vendors can select 'Pay per solicitation (non-member)' when registering.

4.1.3. Bid Security is required in accordance with the BID SECURITY INFORMATION section within this document. Bidders must be registered with a Bid Express® approved bonding service in advance. Bidders

not already registered must register with a Bid Express® approved bonding service, and shall refer to the instructions contained in the BID SECURITY INFORMATION section within this document.

4.1.4. Bidders must establish an Infotech® Digital ID in advance. The Infotech® Digital ID application process may take up to seven business days to complete. Refer to http://www.bidexpress.com for guidance on the application for and installation of Digital IDs. The Digital ID is an electronic tool that allows users to digitally sign bids, contracts, and forms. Digital IDs are used as part of a secure method of maintaining confidentiality and identity verification within the Bid Express® service.

4.2. **For paper bids**: Prepare each bid on the official form furnished by the State.

4.2.1. Make no erasures, cross-outs, whiteouts, write-overs, obliterations, or changes of any kind in the Bid Form phraseology, in the entry of unit prices, or anywhere on the Bid Form.

4.2.2. Fill in all blank spaces legibly. An illegible entry may disqualify the bid in its entirety. If a mistake is made, use a new Bid Form. No post bid meetings will be afforded to any bidder to explain or clarify illegible or changed entries.

4.2.3. Sign the Bid Form in the space provided. An officer or a principal of a corporation or a partnership signing for the bidder shall print or type the legal name of the person, partnership, or corporation on the line provided and place his/her signature after "SIGN BID HERE". The same procedure shall apply to the bid of joint venture by two or more firms, except that the signature and title of an officer or a principal of each member firm of the joint venture shall be required. All signatures must be original. Mechanically reproduced signatures, stamps, or copies are not acceptable. Submitted Bid Forms that do not conform to these requirements will be disqualified.

4.3. For paper or electronic bids, if the Project Manual contains Section 012300 - Alternates, indicate the amounts to be added to or deducted from the base bid in the spaces provided on the Bid Form. If the Work is to be performed at no change in cost, indicate "0". Any bid which fails to indicate an amount for each alternate will be held to be informal and may be rejected.

4.4. For paper or electronic bids, note in the space designated on the Bid Form, each Addenda by numbers, which have been issued.

4.4.1. For paper bids: If no Addenda have been issued, insert the word "NONE" in the space designated on the Bid Form.

4.5. For paper or electronic bids, all contractors submitting bids on public work projects are required to register with the New York State Department of Labor (NYSDOL) under Labor Law Section 220-i. The registration number must be entered in the space provided on the Bid Form. A complete and accurate registration number must be entered in the space provided on the Bid Form. Failure to possess an active and verifiable registration at the time of bid will result in disqualification of the bid.

4.6. All bidders must complete a form DCA-3 – ***Offerer Disclosure of Prior Non-Responsibility Determinations*** and submit it with their Bid.

4.6.1. For electronic bids: Complete and submit form DCA-3 within the Bid Express® website. Fill in all blank spaces.

4.6.2. For paper bids: Complete paper form DCA-3 and include it with the Bid Form. Fill in all blank spaces.

4.7. All bids, regardless of dollar value, must include the cost of Labor and Material and Performance Bonds.

5. BID SECURITY INFORMATION

5.1. Bid security is required as a guarantee that the bidder will enter into the Contract and furnish a satisfactory Performance Bond and Labor and Material Bond within the time specified on the Bid Form. Submit bid security in the amount indicated in the Advertisement for Bids in one of the following forms:

5.1.1. Certified check or bank check drawn upon a legally incorporated bank or trust company (payable to the Office of General Services).

5.1.2. Bid Bond on OGS Form 004313 to be issued by a Surety licensed in the State of New York.

5.1.2.1. **For electronic bids**: Electronic bid bond furnished by a Bid Express® approved bonding service is required for an Electronic Bid. Vendors must be registered with a Bid Express® approved bonding service. Refer to http://www.bidexpress.com for guidance and registration information. Vendors not already registered must complete a one-time registration with a Bid Express® approved bonding service. At the time of this publication, the Bid Express® approved bonding services are Tinubu at https://www.tinubu.com, or Surety2000 at https://surety2000.com. Allow sufficient time for account registration and bond processing prior to the bid due date noted in the Advertisement for Bids.

5.1.2.2. **For paper bids:** Sign the bid bond in the space provided. An officer or a principal of a corporation or a partnership signing for the bidder shall print or type the legal name of the person, partnership, or corporation on the line provided and place his/her signature above "Principal". The same procedure shall apply to the bid security of a joint venture by two or more firms, except that the signature and title of an officer or a principal of each member firm of the joint venture shall be required. The same procedure shall apply to the signature for the Attorney-in-Fact. All signatures must be original. Electronic, mechanically-reproduced or stamped signatures, or copies, are not acceptable for either signature. Submitted Bid Security that does not conform to these requirements will be disqualified

5.2. Upon submission of a certified check or bank check, the bid security of the successful bidder will be returned (check issued by OSC) pending acceptance of the required bonds and the execution of Contract. The second low bidder's bid security will be returned after the successful bidder executes the Contract or with the submission of an approved Substitute Bid Bond on the Design and Construction form. The bid security of all other bidders with a bid security in the form of checks will be returned as soon as possible after the apparent low bidder has been determined.

5.3. Bid Bonds submitted as bid security will not be automatically returned to the bidder. Firms requesting to have bonds returned may do so in writing provided they are not the first or second low bidder prior to award. Only those requests made in writing, directed to the Contract Awards Unit, shall be considered for return.

6. SUBMISSION OF BID

6.1. Do not submit both electronic and paper bids. If both an electronic bid from Bid Express® and a paper bid are received from the same contractor, the electronic bid from Bid Express® will prevail, and the paper bid(s) will be disqualified.

6.2. Submit Bid Form, Bid Security and Form DCA-3 – ***Offerer Disclosure of Prior Non-Responsibility Determinations.***

6.2.1. **For electronic bids**: Complete and submit within Bid Express®.

6.2.1.1. Within Bid Express®, select the procurement from the 'Solicitations' tab and click 'Select For Bidding'. Fill in all blank spaces.

6.2.1.2. In accordance with the BID SECURITY INFORMATION section contained within this document, coordinate with a Surety Agent to obtain a Bond ID from one of the Bid Express® approved bonding services. Refer to the instructions in the BID SECURITY INFORMATION section of this document. Complete the Bid Bond information section within Bid Express® and click 'Verify Bid Bond'. Failure to submit a valid Bond ID from an approved electronic bonding service for a bond of the specified value may result in automatic bid disqualification.

6.2.1.3. Click 'Check Bid' and resolve any errors. Click 'Submit Bid'. Sign the electronic bid form using a Bid Express® approved digital ID by clicking 'Submit Bid'.

6.2.2. **For paper bids:** Provide bid in a sealed envelope addressed to:

NYS Office of General Services – Design & Construction Group
Division of Contract Management, Contract Awards Unit
35th Floor, Corning Tower
Albany, NY 12242

Exterior of sealed envelope shall include the words "SEALED BID ENCLOSED", Project Number and Trade Designation of Bid, Bid Due Date, Company Name, Address and Federal ID Number.

6.2.3. Telephone, email, fax, or electronic bids other than electronic bids submitted within Bid Express® will not be accepted.

6.3. All bids must be received before the time specified, and at the place designated for the receipt of bids.

6.4. **Late Bids**:

6.4.1. Electronic bids cannot be accepted after the due date and time.

6.4.2. Paper bids received after the due date and time will be returned unopened with notification of the reason for its refusal.

6.4.3. A late paper bid will be considered if: (1) its arrival at the place designated after the time specified can be shown by documentary or other proofs to be due to mishandling by OGS and (2) that absent such mishandling, the bid would have arrived timely. Delays in the mail or any other means of transmittal, including couriers or agents of the State, other than employees of OGS will not suffice to excuse late arrival of the bid.

7. MODIFICATION OF BID

7.1. Bid Modifications By Amendment:

7.1.1. **For Modification to Electronic Bids:** Electronic bids may be modified on Bid Express® up to the deadline for receipt of bids. To modify your bid, access your bid in Bid Express®, modify applicable component(s), select Submit Bid to update the bid. Refer to the Submission Status to confirm the Last Submitted date and time. Only the submitted bid will be considered.

7.1.2. **For Modification to Paper Bids:** Modifications by amendment will only be considered on condition that the amendment arrives before the time specified and at the place designated for receipt of bids, and

7.1.2.1. The amendment is in writing and executed by a principal of the bidder firm, and

7.1.2.2. The bid, as amended, conforms in all respects with the Contract Documents. Bidders may mail or fax their bid modifications. Fax bid modifications to (518) 473-7862. Bidders may use a bid modification to acknowledge addenda and/or change the bid amount. Bid modifications received by fax must be on company letterhead and signed by a principal of the bidder firm. DO NOT use the OGS Bid Form to submit bid modifications by fax. Indicate any amounts to be added to or deducted from any part of the bid amount with the words "ADD" or "DEDUCT" next to the amount. The only amounts listed on a faxed bid modification should be the amounts to be added or deducted. **DO NOT expose the new bid amount on the faxed bid modification.** If the bid amount is shown on the faxed bid modification, or otherwise exposed at any time before the bid opening, the bid will be disqualified.

8. WITHDRAWAL OF BID

8.1. A bid may be withdrawn at any time prior to the time specified for receipt of bids.

8.1.1. For electronic bids, bidders can withdraw their bids on Bid Express® up to the time specified for receipt of bids.

8.1.2. For paper bids, should a bidder decide to withdraw its bid before the bid opening, the request must be prepared on company letterhead, signed by a principal of the bidder firm, and faxed to (518) 473-7862, or hand-delivered or mailed to the Contract Awards Unit at the place designated for receipt of bids. OGS will

e-mail an acknowledgment of the withdrawal request that includes an indication that the unopened bid will be returned. Should the withdrawal request be in error, the bidder must call the Contract Awards Unit at (518) 474-0203 immediately. The unopened bid will be returned by mail to the bidder.

8.2. Not more than 7 calendar days after the bid opening or a scheduled pre-award meeting, whichever comes later, a low bidder may request the withdrawal of its bid based on a mistake. The request must be submitted via certified or registered mail to the address in Paragraph 6.2.2 of these Instructions to Bidders. The Contracting Officer may conduct or have conducted on his/her behalf a fact-finding proceeding to develop information concerning the request for withdrawal. A request for withdrawal of a bid made after the specified number of days allowed shall result in forfeiture of the bid security.

8.3. Following a timely request for withdrawal of a bid, the bid security will be returned if the bidder establishes by credible evidence, including original documents when requested, the following:

8.3.1. An error, clerical as opposed to judgmental in nature and verifiable by written evidence, occurred in the computation of the bid,

8.3.2. The error constitutes either an unintentional and substantial computational error or an unintentional omission of a substantial quantity of labor and/or material from the final bid computation,

8.3.3. The absence of gross negligence in the preparation of the bid. For the purposes of this subparagraph, gross negligence may include:

i) the apparent failure of a bidder to account for two or more categories (divisions) of work,

ii) the use of multiple erroneous quotations from subcontractors or suppliers,

iii) submission to the Contracting Officer of a bid withdrawal request within the preceding six (6) months.

8.4. If the bidder fails to meet its burden of proof, the request to withdraw without penalty shall be denied and its bid security will be forfeited and become the property of the State. The decision of the Contracting Officer shall be final and conclusive.

8.5. Once a request to withdraw is made, the bidder is ineligible for award. The Contracting Officer shall continue to progress the award process considering only the remaining bids.

9. DISQUALIFICATION

9.1. Any bid which fails to conform to the requirements of the Bidding and Contract Documents may be rejected.

9.2. The Commissioner may waive any informality or afford the bidder an opportunity to remedy any deficiency resulting from a minor informality or irregularity.

9.3. The State reserves the right to disqualify bidders, before or after bid opening, upon evidence of collusion with third parties or other illegal practices upon the part of the bidder.

9.4. Bidders may review the list of common Bid Informalities and Bid Disqualifications at:

https://online.ogs.ny.gov/dnc/contractorConsultant/esb/informalitylist.asp

10. GOVERNING LAWS AND REGULATIONS ADMINISTERED BY OTHER DEPARTMENTS

10.1. **Taxes**: All taxes pertaining to the Work must be paid. Address inquiries regarding taxes to the Tax Collecting Agency. For information regarding sales and use taxes contact the Sales Tax Bureau, Department of Taxation and Finance.

10.2. While all applicable laws, rules and regulations of the State of New York are incorporated by reference in this Contract, take special note of the provisions of the Labor Law and Industrial Code Rule 23 relative to the safety of workers and of persons lawfully occupying or using the premises. Address inquiries regarding labor law provisions to the New York State Department of Labor.

10.3. **Anti-Discrimination Clause**: Discrimination against any employee or applicant for employment because of race, creed, color, national origin, sex, age, disability, or marital status is prohibited.

11. OPENING OF BIDS

Bids will be opened as announced in the Advertisement for Bids.

12. DETERMINATION OF CONTRACTOR'S RESPONSIBILITY

12.1. The State Public Buildings Law requires that contracts for public work in the State of New York be awarded to the lowest responsible and reliable bidders as will best promote the public interest.

12.2. Each apparent low bidder, and each proposed subcontractor (for subcontract work of $100,000 or more) will be required to submit form CCA-2 - ***New York State Vendor Responsibility Questionnaire For Profit Construction*** prior to contract award or subcontractor approval. OGS reserves the right to request CCA-2 forms from proposed subcontractors for work of less than $100,000 if it is determined to be in the best interest of the State. Submission of these forms will assist the State in determining the responsibility and reliability of the vendor.

OGS recommends that vendors file the required CCA-2 form online via the New York State VendRep System. Use of this system requires that the vendor have a New York State Vendor Identification Number (Vendor ID). Please note that the Vendor ID is not the Taxpayer ID number.

If bidders do not already have a Vendor ID, they are encouraged to obtain one ***in advance of*** the bid opening.

To obtain a Vendor ID, contact the OSC Help Desk at 866-370-4672 or 518-408-4672, or by e-mail at ITServiceDesk@osc.state.ny.us.

To enroll in and use the VendRep System, see the **VendRep System** page at:

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

If you already have a User ID and password, go directly to the VendRep System online at:

https://www.osc.state.ny.us/state-vendors/vendrep/file-your-vendor-responsibility-questionnaire

For direct VendRep System user assistance, contact the OSC Help Desk; the help desk phone numbers and e-mail address are shown above.

Vendors opting to file a paper questionnaire can obtain the appropriate questionnaire from the VendRep website at **http://www.osc.state.ny.us/vendrep/forms_vendor.htm** or may telephone the OSC Help Desk.

12.3. After the bids are opened, the apparent low bidder shall complete and file the CCA-2 within 5 days. Vendors using the online system may certify (or recertify) and file the CCA-2 electronically via the VendRep System: **https://www.osc.state.ny.us/state-vendors/vendrep/file-your-vendor-responsibility-questionnaire**

12.4. It is recommended that all bidders become familiar in advance with all of the requirements of the CCA-2. As mentioned in 12.2, bidders who do not have a Vendor ID are encouraged to obtain one in advance of the bid opening.

12.5. All bidders must submit a completed form DCA-3 - ***Offerer Disclosure of Prior Non-Responsibility Determinations*** along with their Bid Form.

12.6. The determination of responsibility will include a review to ensure the Contractor has not knowingly and willfully violated the provisions of the Procurement Lobby Law or New York State Finance Law §139-j and §139-k.

12.7. New York State Finance Law §139-k (2) obligates a Governmental Entity to obtain specific information regarding prior non-responsibility determinations. This information must be collected in addition to the information that is separately obtained pursuant to State Finance Law §163(9). In accordance with State Finance Law §139-k, a Contractor must be asked to disclose whether there has been a finding of non-responsibility made within the previous four (4) years by any Governmental Entity due to: (a) a violation of State Finance Law §139-j or (b) the intentional provision of false or incomplete information to a Governmental Entity.

12.8. As part of its responsibility determination, State Finance Law §139-k(3) mandates consideration of whether a Contractor fails to timely disclose accurate or complete information regarding the above non-responsibility

determination. In accordance with law, no procurement contract shall be awarded to any Contractor that fails to timely disclose accurate or complete information under this section, unless a finding is made that the award of the Procurement Contract to the Offerer is necessary to protect public property or public health safety, and that the Offerer is the only source capable of supplying the required Article of Procurement within the necessary time frame.

13. AWARD OF CONTRACT

13.1. The Contract may be awarded to the lowest responsible and reliable bidder as will best promote the public interest.

13.2. If alternates are included in the bidding documents, the State reserves the right to accept or reject any or all alternates. The State shall determine the lowest bid by adding to or deducting, from the Base Bid Amount of the bidders, the additive or deductive alternates, if any, that the State elects to accept after the opening of the bids. Alternates will be accepted in the order they are set forth in the contract documents.

13.3. The State reserves the right to reject any or all bids, and advertise for new bids, if in its opinion the best interest of the State will thereby be promoted. In the event that all bids are rejected, each bidder will be so notified.

13.4. A bidder may withdraw its bid if no award is made within forty-five (45) days after the receipt of bids. A written notice must be submitted via certified or registered mail to the address in Paragraph 6.2.2 of these Instructions to Bidders prior to approval of the contract by OSC. The notice must clearly state that the withdrawal is based on the fact that the contract was not awarded within 45 days after the receipt of bids.

13.5. Pursuant to Public Buildings Law § 8(6), effective January 11, 2020, for any projects where the project design commenced on or after January 1, 2020 and for any contracts over $5,000 for the work of construction, reconstruction, alteration, repair, or improvement of any State building, a responsible and reliable NYS-certified Minority or Women-Owned Business Enterprise ("MWBE") that submits a bid within ten percent of the lowest bid will be deemed the apparent low bidder provided that the MWBE bid is $1,737,918 or less, adjusted annually for inflation as of March 1, 2026. If more than one responsible or reliable NYS-certified MWBE firm meets these requirements, the MWBE firm with the lowest bid will be deemed the apparent low bidder. Refer to the Advertisement for Bids for applicability of projects subject to this criteria.

14. MINORITY- AND WOMEN-OWNED BUSINESS ENTERPRISES

14.1. Pursuant to New York State Executive Law Article 15-A and the rules and regulations promulgated thereunder, OGS is required to promote opportunities for the maximum feasible participation of NYS-certified Minority- and Women-owned Business Enterprises and the employment of minority group members and women in the performance of OGS contracts.

14.2. Information on the availability of subcontractors and suppliers for this project may be accessed by first using the following website link:

https://online.ogs.ny.gov/dnc/contractorConsultant/esb/esbplansavailableindex.asp

From this web page, first click on the project number link, then on Interested Subcontractors and Suppliers, and follow the prompts. A list of all interested vendors will be provided with their contact information, MWBE and SDVOB status', and construction specialties.

14.3. Other information on MWBEs, including a directory of MWBE's, is available from:

NYS Empire State Development
Minority and Women's Business Development Division
30 South Pearl Street
Albany, NY 12245
Telephone: (518) 292-5252
Website: https://esd.ny.gov/doing-business-ny/mwbe

15. SURETY BOND

If required, the Contractor shall furnish Performance and Payment Bonds in an amount equal to one hundred percent (100%) of the total Contract price as security for the faithful performance of this Contract, and for the payment of all persons performing labor or furnishing materials in connection with this contract. These bonds are to be executed on the State Comptroller's form and the surety company must be licensed in the State of New York, have a Best Rating of A- or better and appear on the most recent published Department of the Treasury's Listing of Approved Sureties (Department Circular *570*) at the time of filing the bonds.

16. VENDOR PROTEST POLICY

It is the policy of OGS to provide all vendors, prospective bidders, bidders, suppliers and contractors with an opportunity to resolve complaints or inquiries related to bid solicitations, contract awards, or other associated contract award actions. OGS encourages vendors to seek resolution of complaints related to bid solicitations, contract awards, or other associated actions through consultation with the agency designated contact(s). All such complaints will be given impartial and timely consideration. Vendors may also file formal written protests. A copy of the Design and Construction Vendor Protest Policy and Procedures may be obtained by contacting the designated contact or by visiting the OGS website at:

https://ogs.ny.gov/design-construction/vendor-protest-policy-procedures

17. POLICY ON TIED BIDS

A tie-bid is defined as an instance where bids are received from two or more bidders who are the apparent low responsive and reliable bidders with identical offers, or who are MWBEs with identical offers with bids of $1,737,918 or less and whose bids are within ten percent of the lowest bid. A tie-bid does not exist when an apparent low bidder has an identical offer to an MWBE, as the MWBE is deemed the apparent low bidder pursuant to Public Buildings Law § 8(6). It is the policy of OGS to settle the outcome of tie-bids by either drawing a name from a hat or flipping a coin within 24 hours of the bid opening. All affected firms will be notified of the tie and the time and place of the resolution of the tie, and shall be invited to witness the outcome. Attendance is not mandatory. The drawing/flip will be held at OGS, Contract Awards Unit, 35th Floor, Corning Tower, Albany, New York. Two impartial witnesses will be provided and shall be present. All attendees will acknowledge the results of the tie-breaker on the bid tabulation sheet. All firms affected by the tied bids will be notified of the results. The results pursuant to this provision shall be considered final.

18. WORKERS' COMPENSATION INSURANCE AND DISABILITY BENEFITS REQUIREMENTS

Workers' Compensation Law (WCL) §57 & §220 requires the heads of all municipal and state entities to ensure that businesses applying for permits, licenses or contracts provide proof that they have appropriate workers' compensation and disability benefits insurance coverage. These requirements apply to both original contracts and renewals, whether the governmental agency is having the work done or is simply issuing the permit, license or contract. Failure to provide proof of such coverage or a legal exemption will result in a rejection of the vendor's bid or renewal.

18.1. **Proof of Compliance with Workers' Compensation Coverage Requirements**: In order to provide proof of compliance with the requirements of the Workers' Compensation Law pertaining to workers' compensation coverage, a contractor shall: (1) obtain such coverage from an insurance carrier; or (2) be a Workers' Compensation Board-approved self-insured employer or participate in an authorized self-insurance plan; or (3) be legally exempt from obtaining Workers' Compensation insurance coverage.

An ACORD 25 form is **NOT** acceptable as proof of workers' compensation coverage.

A Contractor seeking to enter into a contract with the State of New York **MUST** provide **ONE** of the following forms to OGS upon request, prior to award:

18.1.1. CE-200, ***Certificate of Attestation of Exemption from NYS Workers' Compensation and/or Disability Benefits Coverage,*** which is available on the Workers' Compensation Board's website, www.wcb.ny.gov, under the heading "Forms"; **OR**

18.1.2. C-105.2 – ***Certificate of Workers' Compensation Insurance*** (the contractor's insurance carrier will send this form to OGS upon request); contractors insured through the New York State Insurance Fund should use their version of the form, the U-26.3; **OR**

18.1.3. SI-12 – ***Certificate of Workers Compensation Self-Insurance*** (the contractor should call the Workers' Compensation Board's Self-Insurance Office at 518 402-0247), **OR** GSI-105.2 – ***Certificate of Participation in Workers' Compensation Group Self-Insurance*** (the contractor's Group Self-Insurance Administrator will send this form to OGS upon request).

18.2. Proof of Compliance with Disability Benefits Coverage Requirements: In order to provide proof of compliance with the requirements of the Workers' Compensation Law pertaining to disability benefits, a contractor shall: (1) obtain such coverage from an insurance carrier; or (2) be a Board-approved self-insured employer; or (3) be legally exempt from obtaining disability benefits coverage.

An ACORD 25 form is NOT acceptable as proof of disability benefits coverage.

A Contractor seeking to enter into a contract with the State of New York **MUST** provide **ONE** of the following forms to OGS upon request, prior to award:

18.2.1. CE-200 – ***Certificate of Attestation of Exemption from NYS Workers' Compensation and/or Disability Benefits Coverage,*** which is available on the Workers' Compensation Board's website**,** **www.wcb.ny.gov**, under the heading "Forms"; **OR**

18.2.2. DB-120.1 – ***Certificate of Disability Benefits Insurance*** (the contractor's insurance agent, broker or carrier will send this form to OGS upon request); **OR**

18.2.3. DB-155 – ***Certificate of Disability Benefits Self Insurance*** (the contractor should call the Workers' Compensation Board's Self-Insurance Office at 518 402-0247).

18.3. All of the above-referenced forms, except the CE-200, SI-12 and DB-155, must show the following as the Entity Requesting Proof of Coverage (entity being listed as the Certificate Holder):

NYS Office of General Services – Design & Construction Group
Division of Contract Management
35th Floor, Corning Tower, GNARESP
Albany, NY 12242

19. ELECTRONIC CONTRACTOR PAYMENTS (ECP)

The ECP Program is initiated with an Electronic Contractor Payments (ECP) Certification Form that is forwarded to the contractor with the project agreement and bond forms. This form must be completed, executed and returned with the executed Contract agreement in order for the contractor to participate in the ECP program. The executed ECP Certification Form will remain on file. Note that the certification will apply to this contract and to future ECP-eligible contracts.

19.1. Upon final approval of the contract, an e-mail will be sent to the contractor's designated e-mail address with a hyperlink that will enable the firm to register, using a temporary password, on the OGS Design & Construction Vendor Interface. The temporary password will be sent to the contractor in letter form that is mailed on the same day.

19.2. The OGS Vendor Interface website will provide the ability to view contract information, submit the detailed estimate and payments requests electronically, and communicate with OGS Design & Construction.

20. IRAN DIVESTMENT ACT

20.1 By submitting a bid in response to this solicitation or by assuming the responsibility of a Contract awarded hereunder, bidder/Contractor (or any assignee) certifies that it is not on the "Entities Determined To Be Non-Responsive bidders/Offerers Pursuant to The New York State Iran Divestment Act of 2012" list ("Prohibited Entities List") posted on the OGS website at

http://www.ogs.ny.gov/about/regs/docs/ListofEntities.pdf

and further certifies that it will not utilize on such Contract any subcontractor that is identified on the Prohibited Entities List. Additionally, bidder/Contractor is advised that should it seek to renew or extend a Contract awarded in response to the solicitation, it must provide the same certification at the time the Contract is renewed or extended.

20.2 During the term of the Contract, should OGS receive information that a person (as defined in State Finance Law §165-a) is in violation of the above-referenced certifications, OGS will review such information and offer the person an opportunity to respond. If the person fails to demonstrate that it has ceased its engagement in the investment activity which is in violation of the Act within 90 days after the determination of such violation, then OGS shall take such action as may be appropriate and provided for by law, rule, or contract, including, but not limited to, seeking compliance, recovering damages, or declaring the Contractor in default.

20.3 OGS reserves the right to reject any bid, request for assignment, renewal, or extension for an entity that appears on the Prohibited Entities List prior to the award, assignment, renewal or extension of a contract, and to pursue a responsibility review with respect to any entity that is awarded a contract and appears on the Prohibited Entities list after contract award.

21. NOT USED

END OF DOCUMENT

DOCUMENT 002213

SUPPLEMENTARY INSTRUCTIONS TO BIDDERS - MWBE-EEO

This Supplement modifies the Instructions to Bidders. Where any part of the Instructions to Bidders is modified by this supplement, the unaltered provisions of that part shall remain in effect.

Add the following:

22. GOALS

22.1 To ensure meaningful participation in the Project of certified Minority- and Women-Owned Business Enterprises ("MWBEs") under the Contract, the Commissioner of General Services has established goals set forth in the Supplementary Conditions.

22.2 All bidders should note that important definitions and conditions relating to the foregoing MWBE goals are contained in the Supplementary Conditions.

22.3 In order to assist the State in determining compliance with the goals set forth in the Supplementary Conditions the apparent low bidder will be required to submit an MWBE Utilization Plan via the New York State Contracting System (NYSCS) prior to Contract award or subcontractor approval.

22.4 If unable to submit an MWBE Utilization Plan through the NYSCS, the apparent low bidder must use Form BDC 328 to submit the plan. The BDC 328 form is available for download at https://ogs.ny.gov/mwbe/forms and may be mechanically reproduced. Additional copies may be obtained upon request from the address listed in Paragraph 23.2 below.

22.5 The apparent low bidder must submit the completed MWBE Utilization Plan within seven (7) calendar days after the bids are opened. OGS will review the submitted MWBE Utilization Plan and advise the bidder of OGS acceptance or issue a notice of deficiency within twenty (20) days of receipt.

23. CERTIFICATION

23.1 All Minority- and Women-Owned Business Enterprises ("MBEs" or "WBEs") proposed as contractors, subcontractors or suppliers must be certified by the NYS Empire State Development, Division of Minority and Women's Business Development to be eligible for MBE or WBE credit on this project.

23.2 UPON WRITTEN REQUEST, The New York State Office of General Services' Office of Business Diversity (OBD) will provide a computer printout of certified MBEs and WBEs in specific trades for a given geographical area of New York State.

This printout can be requested in writing as follows:

- By e-mail to: DCMWBEManager@ogs.ny.gov
- By fax to: (518) 486-2679

- By mail to:

  NYS Office of General Services
  Office of Business Diversity
  29th Floor, Corning Tower, GNARESP
  Albany, NY 12242

24. LIQUIDATED DAMAGES – MWBE PARTICIPATION

24.1 Refer to Article 27.8, Document 007307, Supplementary Conditions - MWBE-EEO, for "Liquidated Damages – MWBE Participation".

END OF DOCUMENT

DOCUMENT 002218

SUPPLEMENTARY INSTRUCTIONS TO BIDDERS - PRE-BID SITE VISIT

This Supplement modifies the Instructions to Bidders. Where any part of the Instructions to Bidders is modified by this supplement, the unaltered provisions of that part shall remain in effect.

2. VISIT TO THE SITE

Change 2.1 to Read:

2.1 Prospective bidders will be allowed to visit the job site to take field measurements and examine existing conditions of the project area only during the pre-bid site visit. Prospective bidders are urged to visit the site at this time. Prospective bidders or their representatives attending the pre-bid site visit will not be admitted on facility grounds without proper photo identification. Parking restrictions and security provisions will apply and vehicles will be subject to search. The date, time, location of the pre-bid site visit, and the phone number are included in the Advertisement for Bids.

Bidders are strongly encouraged to visit the project site to assess project conditions or quality standards.

Phone a minimum of 24 hours in advance of the pre-bid site visit with the names of those who will attend.

All participants shall comply with facility rules and regulations.

Participants will not be allowed to deviate from the group walk-thru and must stay with the group for the duration of the visit. All participants will adhere to the direction given by the Director's Representative at all times during the visit.

Individuals shall not attend the site visit if they are feeling ill.

END OF DOCUMENT

DOCUMENT 002219

SUPPLEMENTARY INSTRUCTIONS TO BIDDERS - QUALIFICATIONS OF BIDDERS AND MANDATORY PRE-AWARD SUBMITTAL REQUIREMENTS

This Supplement modifies the Instructions to Bidders. Where any part of the Instructions to Bidders is modified by this supplement, the unaltered provisions of that part shall remain in effect.

Add the following Articles:

25. QUALIFICATIONS OF BIDDERS

25.1 The Contracting Officer or their representative will schedule a pre-award meeting to consider the bid responsiveness of the bid submitted by the apparent low bidder within fourteen (14) calendar days of the bid opening. Bidders will be notified of the time and place of the meeting. On a case by case basis, the State will examine and evaluate the bid as responsive by considering the contractors understanding of: the overall project scope, estimated cost, utilization of proposed sub-contractors, expertise, workmanship and past performance in completing similar contracts.

25.2 The Contracting Officer or their respective representative will conduct an investigation to determine the responsibility of any Bidder, including the ability of any Bidder to perform the Work. Bidders shall furnish to the Officer all information and data requested, including complete financial data, within the time and in the form and manner requested. The Contracting Officer reserves the right to reject any bid if the evidence required by the Officer is not submitted as requested, or if the evidence submitted by or the investigation of any Bidder fails to satisfy the Contracting Officer that the Bidder is responsible, or is able and qualified to carry out the obligations of the Contract, or to complete the Work as indicated in the Contract Documents, or able to reasonably perform the Work for the Bid Amount.

25.3 The criteria contained in Executive Order No. 170.1 Uniform Guidelines for Determining the Responsibility of Bidders will be applied in the evaluation of Bidders. Special criteria that will be considered in establishing the responsibility of the Bidders shall include, but not be limited to established experience in performing the Work required by the Contract Documents. Experience will be viewed from comparable projects as well as experience and knowledge of construction by the firm's personnel.

26. MANDATORY PRE-AWARD SUBMITTAL REQUIREMENTS

26.1 The apparent low bidder must submit the required pre-award submittal package outlined below to the Regional Supervisor within seven (7) calendar days after the bids are opened.

Regional Supervisor Name: John Pupons
Address: Eleanor Roosevelt State Office Building
4 Burnett Blvd., Suite 309, Poughkeepsie, NY 12603
Phone: (845) 431-5976
Email: Region3preawardsubmittals@ogs.ny.gov

Submissions must be emailed and must include the Project Number of this contract in the Subject Line of the Pre-Award submission email (i.e. OGS PN 12345-C: Pre-Award Submission).

Pre-award Submittal Package:

1. References and Experience:
   a. List of all past contracts with OGS. Include OGS Project Number and date.
   b. Provide three (3) references (Name, Title, and Phone Number) associated with three (3) different projects (OGS, public, or private sector) of similar scope and size to the one identified in this contract. Additionally, include the names of two major suppliers used for each of these three (3) projects.

      Provide a copy of recent past experience as required under the filing of the NYS Vendor Responsibility Questionnaire (CCA-2 document) with the Office of the State Comptroller. Provide only Attachment A: Completed Construction Contracts and Attachment B: Uncompleted Construction Contracts. For additional information, see:

      http://www.osc.state.ny.us/vendrep/form_cca2.htm

2. Workforce and Work Plan – Provide a detailed written Work Plan which shall demonstrate the contractor's understanding of overall project scope and shall include, but not be limited, to the following:
   a. Sequential listing of specific project activities required to successfully complete the Work of the contract.
      1. Include Critical Milestones.
      2. Include phasing of the Work, if required.
      3. Include listing of long lead items.
      4. Impact of weather and restricted work period(s).
      5. Include a list of site-/project-specific safety hazards, and how such hazards will be considered in performance of the Work.
   b. Résumés for Contractor's proposed supervisory staff, including qualifications for specialized expertise or any certification(s) required to perform the Work.
   c. Schedule Preparer qualifications when required by specification 013200.
   d. Submittal Coordinator qualifications when required by specification 013300.
   e. Names of proposed major sub-contractors (more than 15% of the bid amount or where critical systems of work are identified in the contract) and a listing of the related trade of work and value.
   f. Any special coordination requirements with other trades.
   g. Any special storage and staging requirements for construction materials.

3. Detailed Cost Estimate:
   a. A copy of a Detailed Cost Estimate outlined in CSI format.

4. Provide information for any other special requirements at the request of the Director's Representative.

26.2 When requested by the Contracting Officer or their representative, Bidders shall, within the time specified by the Officer, submit to the Officer the names of the Subcontractors the Bidder proposes to use on the project. The Contracting Officer reserves the right to disapprove the use of any proposed Subcontractor. In such an event the Bidder shall submit the name of another Subcontractor in like manner within the time specified by the Officer. The Bidder shall have and will make no claim for compensation if the Contracting Officer disapproves any proposed Subcontractor. The Contracting Officer reserves the right to reject any bid if the names of proposed Subcontractors, or additional subcontract information, are not submitted as required.

END OF DOCUMENT

DOCUMENT 003113

REFERENCE SUMMARY PROJECT SCHEDULE

A Summary Project Schedule has been prepared for this project. Refer to SECTION – 011000.01 SUMMARY OF THE WORK for the required phasing or sequencing of the work as presented on the following pages. This Summary Project Schedule is meant to be used as reference in preparing a bid response for the Work Plan requirement of DOCUMENT 002219 - SUPPLEMENTARY INSTRUCTIONS TO BIDDERS - QUALIFICATIONS OF BIDDERS AND MANDATORY PRE-AWARD SUBMITTAL REQUIREMENTS. It is not intended that these examples limit the Contractor in any way in preparation of a bid response.

NOTE: All information presented in the Summary Project Schedule included in this Document are for reference only.

DOCUMENT 003126

EXISTING HAZARDOUS MATERIAL INFORMATION

1.01 ASBESTOS SURVEY REPORT

Samples listed in the report were collected at the Project Site and tested for Asbestos Containing Materials (ACM). The report was compiled for New York State Office of General Services, Design and Construction Group by an ELAP certified laboratory. In order to determine the Asbestos content, samples were analyzed by polarized light microscopy (PLM) and/or transmission electron microscopy (TEM). The report is intended for the State design and estimate purposes only and is included to provide bidders with that same information available to the State. The Bulk Samples are representative of Homogeneous Area (HA) and is defined as a suspect material of similar age, appearance, function and texture. All field information was organized in accordance with 40 CFR Part 763, Asbestos Hazard Emergency Response Act (AHERA). See the Hazardous Materials Survey Pre-Renovation For Asbestos, Lead-Based Paint and PCB in Caulk and the Renovation Survey For Asbestos-Containing Materials, Lead-Based Paint & PCBs reports included in the Appendix for type, condition, location and approximate quantity of ACM.

1.02 LEAD SURVEY REPORT

Samples listed in the report were collected at the Project Site and tested for Lead content. The report was compiled for New York State Office of General Services, Design and Construction Group by an ELAP certified laboratory. In order to determine the lead content the Atomic Absorption method or a XRF Analyzer was used. This report is intended for State design and estimate purposes only and is included to provide bidders with the same information available to the State. The samples are representative of like materials in the Work area. All lead containing materials may not have been sampled. See the Hazardous Materials Survey Pre-Renovation For Asbestos, Lead-Based Paint and PCB in Caulk and PCB in Caulk and the Renovation Survey For Asbestos-Containing Materials, Lead-Based Paint & PCBs reports included in the Appendix for details.

1.03 PCB SAMPLING REPORT

Samples listed in the report were collected at the Project Site and tested for PCBs. The report was compiled for New York State Office of General Services, Design and Construction Group by an ELAP certified laboratory. Bulk, wipe or air sampling was used in determining the PCB content. This report is intended for State design and estimate purposes only and is included to provide bidders with the same information available to the State. All PCB containing materials may not have been sampled. See the Hazardous Materials Survey Pre-Renovation For Asbestos, Lead-Based Paint and PCB in Caulk and PCB in Caulk and the Renovation Survey For Asbestos-Containing Materials, Lead-Based Paint & PCBs reports included in the Appendix for details.

END OF DOCUMENT

DOCUMENT 003132

GEOTECHNICAL DATA

The subsurface logs included in this Document were made on the dates indicated on the individual logs.

The observed water levels and/or conditions noted on the subsurface logs are as recorded at the time of exploration. These water levels and/or conditions may vary considerably with time, according to the prevailing climate, rainfall, or other factors and are otherwise dependent on the duration of and method used in the explorations program.

Sound engineering judgment was exercised in preparing the subsurface logs. This information was prepared and is intended for State design and estimate purposes only. Its presentation is for the purpose of providing intended users with access to the same information available to the State. These subsurface logs are presented in good faith and are not intended as a substitute for personal investigation, independent interpretations, or judgment of the bidders.

END OF SECTION

DETACH AND USE THIS FORM

BID FORM FOR: 47477-H

HVAC WORK
RENOVATE ARMORY
STATE ARMORY
2 QUINCY PLACE
YONKERS, NY

State of New York
Office of General Services
Design and Construction Group
Division of Contract Management
35th Floor, Corning Tower
The Gov. Nelson A. Rockefeller
Empire State Plaza
Albany, NY 12242

THIS IS A 4 PAGE BID FORM. ALL PAGES MUST BE COMPLETED.

THE STATE RESERVES THE RIGHT TO REJECT ANY OR ALL BIDS. EACH BID FORM SHALL BE ACCOMPANIED BY BID SECURITY (AS DESCRIBED IN THE INSTRUCTIONS TO BIDDERS) IN THE AMOUNT STATED IN THE ADVERTISEMENT FOR BIDS.

The Undersigned agrees to complete the Work within the time stated in Section 011000 of the Specifications.

The Undersigned acknowledges his/her understanding of the social policy concerning minority and women business participation in the State building construction program, and pledges to cooperate with the State in the implementation of this policy, and further pledges to exert good faith efforts to achieve participation of minority and female employees.

The Undersigned certifies, as to each of the occupations listed in the Prevailing Rate Schedule applicable to this Project, the ability and willingness to exert good faith efforts to achieve the goal for minority and women workforce participation as set forth in the Supplementary Conditions.

The Undersigned certifies the ability and willingness to exert good faith efforts to achieve the goals for Minority and Women-Owned Business Enterprise and Service-Disabled Veteran-Owned Businesses participation as set forth in the Supplementary Conditions.

The Undersigned declares that the Bidding and Contract Documents have been carefully examined and that all things necessary for the completion of the Work shall be provided.

The Undersigned agrees that the bid security shall be subject to forfeiture if this bid is accepted by the State and he/she does not submit executed copies of the Agreement WITHIN FIVE (5) DAYS OF RECEIPT OF A WRITTEN REQUEST TO PROVIDE SUCH AGREEMENT. A Performance Bond and a Labor and Material Bond, each in an amount equal to the contract sum, shall be supplied with the executed Agreement and shall be the statutory form of public bonds required by Sections 136 and 137 of the State Finance Law.

By submission of this bid, each bidder and each person signing on behalf of any bidder certifies, and in the case of a joint bid each party thereto certifies as to its own organization, under penalty of perjury, that to the best of his/her 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;

(3) No attempt has been made or will be made by the bidder to induce any other person, partnership or corporation to submit or not to submit a bid for the purpose of restricting competition.

(4) This contract shall not cause or result in a violation of Section 74(3)(e) of the Public Officers Law which states: "No officer or employee of a state agency, member of the legislature or legislative employee should engage in any transaction as representative or agent of the State with any business entity in which he/she has a direct or indirect financial interest that might reasonably tend to conflict with the proper discharge of his/her official duties."

Federal Employer I.D. No. _____

(5) The Bidder understands and agrees to comply with the requirements of the Procurement Lobbying Law, State Finance Law § 139-j and § 139-k, and with OGS's procedures relating to permissible contacts during a procurement as required by State Finance Law § 139-j(3) and § 139-j(6)(b). Such requirements and procedures are posted at https://ogs.ny.gov/acpl.

(6) The bidder is not on the list created pursuant to paragraph (b) of subdivision 3 of section 165-a of the state finance law (NYS Iran Divestment Act of 2012). The list can be viewed at the following link:

https://ogs.ny.gov/iran-divestment-act-2012

(7) Will New York State Businesses be used in the performance of this contract (refer to Document 007324)?

Yes ☐ No ☐

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

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

Generally, the Human Rights Law applies to:

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

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

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

(9) In accordance with State Finance Law § 139-l, 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 the bidder cannot make the foregoing certification, such bidder shall so state and shall furnish with the bid a signed statement that sets forth in detail the reasons that the bidder cannot make the certification.

(10) In accordance with State Finance Law § 139-m, 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 gender-based violence and the workplace and has provided such policy to all of its employees, directors and board members. Such policy shall, at a minimum, meet the requirements of subdivision 11 of section five hundred seventy-five of the executive law.

If the bidder cannot make the foregoing certification, such bidder shall so state and shall furnish with the bid a signed statement that sets forth in detail the reasons that the bidder cannot make the certification.

Federal Employer I.D. No. _____

(11) In accordance with Section 165(5) of the State Finance Law, the bidder, by submission of this bid, certifies that it or any individual or legal entity in which the bidder holds a 10% or greater ownership interest, or any individual or legal entity that holds a 10% or greater ownership interest in the bidder, either (answer yes or no to one or both of the following, as applicable):

1. have business operations in Northern Ireland Yes ☐ No ☐ and if yes:

2. shall take lawful steps in good faith to conduct any business operations in Northern Ireland in accordance with the MacBride Fair Employment Principles relating to nondiscrimination in employment and freedom of workplace opportunity regarding such operations in Northern Ireland, and shall permit independent monitoring of compliance with such principles.

Yes ☐ No ☐

(12) Certification Under Executive Order No. 16 - Prohibiting State Agencies and Authorities from Contracting with Businesses Conducting Business in Russia

Executive Order No. 16 provides that "all Affected State Entities are directed to refrain from entering into any new contract or renewing any existing contract with an entity conducting business operations in Russia." The complete text of Executive Order No. 16 can be found here: https://www.governor.ny.gov/executive-order/no-16-prohibiting-state-agencies-and-authorities-contracting-businesses-conducting

The Executive Order remains in effect while sanctions imposed by the federal government are in effect. Accordingly, vendors who may be excluded from award because of current business operations in Russia are nevertheless encouraged to respond to solicitations to preserve their contracting opportunities in case the sanctions are lifted during a solicitation or even after award in the case of some solicitations.

As defined in Executive Order No. 16, an "entity conducting business operations in Russia" means an institution or company, wherever located, conducting any commercial activity in Russia or transacting business with the Russian Government or which the commercial entities headquartered in Russia or with their principal place of business in Russia in the form of contracting, sales, purchasing, investment, or any business partnership.

Is Vendor an entity conducting business operations in Russia, as defined above? Please answer by checking one of the following boxes:

☐ 1. No, Vendor does not conduct business operations in Russia within the meaning of Executive Order No. 16.

☐ 2.a. Yes, Vendor conducts business operations in Russia within the meaning of Executive Order No. 16 but has taken steps to wind down business operations in Russia or is in the process of winding down business operations in Russia. (Please provide a detailed description of the wind down process and a schedule for completion.)

☐ 2.b. Yes, Vendor conducts business operations in Russia within the meaning of Executive Order No. 16 but only to the extent necessary to provide vital health and safety services within Russia or to comply with federal law, regulations, executive orders, or directives. (Please provide a detailed description of the services being provided or the relevant laws, regulations, etc.)

☐ 3. Yes, Vendor conducts business operations in Russia within the meaning of Executive Order No. 16.

(13) In accordance with New York State Labor Law Section 220-i, the bidder certifies that it is registered with the New York State Department of Labor (NYSDOL) for public work projects. By submission of this bid and providing the registration number in the space indicated on this bid form, the bidder affirms that its registration is current and valid as of the date of bid submission.

Federal Employer I.D. No. _____

Addenda to the Contract Documents are available at:
https://online.ogs.ny.gov/dnc/contractorConsultant/esb/ESBPlansAvailableIndex.asp
The Undersigned acknowledges receipt and review of all Addenda to the Contract Documents on the above website, listed by number in the space below:

_____

The Undersigned proposes to perform the Work required for this project in accordance with the Contract Documents for the following amount:

BID AMOUNT

1.	All Work except Allowance(s)	$ _____.00
2.	Allowance(s) (As described in Section 012100)	$ 455,222.00
	Total Bid Amount (Sum of 1. & 2.)	$ _____.00

FEDERAL EMPLOYER I.D. NO. _____

NYSDOL CONTRACTOR REGISTRATION NO. (per NYS LABOR LAW 220-i) _____

Is your firm a NYS-Certified Minority and Women-Owned Business Enterprise (MWBE)? Yes ☐ No ☐

MWBE CERTIFICATION FILE NO. _____

SIGN BID HERE _____
Authorized Signature

PRINT NAME OF SIGNER _____

TITLE OF SIGNER _____

OFFICIAL COMPANY NAME _____

MAILING ADDRESS _____
Street

_____
City State Zip

TELEPHONE NO. _____ FAX NO. _____
Area Code Area Code

E-MAIL ADDRESS _____

*****

Federal Employer I.D. No. _____

FORM OF BID BOND - BID SECURITY
STATE OF NEW YORK
OFFICE OF GENERAL SERVICES - DESIGN & CONSTRUCTION

Sub. 3, Sec. 8 - Public Buildings Law

BE IT KNOWN, That _____

_____
(Name of Contractor)

_____
(Address)

(hereinafter called the "Principal") and _____ a corporation created and existing under the Laws of the State of _____ having its principal office in the City of _____ duly licensed as an insurance company in the State of New York, (hereinafter called the "Surety"), are held and firmly bound unto The People of the State of New York (hereinafter called the "State"), in the full and just sum of $80,600 good and lawful money of the United States of America, for the payment of which said sum of money, well and truly to be made, and done, the Principal binds themselves (himself, herself, itself), their (his, hers, its) heirs, executors and administrators, successors and assigns, and the Surety binds itself, its successors and assigns jointly and severally, firmly by these presents:

WHEREAS, the Principal has submitted to the Office of General Services of the State of New York a proposal for HVAC Work, Renovate Armory, State Armory, 2 Quincy Place, Yonkers, NY

AND

WHEREAS, the Principal intends to file this bond to guarantee that the Principal will execute a contract and furnish performance and labor and material bonds required by the terms of the Principal's proposal.

NOW, THEREFORE, the condition of the foregoing obligation is such, that if the Principal shall promptly submit an executed agreement and furnish performance and labor and material bonds required by the terms of the Principal's proposal, then this obligation shall be null and void, otherwise to remain in full force and virtue.

NOW, THEREFORE, the condition of the foregoing obligation is such that if the Principal fails to promptly submit an executed agreement and furnish performance and labor and material bonds required by the terms of the Principal's proposal, then the Surety itself, its successors and assigns, jointly and severally, shall pay the whole sum of money previously set forth in this document to the State.

IN TESTIMONY WHEREOF, the Principal has hereunto set their (his, hers, its) hand and seal and the Surety has caused this instrument to be signed by its Attorney-in-fact, _____ and its corporate seal to be hereunto affixed.

Signed, sealed and delivered in the presence of:

(Corporate seal
of Principal if a corporation)

_____ (L.S.)

_____ (L.S.)

Principal

_____ Company

(Corporate seal of Surety Co.) _____

_____

Attorney-in-fact

Witness _____

Name

_____

Name

(Acknowledgment by principal, unless it be a corporation)

STATE OF NEW YORK
SS.:
COUNTY OF _____

On this _____ day of _____20_____, before me personally came _____ to me known and known to me to be the person described in and who executed the foregoing instrument, and acknowledged that he/she executed the same.

_____
Notary Public County

(Acknowledgment by principal, if a corporation)

STATE OF NEW YORK
SS.:
COUNTY OF _____

On this _____ day of _____20_____, before me personally came _____ to me known, who being by me duly sworn, did depose and say that he/she resides in _____; that he/she is the _____ of the _____; the corporation described in and which executed the foregoing instrument; that he/she knew the seal of said corporation; that the seal affixed to said corporation; that the seal affixed to said instrument was such corporate seal; that it was so affixed by order of the Board of Directors of said corporation, and that he/she signed his/her name thereto by like order.

_____
Notary Public County

(Acknowledgment by Surety Company)

STATE OF NEW YORK
SS.:
COUNTY OF _____

On this _____ day of _____ 20_____, before me personally came _____ to me known, who being by me duly sworn, did depose and say that he/she resides in _____; that he/she is the _____ of the _____; the corporation described in and which executed the within instrument; that he/she knows the seal of said corporation; that the seal affixed to said instrument is such corporate seal; that is was so affixed by order of the Board of Directors of said corporation; and that he/she signed his/her name thereto by like order.

_____
Notary Public County

Empire State Development

NEW YORK STATE'S SURETY BOND

Assistance Program Helps Small Business Contractors Secure Surety Bonding

What is the NYS Surety Bond Assistance Program?

The NYS Surety Bond Assistance Program (NYSBAP) provides technical and financial assistance to help contractors secure surety bonding. Contractors may be eligible to receive a guarantee of up to 30% to secure a surety bond line, bid bond or a performance and payment bond on state projects.

How does the NYS Surety Bond Assistance Program work?

To apply for financial assistance, small business contractors should review eligibility requirements and fill out a pre-application assessment available at the Empire State Development (ESD) website.

If the assessment indicates you are eligible to submit an application, proceed with the Application and submit the required forms.

Guarantees of up to 30% on a bond line or individual contract bid bonds and payment/performance bonds are available from Empire State Development. Being eligible for this program does not automatically ensure bonding. Approval is based on both underwriting by a surety company and ESD's credit assessment. Participating surety companies will make a credit determination in accordance with their internal underwriting standards.

Small businesses can also enroll to receive training and technical support on how to become bond-ready by using the Contact Information below. The classroom training is held throughout New York State.

Who is eligible?

- Applicant must be a NYS small business or MWBE with at least two years of business operation.
- Maximum bond line or project size is $2 million
- Minimum average gross revenue of $400,000 in the last two fiscal or calendar years and maximum gross revenue not to exceed $5 million in the most recent calendar or fiscal year.
- Minimum credit score of 600.
- Previous experience completing similar work to the contract opportunity being pursued.

Find Out More

If interested in training or financial support, please visit ESD's website:
http://esd.ny.gov/BusinessPrograms/BondingAssistance.html

For additional inquiries, please contact:
Ms. Huey-Min Chuang
Senior Director of Business & Economic Development
212-803-3238
BAP@esd.ny.gov

Offerer Disclosure of Prior Non-Responsibility Determinations

See instructions on next page before completing this form.

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

_____

Address: _____

_____

Name and Title of Person Submitting this Form: _____

_____

Contract Procurement Number: _____ Date: _____

1. Has any Governmental Entity made a finding of non-responsibility regarding the individual or entity seeking to enter into the Procurement Contract in the previous four years? (Please circle):

No Yes

If yes, please answer the next questions:

2. Was the basis for the finding of non-responsibility due to a violation of State Finance Law §139-j (Please circle):

No Yes

3. Was the basis for the finding of non-responsibility due to the intentional provision of false or incomplete information to a Governmental Entity? (Please circle):

No Yes

4. If you answered yes to any of the above questions, please provide details regarding the finding of non-responsibility below and attach additional pages as necessary.

Governmental Entity: _____

Date of Finding of Non-responsibility: _____

Basis of Finding of Non-Responsibility: _____

5. Has any Governmental Entity or other governmental agency terminated or withheld a Procurement Contract with the above-named individual or entity due to the intentional provision of false or incomplete information? (Please circle):

No Yes

6. If yes, please provide details below and attach additional pages as necessary.

Governmental Entity: _____

Date of Termination or Withholding of Contract: _____

Basis of Termination or Withholding: _____

Offerer certifies that all information provided to the Governmental Entity with respect to State Finance Law §139-k is complete, true and accurate.

By: _____ Date: _____

Signature

Instructions for Completing the DCA-3

Offerer Disclosure of Prior Non-Responsibility Determinations

Background:

New York State Finance Law §139-k(2) obligates a Governmental Entity to obtain specific information regarding prior non-responsibility determinations with respect to State Finance Law §139-j. This information must be collected in addition to the information that is separately obtained pursuant to State Finance Law §163(9). In accordance with State Finance Law §139-k, an Offerer must be asked to disclose whether there has been a finding of non-responsibility made within the previous four (4) years by any Governmental Entity due to: (a) a violation of State Finance Law §139-j or (b) the intentional provision of false or incomplete information to a Governmental Entity. The terms "Offerer" and "Governmental Entity" are defined in State Finance Law § 139-k(1). State Finance Law §139-j sets forth detailed requirements about the restrictions on Contacts during the procurement process. A violation of State Finance Law §139-j includes, but is not limited to, an impermissible Contact during the restricted period (for example, contacting a person or entity other than the designated contact person, when such contact does not fall within one of the exemptions).

As part of its responsibility determination, State Finance Law §139-k(3) mandates consideration of whether an Offerer fails to timely disclose accurate or complete information regarding the above non-responsibility determination. In accordance with law, no Procurement Contract shall be awarded to any Offerer that fails to timely disclose accurate or complete information under this section, unless a finding is made that the award of the Procurement Contract to the Offerer is necessary to protect public property or public health safety, and that the Offerer is the only source capable of supplying the required Article of Procurement within the necessary timeframe. See State Finance Law §§139-j (10)(b) and 139-k(3).

Instructions:

OGS Design and Construction includes this disclosure request regarding prior non-responsibility determinations in accordance with State Finance Law §139-k in its solicitation of proposals or bid documents or specifications or contract documents, as applicable, for procurement contracts. The attached form is to be completed and submitted by the individual or entity seeking to enter into a Procurement Contract, Supplement or Change Order. It shall be submitted to the OGS Design and Construction unit conducting the Governmental Procurement.

This document must accompany each Bid Form, Letter of Interest, or Proposal submitted by an offerer and will be required for any contract amendments over $15,000. This document must also accompany each Emergency Contract Bid Form.

STATE OF NEW YORK - EXECUTIVE DEPARTMENT

OFFICE OF GENERAL SERVICES - DESIGN & CONSTRUCTION GROUP

DOCUMENT 007213
GENERAL CONDITIONS
AUGUST 2010 EDITION

TABLE OF ARTICLES

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STANDARD CLAUSES FOR ALL NEW YORK STATE CONTRACTS - APPENDIX A 20

STANDARD CLAUSE FOR CONTRACTOR DEFAULT AND SURETY TAKEOVER - APPENDIX B 28

(Appendix A revised 06/2023)
(Articles 5, 10 and 21 revised in 01/2011)
(Article 23 corrected in 02/2017)

ARTICLE 1 - THE CONTRACT DOCUMENTS

1.1 The Contract Documents consist of the Agreement, the Performance and Payment Bonds, the General Conditions, the Supplementary Conditions, Appendix A, the Drawings and Specifications, Addenda issued prior to the receipt of bids and all subsequent modifications and changes issued pursuant to the General Conditions.

1.1.1 The Performance and Payment Bonds are not a part of Single Trade Contract less than two hundred thousand dollars.

1.2 The Contract Documents form the Contract. The Contract represents the entire and integrated agreement between the parties and supersedes all prior negotiations, representations and agreements, either written or oral including the bidding documents.

1.3 The Contract may not be modified except in accordance with the General Conditions.

1.4 The project is designed in accordance with the Building Codes of New York State and its reference standards. In no instance shall the Contractor deviate from the contract documents except as provided for in the contract. The Contractor shall notify the State of any deviations or conflicts observed that may violate the Building Codes.

ARTICLE 2 - DEFINITIONS

2.1 The following terms shall have the meanings ascribed to them in this Article, wherever they appear in the Contract Documents.

2.2 The term “Agency” means the officer, board, department, commission, authority, fund or public benefit corporation executing the Agreement.

2.3 The term “Commissioner” means the Commissioner of General Services.

2.4 The term “Comptroller” means the Comptroller of the State of New York.

2.5 The term “Contracting Officer” means the Director of Contract Administration of the Design and Construction Group of the Office of General Services or his representative designated in writing.

2.6 The term “Contractor” means the person, firm or corporation executing the Agreement or the successor or assignee of the Contractor approved in writing by the Contracting Officer. If the text requires, the term includes the person, firm or corporation executing any Agreement in furtherance of the Project or the successors or assigns approved in writing by the Contracting Officer.

2.7 The term “days” means calendar days.

2.8 The term “Director” means the Director of Construction of the Design and Construction Group of the Office of General Services who will have general direction and supervision of the Work.

2.9 The term “Director’s Representative” means the employee or agent of the Design and Construction Group designated in writing by the Director as such. Under the general supervision of the Director, the Director’s Representative shall have complete charge of the Work and shall exercise full supervision and direction of the Work. Where the Contract Documents specifically designate a person to perform a function or duty, that person shall be the Director’s Representative but only for the performance of that function or duty. Where the word “directed” appears in the Contract Documents, the words “by the Director’s Representative” shall be deemed inserted thereafter in each case except where it is obviously inappropriate in context.

2.10 The term “Group Director” means the Deputy Commissioner for Design and Construction, Office of General Services.

2.11 The term “liquidated damages” means the amount of money to be assessed against the Contractor for delay in physical completion of the Work.

2.12 The term “physical completion” means the date upon which the Director’s Representative certifies that all deficiencies noted on the Final Inspection List have been corrected and is evidenced by issuance of the Physical Completion Report.

2.13 The term “premises” means all land, buildings, structures and all other things of any kind located on or adjacent to the Site and owned, occupied or otherwise used by the State.

2.14 The term “product data” means manufacturer’s catalog sheets, brochures, standard diagrams, illustrations, schedules, performance charts, test data, standard schematic drawings, specifications and installation instructions.

2.15 The term “Project” means Work at the same Site carried out pursuant to one or more sets of Contract Documents.

2.16 The term “provide” means furnish and install complete, in place and ready for operation and use.

2.17 The term “sample” means physical examples submitted by the Contractor of materials, equipment or workmanship to establish a standard which the Contractor is required to meet and to show the quality, type, range of color, finish, and texture of the material intended to be furnished for the Work.

2.18 The term “shop drawing” means an original drawing prepared by a Contractor, subcontractor, supplier or distributor which illustrates some portion of the Work showing fabrication, layout, fitting or erection details.

2.19 The term “Site” means the area within the contract limit, as indicated by the Contract Documents, including all land, buildings, structures and other things located within those limits.

2.20 The term “State” means the State of New York.

2.21 The term “substantial completion” means that the Work or major milestones there of as contemplated by the terms of this contract are sufficiently complete so that the Work can be used for the purpose for which it is intended.

2.22 The term “Work” means all that which is required of the Contractor by the Contract Documents including labor, materials, tools and equipment.

2.23 The term “Offerer” shall mean the individual or entity, or any employee, agent, consultant or person acting on behalf of such individual or entity that contacts a governmental entity about a governmental procurement during the restricted period of such governmental procurement.

ARTICLE 3 - INTERPRETATION OF CONTRACT DOCUMENTS

3.1 The Contract Documents are complementary, and what is called for by one shall be as binding as if called for by all. It is not intended to include work not properly inferable from the Contract Documents.

3.2 Upon the Contractor’s written request, the Director’s Representative may issue written interpretation or drawings necessary for the proper execution or progress of the Work which interpretation shall be consistent with and reasonably inferable from the Contract Documents.

3.3 The language of the Contract Documents is directed at the Contractor unless specifically stated otherwise.

3.4 The organization of the Specifications into divisions, sections and articles, and the 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.

3.5 In the event of conflicting provisions in the Contract Documents, the drawings will take precedence over the specifications.

3.6 In the event of conflicting provisions within the drawings, the following order of precedence for resolution of the conflict shall apply: the more specific provision will take precedence over the less specific; if not resolved, the less stringent will take precedence over the more stringent; if not resolved, the less expensive item will take precedence over the more expensive. On all drawings, figures take precedence over scaled dimensions.

3.7 In the event of conflicting provisions within the specifications, the following order of precedence for resolution of the conflict shall apply: the more specific provision will take precedence over the less specific; if not resolved, the less stringent will take precedence over the more stringent; if not resolved, the less expensive item will take precedence over the more expensive.

3.8 If during the performance of the work, the Contractor identifies a conflict in the Contract Documents; the Contractor shall promptly notify the Director’s Representative in writing of the conflict and advise as to the course of action the Contractor proposes to follow. The Director’s Representative shall promptly acknowledge the notification in writing and advise the Contractor, pursuant to Paragraph 3.2 of these General Conditions, as to the interpretation to be followed in the performance of the Work.

ARTICLE 4 - SUBMITTALS

4.1 The Contractor and the Director shall adhere to the submittal and scheduling requirements specified in Division 01 - General Requirements.

4.2 The Contractor shall approve all submittals before submitting them. By such approval, the Contractor represents that it has determined and verified field measurements, field construction criteria, materials, catalog numbers, and similar data and that it has checked and coordinated shop drawings, product data and samples with the requirements of the Contract Documents and that it has verified the completeness, correctness, and accuracy of the submittal.

4.3 The Director’s approval of shop drawings, product data and samples shall not relieve the Contractor of responsibility for any deviation from the requirements of the Contract Documents unless the Contractor has previously informed the Director of any anticipated deviation utilizing the required deviation request form,

(available at the OGS D&C website),at the time of submission. Written approval of the specific deviations as outlined on the request form shall be required. The Director's approval shall not relieve the Contractor from responsibility for errors or omissions in the shop drawings, product data or samples.

4.4 Portions of the Work requiring shop drawings, product data, quality assurance information, or sample submittals shall not be commenced until the appropriate submittals have been approved by the Director.

4.5 The Contractor shall deliver to the Director, in the detail and form and at the time the Director shall require, information concerning the Contractor's operations and proposed operations upon the Project all in accordance with Division 01 - General Requirements.

4.6 During the term of this Project, the Director may require any Contractor to modify any schedules which it has submitted either before or after they are approved so that the Work of any contract in furtherance of the Project may be properly progressed and so that changes in the Work or the work of related contracts is properly reflected in the schedules.

4.7 Where indicated under the specific submittal requirements of the specifications, a re-evaluation fee of $250.00 will be assessed against the Contractor for each re-evaluation required of any submittal package that is deemed incomplete, or lacking appropriate content or required format as required by the individual specification section.

ARTICLE 5 - MATERIALS AND LABOR

5.1 All materials, equipment and articles used permanently in the Work which become the property of the State shall be new unless specifically stated otherwise.

5.2 Asbestos Free Materials: All materials used for construction shall be free of asbestos containing materials unless the materials containing the asbestos have been previously approved for use by the State. If asbestos is found in installed products not previously approved by the State, then it will be the responsibility of the contractor to abate the asbestos containing material and replace the work with new asbestos free materials at no cost to the State of New York in compliance with the requirements of the contract.

5.3 Except where specifically provided otherwise, whenever any product is specified by brand name, i.e., manufacturer's or supplier's name or trade name and catalog or model number or name, the intent is not to limit competition but to establish a standard of quality which the Director has determined is necessary. The words "or equal" shall be deemed inserted in each instance. The Contractor may use any product equal to that named in the Contract Documents which is approved by the Director and which meets the requirements of the Contract Documents providing the Contractor gives timely notice of the Contractor's intent in accordance with the submittal and scheduling requirements of Division 01 - General Requirements.

5.4 The Contractor shall have the burden of proving at the Contractor's own cost and expense, to the satisfaction of the Director, that the proposed product is equal to the named product. The Director may establish criteria for product approval. The Director shall determine with absolute discretion whether a proposed product is to be approved.

5.5 If the Contractor fails to comply with the provisions of this Article, or if the Director determines that the proposed product is not equal to that named, the Contractor shall supply the product named.

5.6 The Contractor shall have and make no claim for the extension of time or for damages because the Director requires a reasonable period of time to consider a product proposed by the Contractor or because the Director disapproves such a product.

5.7 Where optional materials or methods are specified, or where "or equal" submissions are approved, the Contractor shall make all adjustments to contingent Work, whether the contingent Work be the Work of its contract or the Work of other Contractor's, necessary to accommodate the option or "or equal" product it selects without extra or additional cost.

5.8 Royalties and Patents: The Contractor shall pay all royalties and license fees. The Contractor shall defend all suits or claims for infringement of any patent rights and shall save the State harmless from loss on account thereof, except that the State shall be responsible for all such loss when a particular design, process or the product of a particular manufacturer is specified.

ARTICLE 6 - CONTRACTOR'S SUPERVISION

6.1 The Contractor shall designate in writing competent supervision and/or management representatives as required below to represent the Contractor at all times with authority to act for the Contractor. All Direction given to the Contractor's Representatives shall be as binding as if given to the Contractor. A Superintendent or Project Manager shall be classified as management representatives included in the Contractor's overhead and shall perform management, supervisory and/or administrative tasks (non labor) only. Individuals listed under this Article shall have the ability to effectively communicate (verbal and written) with all parties associated with the administration/supervision of this contract.

6.1.1 For contracts valued up to $500,000 the contractor shall provide a supervisor for the Contractor's staff who shall be in attendance at the site throughout the active performance of the Work.

6.1.2 For contracts valued from $500,000 to $2,000,000 the Contractor shall provide a Superintendent for the Contractor's staff who shall be in attendance at the site throughout the active performance of the Work until Substantial Completion. Upon Substantial Completion the contractor shall provide a supervisor who shall be in attendance at the site throughout the active performance of the Work until Physical Completion. The Superintendent shall have the authority to direct and schedule the Work, shall attend all project meetings, shall coordinate the Work of subcontractors, and make purchase and cost decisions on behalf of the Contractor.

6.1.3 For contracts valued from $2,000,001 to $5,000,000 the contractor shall provide a Superintendent for the Contractor's staff who shall be in attendance at the site throughout the active performance of the Work until Substantial Completion. Upon Substantial Completion the contractor shall provide a supervisor who shall be in attendance at the site throughout the active performance of the Work until Physical Completion. The Superintendent shall have the authority to direct the Work, attend all project meetings, and coordinate the Work of subcontractors. The Contractor shall also provide a Project Manager who shall attend project meetings, maintain submittal and approval system, and be responsible for change order/field order responses and negotiations. The Contractor shall provide required information to the Director's Representative for the Project Schedule.

6.1.4 For contracts valued from $5,000,001 to $10,000,000 the contractor shall provide a Project Manager and Superintendent for the Contractor's staff that shall be in attendance at the site throughout the active performance of the Work until Substantial Completion. Upon Substantial Completion the contractor shall provide a supervisor who shall be in attendance at the site throughout the active performance of the Work until Physical Completion. The Superintendent shall have the authority to direct the Work, and coordinate the Work of subcontractors. The Project Manager shall attend project meetings, maintain the project schedule, maintain submittal and approval system, and be responsible for change order/field order responses and negotiations.

6.1.5 For contracts valued for more than $10,000,000 the contractor shall provide a Project Manager and Superintendent for the Contractor's staff who shall be in attendance at the site throughout the active performance of the Work until Substantial Completion. Upon Substantial Completion the contractor shall provide a supervisor who shall be in attendance at the site throughout the active performance of the Work until Physical Completion. The Superintendent shall have the authority to direct the Work, attend all project meetings, and coordinate the Work of subcontractors. The Project Manager shall attend project meetings, maintain the project schedule, maintain submittal and approval system, and be responsible for change order/field order responses and negotiations. If at any time there are more than five subcontractors performing work on the site simultaneously an additional Superintendent is required coordinate their Work.

6.2 Should the Director deem any employees of the Contractor incompetent or negligent or for any cause unfit for their duty, the Contractor shall dismiss them and they shall not again be employed on the Work.

6.3 Before any part of the Contract shall be sublet or material purchased, the Contractor shall submit to the Director in writing the name of each proposed subcontractor and supplier and obtain the Director's written consent to such subcontractor and supplier. The names shall be submitted in ample time to permit acceptance or rejection of each proposed subcontractor and supplier by the Director or Contracting Officer without causing delay in the work of the Project. The Contractor shall promptly furnish such information as the Director or Contracting Officer may require concerning the proposed subcontractor's and supplier's ability and qualifications, and Minority/Women Owned Business Enterprises Status. Each request for approval of a subcontractor whose subcontract will be valued at $10,000.00 or more shall also be accompanied by a NYS Vendor Responsibility Questionnaire - For-Profit Construction properly completed and executed by the proposed subcontractor.

6.4 The Contractor's use of subcontractors shall not diminish the Contractor's obligations to complete the Work in accordance with the Contract. The Contractor shall control and coordinate the Work of its subcontractors.

6.5 The Contractor shall be responsible for informing its subcontractors and suppliers of all the terms, conditions and requirements of the Contract Documents including, but not limited to the General Conditions, Supplementary Conditions, the Drawings and Specifications, Appendix A, and changes made by Addenda.

ARTICLE 7 - USE OF PREMISES

7.1 If the Premises are occupied, the Contractor, its subcontractors, and their employees shall comply with the regulations governing access to, operation of, and conduct while in or on the Premises and shall perform

the Work in such a manner as not to unreasonably interrupt or interfere with the conduct of business.

7.2 Any request received by the Contractor from any source other than the Director or the Director's Representative to change the Work or its sequence shall be referred to the Director's Representative for determination.

7.3 The Contractor, its subcontractors and their employees shall not have access to or be admitted to any area of the Premises outside the Site except with the written permission of the Director's Representative.

ARTICLE 8 - PERMITS AND COMPLIANCE

8.1 The Contractor shall obtain, maintain and pay for all permits and licenses legally required and shall give all notices, pay all fees and comply with all laws, rules and regulations applicable to the Work at no additional cost.

ARTICLE 9 - INSPECTION AND ACCEPTANCE

9.1 The Director's Representative will inspect and test the Work at reasonable times at the Site, unless the Director determines to make an inspection or test at a place of production, manufacture or shipment. Such inspection or test shall be conclusive as to whether the material and workmanship inspected or tested conforms to the requirements of the Contract. Such inspection or test shall not relieve the Contractor of responsibility for damage to or loss of the material prior to acceptance, nor in any way affect the continuing rights of the Director to reject the completed Work.

9.2 The Contractor shall, without charge, promptly correct any Work the Director's Representative finds does not conform to the Contract Documents unless in the public interest the Director consents to accept such Work with an appropriate adjustment on the Contract sum and/or to any terms and conditions of the Contract. The Contractor shall promptly remove rejected material from the Premises.

9.3 If the Contractor does not promptly correct rejected Work including the work of other sub-contractors destroyed or damaged by removal, replacement, or correction, the Director may (1) correct such Work and charge the cost thereof to the Contractor; or (2) terminate the Contract in accordance with Article 13 of the General Conditions.

9.4 The Contractor shall furnish promptly without additional charge all facilities, labor, material and equipment reasonably needed to perform in a safe and convenient manner such inspections and tests as the Director's Representative requires.

9.5 The Contractor shall keep the Director's Representative informed of the progress of the Contractor's Work and particularly when the Contractor intends to cover Work not yet inspected or tested. All inspection and tests by the Director's Representative shall be performed in such manner as not to unreasonably delay the Work.

9.5.1 The Contractor shall be responsible for all required tests and appropriate test schedules, approvals and inspections pursuant to the Contract Documents.

9.5.2 The Contractor shall be back-charged with any cost of inspection when the Work is not ready at the time specified by the Director's Representative for inspection, or for deficient work that shall require re-testing.

9.6 Should the Director's Representative determine at any time before acceptance of the entire Work to examine Work already completed by removing, uncovering or testing the same, the Contractor shall, on request, promptly furnish all necessary facilities, labor, materials and equipment to conduct such inspection, examination or test. If such Work is found to be defective or nonconforming in any material respect, the Contractor shall defray all the expenses of such examination and satisfactory reconstruction. If the Work is found to meet the requirements of the Contract Documents, the Contractor shall be compensated for the additional services involved in such examination and reconstruction by order on contract and, if completion of the Work has been delayed thereby, shall receive a suitable extension of time.

9.7 No previous inspection or certificates of payment shall relieve the Contractor from the obligation to perform the Work in accordance with the Contract Documents. The final payment shall not relieve the Contractor of the responsibility for failing to comply with the Contract Documents.

9.8 The Contractor shall remedy all defects, paying the cost of any damage to other work or property of the State resulting there from, which shall appear within a period of one year from the date of physical completion.

9.9 Contractor warrants that Product(s) furnished pursuant to this Contract shall, when used in accordance with the Product documentation, be able to accurately process date/time data (including, but not limited to, calculating, comparing, and sequencing) transitions, including leap year calculations. Where a Contractor proposes or an acquisition requires that specific Products must perform as a package or system, this warranty shall apply to the Products as a system.

9.9.1 Where Contractor is providing ongoing services, including but not limited to: i) consulting, integration, code or data conversion, ii) maintenance or support services, iii) data entry or processing, or iv) contract administration services (e.g. billing, invoicing, claim processing), Contractor warrants that services shall be provided in an accurate and timely manner without interruption, failure or error due to the inaccuracy of Contractor's business operations in processing date/time data (including, but not limited to, calculating, comparing, and sequencing) various date/time transitions, including leap year calculations. Contractor shall be responsible for damages resulting from any delays, errors or untimely performance resulting there from, including but not limited to the failure or untimely performance of such services.

9.9.2 This Date/Time Warranty shall survive beyond termination or expiration of this contract through: a) ninety (90) days or b) the Contractor's or Product manufacturer/developer's stated date/time warranty term, whichever is longer. Nothing in this warranty statement shall be construed to limit any rights or remedies otherwise available under this Contract for breach of warranty.

ARTICLE 10 - ORDERS ON CONTRACT (CHANGE ORDERS)

10.1 The State may make changes by altering, adding to or deleting from the Work, and adjusting the Contract sum accordingly. All changed Work shall be executed in conformity with the terms and conditions of the Contract Documents unless otherwise provided in the order on contract. Any change in the Contract sum or time for completion of the described work of the order on contract shall be contained in the order on contract. Any change in schedule resulting from an order on contract will be issued in accordance with the provisions of Paragraphs 4.6 and 13.5 of these General Conditions.

10.2 No written or oral instructions shall be construed as directing a change in the Work unless in the form of an order on contract signed by the Contracting Officer. The order on contract shall describe or enumerate the Work to be performed, state the amount (if any) to be added to or deducted from the Contract sum and state the time allowed (if any) for the performance of the changed work. If the extent or cost of the Work is not determinable until after the changed Work is performed, the order on contract shall specify the method for determining the cost and extent of the changed Work when completed. If the Contractor disagrees as to any element of the order on contract, the Contractor shall promptly indicate such disagreement in writing by certified mail directed to the Contracting Officer and shall promptly proceed in accordance with the order on contract. The Contractor's letter of disagreement shall identify by number the order on contract with which the Contractor is disagreeing, the elements with which the Contractor disagrees and a statement as to why there is a disagreement on each element. The letter of disagreement shall be accompanied by documentation of every material element of the Contractor's basis for disagreement. The Contracting Officer shall promptly review the Contractor's letter and supporting documentation and advise the Contractor in writing of any modifications to the order on contract or of the confirmation of the order on contract as issued. The Contracting Officer may, in the exercise of discretion, conduct informal discussions or meetings with the Contractor and/or State Officials, employees or agents prior to rendering a decision.

10.3 If the Contractor is required to perform Work for which the Contractor believes it is entitled to an order on contract, the Contractor shall give the Director prompt written notice and await instructions before proceeding to execute such Work. The Contractor shall thereafter proceed diligently with the performance of the contract in accordance with the Director's instructions. The Contractor shall maintain complete cost records including but not limited to time and payroll records, material invoices and delivery tickets, equipment rental and purchase invoices for itself and all subcontractors, suppliers and material-men when the Contractor performs work which the Contractor believes is extra or additional work. Failure to maintain such records shall waive any right to extra and additional costs beyond those costs supported by actual cost records.

10.4 The Contracting Officer shall determine the value of any order on contract by one or more of the methods provided in Division 01 - General Requirements.

10.5 Irrespective of the method used or to be used by the State in determining the value of a change order, the Contractor shall after receipt of a request, promptly submit to the State a detailed breakdown of the Contractor's estimate of the value of the omitted or extra work. The Contractor shall submit evidence, satisfactory to the Contracting Officer, to substantiate each and every item that constitutes his proposal for the change. The State shall promptly respond to such submission.

10.5.1 The contractor shall submit a responsive cost proposal to the Director's Representative in proper form subject to the provisions of this Article. The contractor shall respond no later than 30 days from the date of a "request for proposal" from the Director's Representative. Should the contractor fail to respond or submit the required cost proposal within the 30 day requirement, the State shall determine a fair market value for the work proposed and will issue an order on contract or field order to the contract. The Contractor, by failing to respond or provide an acceptable proposal; waives any claim or rights to any extra and or additional costs as determined by the Contracting Officer.

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

10.7 No order on contract which creates a liability on the State shall be binding unless approved by the Office of the State Comptroller.

ARTICLE 11 - SITE CONDITIONS

11.1 If the Contractor encounters subsurface or other latent physical conditions at the Site which differ substantially from those shown, described or indicated in such information provided by the State or from any information which is a public record and which subsurface or other latent physical condition could not have been reasonably anticipated from that information or from the Contractor's own inspection and examination of the Site, the Contractor shall give immediate written notice to the Director before any such condition is disturbed. The Director shall promptly investigate and, if it is determined that the conditions substantially differ from those which should have been reasonably anticipated, shall make such changes in the Drawings and Specifications as may be required. If necessary, the Contract sum and completion date shall be adjusted, to reflect any increase or decrease in the cost of, or time required for, performance of the Contract.

ARTICLE 12 - SUSPENSION OF WORK

12.1 The Director may order the Contractor in writing to suspend, delay, or interrupt performance of all or any part of the Work for a reasonable period of time as the Director may determine.

12.2 Upon receipt of a suspension order, the Contractor shall, as soon as practicable, cease performance of the Work as ordered and take immediate affirmative measures to protect such Work from loss or damage.

12.3 The Contractor specifically agrees that a suspension, interruption or delay of the performance of the Work pursuant to this Article for a period or periods not exceeding thirty days in total shall not increase the cost of performance of the Work of this Contract other than costs directly related to demobilization and remobilization for the Work, temporary services costs, equipment rental which cannot be practically suspended and temporary protection measures which are unusual but necessary.

ARTICLE 13 - TIME OF COMPLETION AND TERMINATION FOR CAUSE

13.1 All time limits stated in the Contract are of the essence of the Contract.

13.2 Termination for Cause.

13.2.1 If in the judgment of the Group Director, the Contractor fails or refuses to prosecute the Work in accordance with the Contract, or is failing to complete the Work within the time provided by the Contract, the Group Director may terminate the Contract by written notice. In such event, the Group Director shall order the surety to complete the Work.

13.2.2 If it is determined after the award of the contract that there exists any cause of so serious or compelling a nature, including but not limited to, submission to a contracting agency of a false or misleading statement on a NYS Vendor Responsibility Questionnaire, or in some other form in connection with a bid for or award of this or any other contract or a request for approval of a subcontractor, that it raises questions about the present responsibility of a contractor or subcontractor, the Group Director may terminate the Contract by written notice. In such event, the Group Director may or may not in his sole discretion, order the surety to complete the Work.

13.2.3 The Director will notify the Contractor and Surety that the State is considering declaring the Contractor in default and will arrange a hearing with the Contractor and the Surety to discuss methods of performing and completing the contract work.

13.2.4 If the State formally declares the contractor in default the State will demand upon the Surety to complete any and all remaining work pursuant to the terms of the Contract and the Surety Takeover Guidelines incorporated as Appendix B. The Surety may undertake to perform and complete the work itself, through its agents or through independent contractors approved by the State. The State will agree to pay the balance of the Contract price to the Surety in accordance with the terms and conditions of the Contract or to the designee authorized in writing by the surety upon acceptance of the Surety's completion plan pursuant to Appendix B. incorporated herein.

13.2.5 The surety agrees to complete any investigation into the default of the Contractor and advise the Group Director as to its intended course of action within ten days of receipt of the written notice of default. That notice will detail the underlying reasons for the default and provide pertinent documentation including the surety takeover guidelines of the Contracting Officer. Any request by a surety for execution of a takeover agreement, shall be delivered to

the Contracting Officer for consideration, within the same ten day period. No changes in the terms and conditions of the Contract will be considered. All rights remedies and defenses of the parties are reserved and no rights, remedies or defenses of the parties are waived, by virtue of the surety's agreement to assume contract performance under the bond

13.2.6 The Surety may elect to forfeit the remaining penal sum of the Performance Bond within twenty days of notification of default by the State; with no additional penalties imposed, upon the execution of a release prepared by the State. The State will determine the value of the remaining Work based upon its investigation of the Work in place against payments previously authorized. As soon as practical the Surety will tender payment therefore to the State.

13.2.7 If the surety fails or refuses to complete the Work within twenty five days of the notification of the contractors default or if the Surety fails or refuses to complete the work within the time frames allotted by the State, the Group Director may take over the Work and prosecute it to completion by contract publicly let or otherwise, and may take possession of and utilize in completing the Work, such of the Contractor's materials, equipment and plant as may be on the Site of the Work. Whether or not the right to terminate is exercised, the Contractor and the Surety shall be liable for any damage to the State resulting from the failure or refusal to complete the Work in accordance with the Contract or the failure to complete the Work within the time provided by the Contract.

13.2.8 Should the Surety fail to commence the work the Group Director will notify the Surety that the State is considering declaring the Surety in default and will arrange a hearing with the Surety to discuss methods of performing and completing the contract work. It is the policy of the Office of General Services, Design and Construction Group to let a Contract for the remaining work after the 21st day of the demand upon the Surety to complete the Work pursuant to the terms and conditions of the Contract, and the Performance Bond filed with the Office of the State Comptroller.

13.3 The amount of Liquidated Damages shall be the product of $1,000.00 times the number of days of delay in physical completion of the work. Upon the assessment of such damages the State may withhold the sum of the damages contemplated from payments to avoid an overpayment to any firm where damages would apply.

13.3.1 If the Group Director terminates the Contract, damages shall consist of liquidated damages, if any, until the Work is physically completed, plus any increased costs occasioned the State in completing the Work.

13.3.2 If the Group Director does not terminate the Contract, the damages shall consist of liquidated damages, if any, until the Work is physically completed.

13.4 The Contract shall not be so terminated nor the Contractor charged with resulting damage if:

13.4.1 The delay in the completion of the Work arises from unforeseeable causes beyond the control and without the fault or negligence of the Contractor, including but not restricted to, acts of God, acts of the public enemy, acts of the State in either its sovereign or contractual capacity, acts of another contractor in the performance of a contract with the State, fires, floods, epidemics, quarantine restrictions, strikes, freight embargoes, unusually severe weather, or delays of subcontractors or suppliers arising from unforeseeable causes beyond the control and without the fault or negligence of both the Contractor and such subcontractors or suppliers, and

13.4.2 The Contractor notifies the Director in writing of the causes of delay within ten days from when the Contractor knew or ought to have known of any such delay.

13.5 The Director will ascertain the facts and the extent of the delay and extend the time for completing the Work when, in the Director's judgment, the findings of fact justify such an extension, and the Director's findings of fact shall be final and conclusive on the parties.

13.6 If after notice of termination of the Contract, it is determined for any reason the Contractor was not in default or that the delay was excusable, the rights and obligations of the parties shall be the same as if the notice of termination had been issued pursuant to the termination for convenience clause.

13.7 The rights and remedies of the State provided in this Article are in addition to any other rights and remedies provided by law or under this Contract.

13.8 The State, as defined in Article 2 of these General Conditions, reserves the right to terminate this contract in the event it is found that the certification filed by the offerer in accordance with New York State Finance Law §139-k was intentionally false or intentionally incomplete. Upon such finding, the Governmental Entity may exercise its termination right by providing written notification to the offerer in accordance with the written notification terms of the contract.

ARTICLE 14 - TERMINATION OF CONTRACTOR'S EMPLOYMENT FOR THE CONVENIENCE OF THE STATE OF NEW YORK

14.1 The Group Director may terminate this Contract whenever the public interest so requires by delivering to the Contractor a notice of termination specifying the extent to which performance of Work under the Contract is terminated and the date upon which such termination becomes effective. Upon receipt of the notice of termination, the Contractor shall act promptly to minimize the expenses resulting from such termination. The State shall pay the Contractor the sum of:

14.1.1 The costs actually incurred by the Contractor, subcontractors, and sub-subcontractors or their suppliers up to the effective date of such termination, and

14.1.2 The cost of settling and paying claims, provided the concurrence of the Contracting Officer is obtained prior to agreeing to any such settlement, arising out of the termination of Work under subcontracts or orders exclusive of the amounts paid or payable on account of supplies or materials delivered or services furnished by the subcontractor prior to the effective date of the notice of termination of Work under this Contract, which amounts shall be included in the cost on account of which payment is made under 14.1.1 above, and

14.1.3 An amount determined by adding to the amount of the costs under 14.1.1 above a sum equal to 20% (comprised of 10% overhead and 10% profit) thereof, provided, however, that if it appears that the Contractor would have sustained a documentable loss on the entire Contract had it been completed, an appropriate adjustment shall be made reducing the amount to be paid under this Article to reflect the indicated rate of loss.

14.2 In no event shall the Contractor's compensation exceed the total Contract amount.

14.3 The detailed estimate or amount of progress payments made to the Contractor prior to the day termination was effective shall not be conclusive evidence of costs incurred but progress payments shall be offset against any payment which the State makes to the Contractor as a result of such termination.

ARTICLE 15 - DISPUTES

15.1 The Contractor specifically agrees to submit, in the first instance, any dispute or disagreement relating to the performance of this Contract to the Group Director, who shall render a decision in writing and furnish a copy thereof to the Contractor. The Contractor agrees that this clause does not apply to any dispute or disagreement which involves delay, acceleration, interference or any other act or omission constituting a breach of contract; any matter relating to extensions of time, bonuses or liquidated damages; to the value of any order on contract or field order (issued pursuant to Division 01 - General Requirements); any termination for cause or convenience; or to termination costs allowable pursuant to contract.

15.2 The Contractor must request such decision in writing by certified mail no more than fifteen days after the Contractor knew or ought to have known of the facts which are the basis of the dispute or disagreement. Such writing shall identify the nature of the dispute or disagreement; identify the person who rendered the decision or interpretation involved and the date of the decision or interpretation with which the Contractor disputes or disagrees, attaching a copy of such decision or interpretation; contain a statement of the contractual basis for the dispute or disagreement; and identify the relief sought.

15.3 The Group Director may cause an investigation to be made of the circumstances involving the dispute or disagreement and may cause a fact-finding proceeding to be conducted before rendering the decision.

15.4 The Contractor agrees that the decision of the Group Director shall be final and conclusive. Nothing in this Contract shall be construed as making final the decision of any administrative official upon a question of law.

ARTICLE 16 - STATUTORY REQUIREMENTS FOR UTILIZATION OF MINORITY AND WOMEN OWNED BUSINESS ENTERPRISES

16.1 Pursuant to Section 313 of Article 15-A of the Executive Law of the State of New York, the Director of the Division of Minority and Women's Business Development has promulgated rules and regulations (Parts 140 through 145 of Subtitle N of Title 9 New York Code of Rules and Regulations) (the "Regulations") for the purposes of ensuring that certified Minority and Women owned Business Enterprises shall be given the opportunity for meaningful participation in the performance of State contracts and to facilitate the award of a fair share of State contracts and subcontracts to such business enterprises.

16.2 The Contractor shall make a good faith effort to solicit active participation in the Work by enterprises identified in the directory of certified businesses obtainable from the Division of Minority and Women's Business Development, New York State Department of Economic Development.

16.3 The Contractor agrees, as a material condition of this contract, to be bound by the provisions of Section 316 of Article 15-A of the Executive Law of the State of

New York which relates to the resolution of disputes which may arise under this Article.

16.4 The Contractor agrees to include the provisions of Paragraphs 16.2 and 16.3 of these General Conditions in every subcontract it enters into as to Work in connection with this Contract in such a manner that the provisions will be binding upon such subcontractor. However, the provisions of this paragraph shall not be binding upon the Contractor or its subcontractors in the performance of work or the provision of services that are unrelated, separate or distinct from this Contract as expressed by its terms.

16.5 The Regulations referred to in Paragraph 16.1 of these General Conditions require, among other things, that a bidder or proposer for a State contract submit a utilization plan which shall identify certified Minority or Women Owned Business Enterprises which the bidder/proposer intends to use in connection with the performance of the proposed State contract. Such a utilization plan shall be submitted after bids are opened but prior to contract award.

16.5.1 Pursuant to the Regulations: (1) the Commissioner may require the submission by the Contractor of compliance reports relating to the implementation of and adherence to the utilization plan in performing the Contract; (2) the Commissioner shall allow the Contractor to apply for a partial or total waiver of the Minority and Women Owned Business participation requirements; (3) the Contractor may file a complaint with the Executive Director of the Division of Minority and Women's Business Development regarding a denial of a request for waiver of Minority and Women Owned Business participation requirements; (4) the Commissioner may file a complaint with the Executive Director of the Division of Minority and Women's Business Development in the event the Contractor fails to comply with the Minority and Women Owned Business participation requirements set forth in this Contract; and (5) the Commissioner may disqualify the Contractor's bid or proposal as being non-responsive for failure to remedy notified deficiencies contained in the Contractor's utilization plan after an administrative hearing on the record, reviewing all grounds for disqualification stated by the Commissioner and taking into consideration all the criteria set forth in Section 313 of the Executive Law.

16.5.2 The Contractor is referred to the entirety of the provisions of Section 316 of Article 15-A of the Executive Law of the State of New York and of the Regulations for the Contractor's full familiarization with their applicable provisions as terms of this Contract.

ARTICLE 17 - COORDINATION OF SEPARATE CONTRACTS

17.1 The State may award other contracts which affect the Work of this Contract. In that event, the Contractor shall coordinate its Work with the work of other contractors in such manner as the State may direct. Each contractor shall control and coordinate the work of its subcontractors, if any. The State shall approve or require the modification of the work schedules of all contractors to the end that the Project may be progressed as expeditiously as the case permits.

17.2 If any part of the Work depends for proper execution or results upon the work of any other contractor, the Contractor shall inspect and promptly report in writing to the Director's Representative any defects in such work. The Contractor's failure to inspect and report shall constitute an acceptance of the other contractor's work as fit and proper for the reception of the Contractor's Work.

17.3 The Director's Representative shall issue appropriate directions and take such other measures to coordinate and progress the Work as may be reserved to the State in the Contract, and which an ordinarily reasonable project owner in similar circumstances would be expected to take.

17.4 The award of more than one contract for the Project requires sequential or otherwise interrelated contractor operations, and will involve inherent delays in the progress of any individual contractor's work. Accordingly, the State does not guarantee the unimpeded operations of any contractor. The Contractor acknowledges these conditions, and understands that the Contractor shall bear the risk of all delays caused by the presence or operations of other contractors engaged by the State and delays attendant upon any State-approved construction schedule.

17.5 The State shall not be liable for delays which occur by reason of any contractor's failure to comply with directions of the State or because of the neglect, failure or inability of any contractor to perform its work efficiently.

17.6 The Contractor shall defend, indemnify and hold the State harmless from any and all claims or judgments of damages and from costs and expenses to which the State may be subjected or which it may suffer or incur by reason of or based upon an allegation of the Contractor's failure to promptly comply with the directions of the Director's Representatives.

17.7 Should the Contractor sustain any damage through any act or omission of any other contractor having a contract with the State for the performance of work upon the Site of work which may be necessary to

be performed for the proper prosecution of the Work to be performed hereunder, or through any act or omission of a subcontractor of such contractor, the Contractor shall have no claim against the State for such damage, but shall have a right to recover such damage from the other contractor under the provision similar to the following provision which has been or will be inserted in the contract with such other contractors.

17.8 Should any other contractor having or who shall hereafter have a contract with the State for the performance of work upon the Site sustain any damage through any act or omission of the Contractor hereunder or through any act or omission of any subcontractor of the Contractor, the Contractor agrees to reimburse such other contractor for all such damages and to indemnify and hold the State harmless from all such claims.

ARTICLE 17A - DELAYS

17A.1 For the purposes of this Contract, the term delay includes delay, disruption, interference, inefficiencies, impedance, hindrance and acceleration.

17A.2 The Contractor agrees to make claim only for additional costs as defined in Document 012200, section 1.01, paragraph H from causes listed below, attributable to delay in the performance of this contract, occasioned by any act or omission to act by the State or any of its representatives. The Contractor also agrees that delay from any other cause shall be compensated for solely by an extension of time to complete the performance of the work.

17A.2.1 The failure of the State to take reasonable measures to coordinate and progress the work.

17A.2.2 Extended delays attributable to the State in the review or issuance of orders on contract or field orders, in shop drawing reviews and approvals or as a result of the cumulative impact of multiple orders on contract, which constitute a qualitative change to the project work and which have a verifiable impact on project costs.

17A.2.3 The unavailability of the site for such an extended period of time which the Director determines to significantly affect the scheduled completion of the contract.

17A.2.4 The issuance by the Director of a stop work order relative to a substantial portion of work for a period exceeding thirty days.

17A.3 The Contractor shall provide "notice of claim" of an anticipated claim for delay to the Contracting Officer by personal service or certified mail no more than fifteen days after the Contractor knew or ought to have known of the facts which form the basis of the claim. The Contracting Officer shall acknowledge receipt of the Contractor's notice, in writing, within five days. The Contractor agrees that the State shall have no liability for any damages which accrue more than fifteen days prior to the delivery or mailing of the required notice. The notice shall at a minimum provide a description of any operations that were, are being, or will be delayed, the date(s) and reasons for the delay, and, to the extent known, the information required by Paragraph 17A.6 of these General Conditions. In no case, shall oral notice to the Director's Representative or contracting officer constitute notice under this provision or be deemed to constitute a waiver of the written notice requirement. In no case, shall written notice to the Director's Representative or any other individual other that the Contracting Officer constitute notice under this provision or be deemed to constitute a waiver of the written notice requirement. The Contracting Officer is located at the following location:

Division of Contract Administration
Contracting Officer
35th Floor, Corning Tower
Albany, New York 12242

17A.4 Failure by the Contractor to adequately progress the completion of the work will be considered in determining the causes of delay. For any claim asserted under this Article, the Contractor shall keep detailed written records of the costs and shall make them available to the Contracting Officer at any time for the purposes of audit and review. Failure by the Contractor to provide the required written notice or to maintain and furnish records of the costs of such claims to the Contracting Officer shall constitute a waiver of the claim.

17A.5 The provisions of this Article apply only to claims for extra or additional costs attributable to delay and do not preclude determinations by the Director allowing reimbursement for additional costs for extra work pursuant to Article 10 of these General Conditions.

17A.6 REQUIRED CONTENT OF CLAIM SUBMISSION.

17A.6.1 As noted in Paragraph 17.A.3 of these General Conditions, all claims for delay shall be submitted in writing to the Contracting Officer and must be in sufficient detail to enable the Contracting Officer to ascertain the basis and the amount of each claim. The following information shall be provided by the Contractor upon request of the Contracting Officer if not previously supplied:

a. A description of the operations that were delayed, the reasons for the delay and an explanation of how they were delayed.

b. A detailed factual statement of the claim providing all necessary dates, locations and items of work affected by the claim.

c. An as-built chart, "Critical Path Method" scheme or other diagram or chart depicting in graphic form how the operations were or are claimed to be adversely affected including the report and conclusions of all engineering and scheduling experts or other consultants, if any.

d. The date on which actions resulting in the claim occurred or conditions resulting in the claim became evident.

e. A copy of the approved project schedule and a copy of the "notice of claim" required for the specific claim by Paragraph 17A.3 of these General Conditions.

f. To the extent known, the name, function, and activity of each State official, employee or agent, involved in, or knowledgeable about facts that gave rise to such claim.

g. The name, function, and activity of each Contractor or subcontractor officer, or employee, involved in, or knowledgeable about facts that gave rise to such claim.

h. The identification of any pertinent documents, and the substance of any material oral communication relating to such claim.

i. The amount of additional compensation sought and a breakdown of that amount into the categories specified in Division 01 - General Requirements.

j. If an extension of time is also requested, the specific number of days for which it is sought and the basis for such request as determined by an analysis of the construction progress schedule.

17A.7 REQUIRED CERTIFICATION OF CLAIMS.

17A.7.1 When submitting any notice of claim or claim data, the Contractor must certify in writing and under oath:

a. That supporting data is accurate and complete to the Contractor's best knowledge and belief;

b. That the amount of the claim and the claim itself accurately reflects what the Contractor in good faith believes to be the State's liability.

17A.7.2 If the Contractor is an individual, the certification shall be executed by that individual. If the Contractor is not an individual, the certification shall be executed by a company official in charge of the Contractor's operations pertaining to this contract or an officer or general partner of the Contractor having overall responsibility for the conduct of the Contractor's affairs.

17A.7.3 Failure to timely comply with any of the requirements of Article 17A for the submission of any claim for delay may constitute grounds for denial of such claim.

ARTICLE 18 - RESPONSIBILITY FOR DAMAGE

18.1 The Contractor shall faithfully perform and complete all of the Work required by the Contract, and has full responsibility for the following risks:

18.1.1 Loss or damage, direct or indirect, to any property owned by the State or to the Work including the building or structure in which the Work is being performed, or any other construction in progress whether being performed by any other contractor or the State, or to any plant, equipment, tools, materials or property furnished, used, installed or received by the Director under this Contract or any other contract. The Contractor shall bear all such risk of loss or damage, until all of the Work covered by the Contract has been finally accepted. In the event of such loss or damage the Contractor shall forthwith repair, replace, and make good any such loss or damage without additional cost.

18.1.2 Injury to persons (including death resulting there from), or damage to property caused by an occurrence arising out of the performance of this Contract for which the Contractor may be legally liable under the laws of torts.

18.2 The Contractor, however, shall not be responsible for damages resulting from faulty design or from willful acts of State officials or employees or from negligence resulting solely from acts or omissions of the State, its officers or employees. Nothing herein shall vest in third parties any right of action beyond such as may legally exist irrespective of this Article.

18.3 The Contractor shall indemnify and save harmless the State, its employees and agents from suits, actions, damages, and costs of every name and description relating to the performance of this Contract during its prosecution and until the acceptance thereof, and the State may retain such moneys from the amount due the Contractor as may be necessary to satisfy any claim for damages recovered against the State. The Contractor's obligations under this paragraph shall not be deemed waived by the failure of the State to retain the whole or any part of such moneys due the Contractor, nor shall such obligation be deemed limited or discharged by the enumeration or procurement of any insurance for liability for damages imposed by law upon the Contractor, subcontractor or the State.

ARTICLE 19 - INSURANCE - BUILDER'S RISK, LIABILITY AND WORKERS' COMPENSATION

19.1 Before commencing the Work and until the established Physical Completion date, all insurance required by the Contract shall be obtained at the sole cost and expense of the Contractor; and the Contractor shall furnish to the Contracting Officer a Certificate of

Insurance in a form satisfactory to the Contracting Officer showing that the Contractor has complied with this Article. Insurance shall be maintained with insurance carriers licensed to do business in New York State and acceptable to the Contracting Officer; shall be primary and non-contributing to any insurance or self insurance maintained by OGS; and shall be endorsed to provide written notice be given to the Contracting Officer at least thirty days prior to the cancellation, non-renewal, or material alteration of such policies, which notice, evidenced by return receipt of United States Certified Mail, any notice shall be addressed to:

Division of Contract Administration
Director
35th Floor, Corning Tower
Albany, New York 12242

19.1.1 The endorsement shall name The People of the State of New York, its officers, agents, employees and the assigned construction manager as additional insureds there under. This additional insured shall be primary and non-contributory. (General Liability Additional Insured Endorsement shall be on Insurance Service Office's (ISO) form number CG 20 10 11 85 and a copy of which shall be furnished along with the Certificate of Insurance.) The Contracting Officer may modify the provisions of this Article when deemed in the best interest of the State by order on contract or field order.

19.1.2 The Contractor, throughout the term of this Contract, or as otherwise required by this Contract, shall obtain and maintain in full force and effect on an occurrence form, the following insurance with limits not less than those described in this article, and as required by the terms of this Contract, or as required by law, whichever is greater. If such insurance contains an aggregate limit, it shall apply separately on a per job, per location basis.

19.1.3 The Contractor shall be solely responsible for the payment of all deductibles and Self Insured Retentions.

19.1.4 Not less than thirty days prior to the expiration date or renewal date of any insurance policies reflected on such certificates, the Contractor shall supply OGS updated replacement Certificates of Insurance, and amendatory endorsements.

19.2 The kinds and amount of insurance is as follows:

19.2.1 Workers' Compensation Insurance and Disability Benefits Law. A policy covering the obligations of the Contractor in accordance with the Workers' Compensation Law and the Disability Benefits Law covering all operations under the Contract, whether performed by the Contractor or by its subcontractor.

19.2.2 Commercial General Liability, and if necessary, Commercial Umbrella Liability Insurance with a limit of not less than $2,000,000 each occurrence. Such liability shall be written on the ISO occurrence form CG 00 01, or a substitute form providing equivalent coverages and shall cover liability resulting in Bodily Injury, Property Damage, Personal Injury or loss of use arising from premises operations, independent contractors, products-completed operations, broad form property damage, personal & advertising injury, cross liability coverage, liability assumed in a contract (including the tort liability of another assumed in a contract) and explosion, collapse & underground coverage.

If such insurance contains an aggregate limit, it shall apply separately on a per job, per location basis.

19.2.3 Comprehensive Business Automobile Liability, and if necessary, Commercial Umbrella Liability Insurance with a limit of not less than $2,000,000 each accident. Such insurance shall cover liability arising out of any automobile including owned, leased, hired and non-owned automobiles.

19.2.4 Builder's Risk: The Contractor shall be liable for any and all damages and losses to the Project prior to the State of New York's acceptance of the Project as fully completed except that the Contractor shall not be liable for:

19.2.4.1 Losses covered by the Builder's Risk property insurance provided by the State of New York; except that the Contractor shall be liable for the applicable deductible.

19.2.4.2 All policies shall be issued by insurance companies licensed to conduct such business under the laws of the State of New York, shall be written for the benefit of the State of New York and for the Contractor as their interests may appear, and shall run until the contract physical completion date. The State of New York must be listed as loss payee pursuant to this policy. Policies expiring on a fixed date before physical completion must be renewed and re-filed not less than thirty days before such expiration date.

19.2.5 If the work involves abatement, removal, repair, replacement, enclosure, encapsulation and/or disposal of any petroleum, petroleum product, hazardous material or substance including asbestos, lead or mold, and those as defined by applicable State and federal laws and regulations, the Contractor shall procure, or otherwise obtain through an approved subcontractor, and maintain in full force and effect throughout the term of the contract, and for two years after completion hereof, pollution legal liability insurance with limits of not less than $5,000,000, providing coverage for bodily injury and property

damage, including loss of use of damaged property or of property that has not been physically injured. Such policy shall provide coverage for actual, alleged or threatened emission, discharge, dispersal, seepage, release or escape of pollutants, including any loss, cost or expense incurred as a result of any cleanup of pollutants or in the investigation, settlement or defense of any claim, suit, or proceedings against OGS arising from Contractor's work. The State of New York shall be named as additional insured and this shall be primary.

19.2.5.1 If automobiles are to be used for transporting hazardous materials, the Contractor shall provide pollution liability broadened coverage for covered autos (endorsement CA 99 48) as well as proof of MCS 90.

19.3 The Contractor may provide the required proof of insurance on industry forms provided that no other endorsements exclude, delete or restrict those coverage's provided for by this article. It is required that companies affording coverage list the company name in full as filed with the New York State Insurance Department. The contract number and project location must be provided in order to approve the certificate.

19.4 Should the Contractor fail to provide or maintain any insurance required by law the Contract will be considered null and void. Further, no contractor is permitted to access the project site without providing proof of proper insurance to the Contracting Officer or his designated representative. No payments will be authorized by the Contracting Officer to any firm who fails to comply with the provisions of this Article.

ARTICLE 20 - OCCUPANCY PRIOR TO COMPLETION AND ACCEPTANCE

20.1 The State shall have the right to take possession of or use any completed or partially completed portion of the Work. Written notice of such possession shall be given to the Contractor by the Director. The notice shall identify the date when such possession shall commence and the area, equipment or system involved. Written notice shall also be given the Contractor for any cessation of such possession by the State. Such possession or use shall not be deemed an acceptance of any Work. While the State is in such possession, the Contractor, notwithstanding the provisions of Article 18 of the Contract, shall be relieved of the responsibility for loss or damage to the Work except for that resulting from the Contractor's fault or negligence. If such possession or use by the State delays the progress of the Work or causes additional expense to the Contractor, an adjustment in the Contract price and/or the time of completion shall be made and the Contract modified in writing accordingly. The provisions relating to an adjustment in the Contract price or the time of completion contained in this paragraph shall not apply to occupancy or possession after Substantial Completion.

ARTICLE 21 - PAYMENT

21.1 The Contractor shall submit monthly, or at more frequent intervals if permitted in writing by the Contracting Officer, a requisition for a progress payment to the designated payment office for Work performed and materials furnished up to the date of the requisition, less any amount previously paid to the Contractor. Except as otherwise provided by this Contract, the Contracting Officer shall approve and cause to be paid the requisition for the progress payment less an amount necessary to satisfy any claims, liens or judgments against the Contractor which have not been suitably discharged and less any amount authorized by law to be retained. The requisition shall be in such form and supported by such evidence as the Contracting Officer may reasonably require. The designated payment office is listed as follows:

Division of Contract Administration
Bureau of Contract Performance
35th Floor, Corning Tower
Albany, New York 12242

21.1.1 For those contracts designated as Labor and Material reimbursement or similar type contracts, the contractor shall submit to the Contract Payment Audit Group no later than 60 days from the period of when the work occurred, acceptable proof of labor and material costs specific to the approved scope of work as verified by the Directors Representative, to the Contracting Officer for audit, verification and approval prior to the submission of any payment. The Contract Payment Audit Group is located at the following location:

Division of Contract Administration
Contract Payment Audit Group
35th Floor, Corning Tower
Albany, New York 12242

21.1.2 The submittal of cost for reimbursement to the Contractor shall be in such form and supported by such evidence as the Contracting Officer may reasonably require.

21.1.3 For those contracts designated as Electronic Contractor Requisition (ECR) eligible, if the contractor agrees to participate (participation is not mandatory – a contractor may still elect to submit paper requisitions) , the contractor shall provide an Electronic Contractor Requisition (ECR) Program Certification form which shall become part of this agreement. The contractor further certifies that the individual certifying the requisition is duly authorized to undertake requisitioning transactions. The contractor understands that the State will rely on the information disclosed in the contractor's requisition consistent with all of the

provisions of this Article. A contractor need not submit electronic requisitions in order to receive electronic payments.

21.2 The Director or the Contracting Officer may refuse to approve the requisition or a portion of it if the Contractor is failing or refusing to prosecute the Work in accordance with the Contract.

21.3 Payment will be made for approved materials not yet incorporated in the Work which are in short and/or critical supply and for materials determined to be specifically fabricated for the project. Requisitions which require payment for materials shall be accompanied by a notarized statement certifying that the materials for which payment is requisitioned are the Contractor's property and have been suitably stored and insured. The Contractor shall provide such evidence of the value of the material stored as the Contracting Officer may reasonably require. The Contractor shall have full continuing responsibility to insure and protect such materials and maintain them in proper condition to fulfill Contract requirements when installed.

21.4 When the Work or major milestones thereof as contemplated by the terms of this Contract are substantially completed, the Contractor shall submit to the Contracting Officer a requisition for payment of the remaining amount of the Contract balance. Upon receipt of such requisition the Contracting Officer shall, except as otherwise provided by this Contract, approve and cause to be paid 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. As the remaining items of Work are satisfactorily completed or corrected, the Contracting Officer shall cause to be paid, upon receipt of a requisition, for these remaining items less an amount necessary to satisfy any claims, liens or judgments against the Contractor which have not been suitably discharged.

21.5 No more than 60 days after the issuance of the Physical Completion Report, the Contractor shall submit to the Contracting Officer or his designated representative a requisition for payment of the remaining Contract balance. Upon receipt of this requisition, the Contracting Officer shall, except as otherwise provided by this Contract, approve and cause such requisition to be paid less any amount necessary to satisfy any claims, liens or judgments against the Contractor which have not been suitably discharged. The Contractor waives any claim or right to payment of any contract balance which has not been requisitioned for payment within 60 days of the issuance of the Physical Completion Report.

21.6 The final certificate letter will not be issued until all the labor and material required by the Contract has been furnished and completed, all disputes and claims relating to the performance of the Contract considered and disposed of and all accounts for extra work and materials and allowances for omissions have been rendered and considered. The Contractor waives any claim or right to additional compensation which has not been submitted in writing via certified or registered mail to the Contracting Officer pursuant to Article 17A, within thirty days of the issuance of the Physical Completion Report.

21.7 The final certificate letter will constitute the acceptance of the Work by the State, except as to Work thereafter found to be defective. The date of such certificate shall be regarded as the date of acceptance of the Work.

21.8 No payment will be made to a foreign Contractor until it furnishes satisfactory proof that it has paid all taxes required of foreign Contractors under the provisions of the New York State Tax Law. A foreign Contractor as used in this paragraph shall mean a Contractor denominated "foreign" by the New York State Tax Law.

21.9 The contractor is advised that consistent with Subdivision 3-a, of Section 220 of the Labor Law, the filing of certified payroll records is a condition precedent to payment of any sums due and owing to any person performing work on this project. The failure to file pursuant to this section will result in a payment delay until such time as the filing occurs.

21.10 The Contractor acknowledges that it will not receive payment on any requests for payment unless the contractor complies with the State Comptroller's electronic payment deposit procedures Payments requested by the contractor will only be facilitated via electronic deposit, except where the Commissioner has expressly authorized payment by paper check.

ARTICLE 22 - AUDITS AND RECORDS

22.1 The Group Director, the Comptroller or their representatives shall have the right to examine all books, records, documents, and other data of the Contractor, subcontractors, material-men or suppliers relating to the bidding, pricing or performance of this Contract or any change or modification thereto for the purpose of evaluating the accuracy, completeness, and currency of the cost or pricing data submitted. This right of examination shall extend to all documents necessary to permit adequate evaluation of the cost or pricing data submitted along with the computations and projections used therein.

22.2 The above materials shall be made available at the office of the Contractor, subcontractors, material-men or suppliers at all reasonable times for inspection,

audit or reproduction until the expiration of six years from the date of the final certificate for the Contract.

22.3 If this Contract is completely or partially terminated, the records relating to the Work terminated shall be made available for a period of six years from the date of any resulting final settlement.

22.4 Records which relate to the Disputes Clause of this Contract or litigation or the settlement of claims arising out of the performance of this Contract shall be made available until such appeals, litigation or claims have been disposed of.

22.5 The Contractor shall insert a clause containing all of the provisions of Paragraphs 22.1 to 22.4 of these General Conditions in all subcontracts or purchase orders issued hereunder.

22.6 The Contractor shall make available to the Contracting Officer, upon written request, all records required to be kept by this Contract or by Article 3-A of the Lien Law. The failure to provide said records upon the receipt of the written request shall bar any recovery for claimed extra or additional costs under this Contract.

ARTICLE 23 – LABOR LAW PROVISIONS

23.1 The contractor shall post, in a location designated by the State, a copy of the New York State Department of Labor schedules of prevailing wages and supplements for this Project, a copy of all re-determinations of such schedules for the Project, the Workers' Compensation Law Section 51 notice, all other notices required by law to be posted at the Site, the Department of Labor notice that this Project is a public work project on which each worker is entitled to receive the prevailing wages and supplements for the occupation at which he or she is working, and all other notices which the State directs the contractor to post. The contractor shall provide a surface for such notices which is satisfactory to the State. The contractor shall maintain such notices in a legible manner and shall replace any notice or schedule which is damaged, defaced, illegible or removed for any reason. The contractor shall post such notices before commencing any Work on the Site and shall maintain such notices until all Work on the Site is complete.

23.2 The contractor shall distribute to each worker for this Contract a notice, in a form provided by the State, that this Project is a public work project on which each worker is entitled to receive the prevailing wage and supplements for the occupation at which he or she is working. Worker includes employees of contractor and all Subcontractors and all employees of Suppliers entering the Site. Such notice shall be distributed to each worker before he or she starts performing any Work of this Contract. At the time of distribution, the contractor shall have each worker sign a statement, in a form provided by the State, certifying that the worker has received the notice required by this section, which signed statement shall be maintained with the payroll records required by Paragraph 23.3 of these General Conditions.

23.3 The contractor shall maintain on the Site the original certified payroll or certified transcripts thereof which the contractor and all of its Subcontractors are required to maintain pursuant to New York Labor Law Section 220. The contractor shall maintain with the payrolls or transcripts thereof, the statements signed by each worker pursuant to Paragraph 23.2 of these General Conditions.

23.4 A contractor or subcontractor who is required under New York Labor Law Section 220 to maintain transcripts of payroll records must submit to the contracting agency a transcript of the original payroll record within thirty days of issuance of its first payroll and every thirty days, thereafter. The copy of the payroll record must be subscribed and affirmed as true under penalty of perjury. The copy must include the contract number and should be directed to the Director's Representative at the job site. The Directors Representative is hereby designated as the individual responsible for the receipt, collection and review for authenticity of payroll records filed for this contract, consistent with Article 23.4, General Conditions and subparagraph (iii) and (iv) Section 220 Labor Law.

23.5 In accordance with New York Labor Law §222-H, the contractor agrees where the total cost of all work to be performed under the contract is at least two hundred fifty thousand dollars; all laborers, workers, and mechanics employed in the performance of this contract on the public work site, either by the contractor, sub-contractor or other person doing or contracting to do the whole or a part of the work contemplated by this contract, shall be certified prior to performing any work on the project as having successfully completed a course in construction safety and health approved by the United States department of labor's occupational safety and health administration that is at least ten hours in duration.

23.6 In accordance with New York Labor Law § 220 (3) (a), the Contractor and every sub-contractor agrees to notify all laborers, workers or mechanics in their employ in writing of the prevailing rate of wage for their particular job classification. Such notification shall be given to every laborer, worker or mechanic on their first pay stub and with every pay stub thereafter. At the beginning of performance of every public works contract, and with the first paycheck after July first of each year, the Contractor and every sub-contractor shall notify all laborers, workers, and mechanics in their employ in writing, in accordance with such form as is prescribed by the department, of the telephone number and address for the department. The notice shall also

inform each laborer, worker, or mechanic of his or her right to contact the department or some other representative if, at any time while working for the public works contractor or sub-contractor, he or she does not receive the proper prevailing rate of wages or supplements for his or her particular job classification that he or she is entitled to receive under the contract.

ARTICLE 24 - STATUTORY REQUIREMENTS FOR RESTRICTIONS ON CONTACTS DURING THE PROCUREMENT PROCESS AND DISCLOSURE OF CONTACTS AND RESPONSIBILITY OF OFFERERS MISCELLANEOUS PROVISIONS

24.1 New York State Finance Law §139-k requires that every procurement contract award subject to the provisions of State Finance Law §139-k or §139-j shall contain a certification by the offerer that all information provided to the procuring governmental agency with respect to State Finance Law §139-k is complete, true and accurate. The Contractor shall provide that certification in his contract or agreement.

24.2 New York State Finance Law

24.2.1 New York State Finance Law § 139-k(2) obligates a Governmental Entity to obtain specific information regarding prior non-responsibility determinations. This information must be collected in addition to the information that is separately obtained pursuant to State Finance Law § 163 (9). In accordance with State Finance Law § 139-k, an offerer must be asked to disclose whether there has been a finding of non-responsibility made within the previous four (4) years by any Governmental Entity due to: (a) a violation of State Finance Law § 139-j or (b) the intentional provision of false or incomplete information to a Governmental Entity.

24.2.2 As part of its responsibility determination, State Finance Law § 139-k(3) mandates consideration of whether an offerer fails to timely disclose or complete information regarding the above non-responsibility determination. In accordance with law, no procurement contract shall be awarded to any offerer that fails to timely disclose accurate or complete information under this section, unless a finding is made that the award of the Procurement Contract to the Offerer is necessary to protect public property or public health safety, and that the Offerer is the only source capable of supplying the required Article of Procurement within the necessary timeframe. The required forms to be completed by the offerer must be submitted to the Governmental Entity conducting the government procurement. The Governmental Entity will have included the disclosure request in its solicitation of proposals or bid documents or specifications of contract documents, as applicable, for procurement contracts.

ARTICLE 25 – MISCELLANEOUS PROVISIONS

25.1 Appendix A, standard clauses for all N.Y. State contracts, is attached hereto and is made a part of this agreement as if set forth herein.

25.2 If, in carrying out this Work, a harmful dust hazard is created for which appliances or methods for the elimination of harmful dust have been approved by the Board of Standards and Appeals, then the Contractor shall install, maintain and effectively operate such appliances and methods during the life of this Contract; and in case of Contractor's failure to comply, as provided by Section 222-a of the Labor Law, the Contract shall be void.

25.3 RETAINED PERCENTAGES: The Contractor agrees that, if the Contract Documents for this Contract includes Performance and Payment Bonds, the State shall retain five percent of the amount of each progress payment in accordance with Section 139-f of the State Finance Law. The Contractor further agrees that, if the Contract Documents for this Contract do not include Performance and Payment Bonds, the State shall retain ten percent of the amount of each progress payment in accordance with Section 139-f of the State Finance Law.

25.4 DOMESTIC STEEL: The Contractor agrees, that if the value of this contract exceeds $100,000 all structural steel, reinforcing steel and other major steel items to be incorporated in the Work of this Contract shall be produced and made in whole or substantial part in the United States, its territories or possessions.

25.5 COMMENCEMENT OF ACTIONS: The time, as prescribed by law, within which an action on the contract against the Contractor must be commenced shall be computed from the completion of physical work. The Contractor may notify the State in writing that the physical work of the contract has been completed by specifying a completion date, which date shall be no more than thirty days previous to the date of such notice. The completion date set forth in such notice shall be deemed the date of completion of the physical work unless the State, within thirty days of receipt of such notice, notifies the Contractor in writing of its disagreement. Any notice pursuant to this paragraph shall be sent by the Contractor by Certified Mail and addressed to:

Division of Contract Administration
Contracting Officer
35th Floor, Corning Tower
Albany, New York 12242

25.5.1 In the event that the Contractor fails to send the notice provided for herein or the State disagrees in the manner provided for herein, the date of completion of the physical work shall be determined in any other manner provided by law.

25.6 WORKER'S COMPENSATION LAW: In accordance with Worker's Compensation Law (WCL) §141-b (Suspension and Debarment), any person subject to a final assessment of civil fines or penalties or a stop-work order, or that has been convicted of a misdemeanor for a violation of WCL §§ 26 (Enforcement of Payment in Default), 52 (Effect of Failure to Secure Compensation) or 131 (Payroll Records), and any substantially-owned affiliated entity of such person, shall be ineligible to submit a bid on or be awarded any such public work contract or subcontract with the State, any municipal corporation or public body for a period of one (1) year from the final determination or conviction. Any person convicted of a felony under Article 8 (Administration) of the WCL, or a misdemeanor under WCL §§125 (Job Description Prohibited Based on Prior Receipt of Benefits) and 125-a (Civil Enforcement) shall be ineligible to submit a bid or be awarded any public work contract or subcontract with the State, any municipal corporation or public body for a period of five (5) years from such conviction.

25.7 ENVIRONMENTAL CONSERVATION LAWS: The Contractor certifies and warrants that all heavy duty vehicles, as defined in New York State Environmental Law (ECL) section 19-0323, to be used under this Contract, will comply with the specifications and provisions of ECL section 19-0323 and any regulations promulgated pursuant thereto, which requires the use of BART and ULSD, unless specifically waived by NYSDEC. Qualification for a waiver under this law will be the responsibility of the Contractor.

25.8 REPORTING OF ILLEGAL ACTIVITY: During the term of the contract, the Contractor agrees to report any observed or suspected illegal activity of its employees, agents or other third parties, to the Contracting Officer at 518-474-0201, the Group Director, OGS Legal Services, the State Inspector General or other law enforcement agency. Failure to report criminal conduct associated with a contract awarded by the Office of General Services, will be considered a material breach of the contract and may provide grounds for disqualification of the subject Contractor or Subcontractor for award of future contracts. The Contractor will include the provisions of this section in every subcontract, in such a manner that the provisions will be binding upon each Subcontractor as to work performed in connection with the State contract.

APPENDIX A

STANDARD CLAUSES FOR NEW YORK STATE CONTRACTS

**PLEASE RETAIN THIS DOCUMENT
FOR FUTURE REFERENCE.**

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STANDARD CLAUSES FOR NYS CONTRACTS

The parties to the attached contract, license, lease, amendment or other agreement of any kind (hereinafter, "the contract" or "this contract") agree to be bound by the following clauses which are hereby made a part of the contract (the word "Contractor" herein refers to any party other than the State, whether a contractor, licenser, licensee, lessor, lessee or any other party):

1. EXECUTORY CLAUSE. In accordance with Section 41 of the State Finance Law, the State shall have no liability under this contract to the Contractor or to anyone else beyond funds appropriated and available for this contract.

2. NON-ASSIGNMENT CLAUSE. In accordance with Section 138 of the State Finance Law, this contract may not be assigned by the Contractor or its right, title or interest therein assigned, transferred, conveyed, sublet or otherwise disposed of without the State's previous written consent, and attempts to do so are null and void. Notwithstanding the foregoing, such prior written consent of an assignment of a contract let pursuant to Article XI of the State Finance Law may be waived at the discretion of the contracting agency and with the concurrence of the State Comptroller where the original contract was subject to the State Comptroller's approval, where the assignment is due to a reorganization, merger or consolidation of the Contractor's business entity or enterprise. The State retains its right to approve an assignment and to require that any Contractor demonstrate its responsibility to do business with the State. The Contractor may, however, assign its right to receive payments without the State's prior written consent unless this contract concerns Certificates of Participation pursuant to Article 5-A of the State Finance Law.

3. COMPTROLLER'S APPROVAL. In accordance with Section 112 of the State Finance Law, if this contract exceeds $50,000 (or $75,000 for State University of New York or City University of New York contracts for goods, services, construction and printing, and $150,000 for State University Health Care Facilities) or if this is an amendment for any amount to a contract which, as so amended, exceeds said statutory amount, or if, by this contract, the State agrees to give something other than money when the value or reasonably estimated value of such consideration exceeds $25,000, it shall not be valid, effective or binding upon the State until it has been approved by the State Comptroller and filed in his office. Comptroller's approval of contracts let by the Office of General Services, either for itself or its customer agencies by the Office of General Services Business Services Center, is required when such contracts exceed $85,000. Comptroller's approval of contracts established as centralized contracts through the Office of General Services is required when such contracts exceed $125,000, and when a purchase order or other procurement transaction issued under such centralized contract exceeds $200,000.

4. WORKERS' COMPENSATION BENEFITS. In accordance with Section 142 of the State Finance Law, this contract shall be void and of no force and effect unless the Contractor shall provide and maintain coverage during the life of this contract for the benefit of such employees as are required to be covered by the provisions of the Workers' Compensation Law.

5. NON-DISCRIMINATION REQUIREMENTS. To the extent required by Article 15 of the Executive Law (also known as the Human Rights Law) and all other State and Federal statutory and constitutional non-discrimination provisions, the Contractor will not discriminate against any employee or applicant for employment, nor subject any individual to harassment, because of age, race, creed, color, national origin, citizenship or immigration status, sexual orientation, gender identity or expression, military status, sex, disability, predisposing genetic characteristics, familial status, marital status, or domestic violence victim status or because the individual has opposed any practices forbidden under the Human Rights Law or has filed a complaint, testified, or assisted in any proceeding under the Human Rights Law. Furthermore, in accordance with Section 220-e of the Labor Law, if this is a contract for the construction, alteration or repair of any public building or public work or for the manufacture, sale or distribution of materials, equipment or supplies, and to the extent that this contract shall be performed within the State of New York, Contractor agrees that neither it nor its subcontractors shall, by reason of race, creed, color, disability, sex, or national origin: (a) discriminate in hiring against any New York State citizen who is qualified and available to perform the work; or (b) discriminate against or intimidate any employee hired for the performance of work under this contract. If this is a building service contract as defined in Section 230 of the Labor Law, then, in accordance with Section 239 thereof, Contractor agrees that neither it nor its subcontractors shall by reason of race, creed, color, national origin, age, sex or disability: (a) discriminate in hiring against any New York State citizen who is qualified and available to perform the work; or (b) discriminate against or intimidate any employee hired for the performance of work under this contract. Contractor is subject to fines of $50.00 per person per day for any violation of Section 220-e or Section 239 as well as possible termination of this contract and forfeiture of all moneys due hereunder for a second or subsequent violation.

6. WAGE AND HOURS PROVISIONS. If this is a public work contract covered by Article 8 of the Labor Law or a building service contract covered by Article 9 thereof, neither Contractor's employees nor the

employees of its subcontractors may be required or permitted to work more than the number of hours or days stated in said statutes, except as otherwise provided in the Labor Law and as set forth in prevailing wage and supplement schedules issued by the State Labor Department. Furthermore, Contractor and its subcontractors must pay at least the prevailing wage rate and pay or provide the prevailing supplements, including the premium rates for overtime pay, as determined by the State Labor Department in accordance with the Labor Law. Additionally, effective April 28, 2008, if this is a public work contract covered by Article 8 of the Labor Law, the Contractor understands and agrees that the filing of payrolls in a manner consistent with Subdivision 3-a of Section 220 of the Labor Law shall be a condition precedent to payment by the State of any State approved sums due and owing for work done upon the project.

7. NON-COLLUSIVE BIDDING CERTIFICATION. In accordance with Section 139-d of the State Finance Law, if this contract was awarded based upon the submission of bids, Contractor affirms, under penalty of perjury, that its bid was arrived at independently and without collusion aimed at restricting competition. Contractor further affirms that, at the time Contractor submitted its bid, an authorized and responsible person executed and delivered to the State a non-collusive bidding certification on Contractor's behalf.

8. INTERNATIONAL BOYCOTT PROHIBITION. In accordance with Section 220-f of the Labor Law and Section 139-h of the State Finance Law, if this contract exceeds $5,000, the Contractor agrees, as a material condition of the contract, that neither the Contractor nor any substantially owned or affiliated person, firm, partnership or corporation has participated, is participating, or shall participate in an international boycott in violation of the federal Export Administration Act of 1979 (50 USC App. Sections 2401 et seq.) or regulations thereunder. If such Contractor, or any of the aforesaid affiliates of Contractor, is convicted or is otherwise found to have violated said laws or regulations upon the final determination of the United States Commerce Department or any other appropriate agency of the United States subsequent to the contract's execution, such contract, amendment or modification thereto shall be rendered forfeit and void. The Contractor shall so notify the State Comptroller within five (5) business days of such conviction, determination or disposition of appeal (2 NYCRR § 105.4).

9. SET-OFF RIGHTS. The State shall have all of its common law, equitable and statutory rights of set-off. These rights shall include, but not be limited to, the State's option to withhold for the purposes of set-off any moneys due to the Contractor under this contract up to any amounts due and owing to the State with regard to this contract, any other contract with any State department or agency, including any contract for a term commencing prior to the term of this contract, plus any amounts due and owing to the State for any other reason including, without limitation, tax delinquencies, fee delinquencies or monetary penalties relative thereto. The State shall exercise its set-off rights in accordance with normal State practices including, in cases of set-off pursuant to an audit, the finalization of such audit by the State agency, its representatives, or the State Comptroller.

10. RECORDS. The Contractor shall establish and maintain complete and accurate books, records, documents, accounts and other evidence directly pertinent to performance under this contract (hereinafter, collectively, the "Records"). The Records must be kept for the balance of the calendar year in which they were made and for six (6) additional years thereafter. The State Comptroller, the Attorney General and any other person or entity authorized to conduct an examination, as well as the agency or agencies involved in this contract, shall have access to the Records during normal business hours at an office of the Contractor within the State of New York or, if no such office is available, at a mutually agreeable and reasonable venue within the State, for the term specified above for the purposes of inspection, auditing and copying. The State shall take reasonable steps to protect from public disclosure any of the Records which are exempt from disclosure under Section 87 of the Public Officers Law (the "Statute") provided that: (i) the Contractor shall timely inform an appropriate State official, in writing, that said records should not be disclosed; and (ii) said records shall be sufficiently identified; and (iii) designation of said records as exempt under the Statute is reasonable. Nothing contained herein shall diminish, or in any way adversely affect, the State's right to discovery in any pending or future litigation.

11. IDENTIFYING INFORMATION AND PRIVACY NOTIFICATION. (a) Identification Number(s). Every invoice or New York State Claim for Payment submitted to a New York State agency by a payee, for payment for the sale of goods or services or for transactions (e.g., leases, easements, licenses, etc.) related to real or personal property must include the payee's identification number. The number is any or all of the following: (i) the payee's Federal employer identification number, (ii) the payee's Federal social security number, and/or (iii) the payee's Vendor Identification Number assigned by the Statewide Financial System. Failure to include such number or numbers may delay payment. Where the payee does not have such number or numbers, the payee, on its invoice or Claim for Payment, must give the reason or reasons why the payee does not have such number or numbers.

(b) Privacy Notification. (1) The authority to request the above personal information from a seller of goods or services or a lessor of real or personal property, and the authority to maintain such information, is found in Section 5 of the State Tax Law. Disclosure of this information by the seller or lessor to the State is mandatory. The principal purpose for which the information is collected is to enable the State to identify individuals, businesses and others who have been delinquent in filing tax returns or may have understated their tax liabilities and to generally identify persons affected by the taxes administered by the Commissioner of Taxation and Finance. The information will be used for tax administration purposes and for any other purpose authorized by law. (2) The personal information is requested by the purchasing unit of the agency contracting to purchase the goods or services or lease the real or personal property covered by this contract or lease. The information is maintained in the Statewide Financial System by the Vendor Management Unit within the Bureau of State Expenditures, Office of the State Comptroller, 110 State Street, Albany, New York 12236.

12. EQUAL EMPLOYMENT OPPORTUNITIES FOR MINORITIES AND WOMEN. In accordance with Section 312 of the Executive Law and 5 NYCRR Part 143, if this contract is: (i) a written agreement or purchase order instrument, providing for a total expenditure in excess of $25,000.00, whereby a contracting agency is committed to expend or does expend funds in return for labor, services, supplies, equipment, materials or any combination of the foregoing, to be performed for, or rendered or furnished to the contracting agency; or (ii) a written agreement in excess of $100,000.00 whereby a contracting agency is committed to expend or does expend funds for the acquisition, construction, demolition, replacement, major repair or renovation of real property and improvements thereon; or (iii) a written agreement in excess of $100,000.00 whereby the owner of a State assisted housing project is committed to expend or does expend funds for the acquisition, construction, demolition, replacement, major repair or renovation of real property and improvements thereon for such project, then the following shall apply and by signing this agreement the Contractor certifies and affirms that it is Contractor's equal employment opportunity policy that:

(a) The Contractor will not discriminate against employees or applicants for employment because of race, creed, color, national origin, sex, age, disability or marital status, shall make and document its conscientious and active efforts to employ and utilize minority group members and women in its work force on State contracts and will undertake or continue existing programs of affirmative action to ensure that minority group members and women are afforded equal employment opportunities without discrimination. Affirmative action shall mean recruitment, employment, job assignment, promotion, upgradings, demotion, transfer, layoff, or termination and rates of pay or other forms of compensation;

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

(c) the Contractor shall state, in all solicitations or advertisements for employees, that, in the performance of the State contract, all qualified applicants will be afforded equal employment opportunities without discrimination because of race, creed, color, national origin, sex, age, disability or marital status.

Contractor will include the provisions of "(a), (b) and (c)" above, in every subcontract over $25,000.00 for the construction, demolition, replacement, major repair, renovation, planning or design of real property and improvements thereon (the "Work") except where the Work is for the beneficial use of the Contractor. Section 312 does not apply to: (i) work, goods or services unrelated to this contract; or (ii) employment outside New York State. The State shall consider compliance by a contractor or subcontractor with the requirements of any federal law concerning equal employment opportunity which effectuates the purpose of this clause. The contracting agency shall determine whether the imposition of the requirements of the provisions hereof duplicate or conflict with any such federal law and if such duplication or conflict exists, the contracting agency shall waive the applicability of Section 312 to the extent of such duplication or conflict. Contractor will comply with all duly promulgated and lawful rules and regulations of the Department of Economic Development's Division of Minority and Women's Business Development pertaining hereto.

13. CONFLICTING TERMS. In the event of a conflict between the terms of the contract (including any and all attachments thereto and amendments thereof) and the terms of this Appendix A, the terms of this Appendix A shall control.

14. GOVERNING LAW. This contract shall be governed by the laws of the State of New York except where the Federal supremacy clause requires otherwise.

15. LATE PAYMENT. Timeliness of payment and any interest to be paid to Contractor for late payment shall be governed by Article 11-A of the State Finance Law to the extent required by law.

16. NO ARBITRATION. Disputes involving this contract, including the breach or alleged breach thereof, may not be submitted to binding arbitration (except where statutorily authorized), but must, instead, be heard in a court of competent jurisdiction of the State of New York.

17. SERVICE OF PROCESS. In addition to the methods of service allowed by the State Civil Practice Law & Rules ("CPLR"), Contractor hereby consents to service of process upon it by registered or certified mail, return receipt requested. Service hereunder shall be complete upon Contractor's actual receipt of process or upon the State's receipt of the return thereof by the United States Postal Service as refused or undeliverable. Contractor must promptly notify the State, in writing, of each and every change of address to which service of process can be made. Service by the State to the last known address shall be sufficient. Contractor will have thirty (30) calendar days after service hereunder is complete in which to respond.

18. PROHIBITION ON PURCHASE OF TROPICAL HARDWOODS. The Contractor certifies and warrants that all wood products to be used under this contract award will be in accordance with, but not limited to, the specifications and provisions of Section 165 of the State Finance Law, (Use of Tropical Hardwoods) which prohibits purchase and use of tropical hardwoods, unless specifically exempted, by the State or any governmental agency or political subdivision or public benefit corporation. Qualification for an exemption under this law will be the responsibility of the contractor to establish to meet with the approval of the State.

In addition, when any portion of this contract involving the use of woods, whether supply or installation, is to be performed by any subcontractor, the prime Contractor will indicate and certify in the submitted bid proposal that the subcontractor has been informed and is in compliance with specifications and provisions regarding use of tropical hardwoods as detailed in § 165 State Finance Law. Any such use must meet with the approval of the State; otherwise, the bid may not be considered responsive. Under bidder certifications, proof of qualification for exemption will be the responsibility of the Contractor to meet with the approval of the State.

19. MACBRIDE FAIR EMPLOYMENT PRINCIPLES. In accordance with the MacBride Fair Employment Principles (Chapter 807 of the Laws of 1992), the Contractor hereby stipulates that the Contractor either (a) has no business operations in Northern Ireland, or (b) shall take lawful steps in good faith to conduct any business operations in Northern Ireland in accordance with the MacBride Fair Employment Principles (as described in Section 165 of the New York State Finance Law), and shall permit independent monitoring of compliance with such principles.

20. OMNIBUS PROCUREMENT ACT OF 1992. It is the policy of New York State to maximize opportunities for the participation of New York State business enterprises, including minority- and women-owned business enterprises as bidders, subcontractors and suppliers on its procurement contracts.

Information on the availability of New York State subcontractors and suppliers is available from:

NYS Department of Economic Development
Division for Small Business and Technology Development
625 Broadway
Albany, New York 12245
Telephone: 518-292-5100

A directory of certified minority- and women-owned business enterprises is available from:

NYS Department of Economic Development
Division of Minority and Women's Business Development
633 Third Avenue 33rd Floor
New York, NY 10017
646-846-7364
email: mwbebusinessdev@esd.ny.gov
https://ny.newnycontracts.com/FrontEnd/searchcertifieddirectory.asp

The Omnibus Procurement Act of 1992 (Chapter 844 of the Laws of 1992, codified in State Finance Law § 139-i and Public Authorities Law § 2879(3)(n)–(p)) requires that by signing this bid proposal or contract, as applicable, Contractors certify that whenever the total bid amount is greater than $1 million:

(a) The Contractor has made reasonable efforts to encourage the participation of New York State Business Enterprises as suppliers and subcontractors, including certified minority- and women-owned business enterprises, on this project, and has retained the documentation of these efforts to be provided upon request to the State;

(b) The Contractor has complied with the Federal Equal Opportunity Act of 1972 (P.L. 92-261), as amended;

(c) The Contractor agrees to make reasonable efforts to provide notification to New York State residents of employment opportunities on this project through listing any such positions with the Job Service Division of the New York State Department of Labor, or providing such notification in such manner as is consistent with existing collective bargaining contracts or agreements. The Contractor agrees to document these efforts and to provide said documentation to the State upon request; and

(d) The Contractor acknowledges notice that the State may seek to obtain offset credits from foreign countries as a result of this contract and agrees to cooperate with the State in these efforts.

21. RECIPROCITY AND SANCTIONS PROVISIONS. Bidders are hereby notified that if their principal place of business is located in a country, nation, province, state or political subdivision that penalizes New York State vendors, and if the goods or services they offer will be substantially produced or performed outside New York State, the Omnibus Procurement Act 1994 and 2000 amendments (Chapter 684 and Chapter 383, respectively, codified in State Finance Law § 165(6) and Public Authorities Law § 2879(5)) require that they be denied contracts which they would otherwise obtain. NOTE: As of May 2023, the list of discriminatory jurisdictions subject to this provision includes the states of South Carolina, Alaska, West Virginia, Wyoming, Louisiana and Hawaii.

22. COMPLIANCE WITH BREACH NOTIFICATION AND DATA SECURITY LAWS. Contractor shall comply with the provisions of the New York State Information Security Breach and Notification Act (General Business Law §§ 899-aa and 899-bb and State Technology Law § 208).

23. COMPLIANCE WITH CONSULTANT DISCLOSURE LAW. If this is a contract for consulting services, defined for purposes of this requirement to include analysis, evaluation, research, training, data processing, computer programming, engineering, environmental, health, and mental health services, accounting, auditing, paralegal, legal or similar services, then, in accordance with Section 163 (4)(g) of the State Finance Law (as amended by Chapter 10 of the Laws of 2006), the Contractor shall timely, accurately and properly comply with the requirement to submit an annual employment report for the contract to the agency that awarded the contract, the Department of Civil Service and the State Comptroller.

24. PROCUREMENT LOBBYING. To the extent this agreement is a "procurement contract" as defined by State Finance Law §§ 139-j and 139-k, by signing this agreement the contractor certifies and affirms that all disclosures made in accordance with State Finance Law §§ 139-j and 139-k are complete, true and accurate. In the event such certification is found to be intentionally false or intentionally incomplete, the State may terminate the agreement by providing written notification to the Contractor in accordance with the terms of the agreement.

25. CERTIFICATION OF REGISTRATION TO COLLECT SALES AND COMPENSATING USE TAX BY CERTAIN STATE CONTRACTORS, AFFILIATES AND SUBCONTRACTORS.
To the extent this agreement is a contract as defined by Tax Law § 5-a, if the contractor fails to make the certification required by Tax Law § 5-a or if during the term of the contract, the Department of Taxation and Finance or the covered agency, as defined by Tax Law § 5-a, discovers that the certification, made under penalty of perjury, is false, then such failure to file or false certification shall be a material breach of this contract and this contract may be terminated, by providing written notification to the Contractor in accordance with the terms of the agreement, if the covered agency determines that such action is in the best interest of the State.

26. IRAN DIVESTMENT ACT. By entering into this Agreement, Contractor certifies in accordance with State Finance Law § 165-a that it is not on the "Entities Determined to be Non-Responsive Bidders/Offerers pursuant to the New York State Iran Divestment Act of 2012" ("Prohibited Entities List") posted at: https://ogs.ny.gov/iran-divestment-act-2012

Contractor further certifies that it will not utilize on this Contract any subcontractor that is identified on the Prohibited Entities List. Contractor agrees that should it seek to renew or extend this Contract, it must provide the same certification at the time the Contract is renewed or extended. Contractor also agrees that any proposed Assignee of this Contract will be required to certify that it is not on the Prohibited Entities List before the contract assignment will be approved by the State.

During the term of the Contract, should the state agency receive information that a person (as defined in State Finance Law § 165-a) is in violation of the above-referenced certifications, the state agency will review such information and offer the person an opportunity to respond. If the person fails to demonstrate that it has ceased its engagement in the investment activity which is in violation of the Act within 90 days after the determination of such violation, then the state agency shall take such action as may be appropriate and provided for by law, rule, or contract, including, but not limited to, imposing sanctions, seeking compliance, recovering damages, or declaring the Contractor in default.

The state agency reserves the right to reject any bid, request for assignment, renewal or extension for an entity that appears on the Prohibited Entities List prior to the award, assignment, renewal or extension of a contract, and to pursue a responsibility review with respect to any entity that is awarded a contract and appears on the Prohibited Entities list after contract award.

27. ADMISSIBILITY OF REPRODUCTION OF CONTRACT. Notwithstanding the best evidence rule or any other legal principle or rule of evidence to the contrary, the Contractor acknowledges and agrees that it waives any and all objections to the admissibility into evidence at any court proceeding or to the use at any examination before trial of an electronic reproduction of this contract, in the form approved by the State Comptroller, if such approval was required, regardless of whether the original of said contract is in existence.

1. If the Contractor performs the Contract, the Surety and the Contractor shall have no obligation under the Performance Bond.

2. The Surety's obligation under this Bond shall arise after:

2.1 The State has notified the Contractor and the Surety in writing that the State is considering declaring a Contractor in default, or

2.2 The State has declared a Contractor in default and formally terminated the Contractor's right to complete the Contract, and

2.3 The State has agreed to pay the Balance of the Contract Price to the Surety or to a Contractor selected to complete the Contract in accordance with the terms of the Contract with the State.

3. The Surety shall promptly and at its own expense, take the following actions:

3.1 Undertake to perform and complete the Contract, through its agent or retained contractor; according to the following schedule:

Day 1-10 Immediately begins it investigation Advises OGS of its Representatives.

Day 10-25 Visits Site with OGS representatives to review the contract documents and completed work; and determines extent of acceptable Work.

Day 25-30 Submits proposed completion contractor, completion plan, and CPM as required, for approval by the Office of General Services.

Day 30-44 As completing contractor, the surety or its representative, presents its list of subcontractors to OGS for approval. Additionally an Insurance Certificate naming the Surety and completion Contractor as named insured must be submitted to the Contracting Officer prior to the beginning any completion of the Work. The completion plan and schedule is returned to Surety.

Day 45 Surety begins the Completion of the Work.

4. If the Surety does not proceed with reasonable promptness, the Surety shall be deemed to be in default on the Bond, and the State shall be entitled to enforce any remedy available pursuant to the terms of the contract.

5. After the State has terminated the Contractor's right to complete the Contract, and if the Surety elects to act then the responsibilities of the Surety to the State shall not be greater than those of the Contractor under the Contract, and the responsibilities of the State to the Surety shall not be greater than those provided under the Contract. To the limit of the amount of this Bond, the Surety is obligated to correct defective work and complete the work of the Contract in a timely manner.

6. The penal sum of the Performance Bond furnished by the contractor to the State, approved and filed with the Office of the State Comptroller, in no way shall be impaired or affected by any other bond that may relate to the contract in question.

END OF DOCUMENT

DOCUMENT 007305

SUPPLEMENTARY CONDITIONS - LIQUIDATED DAMAGES

This supplement modifies the General Conditions. Where any part of the General Conditions is modified by this supplement, the unaltered provisions of that part shall remain in effect.

ARTICLE 2 - DEFINITIONS

2.11 Delete this Paragraph in its entirety and replace with the following:

2.11 The term "liquidated damages" means the amount of money to be assessed against the Contractor for delay in completion of the Work.

ARTICLE 13 - TIME OF COMPLETION AND TERMINATION FOR CAUSE

13.3 Delete this Paragraph in its entirety and replace with the following:

13.3 Liquidated Damages: Should Contractor fail to substantially complete the Work within the time frame set forth in the contract, or as described in a subsequent Order(s) on Contract, the Group Director may assess Liquidated Damages for such failure in the amount of $1,000.00 per day until such time as the Group Director determines that the Work is substantially complete as defined in Section 2.21 herein. Should Contractor fail to achieve physical completion of the work within the time frame set forth in the contract, the Group Director may assess Liquidated Damages for such failure in the amount of $500.00 per day until such time as the Group Director determines that the Work is physically complete as defined in Section 2.12 herein. Notwithstanding the provisions of Article 21 herein, Contractor agrees that the Group Director may withhold the sum of the Liquidated Damages from payments to be made to Contractor as compensation to the State for administrative fees and public inconvenience.

END OF DOCUMENT

DOCUMENT 007307

SUPPLEMENTARY CONDITIONS – MWBE-EEO

CONTRACTOR REQUIREMENTS AND PROCEDURES FOR PARTICIPATION BY NEW YORK STATE CERTIFIED MINORITY- AND WOMEN-OWNED BUSINESS ENTERPRISES AND EQUAL EMPLOYMENT OPPORTUNITIES FOR MINORITY GROUP MEMBERS AND WOMEN

This supplement modifies the General Conditions. Where any part of the General Conditions is modified by this supplement, the unaltered provisions of that part shall remain in effect.

ARTICLE 16 - REQUIREMENTS FOR UTILIZATION OF MINORITY- AND WOMEN-OWNED BUSINESS ENTERPRISES (MWBEs)

Add the following:

16.6 Participation by Minority Group Members and Women with Respect to State Contracts: Requirements and Procedures: General Provisions:

16.6.1 OGS is required to implement the provisions of New York State Executive Law Article 15-A and 5 NYCRR Parts 140-145 ("MWBE Regulations") for all State contracts as defined therein, with a value (1) in excess of $25,000 for labor, services, equipment, materials, or any combination of the foregoing or (2) in excess of $100,000 for real property renovations and construction (the "Work").

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

16.6.3 Failure to comply with all of the requirements herein may result in a finding of non-responsiveness, a finding of non-responsibility, a breach of contract, leading to the withholding of funds, liquidated damages pursuant to Section 27.9 herein, and/or enforcement proceedings as allowed by the Contract and applicable law.

16.7 Contract Goals:

16.7.1 OGS hereby establishes an overall goal of 30% for MWBE participation, 15% for Minority-Owned Business Enterprises ("MBE") participation and 15% for Women-Owned Business Enterprises ("WBE") participation (based on the current availability of MBEs and WBEs). The total contract goal can be obtained by utilizing any combination of MBE and /or WBE participation for subcontracting and supplies acquired under this Contract.

16.7.2 For purposes of providing meaningful participation by MWBEs on the Contract and achieving the Contract Goals established in Section 16.7.1 hereof, Contractor should reference the directory of NYS Certified MBWEs found at the following internet address:

https://ny.newnycontracts.com/FrontEnd/VendorSearchPublic.asp?TN=ny&XID=2528.

The MWBE Regulations are located at 5 NYCRR §§ 140 – 145. Additionally, Contractor is encouraged to contact the Division of Minority and Women's Business Development (518) 292-5250; (212) 803-2414; or (716) 846-8200) to discuss additional methods of maximizing participation by MWBEs on the Contract.

16.7.3 Pursuant to 5 NYCRR §142.8, Contractor must document "good faith efforts" to provide meaningful participation by MWBEs as subcontractors or suppliers in the performance of the Contract.

16.7.4 In accordance with Executive Law Section 316-a and 5 NYCRR §142.13, the Contractor acknowledges that if it is found to have willfully and intentionally failed to comply with the MWBE participation goals set forth in the Contract, such a finding constitutes a breach of contract and the Contractor shall be liable to OGS for liquidated or other appropriate damages, as set forth herein.

16.7.5 In accordance with 5 NYCRR § 142.8, Contractors must document their good faith efforts toward utilizing MWBEs on the Contract. Evidence of required good faith efforts shall include, but not be limited to, the following:

a. A list of the general circulation, trade, and MWBE-oriented publications and dates of publications in which the Contractor solicited the participation of certified MWBEs as subcontractors/suppliers, copies of such solicitations, and any responses thereto.

b. A list of certified MWBEs appearing in the Empire State Development ("ESD") MWBE directory that were solicited for this Contract. Provide proof of dates or copies of the solicitations and copies of the responses made by the certified MWBEs. Describe specific reasons that responding certified MWBEs were not selected.

c. Descriptions of the Contract documents/plans/specifications made available to certified MWBEs by the Contractor when soliciting their participation and steps taken to structure the scope of work for the purpose of subcontracting with, or obtaining supplies from, certified MWBEs.

d. A description of the negotiations between the Contractor and certified MWBEs for the purposes of complying with the MWBE goals of this Contract.

e. Dates of any pre-bid, pre-award, or other meetings attended by Contractor, if any, scheduled by OGS with certified MWBEs whom OGS determined were capable of fulfilling the MWBE goals set in the Contract.

f. Other information deemed relevant to the request.

16.7.6 The goal for participation in the conduct of the Work is expressed as a percentage equal to the dollar value of the Work performed divided by the Contract Sum. Where the cost to the Contractor of a single item of equipment exceeds twenty-five percent (25%) of the total contract price and where the Contractor has shown good faith efforts to obtain such equipment from MWBE manufacturers and suppliers, and was unsuccessful in obtaining the equipment from an MWBE, the cost of such equipment shall be deducted from the contract sum prior to computing the MWBE participation.

16.7.7 The MWBE utilization credit for Work performed by MWBEs will be determined as follows:

a. Where an MWBE is not the Contractor - MWBE utilization credit will vary depending on how the MWBE performs Work under the Contract, as follows:

i. Where the MWBE performs Work under the Contract as a subcontractor, MBE or WBE utilization credit will be 100% of the dollar value of the Work performed by the MBE or WBE.

ii. Where the MWBE performs Work under the Contract as a manufacturer, MBE or WBE utilization credit will be 100% of the dollar value of the Work performed by the MBE or WBE.

iii. Where the MWBE assists in the performance of the Work under the Contract as a supplier, MBE or WBE utilization credit will be 60% of the dollar value of the Work performed by the MBE or WBE.

iv. Where the MWBE assists in the performance of the Work under the Contract as a broker, MBE or WBE utilization credit will be equal to the percentage of the commission, or the mark-up percentage, of the items brokered, applied to the dollar value of the Work performed by the MBE or WBE.

b. Where the Contractor is a joint venture including one or more MWBEs as joint venturers, MBE or WBE utilization credit will be the Contract Sum multiplied by the percentage of the joint venture's profits (or losses) that are to accrue to the MWBE joint venturer(s) under the joint venture agreement.

c. Where any MWBE is the Contractor or where the Contractor is a joint venture consisting entirely of MWBEs, and the Contractor can document good faith efforts to subcontract to MWBE subcontractors and/or suppliers - the Contract Sum.

Add the following articles:

ARTICLE 26 – EQUAL EMPLOYMENT OPPORTUNITY (EEO)

26.1 The provisions of Article 15-A of the Executive Law and the rules and regulations promulgated thereunder pertaining to equal employment opportunities for minority group members and women shall apply to all Contractors, and any subcontractors, awarded a subcontract over $25,000 for labor, services, including legal, financial and other professional services, travel, supplies, equipment, materials, or any combination of the foregoing, to be performed, or rendered or furnished to, the contracting State agency ("the Work") except where the Work is for the beneficial use of the Contractor.

26.1.1 Contractor and Subcontractors shall undertake or continue existing EEO programs to ensure that minority group members and women are afforded equal employment opportunities without discrimination because of race, creed, color, national origin, sex, age, disability, or marital status. For these purposes, EEO shall apply in the areas of recruitment, employment, job assignment, promotion, upgrading, demotion, transfer, layoff or termination, and rates of pay or other forms of compensation. This requirement does not apply to: (i) the performance of work or the provision of services or any other activity that is unrelated, separate, or distinct from the Contract; or (ii) employment outside New York State.

26.1.2 By entering into this Contract, Contractor certifies that the text set forth in clause 12 of Appendix A, attached hereto and made a part hereof, is Contractor's equal employment opportunity policy. In addition, Contractor agrees to comply with the Non-Discrimination Requirements set forth in clause 5 of Appendix A.

The Contractor will include the provisions of Clause 26.1.2 and Clause 26.3 of this Article, which provides for relevant provisions of the Human Rights Law, in every subcontract in such a manner that the requirements of the subdivisions will be binding upon each subcontractor as to work in connection with the Contract.

26.2 New York State Contract System Workforce Utilization Reporting Module (Construction)

The Contractor shall submit, and shall require each of its subcontractors to submit, a Workforce Audit throughout the term of this Contract, by the 10th day of each month to report the actual workforce utilized during the previous month in the performance of the Contract by the specified categories listed including ethnic background, gender, and Federal

occupational categories. Contractor shall coordinate with its subcontractors to ensure that all workers associated with this Contract are properly counted and reported. To prepare the report, Contractor and its subcontractors shall use the New York State Contract System Workforce Audit Module found at the following website:

https://ny.newnycontracts.com/

The Workforce Audit must be submitted electronically in the New York State Contract System (NYSCS). Separate audits shall be completed by Contractor and all subcontractors. In limited instances, the Contractor or subcontractor may not be able to separate out the workforce utilized in the performance of the Contract from its total workforce. When a separation can be made, the Contractor or subcontractor shall submit the Workforce Audit and indicate that the information provided relates to the actual workforce utilized on the Contract. When the workforce to be utilized on the Contract cannot be separated out from the Contractor's or subcontractor's total workforce, the Contractor or subcontractor shall submit the Workforce Audit and indicate that the information provided is the Contractor's or subcontractor's total workforce during the subject time frame, not limited to work specifically performed under the Contract.

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

ARTICLE 27- MWBE COMPLIANCE

27.1 By entering into a Contract with OGS, Contractor certifies that it has submitted a completed MWBE Utilization Plan via the New York State Contract System (NYSCS) prior to contract award and will follow such Plan for the performance of MWBEs on the Contract pursuant to the prescribed MWBE goals set forth in Section 16.7.1 of this Supplement. The NYSCS may be accessed at **https://ny.newnycontracts.com**. The Utilization Plan shall list the MWBEs the Bidder intends to use to perform the Contract, a description of the Contract scope of work the Bidder intends the MWBE to perform to meet the goals on the Contract, and the estimated, or if known, actual dollar amounts to be paid to an MWBE. If Contractor is unable to submit such Plan through the NYSCS, Contractor certifies that it used Form BDC 328 (Contractor's Utilization Plan) to submit the Plan. The BDC 328 form is available for download at https://ogs.ny.gov/mwbe/forms.

27.2 By entering into the Contract, Bidder/Contractor understands that only sums paid to MWBEs for the performance of a commercially useful function, as that term is defined in 5 NYCRR § 140.1, may be applied towards the achievement of the applicable MWBE participation goal. When an MWBE is serving as a broker on the Contract, only 25 percent of all sums paid to a broker shall be deemed to represent the commercially useful function performed by the MWBE.

27.3 OGS will review the submitted MWBE Utilization Plan and advise the Bidder of OGS' acceptance or issue a notice of deficiency within 30 calendar days of receipt. Contractor understands that making false representations or including information evidencing a lack of good faith as part of, or in conjunction with, the submission of a Utilization Plan is prohibited by law and may result in penalties including, but not limited to, termination of a contract for cause, loss of eligibility to submit future bids, and/or withholding of payments.

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

27.5 Access to the Contractor's Books: The Contractor shall permit access to its books, records and accounts by the State for purposes of investigation to ascertain compliance with the provisions of this Article. The contractor shall include this provision in every subcontract so that such provision will be binding upon each subcontractor.

27.6 If the Contractor, after making good faith efforts, is unable to comply with MWBE goals, the Contractor may submit an Application for MWBE Waiver form (BDC 333) documenting good faith efforts by the Contractor to meet such goals. If the documentation included with the waiver request is complete, OGS shall evaluate the request and issue a written notice of acceptance or denial within twenty (20) business days of receipt.

27.7 If OGS, upon review of the MWBE Utilization Plan and updated Contractors list of Subcontractors and Suppliers determines that Contractor is failing or refusing to comply with the Contract goals and no waiver has been issued in regards to such non-compliance, OGS may issue a notice of deficiency to the Contractor. The Contractor must respond to the notice of deficiency within seven (7) business days of receipt. Such response may include a request for partial or total waiver of MWBE Contract Goals.

27.8 **Monthly MWBE Contractor Compliance Report**

27.8.1 In accordance with 5 NYCRR § 142.10, Contractor is required to report Monthly MWBE Contractor Compliance to OGS during the term of the Contract for the preceding month's activity, documenting progress made towards achievement of the Contract MWBE goals. OGS requests that all Contractors use the NYSCS to report subcontractor and supplier payments made by Contractor to MWBEs performing work under the Contract. The NYSCS may be accessed at **https://ny.newnycontracts.com**. This is a New York State-based system that all State agencies and authorities will be implementing to ensure uniform contract compliance reporting throughout New York State.

27.8.2 When a Contractor receives a payment from OGS under an OGS contract, it is the Contractor's responsibility to pay its subcontractors and suppliers in a timely manner. On or after the first day of each month, the Contractor will receive an e-mail or fax notification ("audit notice") indicating that a representative of its company needs to log-in to the NYSCS to report the company's MWBE subcontractor and supplier payments for the preceding month. The Contractor must also report when no payments have been made to a subcontractor or supplier in a particular month with entry of a zero dollar value in the NYSCS. Once subcontractor and supplier payments have been entered into the NYSCS, the subcontractor(s) and supplier(s) will receive an email or fax notification advising them to log into the NYSCS to confirm that they actually received the reported payments from the Contractor. It is the Contractor's responsibility to educate its MWBE subcontractors and suppliers about the NYSCS and the need to confirm payments made to them in the NYSCS.

27.8.3 To assist in the use of the NYSCS, OGS recommends that all Contractors and MWBE subcontractors and suppliers sign up for the following two webinar trainings offered through the NYSCS: "Introduction to the System – Vendor Training" and "Contract Compliance Reporting - Vendor Training" to become familiar with the NYSCS. To view the training schedule and to register visit:

https://ny.newnycontracts.com/events.asp.

27.8.4 As soon as possible after the Contract is approved, Contractor should visit https://ny.newnycontracts.com and click on "Account Lookup" to identify the Contractor's account by company name. Contact information should be reviewed and updated if necessary by choosing "Change Info." It is important that the staff member who is responsible for reporting payment information for the Contractor be listed as a user in the NYSCS. Users who are not already listed may be added through "Request New User." When identifying the person responsible, please add "- MWBE Contact" after their last name (i.e., John Doe – MWBE Contact) to ensure that the correct person receives audit notices from the NYSCS. NYSCS Technical Support should be contacted for any technical support questions by clicking on the links

for “Contact Us & Support” then “Technical Support” on the NYSCS website.

27.8.5 If Contractor is unable to report MWBE Contractor Compliance via the NYSCS, Contractor must submit Contractor’s Monthly Payment Report on Form BDC 58 to OGS, by the 10th day of each month during the term of the Contract, for the preceding month’s activity to: OGS OBD, 29th Floor Corning Tower, Empire State Plaza, Albany, NY 12242. Phone: 518-486-9284; Fax: 518-486-9285.

27.8.6 It is the Contractor’s responsibility to report subcontractor and supplier payments. Failure to respond to payment audits in a timely fashion through the NYSCS, or by paper to OGS, may jeopardize future payments pursuant to the MWBE liquidated damages clause in Section 27.9 below.

27.9 Liquidated Damages – MWBE Participation

27.9.1 Where OGS determines that Contractor is not in compliance with the requirements of the Contract and Contractor refuses to comply with such requirements, or if Contractor is found to have willfully and intentionally failed to comply with the MWBE participation goals, Contractor shall be obligated to pay liquidated damages to OGS.

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

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

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

27.9.3 After the Contractor has been afforded the process it is due, if OGS determines that Contractor is liable for liquidated damages and such identified sums have not been withheld by OGS, Contractor shall pay such liquidated damages to OGS within sixty (60) days after they are assessed. Provided, however, that if the Contractor has filed a complaint with the Director of the Division of Minority and Women’s Business Development pursuant to 5 NYCRR § 142.12, liquidated damages shall be payable only in the event of a determination adverse to the Contractor following the complaint process.

27.10 Any suspicion of fraud, waste, or abuse involving the contracting or certification of MWBEs shall be immediately reported to ESD’s Division of Minority and Women’s Business Development at (855) 373-4692.

DOCUMENT 007308

SUPPLEMENTARY CONDITIONS – BUY AMERICA PREFERENCE

This supplement modifies the General Conditions. Where any part of the General Conditions is modified by this supplement, the unaltered provisions of that part shall remain in effect.

ARTICLE 25 – MISCELLANEOUS PROVISIONS

25.4 Delete this Paragraph in its entirety and replace with the following:

25.4 BUY AMERICA PREFERENCE

Recipients of an award of Federal financial assistance from a program for infrastructure are hereby notified that none of the funds provided under this award may be used for an infrastructure project unless:

(1) All iron and steel used in the project are produced in the United States—this means all manufacturing processes, from the initial melting stage through the application of coatings, occurred in the United States;

(2) All manufactured products used in the project are produced in the United States— this means the manufactured product was manufactured in the United States; and the cost of the components of the manufactured product that are mined, produced, or manufactured in the United States is greater than 55 percent of the total cost of all components of the manufactured product, unless another standard that meets or exceeds this standard has been established under applicable law or regulation for determining the minimum amount of domestic content of the manufactured product; and

(3) All construction materials are manufactured in the United States—this means that all manufacturing processes for the construction material occurred in the United States. The construction material standards are listed below.

Incorporation into an infrastructure project. The Buy America Preference only applies to articles, materials, and supplies that are consumed in, incorporated into, or affixed to an infrastructure project. As such, it does not apply to tools, equipment, and supplies, such as temporary scaffolding, brought to the construction site and removed at or before the completion of the infrastructure project. Nor does a Buy America Preference apply to equipment and furnishings, such as movable chairs, desks, and portable computer equipment, that are used at or within the finished infrastructure project, but are not an integral part of the structure or permanently affixed to the infrastructure project.

Categorization of articles, materials, and supplies. An article, material, or supply should only be classified into one of the following categories: (i) Iron or steel products; (ii) Manufactured products; (iii) Construction materials; or (iv) Section 70917(c) materials. An article, material, or supply should not be considered to fall into multiple categories. In some cases, an article, material, or supply may not fall under any of the categories listed in this paragraph. The classification of an article, material, or supply as falling into one of the categories listed in this paragraph must be made based on its status at the time it is brought to the work site for incorporation into an infrastructure project. In general, the work site is the location of the infrastructure project at which the iron, steel, manufactured products, and construction materials will be incorporated.

Application of the Buy America Preference by category. An article, material, or supply incorporated into an infrastructure project must meet the Buy America Preference for only the single category in which it is classified.

Determining the cost of components for manufactured products. In determining whether the cost of components for manufactured products is greater than 55 percent of the total cost of all components, use the following instructions:

(a) For components purchased by the manufacturer, the acquisition cost, including transportation costs to the place of incorporation into the manufactured product (whether or not such costs are paid to a domestic firm), and any applicable duty (whether or not a duty-free entry certificate is issued); or

(b) For components manufactured by the manufacturer, all costs associated with the manufacture of the component, including transportation costs as described in paragraph (a), plus allocable overhead costs, but excluding profit. Cost of components does not include any costs associated with the manufacture of the manufactured product.

Construction material standards. The Buy America Preference applies to the following construction materials incorporated into infrastructure projects. Each construction material is followed by a standard for the material to be considered "produced in the United States." Except as specifically provided, only a single standard should be applied to a single construction material.

(1) Non-ferrous metals. All manufacturing processes, from initial smelting or melting through final shaping, coating, and assembly, occurred in the United States.

(2) Plastic and polymer-based products. All manufacturing processes, from initial combination of constituent plastic or polymer-based inputs, or, where applicable, constituent composite materials, until the item is in its final form, occurred in the United States.

(3) Glass. All manufacturing processes, from initial batching and

melting of raw materials through annealing, cooling, and cutting, occurred in the United States.

(4) Fiber optic cable (including drop cable). All manufacturing processes, from the initial ribboning (if applicable), through buffering, fiber stranding and jacketing, occurred in the United States. All manufacturing processes also include the standards for glass and optical fiber, but not for non-ferrous metals, plastic and polymer-based products, or any others.

(5) Optical fiber. All manufacturing processes, from the initial preform fabrication stage through the completion of the draw, occurred in the United States.

(6) Lumber. All manufacturing processes, from initial debarking through treatment and planing, occurred in the United States.

(7) Drywall. All manufacturing processes, from initial blending of mined or synthetic gypsum plaster and additives through cutting and drying of sandwiched panels, occurred in the United States.

(8) Engineered wood. All manufacturing processes from the initial combination of constituent materials until the wood product is in its final form, occurred in the United States.

Waivers

At any time after award of a construction contract, if a vendor identifies that a material or component cannot be obtained in accordance with Buy America, a waiver request may be submitted to the Director's Representative. Waivers may be requested if:

1. The types of iron, steel, manufactured products, or construction materials are not produced in the United States in sufficient and reasonably available quantities or of a satisfactory quality; or

2. The inclusion of iron, steel, manufactured products or construction materials produced in the United States will increase the cost of the overall project by more than 25%

Waiver requests must be submitted to the Director's Representative in writing prior to purchase of the non-compliant component or material from a manufacturer or distributor. Waivers must be approved by the Made in America Office and are subject to a public comment period of not less than 15 days.

Definitions

"Buy America Preference" means the "domestic content procurement preference" set forth in section 70914 of the Build America, Buy America Act, which requires the

head of each Federal agency to ensure that none of the funds made available for a Federal award for an infrastructure project may be obligated unless all of the iron, steel, manufactured products, and construction materials incorporated into the project are produced in the United States.

"Construction materials" means articles, materials, or supplies that consist of only one of the items listed in paragraph (1) of this definition, except as provided in paragraph (2) of this definition. To the extent one of the items listed in paragraph (1) contains as inputs other items listed in paragraph (1), it is nonetheless a construction material.

(1) The listed items are:

(i) Non-ferrous metals;
(ii) Plastic and polymer-based products (including polyvinylchloride, composite building materials, and polymers used in fiber optic cables);
(iii) Glass (including optic glass);
(iv) Fiber optic cable (including drop cable);
(v) Optical fiber;
(vi) Lumber;
(vii) Engineered wood; and
(viii) Drywall.

(2) Minor additions of articles, materials, supplies, or binding agents to a construction material do not change the categorization of the construction material.

"Infrastructure" means public infrastructure projects in the United States, which includes, at a minimum, the structures, facilities, and equipment for roads, highways, and bridges; public transportation; dams, ports, harbors, and other maritime facilities; intercity passenger and freight railroads; freight and intermodal facilities; airports; water systems, including drinking water and wastewater systems; electrical transmission facilities and systems; utilities; broadband infrastructure; and buildings and real property; and structures, facilities, and equipment that generate, transport, and distribute energy including electric vehicle (EV) charging.

"Infrastructure project" means any activity related to the construction, alteration, maintenance, or repair of infrastructure in the United States regardless of whether infrastructure is the primary purpose of the project. See also paragraphs (c) and (d) of 2 CFR 184.4.

"Iron or steel products" means articles, materials, or supplies that consist wholly or predominantly of iron or steel or a combination of both.

“Manufactured products” means:

(1) Articles, materials, or supplies that have been:

(i) Processed into a specific form and shape; or
(ii) Combined with other articles, materials, or supplies to create a product with different properties than the individual articles, materials, or supplies.

(2) If an item is classified as an iron or steel product, a construction material, or a Section 70917(c) material under 2 CFR 184.4(e) and the definitions set forth in 2 CFR 184.3, then it is not a manufactured product. However, an article, material, or supply classified as a manufactured product under 2 CFR 184.4(e) and paragraph (1) of this definition may include components that are construction materials, iron or steel products, or Section 70917(c) materials.

“Predominantly of iron or steel or a combination of both” means that the cost of the iron and steel content exceeds 50 percent of the total cost of all its components. The cost of iron and steel is the cost of the iron or steel mill products (such as bar, billet, slab, wire, plate, or sheet), castings, or forgings utilized in the manufacture of the product and a good faith estimate of the cost of iron or steel components.

“Section 70917(c) materials” means cement and cementitious materials; aggregates such as stone, sand, or gravel; or aggregate binding agents or additives. See Section 70917(c) of the Build America, Buy America Act.

END OF DOCUMENT

DOCUMENT 007310

SUPPLEMENTARY CONDITIONS - CONTRACTOR'S SUPERVISION

This supplement modifies the General Conditions. Where any part of the General Conditions is modified by this supplement, the unaltered provisions of that part shall remain in effect.

ARTICLE 6 - CONTRACTOR'S SUPERVISION

ARTICLE 6 Delete this Article in its entirety and replace with the following:

6.1 The Contractor shall designate in writing, competent supervision and/or management representatives as required below to represent the Contractor at all times with authority to act for the Contractor. All direction given to the Contractor's representatives shall be as binding as if given to the Contractor. A superintendent or project manager shall be classified as management representatives included in the Contractor's overhead and shall perform management, supervisory and/or administrative tasks (non labor) only. Individuals listed under this Article shall have the ability to effectively communicate (verbal and written) with all parties associated with the administration/supervision of this contract.

6.1.1 For contracts awarded up to $1,000,000 the Contractor shall provide a supervisor, for the Contractor's staff, who shall be in attendance at the Site throughout the active performance of the Work, including active performance of the Work by subcontractors.

6.1.2 For contracts awarded from $1,000,001 to $5,000,000, the Contractor shall provide a superintendent, for the Contractor's staff, who shall be in attendance at the Site throughout the active performance of the Work until Substantial Completion. Upon Substantial Completion the Contractor shall provide a supervisor who shall be in attendance at the Site throughout the active performance of the Work until Physical Completion. The superintendent's responsibilities include, but are not limited to, directing and scheduling the Work, attending all Project meetings, coordinating and controlling the Work of subcontractors, and ensuring full compliance with the Contract documents. The Contractor shall also provide a project manager for the Contractor's staff from award through Substantial Completion. The Project Manager's responsibilities shall include, but are not limited to, developing and maintaining the submittal system and project schedules, attending Project meetings, making purchasing and cost decisions on behalf of the Contractor, Orders on Contract responses and negotiations, and closeout and warranty documentation. The Contractor shall provide required information to the Director's Representative for the Project schedule.

6.1.3 For contracts awarded from $5,000,001 to $10,000,000, in addition to the requirements of Article 6.1.2, the contractor shall provide a Project Manager for the Contractor's staff that shall be in attendance at the site throughout the active performance of the Work until Substantial Completion.

6.1.4 For contracts awarded for more than $10,000,000, in addition to the requirements set forth in Article 6.1.3, if at any time the Contractor has more than five subcontractors performing Work on the Site simultaneously, the Contractor shall provide an additional Superintendent to coordinate the Work of the subcontractors.

6.2 Should the Director deem any employees of the Contractor not satisfactory or unfit for their duty, the Contractor shall dismiss them and they shall not again be employed on the Work.

6.2.1 Infractions that are dismissible for project managers, superintendents, or supervisors include, but are not limited to, the failure to develop and maintain Project schedules, failure to comply and enforce safety regulations, failure to schedule inspections or provide adequate notice as required by Contract Documents, failure to attend and adequately prepare for meetings as required by Contract Documents, and failure to follow directions regarding the Work provided by the Director's Representative.

6.3 The experience levels noted below in this Article will be used in evaluating the qualifications and experience of the supervisors, superintendents, and Project Managers, as applicable.

6.3.1 Supervisors, required by paragraph 6.1.1, shall have a minimum of five years of experience in the role of supervisor with a minimum of three projects of similar size and scope, and shall be subject to review and written approval by the Director's Representative before commencing the Work, and subsequently during the course of the Project if the supervisor is replaced after Work has commenced. The Contractor will provide references to validate qualifications of the proposed supervisor upon request.

6.3.2 Superintendents, required for any contracts awarded above $1,000,000 as set forth in Article 6.1.2, shall have a minimum of five years of experience in the role of Superintendent with a minimum of three projects of similar size and scope, and shall be subject to review and written approval by the Director's Representative before commencing the Work, and subsequently during the course of the Project if the Superintendent is replaced after Work has commenced. The Contractor will provide references to validate qualifications of the proposed Superintendent upon request.

6.3.3 The Project Manager, required for any contracts awarded above $1,000,000 as set forth in Article 6.1.2, shall have a minimum of five years of experience in the role of Project Manager with a minimum of three projects of similar size and scope, and shall be subject to review and written approval by the Director's Representative before commencing the Work, and subsequently during the course of the Project if the Project Manager is replaced after Work has commenced. The Contractor will provide references to validate qualifications of the proposed Project Manager upon request.

6.4 No subcontractor shall be allowed at the Work Site before approval by the Director and the Contracting Officer. Before any part of the Contract shall be sublet or material purchased, the Contractor shall submit to the Director in writing the name of each proposed subcontractor and supplier and obtain the Director's written consent to such subcontractor and supplier. The names shall be submitted in ample time to permit acceptance or rejection of each proposed subcontractor and supplier by the Director or Contracting Officer without causing delay in the Work of the Project. The Contractor shall promptly furnish such information as the Director or Contracting Officer may require concerning the proposed subcontractor's and supplier's ability and qualifications, and certification status as a Minority- and Women-Owned Business Enterprises and/or Service-Disabled Veteran-Owned Business. For each proposed subcontractor, the Contractor shall also provide the New York State Department of Labor registration number in accordance with NYS Labor Law Section 220-i. Each request for approval of a subcontractor whose subcontract will be valued at $10,000 or more shall also be accompanied by a NYS Vendor Responsibility Questionnaire - For-Profit Construction properly completed and executed by the proposed subcontractor.

6.5 The Contractor's use of subcontractors shall not diminish the Contractor's obligations to complete the Work in accordance with the Contract. The Contractor shall control and coordinate the Work of its subcontractors.

6.6 The Contractor shall be responsible for informing its subcontractors and suppliers of all the terms, conditions and requirements of the Contract Documents including, but not limited to, the General Conditions, Supplementary Conditions, the Drawings and Specifications, Appendix A, and changes made by Addenda and Orders on Contract.

END OF DOCUMENT

DOCUMENT 007311

SUPPLEMENTARY CONDITIONS – PAYMENT

This supplement modifies the General Conditions. Where any part of the General Conditions is modified by this supplement, the unaltered provisions of that part shall remain in effect.

ARTICLE 21 - PAYMENT

Add the following sub-paragraph:

21.2.1 The Director or the Contracting Officer may withhold payment requisitions or refuse to approve a portion of a payment requisition if the Contractor fails to provide an agreed to Baseline Project Work Plan, Project Schedule Updates, Recovery Project Schedule, or other scheduling requirements in accordance with Division 01 - General Requirements.

END OF DOCUMENT

DOCUMENT 007322

SUPPLEMENTARY CONDITIONS - WORKERS' COMPENSATION

This supplement modifies the General Conditions. Where any part of the General Conditions is modified by this supplement, the unaltered provision of that part shall remain in effect.

ARTICLE 19 - INSURANCE - BUILDER'S RISK, LIABILITY AND WORKERS' COMPENSATION

Add the following paragraphs to 19.2.1:

The contractor agrees that pursuant to WCL Section 141-b, this contract may be terminated if it is determined that at the time of either the bid submission or contract award, the contractor was, in fact, debarred by WCL Section 141-b, or was a substantially owned affiliate of a debarred contractor.

Additionally, the contractor agrees that it must replace, at no additional charge to the State, any subcontractor who the State or the contractor learns was debarred by WCL Section 141-b prior to or during the contract.

END OF DOCUMENT

DOCUMENT 007323

SUPPLEMENTARY CONDITIONS – VENDOR RESPONSIBILITY

This supplement modifies the General Conditions. Where any part of the General Conditions is modified by this supplement, the unaltered provision of that part shall remain in effect.

ARTICLE 25 - MISCELLANEOUS PROVISIONS

Add the following paragraphs:

25.10 VENDOR RESPONSIBILITY: Contractor shall at all times during the Contract term remain responsible. Contractor agrees, if requested by the Commissioner of OGS or his or her designee, to present evidence of its continuing legal authority to do business in New York State, integrity, experience, ability, prior performance, and organizational and financial capacity.

The Commissioner of OGS or his or her designee, in his or her sole discretion, reserves the right to suspend any or all activities under this Contract, at any time, when he or she discovers any information that calls into question the responsibility of Contractor. In the event of such suspension, Contractor will be given written notice outlining the particulars of such suspension. Upon issuance of such notice, Contractor must comply with the terms of the suspension order. Contract activity may resume at such time as the Commissioner of OGS or his or her designee issues a written notice authorizing a resumption of performance under the contract.

Upon written notice to Contractor, and a reasonable opportunity to be heard with appropriate OGS officials or staff, the Contract may be terminated by the Commissioner of OGS or his or her designee at Contractor's expense where Contractor is determined by the Commissioner of OGS or his or her designee to be non-responsible. In such event, the Commissioner of OGS or his or her designee may complete the contractual requirements in any way he or she may seem advisable and pursue available legal or equitable remedies for breach.

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

END OF DOCUMENT

DOCUMENT 007324

SUPPLEMENTARY CONDITIONS - ENCOURAGING USE OF NEW YORK STATE BUSINESSES IN CONTRACT PERFORMANCE

This supplement modifies the General Conditions. Where any part of the General Conditions is modified by this supplement, the unaltered provisions of that part shall remain in effect.

ARTICLE 25 – MISCELLANEOUS PROVISIONS

Add the following paragraphs:

25.11 Encouraging New York State Businesses

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

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

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

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

Bidders can demonstrate their commitment to the use of New York State businesses by responding to the question shown below ***on the Bid Form for this project***:

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

The successful bidder who answers "Yes" to this question on the bid form will be required to list the New York State business(es) that will be used on the **Contractor's List of Subcontractors/Suppliers** (Form BDC 329), which must be submitted within ***fifteen (15) days after award*** of the contract.

END OF DOCUMENT

DOCUMENT 007326

SUPPLEMENTARY CONDITIONS - ORDERS ON CONTRACT (CHANGE ORDERS)

This supplement modifies the General Conditions. Where any part of the General Conditions is modified by this supplement, the unaltered provision of that part shall remain in effect.

ARTICLE 10 - ORDERS ON CONTRACT (CHANGE ORDERS)

Replace paragraph 10.1 with the following:

10.1 The State may make changes by altering, adding to or deleting from the Work, and adjusting the Contract sum accordingly. All changed Work shall be executed in conformity with the terms and conditions of the Contract Documents unless otherwise provided in the order on contract. Any change in the Contract sum or time for completion of the described work of the order on contract shall be contained in the order on contract. The Contractor shall complete a time impact analysis (TIA) pursuant to specification section 013113 concurrently with the pricing of the order on contract. Potential time adjustments shall be determined based on the TIA with presented costs. If the Work of the order on contract impacts the substantial completion date, the Contractor must notify the Director's Representative prior to the negotiation of the order on contract and a time adjustment may be issued. If the Contractor does not develop a time impact analysis during the negotiation of an order on contract, the Contractor shall forfeit their right to a time adjustment.

Replace paragraph 10.5.1 with the following:

10.5.1 The contractor shall submit a responsive cost proposal to the Director's Representative in proper form subject to the provisions of this Article. The contractor shall respond no later than 15 calendar days from the date of a "request for proposal" from the Director's Representative with their cost proposal and time impact analysis (TIA). If the contractor believes additional time is required to prepare and submit a responsive proposal, a justification and proposed response duration must be submitted to the Director's Representative or his/her designated representative within 10 days from the date of a "request for proposal". If approved, the 10-day requirement will be extended as the State may deem appropriate. Should the contractor fail to respond or fail to submit the required cost proposal within the 15-day requirement, the State shall determine a fair market value for the work proposed and will issue an order on contract or field order to the contract. The Contractor, by failing to respond to a request for proposal or provide an acceptable and responsive cost proposal; waives any claim or rights to any extra and or additional costs and/or time as may be determined by the Contracting Officer, and the overrides resulting from this action will be limited to the values as set forth in section 012200.

END OF DOCUMENT

DOCUMENT 007327

SUPPLEMENTARY CONDITIONS – SDVOB

This supplement modifies the General Conditions. Where any part of the General Conditions is modified by this supplement, the unaltered provisions of that part shall remain in effect.

Add the following article:

ARTICLE 28 – PARTICIPATION OPPORTUNITIES FOR NEW YORK STATE CERTIFIED SERVICE-DISABLED VETERAN-OWNED BUSINESSES

Article 3 of the Veterans' Services Law provides for more meaningful participation in public procurement by certified Service-Disabled Veteran-Owned Businesses ("SDVOB"), thereby further integrating such businesses into New York State's economy. OGS recognizes the need to promote the employment of service-disabled veterans and to ensure that certified service-disabled veteran-owned businesses have opportunities for maximum feasible participation in the performance of OGS contracts.

In recognition of the service and sacrifices made by service-disabled veterans and in recognition of their economic activity in doing business in New York State, Bidders are expected to consider SDVOBs in the fulfillment of the requirements of the Contract. Such participation may be as subcontractors or suppliers, as protégés, or in other partnering or supporting roles.

28.1 Contract Goals

28.1.1 OGS hereby establishes overall goals under this contract of 6% for SDVOB participation for the C trade contractor, 3% for SDVOB participation for the E trade contractor, 3% for SDVOB participation for the H trade contractor, and 3% for SDVOB participation for the P trade contractor, based on the current availability of qualified SDVOBs. Trades with 0% goals are encouraged to make "good faith efforts" to promote and assist in the participation of SDVOBs on the Contract for the provision of services and materials. For purposes of providing meaningful participation by SDVOBs, the Bidder/Contractor should refer to the **List of Certified NYS Service-Disabled Veteran-Owned Businesses**, which can be accessed from the OGS website page at the following link:

https://online.ogs.ny.gov/SDVOB/search .

Questions regarding compliance with SDVOB participation goals should be directed to the Designated Contacts specified in Document 002113 Instructions to Bidders. Additionally, following Contract execution, Contractor is encouraged to contact DCSDVOB@ogs.ny.gov to discuss additional methods of maximizing participation by SDVOBs on the Contract.

28.1.2 Contractor must document "good faith efforts" to provide meaningful participation by SDVOBs as subcontractors or suppliers in the performance of the Contract (see clause 28.4 below).

28.2. SDVOB Utilization Plan

28.2.1 The Contractor's SDVOB Utilization Plan, using the form BDC 328S, available for download at https://ogs.ny.gov/veterans/forms, shall list the SDVOBs that the Bidder intends to use to perform the Contract, a description of the work that the Bidder intends the SDVOB to perform to meet the goals on the Contract, and the estimated dollar amounts to be paid to an SDVOB, or, if not known, an estimate of the percentage of Contract work the SDVOB will perform. By signing the Utilization Plan, the Bidder acknowledges that making false representations or providing information that shows a lack of good faith as part of, or in conjunction with, the submission of a Utilization Plan is prohibited by law and may result in

penalties including, but not limited to, termination of a contract for cause, loss of eligibility to submit future bids, and/or withholding of payments. Any modifications or changes to the agreed participation by SDVOBs after the Contract award and during the term of the Contract must be reported on a revised SDVOB Utilization Plan and submitted to OGS.

28.2.2 The apparent low bidder must submit the completed SDVOB Utilization Plan within seven (7) calendar days after the bids are opened. OGS will review the submitted SDVOB Utilization Plan and advise the bidder of OGS acceptance or issue a notice of deficiency within twenty (20) calendar days of receipt.

28.2.3 If a notice of deficiency is issued, Bidder/Contractor agrees that it shall respond to the notice of deficiency, within nine (9) calendar days of receipt, by submitting to OGS a written remedy in response to the notice of deficiency. If the written remedy that is submitted is not timely or is found by OGS to be inadequate, OGS shall notify the Bidder/Contractor and direct the Bidder/Contractor to submit, within seven (7) calendar days of notification by OGS, a request for a partial or total waiver of SDVOB participation goals on form BDC 333S. Failure to file the waiver form in a timely manner may be grounds for disqualification of the bid or proposal.

28.2.4 OGS may disqualify a Bidder's bid or proposal as being non-responsive under the following circumstances:

a. If a Bidder fails to submit an SDVOB Utilization Plan;

b. If a Bidder fails to submit a written remedy to a notice of deficiency;

c. If a Bidder fails to submit a request for waiver; or

d. If OGS determines that the Bidder has failed to document good faith efforts.

28.2.5 If awarded a Contract, Contractor certifies that it will follow the submitted SDVOB Utilization Plan for the performance of SDVOBs on the Contract pursuant to the prescribed SDVOB contract goals set forth in this section.

28.2.6 Contractor further agrees that a failure to use SDVOBs as agreed in the Utilization Plan shall constitute a material breach of the terms of the Contract. Upon the occurrence of such a material breach, OGS shall be entitled to any remedy provided herein, including but not limited to, a finding of Contractor non-responsibility.

28.3 Request for Waiver

28.3.1 In accordance with 9 NYCRR § 252.2(m), a Bidder/Contractor that is able to document good faith efforts to meet the goal requirements, as set forth in 28.4 below, may submit a request for a partial or total waiver on form BDC 333S (https://ogs.ny.gov/veterans/forms), accompanied by supporting documentation. A Bidder may submit the request for waiver at the same time it submits its SDVOB Utilization Plan. If a request for waiver is submitted with the SDVOB Utilization Plan and is not accepted by OGS at that time, the provisions of clauses 28.2.2, 28.2.3 and 28.2.4 will apply. If the documentation included with the waiver request is complete, OGS shall evaluate the request and issue a written notice of acceptance or denial within 20 days of receipt.

28.3.2 Contractor shall attempt to utilize, in good faith, the SDVOBs identified within its SDVOB Utilization Plan, during the performance of the Contract. Requests for a partial or total waiver of established goal requirements made subsequent to Contract award may be made at any time during the term of the Contract to OGS, but must be made prior to the submission of a request for final payment on the Contract. Such waiver requests shall be made on form BDC 333S, accompanied by supporting documentation, and emailed to ogs.sm.sdvobcomp@ogs.ny.gov.

28.3.3 If OGS, upon review of the SDVOB Utilization Plan (BDC 328S) and Contractor's Monthly SDVOB Payment Report (BDC 58S), determines that Contractor is failing or refusing to comply with the contract goals and no waiver has been issued in regards to such non-compliance, OGS may issue a notice of deficiency to the Contractor. The Contractor must respond to the notice of deficiency within nine (9) calendar days of receipt. Such response may include a request for partial or total waiver of SDVOB contract goals.

28.4 Required Good Faith Efforts

In accordance with 9 NYCRR § 252.2(n), Contractors must document their good faith efforts toward utilizing SDVOBs on the Contract. Evidence of required good faith efforts shall include, but not be limited to, the following:

a. A list of the general circulation, trade, and other publications and dates of publications in which the Contractor solicited the participation of certified SDVOBs as subcontractors/suppliers, copies of such solicitations, and any responses thereto.

b. A list of certified SDVOBs that were solicited for this Contract. Provide proof of dates or copies of the solicitations and copies of the responses made by the certified SDVOBs. Describe specific reasons that responding certified SDVOBs were not selected.

c. Descriptions of the Contract documents, plans and specifications made available to certified SDVOBs by the Contractor when soliciting their participation and steps taken to structure the scope of work for the purpose of subcontracting with, or obtaining supplies from, certified SDVOBs.

d. A description of the negotiations between the Contractor and certified SDVOBs for the purposes of complying with the SDVOB goals of this Contract.

e. Dates of any pre-bid, pre-award, or other meetings attended by Contractor, if any, scheduled by OGS with certified SDVOBs whom OGS determined were capable of fulfilling the SDVOB goals set in the Contract.

f. Other information deemed relevant to the request.

28.5 Monthly SDVOB Contractor Compliance Report

In accordance with 9 NYCRR § 252.2(q), Contractor is required to report Monthly SDVOB Contractor Compliance each month to OGS during the term of the Contract for the preceding month's activity, documenting progress made towards achieving the Contract SDVOB goals. This information must be reported by the Contractor using form BDC 58S (form and instructions located at https://ogs.ny.gov/veterans/forms) and emailed by the 10th day of each month for the preceding month's activity to ogs.sm.sdvobcomp@ogs.ny.gov.

28.6 Breach of Contract and Damages

In accordance with 9 NYCRR § 252.2(s), any Contractor found to have willfully and intentionally failed to comply with the SDVOB participation goals set forth in the Contract shall be found to have breached the contract and Contractor shall pay damages as set forth therein.

END OF DOCUMENT

DOCUMENT 007331

SUPPLEMENTARY CONDITIONS – LABOR LAW PROVISIONS

This supplement modifies the General Conditions. Where any part of the General Conditions is modified by this supplement, the unaltered provisions of that part shall remain in effect.

ARTICLE 23 – LABOR LAW PROVISIONS

Add the following paragraph:

23.7 In accordance with New York Labor Law §220-i, the Contractor and all subcontractors shall be registered with the New York State Department of Labor prior to commencing any Work. The Contractor is responsible for ensuring and verifying that all subcontractors are registered before they commence work on the project. Any delays or costs incurred due to a Contractor's or subcontractor's failure to be registered, or the Contractor's failure to verify such registration, shall be borne solely by the Contractor and shall not be grounds for an extension of time or additional compensation.

END OF DOCUMENT

SECTION 011000.01 - SUMMARY OF THE WORK

PART 1 - GENERAL

1.1 WORK COVERED BY CONTRACT DOCUMENTS

A. The title and location of the Work is printed on the cover of this Project Manual.

B. Type of Contract: Fixed price.

1.2 RELATED CONTRACTS

A. The Project consists of the following separate contracts:

1. Construction Work Project No. 47477- C
2. HVAC Work Project No. 47477- H
3. Plumbing Work Project No. 47477- P
4. Electrical Work Project No. 47477- E

B. The suffix letter at the end of the project number distinguishes the separate Contracts. The Sections in Division 01 of the Specifications which have more than one suffix letter (such as this Section) are common to each related Contract.

1.3 SUBSTANTIAL AND PHYSICAL COMPLETION DATES

A. Substantially complete the Work within 631 days after the Agreement is approved by the Comptroller.

1. The time allocated for the performance of work under this contract includes 10 days for notification of the Contractor of the Comptroller's approval of the Agreement.
2. The approval of the Agreement by the Comptroller constitutes the filing of the Contract Documents as a public record and notice to the Contractor that a fully executed contract exists between the Contractor and the State.

B. Physically complete the Work within 90 days after the established Substantial Completion date.

1.4 CONTRACT AWARD SUBMITTALS

A. Submittal No. 1: Submit the CONTRACTOR'S LIST OF SUBCONTRACTORS-SUPPLIERS information required in SCHEDULES AND RECORDS Article in Specification Section 013000 not later than 15 days after approval of the Contract by the Comptroller.

B. Submittal No. 2: Submit Preliminary Project Schedule related information noted in 013113 Project Planning and Scheduling or 013200 Construction Progress Documentation, whichever

section is applicable, within 15 days after approval of the Contract by the Comptroller for review by the Director's Representative and OGS Scheduling.

C. Submittal No. 3: Submit the Submittal Coordinator Qualifications not later than 10 days after award. Include resume and references, and other certification, licenses, or other requested information.

1.5 RESTRICTED WORK PERIOD

A. Construction Work Contract: Do not perform the roofing and related Work on or after December 1st and up to, but not including April 1st unless approved otherwise, in writing, by the Director. During this period, clear the roof of materials, equipment, and debris. Maintain the roof in a watertight condition.

B. Construction Work Contract: Do not perform the waterproofing and related Work on or after December 1st and up to, but not including April 1st unless approved otherwise, in writing, by the Director. During this period, clear the work area of materials, equipment, and debris.

C. Construction Work Contract: Do not perform the asphalt paving Work on or after November 15th and up to, but not including April 15th, unless approved otherwise, in writing, by the Director. During this period, leave the disturbed earthwork areas stabilized for winter shutdown and clear the Work area of materials, equipment, and debris.

D. HVAC Work Contract: Do not perform Work requiring shut off of active heating piping and equipment on or after October 15th and up to, but not including May 1st unless approved otherwise, in writing, by the Director.

E. Asbestos-containing materials will be abated by the Construction Work Contractor. Do not perform other Work in the area of such activity during the abatement of asbestos-containing materials.

1.6 ITEMS NOT INCLUDED

A. The following items shown on the Drawings are not included in the Contract:

1. Items indicated "NIC" (Not in Contract).
2. Existing construction, except where such construction is to be removed, replaced, or altered.

1.7 CONFINED SPACE

A. Comply with confined space and permit-required confined space as defined in Title 29, Part 1910, Section 146 of the Code of Federal Regulations (29CFR 1910.146).

B. Comply with Safety Requirements for Confined Spaces (ANSI/ASSE Z117.1-2009).

C. All spaces shall be treated as permit-required confined spaces until the Contractor and/or subcontractors are able to re-classify the space to a non-permit confined space as per 29CFR 1910.146 and ANSI/ASSE Z117.1-2009.

D. Confined spaces are not intended to limit or define Contractor's or subcontractors' regulatory compliance requirements. In addition to confined spaces indicated on the drawings, other confined spaces may be present or created by the work of this contract. Notify the Director's Representative, in writing, of confined spaces created or eliminated during execution of the Work.

E. For the purpose of inspecting ongoing work, furnish at no additional cost to the State, personnel, as directed, to allow the Director's Representative to enter confined space and permit-required confined space in compliance with Title 29, Part 1910, Section 146 of the Code of Federal Regulations (29CFR 1910.146).

1.8 OCCUPANCY

A. This is an occupied Facility, however the building will be vacated during execution of the Work.

1.9 CONTRACTOR USE OF PREMISES

A. Work hours shall be as established by the Facility authorities thru the Director's Representative.

B. Inform the Director's Representative of work area access requirements. The Director's Representative will coordinate and schedule the requirements with Facility staff to obtain and ensure timely availability of work areas.

C. Check in with the Facility Representative, as directed, at the beginning of each workday. Furnish information regarding where employees will be working during the day.

D. Comply with the Facility's Visitor Identification Policy. A copy of the current policy will be distributed at the initial job meeting.

E. The following items are not allowed on the Site or on Facility premises.

1. Firearms, ammunition, weapons, and dangerous instruments (other than tools required for the Work).
2. Alcoholic beverages and persons under the influence of same.
3. Cannabis and persons under the influence of same. Cannabis, as used herein shall refer to any form of cannabis that has psychoactive properties.
4. Illegal controlled substances and persons under the influence of same.
5. Cameras (except with written permission from the Director's Representative).

F. Comply with Facility policies relating to smoking at the Site.

G. Routes of ingress and egress within the building to the location of the Work shall be as directed by the Director's Representative.

H. Store materials and perform the Work so that pedestrian and vehicular traffic is not obstructed.

I. Do not diminish the level of life safety during performance of the Work.

J. Remove furniture and portable equipment which interferes with execution of the Work and store where directed. Reset such items when directed.

K. Utility Outages and Shutdowns: Do not interrupt utility services or branch services within the building except for the time required to make new connections. Arrange with the Director's Representative for the time and duration of interruptions of services. Provide temporary services required to maintain building services at all times other than during scheduled interruptions.

1. Construction Work Contract: During the asbestos abatement portion of the Project, comply with the requirements specified in Section 028213.

L. Be responsible and accountable for employees, suppliers, subcontractors and their employees, with regard to their use of the premises. Direct them to comply with the Facility Regulations and with the security and traffic regulations.

M. Furnish Facility authorities with a telephone number or method to contact the supervisor for the Work in case of an emergency after work hours, including weekends and holidays.

N. Comply with applicable federal and State of New York Right-to-Know Law provisions. Provide Safety Data Sheets (SDS) documents for products that have SDS data prior to use on the project site.

1. Upload and maintain electronic SDS documents on the Submittals Website (SDS tab).
2. SDS tab is organized by prime contracts. To be readily identified, name products with SDS by specification section number and product name.
3. Supply and maintain one hard copy of the appropriate SDS on the project site and one hard copy with the Facility's Right-to-Know Information Officer.

O. Direct employees to be watchful for people in or near the work area where safety hazards may be present. Notify the Facility Safety/Security Department, if necessary, to remove them from the work area or Site.

P. Report fire and other emergency situations to the Facility Safety/Security Department immediately.

1.10 OPENINGS AND CHASES IN NEW CONSTRUCTION

A. Construction Work Contract:

1. Unless specifically indicated otherwise, provide openings, chases, and similar items in new construction provided under this Contract, as required for items to be provided under related contracts.
2. After the installation and completion of the items for which openings and chases have been provided, build in, over, around and finish the openings and chases to complete the Work.
3. Provide all cutting, patching, and refinishing resulting from failure to provide the required openings and chases, if the necessary information was furnished by the related contractor before 24 hours of start of the applicable part of the Work.

4. If related contractors fail to furnish drawings or written information covering the openings and chases they require in new construction at least 24 hours before installation of the Work affected by those items, the related contractors will be required to do all cutting, patching, and refinishing of the construction so affected, at their own expense.

B. HVAC Work, Plumbing Work, and Electrical Work Contracts:

1. Unless specifically indicated otherwise, furnish drawings or written information to the Construction Work Contractor covering the openings and chases required in new construction for the Work. If such information is not furnished at least 24 hours before start of the applicable part of the Construction Work Contractor's work, all necessary cutting, patching, and refinishing will be included in the Contract at no additional cost to the State.

1.11 REFERENCE SPECIFICATIONS AND STANDARDS

A. Comply with the requirements of the various specifications and standards referred to in these Specifications, except where they conflict with the requirements of these Specifications. Such reference specifications and standards shall be the date of latest revision in effect at the time of receiving bids unless the date is given.

B. DOT Specifications: If the abbreviation DOT appears in these Specifications, it shall mean the most current edition of the New York State Department of Transportation, Office of Engineering specifications entitled "STANDARD SPECIFICATIONS - CONSTRUCTION AND MATERIALS", including all applicable Addenda in effect at the time of receipt of bids. The DOT specifications may be purchased from the Department of Transportation, Plan and Publication Sales, 50 Wolf Road, Albany, NY 12232, (518) 457-2124.

1.12 LAYING OUT

A. Examine the Contract Documents thoroughly and promptly report any errors or discrepancies to the Director's Representative before commencing the Work.

B. Lay out the Work in accordance with the Contract Documents.

C. Construction Work Contract:

1. Location of the building on the Site shall be performed by a licensed Land Surveyor or Professional Engineer.
2. Provide and maintain axis lines on each floor.
3. Provide and maintain marks 4 feet above finish floor on each column at each floor.
4. Take elevations and locations from control points located by the Director's Representative.

1.13 SPECIAL INSPECTIONS

A. Special Inspections and tests are required by Chapter 17 of the Building Code of New York State (BCNYS). Inspections & Testing Services will be provided by the state unless otherwise noted.

B. Contractors are responsible for notifying the Directors Representative regarding individual inspections listed in the **STATEMENT OF SPECIAL INSPECTIONS**. Contractors shall cooperate with the inspectors and testing agencies and sufficient notice and lead time (minimum 48 hours) must be allowed for inspection and testing to be performed.

C. Where deficiencies are identified, the contractor must take corrective actions to comply with the contract documents or remedy the deficiencies in accordance with Article 9 of the General Conditions.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011000

SECTION 011100 - SAFETY

PART 1 - GENERAL

1.1 SUMMARY

A. This section requires compliance with applicable Safety codes, standards, and regulations, including but not limited to OSHA, Building Code of New York State, Fire Code of New York State, and Facility Regulations.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Summary of the Work: Section 011000.

B. Regulatory Requirements: Section 014100.

1.3 DEFINITIONS, ABBREVIATIONS

A. OSHA: Occupational Safety and Health Administration.

B. BCNYS: Building Code of New York State.

C. EBCNYS: Existing Building Code of New York State.

D. FCNYS: Fire Code of New York State.

E. NFPA: National Fire Protection Association.

F. NEC: NFPA 70E.

1.4 SUBMITTALS

A. Provide a SITE SPECIFIC SAFETY PLAN no later than 15 days after approval of the Contract by the Comptroller. The plan must include at a minimum:

1. Cover page including Project Name/Location/Project Number/Contractor Name/Potential Start/Finish Dates.
2. Complete Scope of work.
3. Roles and Responsibilities page identifying Supervision, list of the names of all competent and/or qualified persons, including their qualifications, for each activity requiring a competent person i.e. excavations, scaffolding, rigging, fall protection, etc.
4. A program for implementing appropriate PPE as specified in the High 5. Hazard Assessment detailed in Subparagraph 1.04 A.11 below.
5. A program for assuring employees have proper work attire, i.e. substantial sole safety-toed footwear, long pants, shirts with minimum 4-inch sleeves, etc.

6. A 100% 6-foot conventional fall protection program which provides full body harnesses, lanyards (connectors), and anchorage points, or guardrails for all trades when working 6 feet above a lower level.

    a. Exception:

        1) When the employer can demonstrate that it is infeasible or creates a greater hazard to utilize these systems, the employer shall develop and implement a Fall Protection Plan, which meets the requirements of paragraph (k) 1926.502. This plan must be approved before implementation by the applicable OGS Regional Safety Manager.
        2) When working from portable ladders.

7. A program for raising employee awareness through the use of weekly Safety Talks (i.e. "Toolbox Talks" or "Tailgate Meetings") on topics related to upcoming/relevant work on the project. Contractor shall be required to verify that all employees on site participated in meeting, with documentation submitted to the Director's Representative.
8. Confined Space entry program and procedures for entry, when applicable.
9. A written Respirable Silica Protection Plan, including tasks for which employees could reasonably be expected to be exposed to harmful silica dust, and control methods that will be used to limit or eliminate exposure, as well as any PPE necessary to ensure protection.
10. Identify specific hazards related to this Project, and how employees will be protected from those hazards.
11. High Hazard Assessment's detailing procedures for all high hazard work activities including, but not limited to:

    a. All lifts involving cranes or material handling equipment.
    b. Scaffolding where scaffold working deck is expected to be 10' or higher from a lower level.
    c. Demolition.
    d. Excavations where anticipated depth is 5' or more.
    e. Hot work activities, which shall follow all applicable requirements stated in NFPA 51B.
    f. Steel erection with specific fall protection requirements detailed.
    g. Work at elevations, including roofing work.
    h. Electrical work involving Lock Out - Tag Out (LOTO) procedures.

        1) High Hazard Assessments shall include a step-by-step breakdown of a given task, the hazards associated with each step, the controls that will be utilized to eliminate or minimize the hazards, and the PPE that will be used to protect from remaining hazards.
        2) All required certifications shall be provided for all applicable types of work with required training/certifications (i.e., Powder Actuated Tools, Aerial Lifts, Forklifts, Crane Operators License, etc.).

12. A project safety inspection program, with a minimum of one documented safety inspection per week, during the course of construction. Submit copies of all resultant inspection reports to the Director's Representative on a weekly basis.

13. A program for providing proper care for injured employees, including the name of the employee with First Aid/CPR certification who will be on site at all times during the course of construction, to include local hospital/medical facility locations and contact information.
14. Provide an Emergency Action and Evacuation Plan, including Fire Protection and Emergency Response, when applicable.

    a. Plan to include:

        1) Procedures for reporting a fire or other emergency.
        2) Procedures for emergency evacuation, including type of evacuation and exit route assignments.
        3) Emergency Contact information.
        4) Procedures on how to alert workers of an emergency.
        5) Procedures to account for all employees after evacuation and muster/evacuation points.
        6) A list of all major fire hazards, to include type of fire protection equipment necessary to control hazard.

B. Provide safety orientation training for each employee prior to their starting work on site. This orientation shall include, but not be limited to: Fitness for Duty (drug, alcohol, and cannabis policies), training on general safety hazards, site-specific safety policies and procedures, personal protective equipment, injury reporting and protocols, emergency evacuation and preferred medical providers, and HAZCOM (GHS Harmonization). Provide documentation of all safety orientation training for each new employee on the site, including all subcontractors, to the Director's Representative.

C. Accident Reporting: The Director's Representative shall be immediately notified of any and all accidents. A copy of a written accident report shall be furnished to the Director's Representative within 24 hours of an incident.

    1. After any incident on site resulting in an employee being injured or damage to property, a Post- Accident Review Investigation shall be held as soon as possible after any incident. As a minimum, this investigation will involve the injured person, his/her supervisor, the responsible project superintendent and/ or supervisor and the onsite safety supervisor. The contractor shall be responsible to provide a written Post-Accident Corrective Action Plan, which will detail immediate steps taken to correct any unsafe condition that led to injury/property damage, long-term actions to prevent repeat incidents from happening on the site, and roles and responsibilities of individuals who will be implementing the corrective measures, which will be reviewed for effectiveness and continually monitored for implementation.

1.5 STOP WORK ACTIVITY AUTHORITY

A. All NYS OGS Representatives have the authority to stop a work activity that exposes any Contractor employees to potentially serious injury and/or illness. The responsible Contractor shall immediately cease work, perform an assessment of the activity that is exposing employees to any Immediately Dangerous to Life or Health (IDLH) conditions, and take action necessary to satisfactorily address the unsafe condition(s), at no cost to the State. The activity may only resume when a NYSOGS Representative and respective Contractor's Safety Representative verify

corrective measures have been satisfactorily completed. Any related impact to time of completion shall be considered within the Contractor's control.

B. No site work, other than mobilization, shall commence until the Site-Specific Safety Plan is approved.

1.6 ADDITIONAL SAFETY POLICIES THAT WILL BE ADHERED TO THROUGHOUT THE CONSTRUCTION PHASE

A. All contractors are required to utilize head (hardhat) and eye protection (safety glasses) at all times well within the project limits.

B. Any employee exposed to equipment/vehicles shall be required to utilize an ANSI Level 2 Safety Work Vest.

C. Contractors are strictly prohibited from utilizing any state-owned equipment or materials during construction.

D. All tools/equipment on multi-trade projects shall bear identifiable markings as to which contractor the tool/equipment belongs to. If any tool/equipment on the project does not have contractor's markings, the tool shall be immediately removed from the site until owner claims the tool/equipment.

E. Seatbelts shall be utilized when operating all heavy equipment designed to be operated in a seated position. When traveling in a vehicle, all employees shall be seated in a secured seat with a seatbelt in place.

F. Inspections of scaffolding prior to use, and excavations prior to entry shall be documented by an on-site competent person. Documented inspection will be available on-site for inspection by the Director's Representative.

G. All electrical cords/water hoses, if feasible, shall be run overhead to avoid additional slip/trip hazards. If not feasible due to physical restrictions, cords/hoses shall be placed to avoid all walkways and work areas.

H. All heavy equipment being utilized on site shall have a fire extinguisher of suitable size/rating within reach of operator.

I. Any fuel-powered equipment shall have a fire extinguisher of suitable size/rating no closer than 10 feet and no further than 25 feet from the equipment.

J. All electrical work shall be done when panels/lines/boxes have been de-energized and locked out, unless otherwise approved in writing by the Director's Representative.

K. An applicable sized Spill Kit shall be available on all jobsites where heavy equipment is being utilized.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011100

SECTION 012100 - ALLOWANCES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Include in the contract sum the allowances stated in this Section.

B. Should the net cost be more than the specified amount of the allowance, the contract sum will be adjusted by Order on Contract in accordance with the General Conditions. No Work in excess of the allowance will be permitted except by Order on Contract. Should the net cost be less than the specified amount of the allowance, the balance will be deducted from the final payment.

1.2 TOTALS FOR ALLOWANCES

A. The sum of allowances required by the Construction Work Contract is $613,246.

B. The sum of allowances required by the HVAC Work Contract is $455,222.

C. The sum of allowances required by the Plumbing Work Contract is $112,919.

D. The sum of allowances required by the Electrical Work Contract is $154,005.

1.3 ALLOWANCES FOR CONTINGENCIES

A. Include in the contract sum the amount indicated below to cover the cost of additional labor and materials for contingent activities within the scope of the Contract as directed in writing by Field Order. The Field Order will include a description of the Work and a method for determining the cost of such Work.

1. Construction Work Contract: $613,246.
2. HVAC Work Contract: $133,818.
3. Plumbing Work Contract: $112,919.
4. Electrical Work Contract: $154,005.

B. The value of the directed Work under this allowance will be determined by one or more of the methods authorized in Section 012200 which will be specified in the Field Order.

1.4 ALLOWANCE FOR DIRECT DIGITAL BUILDING CONTROL SYSTEM

A. HVAC Work Contract: Include in the contract sum the amount of $321,404 to cover the cost of providing modifications TO THE EXISTING Direct Digital Building Control System as specified in Section 230924 and as shown on the H-Contract Drawings.

1. The cost of providing the Work of this allowance will be paid in the amount specified. It is a fixed price allowance. Progress payments will be determined, by the Director, by evaluating the work completed.
2. Include overhead and profit for administering this allowance separately in the contract sum, not in the allowance.
3. Cause the products covered by this allowance to be provided by such persons or firm and for such amount as designated.
4. The amount of the allowance includes furnishing the products in accordance with the requirements of referenced Specification Section. Labor for the installation of the products covered by the referenced Specification Section shall be included in the Contract sum (not in the Allowance).
5. The amount of the Allowance includes delivery to the site and applicable taxes.
6. Include unloading and on-site handling costs, storage, and protection costs, installation costs, and other expenses separately in the Contract sum, not in the Allowance.
7. Purchase and Delivery:

    a. Execute purchase agreement with designated supplier.
    b. Arrange for samples, shop drawings, and product data as required.
    c. Make arrangements for delivery.
    d. Upon delivery, promptly inspect products for damage or defects. Submit claims for transportation damage.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012100

SECTION 012200 - COST COMPUTATIONS

PART 1 - GENERAL

1.1 DESCRIPTION

A. The Contracting Officer shall determine the value of any order on contract or field order by one or more of the following methods:

1. Agreed to Amount:

a. By estimating the fair and reasonable cost of:

1) Labor, including all wages, required wage supplements and insurance/taxes required by law (workers' compensation, social security, disability, unemployment, etc.) paid to or on behalf of working foremen, workers and other employees below the rank of the Contractor's designated representative directly employed at the Site of the Project, and, on contracts with an award price less than $500,000, the Contractor's designated representative, regardless of job title or work status.
2) Materials (to be installed or turned over to the State).
3) Consumables are items that are used during the progression of the extra work that do not become a permanent part of the Work and as such are considered overhead.
4) Equipment, excluding hand tools, which, in the judgment of the State, would have been or will be employed exclusively and directly on the omitted work or extra work.
5) Where the omitted or extra work is performed directly by the Contractor; by adding to the total of such estimated costs a sum equal to 15 percent thereof, but, where the omitted or extra work is performed by a subcontractor, by adding a sum equal to 15 percent of said costs for the benefit of such subcontractor, and by adding, for the benefit of the Contractor (no further allowance will be made where extra work is performed by any sub-subcontractor), an additional sum equal to:

a) 10 percent of the first $10,000 of the above-estimated costs, including the subcontractor's percentage override.
b) Plus 5 percent of the next $90,000 of the total of said items.
c) Plus 3 percent of any sum in excess of $100,000 of the total of said items.
d) For the purposes of the aforesaid percentage overrides, the words "extra work" shall be defined as a complete item of added, modified, or changed work as described in writing to the Contractor and the reductions enumerated shall be applied individually to each Order on contract issued on a Contract. Such "extra work" may include the work of one or more trades and/or subcontractors or sub-subcontractors and shall include all labor, material, plant, equipment, tools and all

incidentals directly and/or indirectly necessary, related, involved in or convenient to the successful completion of the extra work item.

6) By accepting an amount agreed upon by both parties, which amount is to be calculated in a manner similar to that provided in subparagraph 1.01 A. 1. a.
7) Should the Contractor fail to submit the required proposal as required by Article 10.5.1, the Contractor shall be compensated as follows:

a) The costs will be determined by the State as described in 1.01 A. 1. a. above, but the percentages for profit and overhead will be as follows:

(1) Where the omitted or extra work is performed directly by the Contractor; by adding to the total of such estimated costs a sum equal to 10 percent thereof, but, where the omitted or extra work is performed by a subcontractor, by adding a sum equal to 10 percent of said costs for the benefit of such subcontractor, and by adding, for the benefit of the Contractor (no further allowance will be made where extra work is performed by any sub-subcontractor), an additional sum equal to:

(a) 5 percent of the first $10,000 of the above-estimated costs, including the subcontractor's percentage override.
(b) Plus 3 percent of any sum in excess of $10,000 of the total of said items.

2. ACTUAL COSTS - By determining the actual cost of the extra work in the same manner as in the above Subparagraph 1.01 A. 1.a. except that actual costs of the Contractor be utilized in lieu of estimated costs. The State shall have the option to utilize this method provided it notifies the Contractor of its intent to do so prior to the time the Contractor is properly authorized to commence performance of such work.
3. By applying the applicable price or prices set forth in the Contract Documents or by applying a unit price agreed to by both parties.
4. All profit, overhead and expense of whatsoever kind and nature, other than those set forth above in Subparagraphs A.1.a. 1), 2) and 4), and below in Paragraph 1.01 F., of the Contractor, its subcontractors and sub-subcontractors, are covered by the aforesaid percentage overrides and no additional payment therefore will be made by the State.

B. Irrespective of the method used or to be used by the State in determining the value of extra or omitted work, the Contractor shall, after receipt of a request, shall within 15 days submit to the State a detailed breakdown of the Contractor's estimate of the value of the omitted or extra work. The Contractor shall submit evidence, satisfactory to the Contracting Officer, to substantiate each and every item that constitutes their proposal for the change. The State shall promptly respond to such submission.

C. Whenever this Contract requires the determination of labor hours, it shall be determined as follows:

1. Labor Hours shall be based on the labor factors as published in "RSMeans" by Reed Construction Data. The latest versions of the following books shall be used:

a. Building Construction Cost Data
b. Electrical Cost Data
c. Mechanical Cost Data
d. Plumbing Cost Data
e. Site Work and Landscape Cost Data

2. In the event that a labor factor for an item of work is not available from these publications the Director shall establish a labor factor as to the amount of time it takes to perform an item of Work.

a. Conditions that affect the performance of the extra work whether addressed in the Contract Documents or not shall be taken into consideration and negotiated.
b. Unforeseen conditions or conditions that are not identifiable shall not be included in the Contractor's proposal. If while in the process of performing the omitted or extra work a condition or event that affects the work becomes evident, it will be addressed at that time via a field order or change order.

D. Materials:

1. Materials used in performance of the extra work shall conform to Contract Documents and shall be listed by description, quantity, and standard unit of measure.
2. Where the extended value of an item of material is FIVE THOUSAND DOLLARS OR MORE a quote or invoice from a supplier shall be included as part of the Contractor's proposal. The Director's Representative reserves the right to request substantiating pricing documentation to verify actual and reasonableness of any and all submitted costs. This requirement does not impede Subparagraph 1.01 B. above.
3. Travel costs including mileage, tolls, and overnight lodging and meal per diems incurred as a result of the extra work will be reimbursed at costs without any markup for the Contractor or subcontractor as the case may be. Daily travel to the project site must exceed 35 miles, one way, from the Contractor's office address to claim mileage and toll expenses; only mileage beyond 35 miles will be reimbursed. Distance must exceed 50 miles, one way, from Contractor's office address to the project site to claim overnight lodging and meal per diems. Actual cost for overnight lodging and meal per diems will be reimbursed up to the maximum rates listed per locality, as established by U.S. General Services Administration (GSA).
4. Personal Protection equipment required for hazardous materials abatement and materials used to create critical barriers and protection barriers, provided that they are expended during the performance of the extra work or turned over to the State at the request of the Director's Representative, are reimbursable as part of an order on contract.

E. Whenever this Contract requires the determination of the cost of equipment, it shall be determined as follows:

1. Equipment used or to be used in the performance of Work shall be specifically described by the manufacturer, model number and date of manufacture and be of suitable size and capacity required for the work to be performed.
2. Equipment, excluding hand tools which are defined as tools and equipment having a new purchase price of less than ONE THOUSAND DOLLARS, and which will be used exclusively and directly on the Work. For the purposes of computing the Contractor's cost for self-owned equipment, the rate used for periods of under five days shall be the monthly

rate set forth for the item of equipment in the Equipment Watch® "Rental Rate Blue Book" published by Penton Media (800 669-3282) divided by 22 days to establish a daily rate and divided again by eight hours to establish an hourly rate. The rate used for periods of 5 days or more shall be 45% of the published monthly rate. In the event the "Rental Rate Blue Book" does not list the item of equipment used, the applicable rate shall be determined in the same manner as set forth above except that the monthly rate used shall be that set forth in "The AED Green Book" published by Penton Media (800 669-3282). In the event that a rate is not established in the "Rental Rate Blue Book" or "The AED Green Book" for a particular piece of equipment, the Contracting Officer shall establish a rate for ownership costs and operating costs for that piece of equipment that is consistent with its cost and expected life. Self-owned equipment is defined to include equipment rented from controlled or affiliated companies.

3. Rented equipment will be paid for at the actual rental cost. Equipment rented for the Work used in the performance of extra work will be reimbursed for operating costs only.
4. For the purposes of the performance of extra or additional work, when, in the opinion of the Contractor, and as approved in writing by the Director's Representative, suitable equipment is not available on the Site, the moving of said equipment to and from the Site will be paid for at actual cost.
5. Notwithstanding any other provision, if the State should determine that the nature or size of the equipment used by the Contractor in connection with the performance of Work is larger or more elaborate, as the case may be, than the size or nature of the minimum equipment determined by the State to be suitable for the performance of Work, the cost of equipment used in calculating the costs of extra work or delay damages will not be based upon the equipment used by the Contractor but instead will be based on the smallest or least elaborate equipment determined by the State to have been suitable for the performance of the Work. In no event shall the amount paid to the Contractor as the allowance for the use of self-owned construction equipment exceed the lower of the actual cost of such equipment or the depreciated value of such equipment as carried on the Contractor or subcontractors' books.
6. The Contractor shall be reimbursed for its operating costs for self-owned equipment based on actual cost data. Operating costs shall include fuel, lubricants, other operating expendables, and preventive and field maintenance. Operating costs do not include the operator's wages. In the event, after documented and demonstrated due diligence, actual operating costs are not ascertainable, then the Contractor will be compensated utilizing 100 percent of the operating costs set forth in the "Rental Rate Blue Book" and the Contractor shall be reimbursed the product of the number of hours of actual use multiplied by the operating cost per hour.
7. The maximum amount of reimbursement for the ownership costs of self-owned equipment is limited to the original purchase price of the equipment as listed in the "Green Guide for Construction Equipment" published by Penton Media (800) 669-3282. In the specific event when the ownership reimbursement is limited by the original purchase price, the Contractor shall, nevertheless, be reimbursed for the operating cost per hour for each hour of actual use.

F. Insurance and Bonds:

1. The additional cost of all required Bonds and Liability and Builder's Risk Insurance Premium required by this Contract, arising from the additional cost of performing extra work shall be paid by a change order or field order to be issued upon physical completion

of the Work and upon the submission of proof of payment of such additional premiums assessed by the respective insurance companies for such additional cost of the extra work.

2. Should the additional work require an additional insurance policy not initially required or anticipated in the execution of the contract, whether required of the Contractor or a subcontract between the Contractor and a subcontractor actually performing extra work, will be reimbursed based on actual cost.

G. Unless otherwise specifically provided for in an order on contract or field order, the compensation specified therein for extra work includes full payment for both the extra work covered thereby and for any damage or expense caused the Contractor by any delays to other work to be done under the Contract resulting from or on account of said extra work, and the Contractor waives all rights to any other compensation for said extra work, damage or expense.

H. In computing the value of an order on contract or field order which involves additions and deletions of work and the cost of the added work exceeds the cost of the deleted work, overhead and profit shall be computed on the amount by which the actual cost of additional labor and material exceeds the actual cost of the deleted labor and material, except no additional overhead and profit shall be allowed on the value of any order on contract or field order determined by the method provided in Subparagraphs 1.01 A. 1.b. or 1.01 A. 3.

I. In computing the value of an order on contract or field order which involves additions and deletions of work and the cost of the deleted work exceeds the cost of the added work, the Contractor will be allowed to retain the overhead and profit on the amount by which the cost of the deleted work exceeds the cost of the added work, except that no overhead and profit shall be retained on the cost of work determined by the method provided in Subparagraphs 1.01 A. 1.b. or 1.01 A. 3.

J. Subject to the provisions of Article 17A of the General Conditions, the following elements of damage, and only the following elements, as determined by the Contracting Officer, will be recoverable by the Contractor as "delay damages" provided that they are actual, reasonable and necessary:

1. Documented additional or escalated job site labor expenses.
2. Documented additional or escalated costs for materials.
3. Documented additional or escalated equipment costs less appropriate credits, as such are determined in accordance with this Section.
4. Documented costs of extended job-site overhead (including job superintendent, office engineer and clerical staff, but not including working foremen).
5. An additional 15 percent of the total of the above items in Subparagraphs 1.01 J. 1., 2., 3. and 4. for home office overhead and profit thereon.
6. Documented additional or escalated insurance and bond costs.
7. When the work is performed by a subcontractor, the Contractor shall be paid the actual, reasonable and necessary cost of such subcontracted work as outlined Subparagraphs 1.01 J. 1. through 4., including the subcontractor's main office overhead and profit of 15 percent. The Contractor shall also be allowed an additional 5 percent administrative fee for processing.
8. The phrases "additional expenses", "escalated expenses", "additional costs" and "escalated costs" shall include expenses and costs above or below those normally incurred in the performance of the work, less any appropriate credit, and/or attributable, with appropriate

credits, to the performance of work or portions of work in a different time period than that which was indicated on the approved progress schedule.

K. The parties agree that, with regard to delay damages, the State will have no liability for the following items and the Contractor further agrees it shall make no claim for the following items:

1. Profit, in excess of that provided for above.
2. Loss of anticipated or unanticipated profit.
3. Labor inefficiencies and loss of productivity.
4. Home office overhead in excess of that provided for above.
5. Consequential damages, including but not limited to interest on monies in dispute, including interest which is paid on such monies, loss of bonding capacity, bidding opportunities, or interest on retainage or investment, or any resultant insolvency.
6. Indirect costs or expenses of any nature.
7. Direct or indirect costs attributable to performance of work where the Contractor, because of situations or conditions within its control, has not progressed in a manner satisfactory to the Executive Director.
8. Attorneys' fees or claims preparation expenses.

L. Remedies Exclusive: With respect to extra costs and delay damages, the parties agree that the State shall have no liability to the Contractor for expenses, costs, or items of damage other than those which are specifically identified as payable above. In the event any legal action is instituted against the State by the Contractor on account of any extra work or for additional compensation, whether on account of delay, acceleration, breach of contract, or otherwise, the Contractor agrees that the State's liability will be limited to those items which are specifically identified as compensable above. The Contractor further agrees to make no claim for expenses other than those which are specifically identified as compensable above.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012200

SECTION 013000.01 - ADMINISTRATIVE REQUIREMENTS-ECP Version

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS SPECIFIED ELSEWHERE

A. Other requirements pertaining to payments are included in the General Conditions and in the various sections of the Specifications.

B. Cost Computations: Section 012200.

C. Submittals: Section 013300.

1.2 WAIVER OF CERTAIN SUBMITTAL REQUIREMENTS

A. The Electronic Contractor Payments (ECP) program facilitates electronic submission of payment applications and related documents and information via a secure web-based portal. This portal is hereinafter referred to as the "Vendor Interface". Hardcopy (paper) submission of the following forms is waived, and the information required by these forms shall be submitted via the Vendor Interface:

1. BDC 169 (Contractor's Application for Payment form).
2. BDC 187 (Detailed Estimate form).
3. BDC 329 (Contractor's List of Subcontractors–Suppliers).

1.3 SCHEDULES AND RECORDS

A. Submit the following information not later than 15 days after approval of the Contract unless the Contractor or the Director determines an earlier submission is required to properly schedule or progress the Work.

1. CONTRACTOR'S LIST OF SUBCONTRACTORS – SUPPLIERS: An affirmative review of the subcontractor's responsibility will be conducted. Any subcontractor disapprovals resulting from negative information derived from the State's review will result in written notice (by letter or e-mail) to the Contractor. A responsibility meeting may result from these actions. The Contractor will defer to the provisions of Article 6, General Conditions, regarding its responsibility to prosecute the work.

a. Submit the CONTRACTOR'S LIST OF SUBCONTRACTORS – SUPPLIERS information using the required electronic entry process via the Vendor Interface.
b. Indicate the items of Work proposed to be accomplished by subcontractors, the name and address of each proposed subcontractor, the dollar value of the subcontract, and Minority and Women-Owned Business Enterprise (MWBE) information.

1) Attach a properly completed and executed NEW YORK STATE VENDOR RESPONSIBILITY QUESTIONNAIRE – FOR PROFIT CONSTRUCTION (CCA-2) and forward to the Vendor Responsibility Unit for each subcontractor whose subcontract is valued at $100,000.00 or more unless requested otherwise by the Contracting Officer and/or the Director's Representative.
2) As an alternative to submitting a paper version of the form, subcontractors may opt to submit the CCA-2 on-line via the New York State VendRep System. Information on this system and the New York State vendor responsibility requirements is available at: http://www.osc.state.ny.us/vendrep/index.htm.

c. Indicate the names and addresses of proposed suppliers, the dollar value of the supplies, and MWBE information.
d. Failure in providing this information may result in payments being withheld and referral to the Contracting Officer for a responsibility determination.

B. If after initial approval, circumstances require a change in a subcontractor or supplier or require additional subcontractors or suppliers to be used, use the Vendor Interface to submit a revised BDC 329 form that reflects the changes or additions.

1.4 DETAILED ESTIMATE

A. Before making the first requisition for a progress payment, prepare a detailed estimate of quantities and prices for materials, labor and other items required for the Work, which shall aggregate the contract sum.

1. Submit the DETAILED ESTIMATE information using the required electronic entry process via the Vendor Interface.

B. The detailed estimate shall be supported by such evidence, including certified copies of subcontracts, as the Director may require.

C. The detailed estimate must be approved by the Director who may revise it as, in their reasonable judgment, is necessary to make the various items conform to their true values.

1. The value of each requisition for payment shall be based on the approved detailed estimate.

D. The Contractor shall bill any item of work listed as "Lump Sum" to 100%, no partial percentages will be allowed.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013000.01

SECTION 013113 - PROJECT PLANNING AND SCHEDULING

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS AND INFORMATION SPECIFIED ELSEWHERE

A. Summary of the Work: Section 011000.

B. Administrative Requirements: Section 013000.

C. Project Meetings: Section 013119.

1.2 SUMMARY

A. Section includes administrative and procedural requirements to plan, schedule, and document the progress of the Project, work in place, and predict and prevent delays to established activities and milestones during performance of the Work.

1.3 DEFINITIONS

A. Activity: A task or grouping of tasks containing an anticipated start-date and corresponding duration in work days, anticipated labor resources, person responsible for the work, restricted work period, contract reference document, sequence of work, and budgeted cost (if required) comprising a generalized portion of the Work, that can be identified and measured for planning, coordinating, monitoring, and controlling the project.

B. Activity Duration: Time needed for the represented work in work days. No duration in any baseline or recovery schedule shall be longer than one (1) reporting period as defined in Section 013119, except for submittal items. All procurement and work activities must be provided in sufficient detail to meet this duration requirement.

C. Baseline Agreement: The agreement document for Section 013113 which will contain the baseline schedule report.

D. Baseline Project Schedule: The schedule derived from the Contractors' Project Work Plan activities and their prescribed durations, predecessor activities, etc., recognizing the completion of the Work of the Project Work Plan in accordance with the Contract duration. The Baseline Project Schedule will remain unaltered as a tool to measure progress outlined and anticipated during the Initial Schedule Meetings and from the agreed-upon Baseline Project Schedule. The Project Team will agree to the resulting schedule by completing the Baseline Agreement within the Project Work Plan software. OGS Scheduling will maintain the agreed-upon Baseline Project Schedule as the assigned project baseline schedule.

E. Calendar: The calendar utilized for each activity, set according to the direction of OGS Scheduling to accurately reflect anticipated State and Federal holidays. Calendars reflecting

additional shifts or non-traditional work hours must be reviewed with the Director's Representative and approved by OGS Scheduling and prior to use in the schedule.

F. Constraints: Constraints are a function which can manipulate or hold specific dates. Constraints are used by OGS Scheduling in specific instances during the baseline process to hold dates dictated by the terms of the Contract or assigned to submittal & procurement items in the Project Work Plan. Constraints are not allowed to be used/entered by Contractors on any activities except for mobilization items.

G. Data Date: The progress point or "status date" for activities/tasks in the project. Project status is up-to-date as of the Data Date. OGS Scheduling will specify the Data Date for each Project Update Reporting Period.

H. Float: The measure of latitude in starting and/or completing an activity without impeding the successful realization of Project Milestones. It is an expiring Project resource that is jointly owned, not for the exclusive use or benefit of either the State or the Contractors. Float is available as needed to meet scheduled milestones and Project completion. Recognizing float within an activity, or chain of activities, does not permit the Contractors to disrupt progress or to delay completion of an activity.

I. Milestone Activity: A significant start or finish to Work on a given set of activities on the Project, defined by both the Director's Representative and the Contractors. The Project Team will identify milestones, activities, or summary activities for incorporation into the Baseline or Project Schedule to assist in planning, scheduling, and coordinating the Project. This may include major milestones or phases required by the Contract Documents to be utilized by the Contractors and Project Team in developing the Baseline Project Schedule.

J. OGS Project Work Plan System (OGS PWPS): The collaborative online system provided by OGS for Contractors to establish their Project Work Plan activities, duration, prerequisites, resources and budgeted cost (if required) for Work of the Project. All work is entered into the OGS PWPS by the Contractor(s).

1. Importing of any information is not allowed.
2. Time lags are not allowed to be scheduled between activities.

K. OGS Scheduling: The department responsible for assisting and training the Project Team, reviewing, reporting, and interpreting the Contractor Project Work Plan and related information.

L. Preliminary Project Schedule: This schedule is a summary outline of the Contractor's anticipated Project Work Plan for the sequence of work of this Contract through Substantial Completion as noted in the Summary of Work (Section 011000). The activities are developed using anticipated dates and are coordinated among the Contractor(s). The resulting Schedule outlines and aligns the sequence of work for the individual Contract and coordinates the Contracts that are part of a multiple trade Project. The Project Work Plan needs to address sequencing of the work, long lead items, and impact of weather and restricted work periods as noted in Section 002219. The Project Team will agree to the resulting schedule by completing the Baseline Agreement within the Project Work Plan software.

M. Project: Work to be performed as part of one or more Contracts.

N. Project Team: The Designated Representatives acting on behalf of the State and/or Contractors to successfully plan, schedule, and coordinate the Work of the Project.

O. Project Update Reporting Period (Project Schedule Updates): A regular reporting period as stipulated for this Project in Section 013119, that is concluded by a Project Update Meeting for review, evaluation, and adjustments to the Project Work Plan and Activity progress.

P. Project Work Plan: A comprehensive list of Contractor tasks, including prerequisite activities, durations, labor resources, budgeted costs (if required), etc. used to develop the Project Schedule as entered by the Contractor's Supervision staff in the OGS PWPS.

Q. Recovery Project Schedule: Revised Project Work Plan developed from recovery options presented by the Contractor to the Director's Representative when Project Update Reporting indicates the Work is 15 or more work days behind the current Substantial Completion dates of the agreed-to Baseline Project Schedule. The Contractor will update their Project Work Plan accordingly for the revision. The Project Team will agree to the resulting recovery project schedule by completing the Baseline Agreement within the Project Work Plan software. OGS Scheduling will maintain the Baseline Agreement Recovery Project Schedule as the assigned Baseline Project Schedule.

1. The Recovery Project Schedule will only be reviewed by OGS when it is entered in the OGS PWPS

R. Resource: Any labor (workers), material, or equipment, shared or exclusive, required for the completion of the Work or an Activity, for which an associated cost is recognized.

S. Schedule: A comprehensive plan of necessary procedural tasks, including task sequencing, projected start and finish dates, and resource allocation required to successfully complete the Work by the Project completion date. The dates in the Schedule are the result of the sequence, duration, and requirements from the Project Work Plan.

PART 2 - PRODUCTS

2.1 SCHEDULE SOFTWARE

A. The Project Work Plan software (Oracle Primavera) is provided by OGS through the OGS PWPS for use on this OGS contract only.

B. Contractors are required to have Internet access to utilize the OGS PWPS for all parts of this section.

C. Meetings will be held in accordance with Section 013119 and will be conducted via WebEx™ or an equivalent online method provided by OGS.

D. OGS will provide training for access and use of the OGS PWPS. Additional support is available by OGS Scheduling as requested.

PART 3 - EXECUTION

3.1 PROJECT AWARD

A. OGS Scheduling will establish one account for each Contractor.

B. The Initial Schedule and Training Meeting is coordinated by the Director's Representative and Project Team. Prior to the meeting all Contractor accounts need to be set up by OGS Scheduling.

3.2 INITIAL SCHEDULE MEETING – (PERIOD DEFINED BY SECTION 013119)

A. The meeting is mandatory for the members of the Project Team and will be conducted by OGS Scheduling for the purpose of defining the intent of the specification and reporting structure of the Project. The mutual agreements reached at this and subsequent meetings form the basis for the Baseline and other Project Schedule(s), and will be used for coordinating, scheduling, and monitoring the Work of all related contracts.

B. This meeting also includes training for the Project Team using the OGS PWPS. Each session will be one hour (total of two hours) via WebEx™ or an equivalent online method provided by OGS.

1. SESSION 1 - Preliminary Project Schedule & Initial Training
2. SESSION 2 - Baseline Project Schedule Training

3.3 PRELIMINARY PROJECT SCHEDULE – (PERIOD DEFINED BY SECTION 011000, if specified)

A. In the OGS PWPS, the Contractor will develop their Project Work Plan activities and provide information relating to activity naming, anticipated work dates, resources, and budgeted cost (if required) on the OGS PWPS. The Project Team will establish a focused work breakdown structure (WBS). The activities are developed using anticipated dates and are coordinated among the Contractor(s).

B. Activities are to be appropriately placed within the OGS PWPS. Activity durations are only limited by the requirements of coordinating the work of the Preliminary Project Schedule by the Project Team. For the purposes of coordinating this schedule, relationships (predecessors and successors) are not required between the activities.

C. The Preliminary Project Schedule must be agreed to by the Project Team. Each Contractor and the Director's Representative shall agree to it by completing the Baseline Agreement within the Project Work Plan Software (sample agreement included at the end of Section 013113) .

3.4 BASELINE PROJECT SCHEDULE – (45 DAYS AFTER AWARD)

A. The Contractor(s) shall develop and enter their Project Work Plan activities which adequately represent their scope of Work of the Contract and the required coordination efforts for the Project. This includes, but is not limited to, sequence requirements, identification of logical connections to other work critical to Substantial Completion, accounting for critical submittals or submissions,

the fabrication and delivery of long-lead materials, products, specialized equipment or services, and the recognition of critical testing, inspection, or commissioning durations for coordination and tracking.

B. Each activity will identify the Contractor's anticipated duration for the activity defined in workdays, resources, and budgeted cost (if required) of the activity. The Contractor is responsible to provide the mandatory requirements outlined by OGS and the online OGS PWPS layout within the project structure provided by OGS. Revisions to the project structure must be agreed upon by the Project Team.

C. Activity durations cannot exceed the time frame in work days of the Project Reporting Period as defined in Section 013119.

D. The Contractors will identify each activity with a unique Activity Name that clearly communicates the scope of the work item to the rest of the Project Team. No Activity Name or Activity ID will be altered without approval of the Director's Representative and OGS Scheduling after the Baseline Project Schedule has been agreed to by the Director's Representative.

E. The Baseline Project Schedule must be agreed to by the Project Team. Each Contractor and the Director's Representative shall agree to it by completing the Baseline Agreement within the Project Work Plan software (sample agreement included at the end of Section 013113).

3.5 PROJECT SCHEDULE UPDATES (PERIOD DEFINED BY SECTION 013119)

A. Project Schedule meetings will be led by the Director's Representative and held to review Contractor updates to the actual starts, actual finishes, and remaining duration of in-progress activities, and consider logic changes, predecessor alterations, duration amendments, time impact events, and scope changes, for the purpose of determining the status of construction progress for the updated Project Schedule. At each meeting the Project Team will:

1. Agree to the completed Activity dates.
2. Coordinate and agree to the next 6-week Project Work Plan.
3. Evaluate and acknowledge any impact to the Contractor's ability to execute the Project Schedule according to the Baseline Project Schedule.

B. During the progress of Work on the Project, the Contractors are required to document actual start, actual finish, and remaining duration on a daily basis. Information will be posted by the Contractor to the OGS PWPS as defined during the Initial Schedule Meeting.

C. Contractors are required to update the status of all their activities two (2) days prior to the Project Schedule Meeting. The Contractors will notify the Director's Representative and OGS Scheduling when their update information for all activities is complete.

1. Any variation of 5 days (+/-) in the start or finish date for each activity must be explained and posted to each activity.
2. All necessary initiated documents such as Request for Information (RFI), Information Bulletins (IB), Field Orders (FO), Change Orders (CO), and Notice of Claim (NOC) must be incorporated by the Contractor into the Contractor's Work Plan.

3. Any Contractor failing to progress their Work as outlined in the updated Project Work Plan will be informed of their deficiencies and, if required, be requested to provide a recovery option.

D. Performing Work out of sequence with the Project Schedule is not permitted unless written approval is obtained from the Director's Representative prior to commencement.

3.6 RECOVERY PROJECT SCHEDULE

A. When the Project Schedule completion date is projected to be greater than the agreed-to Baseline Project Schedule's Substantial Completion date by 15 or more work days, the Contractor(s) will revise the existing Project Work Plan as necessary towards meeting the specified completion date within 10 calendar days after the Project Schedule update meeting.

B. Contractor recovery options may include, but are not limited to, allocating additional resources to reduce activity duration or modify activity sequencing.

C. Alterations to the Project Work Plan activities for a Recovery Work Plan will require the approval of the Contractor(s) and the Director's Representative. Agreed-to alterations to the Project Work Plan activities for a Recovery Work Plan will constitute the updated Project Schedule.

D. The updated Project Schedule must be agreed to by the Project Team. Each Contractor and the Director's Representative shall agree to it by completing the Baseline Agreement within the Project Work Plan Software (sample agreement included at the end of Section 013113).

E. The previous Baseline Project Schedule will be retained. The new agreed-upon Baseline Project Schedule will be used to measure progress moving forward.

3.7 SCHEDULE CLOSEOUT (AS-BUILT SCHEDULE)

A. A schedule meeting must occur to update the project schedule with the actual progress dates and to confirm that all activities are complete for Substantial Completion.

B. The Director's Representative will determine if any of the original Substantial Completion activities need to be tracked for Physical Completion in the project schedule.

3.8 TIME IMPACT AND TIME IMPACT ANALYSIS (TIA)

A. The Contractor(s) will represent the impact relative to the assigned Baseline Project Schedule in the OGS PWPS. The Contractor will incorporate the impact of any change in their Work Plan per the current OGS PWPS requirements for impacts. The requirements include but are not limited to:

1. A day-for-day tracking of the impact to illustrate the sequence of the impact from the initiating event.
2. All information required to create an Activity and the associated codes for the impact in the OGS PWPS as defined previously.

3. Modification of existing activities so that the name of each associated task enhances the reader's understanding of the impact. Modification of the associated (TIA) codes for the change in the OGS PWPS.
4. For the addition of any new activities, an explanation of how the modified scope impacts the agreed-to Baseline Project Schedule.

B. Contractors and the Project Team will use the most current Project Work Plan update to prepare the Time Impact representation.

C. If Project Work Plans have not been updated in accordance with this specification, an update by the Contractor must be generated which includes an accurate realization of the Work performed and progressed up to the Time Impact event. Failure to maintain Project Work Plan updates in accordance with this or related specifications will not absolve the Contractors of the responsibility to identify Time Impact as defined by, but not limited to, Specification Section 013113 or the General Conditions.

D. OGS Scheduling will assist the Contractor with this process as requested.

E. A Request for Time Extension will require Time Impact recognition within the OGS PWPS and Schedule.

F. Time Impact events will be reviewed for accuracy and are to be updated in accordance with relevant new information regarding time for resolution and impact to the remaining work on the Project.

G. All impacts (sequence, duration, and scope) must be agreed to by the Project Team.

3.9 SUBSTANTIAL COMPLETION DATE CHANGES

A. If the Substantial Completion date of the project is modified by an Order on Contract in accordance with the General Conditions, the Project Team will agree to a new Baseline Project Schedule within 10 calendar days after the approval of the Order on Contract.

1. The previous Baseline Project Schedule will be retained. The new agreed-upon Baseline Project Schedule will be used to measure progress moving forward.
2. The new Baseline Agreement must be agreed to by the Project Team. Each Contractor and the Director's Representative shall agree to it by completing the Baseline Agreement within the Project Work Plan Software (sample agreement included at the end of Section 013113).

SAMPLE BASELINE AGREEMENT

Baseline Agreement

NEW YORK STATE OF OPPORTUNITY. | Office of General Services Design & Construction

Project:

It is agreed that the referenced Project Schedule defined by the following reports has been reviewed and is accepted for use in coordinating, scheduling, and monitoring the work of all related contracts

By acknowledging within the Project Work Plan software, OGS does not waive the terms and conditions set forth in the Contract Documents. In accordance with the General Conditions (Document 007213) any change in the Contract sum or time of completion requires an Order on Contract.

Refer to the following report for the specific dates.

Contract	Representative	Activity Name	Date

END OF SECTION 013113

SECTION 013119 - PROJECT MEETINGS

PART 1 - GENERAL

1.1 INITIAL JOB MEETING

A. The Director's Representative will notify all parties concerned of the time and place of the initial job meeting. The meeting will be conducted by the Director's Representative. The agenda will be based on the Format for Initial Job Meeting. All items on the format, as they apply, will be discussed.

1. A copy of the Facility's current Visitor Identification Policy will be distributed.

1.2 PROJECT SCHEDULE MEETINGS

A. The Initial Schedule Meeting will be held within 15 days of Project award. The Director's Representative will notify all members of the Project Team of the time and place of the meeting. The meeting will be conducted by the Director's Representative and OGS Scheduling via WebEx™ or an equivalent online method for the following purposes:

1. Define the intent of the specification.
2. Review the reporting structure of the Project.
3. Provide training to the Project Team.

B. The Director's Representative will notify all members of the Project Team of any Schedule development/coordination meetings conducted by the Director's Representative and OGS Scheduling via WebEx™ or an equivalent online method.

C. The Project will have monthly project update reporting periods. The update meetings will be conducted by the Director's Representative and OGS Scheduling via WebEx™ or an equivalent online method for the following purposes:

1. Agree to the completed Activity dates.
2. Coordinate and approve the next 6-week Project Work Plan.
3. Evaluate and acknowledge any impact to the Contractor's ability to execute the Project Schedule according to the approved Baseline Project Schedule.

1.3 BI WEEKLY JOB MEETINGS

A. Unless otherwise directed, job meetings will be held bi weekly, at a time and place agreed upon by the Director's Representative, the Contractor, and the Facility Representative. Other interested parties may attend when needed, e.g., subcontractors and representatives from suppliers, public utilities, and local government. The meetings will be conducted by the Director's Representative for the following purposes:

1. Review job progress, quality of Work, and approval and delivery of materials.

2. Identify and resolve problems which impede planned progress.
3. Coordinate the efforts of all concerned so that the project progresses on schedule to on-time completion.
4. Maintain sound working relationships between the Contractors and the Director's Representative, and a mutual understanding of the project requirements.
5. Maintain sound working procedures.

1.4 PRE-INSTALLATION MEETINGS

A. Pre-installation meetings will be held to review the specifications, Project Schedule, drawings, and approved submittals in preparation for start of a particular activity.

B. The meetings shall be attended by the Director's Representative, a Design Representative, and the Contractor's Representative, including installer and representatives of manufacturers & fabricators involved in or affected by the installation and its coordination with other materials/trades.

C. The Director's Representative shall schedule the meetings prior to the start of the work. The goal of these meetings is to ensure the quality of construction and to maintain the schedule.

1.5 ATTENDANCE

A. A Contractor's Representative shall be required to attend all meetings scheduled by the Director's Representative, as set forth above.

B. If the Contractor's Representative fails to attend two scheduled meetings without prior approval, the Contractor will be directed to replace the current Contractor's Representative. Further incidents of non-attendance by the Contractor's Representative will form the basis for review of the Contractor's responsible vendor status.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013119

SECTION 013300.0 - SUBMITTALS

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS SPECIFIED ELSEWHERE

A. Other requirements pertaining to submittals are included in the General Conditions and in the various sections of the Specifications.

B. Summary of the Work: Section 011000.01.

C. Administrative Requirements: Section 013000.

D. Contract Closeout Submittals: Section 017716.

1.2 DEFINITIONS

A. Deviation: Changes in products, materials, equipment and methods of construction from those required by the Contract Documents and proposed by the Contractor.

B. Acceptable Manufacturer, Company or Product: A manufacturer, company or product capable of achieving the requirements established in the Contract Documents and demonstrating compliance.

C. Portable Document Format (PDF): An open standard file format used for representing documents in a device-independent and display resolution-independent fixed layout document format.

D. Environmental Product Declaration (EPD): a third-party verified (also known as “type III”) product declarations that quantify environmental information the full life cycle of a product, from raw material supply, transport, manufacturing, installation, and operational use, through to waste processing and disposal at end-of-life, per ISO 14025.

1.3 DEVIATIONS FROM REQUIREMENTS OF THE CONTRACT DOCUMENTS

A. Deviations from the requirements of the Contract Documents will not be allowed unless a request for deviation is made in writing prior to or at the time of submission and the specific deviation is approved by the Director’s Representative subject to the requirements of Article 4 of the General Conditions. The request for deviation shall be made utilizing the CONTRACT DOCUMENT DEVIATION REQUEST FORM (Form BDC 49) accessible from the OGS Web Site.

1. The submission of a deviation shall be done in a timely manner according to the schedule of submittals to allow the Director sufficient time for review.

1.4 "OR EQUAL" TO BRAND NAME PRODUCTS

A. Whenever a product is specified by brand name, a comparable brand, equal to that named, may be submitted for approval subject to the requirements of Article 5 of the General Conditions.

1. The Contractor shall bear the burden of proving that the proposed product is equal to the specified product. The submission of an "or equal" shall be done in a timely manner to allow the Director sufficient time to review the proposed product.
2. Whenever a color or pattern is indicated by a specific manufacturer's name or number, the intent is to communicate the required color or pattern of the material. Other manufacturers' comparable colors or patterns may be submitted for approval as equal.

1.5 WAIVER OF CERTAIN SUBMITTAL REQUIREMENTS

A. Unless otherwise specified, the requirement to submit product data and samples for approval will be waived for products specified by brand name if the specifically named products are furnished for the Work. In such cases, submit required Product Data to the Director's Representative via Submittal Exchange® for information only.

1.6 ADMINISTRATIVE REQUIREMENTS

A. Participate in the OGS's hosted web-based collaboration service (Submittal Exchange® at www.submittalexchange.com) to transmit and track Contractor provided project related documents.

B. Identify submittals by project title and number. Include Contractor's name, date, and revision date. On shop drawings, product data and samples, also include the name of the supplier and subcontractor (if any), and applicable specification section number. Stamp each submittal and initial or sign the stamp to certify review and approval of submittal.

C. Assemble submittals in accordance with the requirements in the individual sections of the Specifications and as required by this section. It is the Contractor's responsibility to review and verify that all information required for each submittal is included in the submittal package. Errors or omissions found by the Contractor are to be corrected prior to the submission of the submittal package for approval. Incomplete submittal packages that have been submitted for review and approval will be returned.

1. It is the Contractor's responsibility to verify that portions of the submittal package to be provided by a subcontractor (or supplier) are complete, as well as portions of the submittal package being provided directly by the Contractor.
2. Do not combine the submittals of more than one specification section with submittals required by other specification sections unless specifically stated in the contract Specifications.

D. If a submittal is based on, or the result of, a change order or field order to the Contract Documents, include copies of the applicable change order or field order with the submittal.

E. 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 instructions for partial submittals are required in a specific specification section requiring sequential submissions.
3. Submit action submittals and informational submittals required by the same specification section as separate packages under separate transmittals.
4. Coordinate transmittals of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.

    a. The Director's Representative reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

F. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on uploading the submittal to Submittal Exchange®. No extension of the project schedule will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.

1. Initial Review: Allow time for the initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. The Designer of Record will advise the Director's Representative when a submittal being processed must be delayed for coordination.
2. Resubmittal Review: Allow time for review of each resubmittal.
3. Sequential Review: Where sequential review of submittals by the project team is necessary for coordination, allow time for review.

G. The Construction Contractor shall employ or otherwise provide a full-time Submittal Coordinator for no less than 90 days after the Initial Job Meeting (IJM). The Submittal Coordinator is responsible to manage, coordinate and facilitate the submittal process on behalf of the Contractor. The Submittal Coordinator shall have regularly been engaged in construction administration for a minimum of 3 years and shall not be employed or otherwise engaged as the Project Manager or Superintendent for either the Work of this Contract or be employed in any role, full or part time, outside of this Contract.

1.7 SUBMITTALS

A. Submittal Coordinator Qualifications: Not later than 10 days after Award. Include resume and references, and other certification, licenses, or other requested information.

B. Schedule of Submittals acknowledgement: Provide written acknowledgement that the Schedule of Submittals has been received and reviewed with Critical Submittals identified and Contractor's Projected Dates (three dates inserted into each column) are entered for each specification item.

1.8 RE-EVALUATION FEE

A. In accordance with Article 4.7 of the General Conditions, a re-evaluation processing fee will be levied against the Contractor for each re-evaluation of a Submittal or Submittal Package

submission that was returned for failure to comply with the submittal requirements relative to completeness, content or format.

1.9 ELECTRONIC SUBMITTALS

A. Submittal Exchange® is used to provide an on-line database and repository which shall be used to transmit and track project related documents. The intent for using this service is to expedite the construction process by reducing paperwork, improving information flow, and decreasing submittal review turnaround time.

1. Project submittals (shop drawing, product data and quality assurance submittals) shall be transmitted by the Contractor in PDF to Submittal Exchange®, where it will be tracked and stored for retrieval for review. After the submittal is reviewed it is uploaded back to Submittal Exchange® for action or use by the Contractor and Director's Representatives.
2. The service also tracks and stores documents related to the project such as RFI's (Request for Information), IB's (Information Bulletins), CAD Coordination, Minutes, Testing, Closeout, and SWPPP documents.

B. For each submittal, the Contractor shall review and apply electronic stamp certifying that the submittal complies with the requirements of the Contract Documents, including verification of manufacturer/product, dimensions and coordination of information with other parts of the work.

C. It is the Contractor's responsibility to provide submittals in PDF. The Contractor may use the following options:

1. Subcontractors and suppliers provide electronic submittals in PDF to the Contractor through Submittal Exchange®.
2. Subcontractors and suppliers provide paper submittals to the Contractor, who electronically scans and converts them to PDF.
3. Contract a Scanning Service, which will allow the Contractor and the Contractor's subcontractors and suppliers to provide paper submittals to the Scanning Service, which electronically scans and converts them to PDF. It will be the Contractor's responsibility to transmit the scanned submittals to Submittal Exchange®.

D. Image Quality:

1. Image resolution: The PDF files shall be created at a minimum resolution of 200 dots per inch utilizing the original document size. The Contractor will be responsible to increase the resolution of the scanned file or images being submitted as required to adequately present the information.
2. Image Color Rendition: When information represented requires color to convey the intent and compliance, provide full color PDF reproduction.

E. Internet Service and Equipment Requirements:

1. The Contractor will be required to have an Email address and Internet access at Contractor's main office.
2. Unless the Contractor will exclusively be using a Scanning Service to create PDF documents, the Contractor will be required to own a PDF reviewing, creating and editing software, such as Adobe Acrobat (www.adobe.com), Bluebeam PDF Revu®

(www.bluebeam.com), or other similar PDF reviewing, creating and editing software for applying electronic stamps and comments.

F. Training and Support:

1. Submittal web-based collaboration training and support shall be available, free of charge from Submittal Exchange®, for project participants using the submittals website.
2. Training schedule will be coordinated through the Director's Representative.

G. Paper prints (hardcopies) of reviewed submittals:

1. Record Copy: Each Contractor shall provide one paper copy of each submittal they are responsible for to the Director's Representative within 14 days of receipt of a released submittal (i.e. marked "Approved", "Approved As Noted", or other implied acceptance of a submittal), or meeting the requirements of Waiver Of Certain Submittal Requirements Article of this specification section.

   a. Exception: Paper copies are not required for a submittal that is disapproved or requiring resubmission.
   b. Paper copies shall be printed in a size format equal to the original document.
   c. Scaled Shop Drawings shall be printed to the scale noted on the drawings.
   d. The resolution of the printed copy shall be equal to that of the PDF file that it is being printed from.
   e. The Record Copy shall be used by the Director's Representative during the construction of the project and shall be retained as a turn-over item to the facility at the end of the project as required under Section 017716 Contract Closeout.

2. Use for Construction: Retain complete copies of submittals on project site. The Contractor shall not commence work for related activities until the appropriate submittals are approved and the corresponding record copies are delivered to the Director's Representative.
3. Distribution: The Contractor will furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Maintain transmittal forms indicating distribution of submittals.

1.10 SHOP DRAWINGS

A. Provide shop drawings in the format required by the Specifications. Show the information, dimensions, connections and other details necessary to insure that the shop drawings accurately interpret the Contract Documents. Show adjoining construction in such detail as required indicating proper connections. Where adjoining connected construction requires shop drawings or product data, submit such information for approval at the same time so that connections can be accurately checked.

B. Electronic copies of CAD Drawings of the Contract Drawings will not be provided by the Director's Representative for Contractor's use in preparing submittals.

C. Have shop drawings prepared by a qualified detailer. Shop drawings shall be neatly drawn and clearly legible. Machine duplicated copies of Contract Drawings will not be accepted as shop drawings.

1. Where shop drawings are indicated to be drawn to scale:

    a. Use scale normally found on an “Architect” or “Engineer” scale.
    b. Written Scale: Clearly label scales being used on each drawing and/or on each detail on the drawing.

        1) Examples: 1/8” = 1’-0” 1” = 40’-0”.

    c. Graphic Scale: Adjacent to each Written Scale, provide a graphic scale delineating the scale being used. Graphic scale shall be divided into measuring units relating to the accuracy required for the drawing or details.
    d. Clearly dimension key elements of the drawing or detail.

2. When the drawing sheet is printed full size, the minimum text size shall be 1/8" (3.2 mm) for hand drafting and 3/32" (2.5 mm) for CADD drawings.

D. Submit the shop drawings through Submittal Exchange®. The shop drawings will be reviewed and the review results will be posted on Submittal Exchange®. Contractor will receive email notice of completed review. If the review results in disposition of “DISAPPROVED” or “RETURNED FOR CORRECTION”, promptly correct the deficiencies and resubmit the shop drawings meeting Contract requirements.

1.11 PRODUCT DATA

A. Provide product data in the format required by the Specifications. Modify product data by deleting information that is not applicable to the project or by marking the product data to identify pertinent products. Supplement standard information, if necessary, to provide additional information applicable to project.

B. Submit the product data through Submittal Exchange®. The product data will be reviewed and the review results will be posted on Submittal Exchange®. Contractor will receive email notice of completed review. If the review results in disposition of “DISAPPROVED” or “RETURNED FOR CORRECTION”, promptly correct the deficiencies and resubmit the product data meeting Contract requirements.

C. Comply with applicable federal and State of New York Right-to-Know Law provisions. Provide Safety Data Sheets (SDS) documents for products that have SDS data prior to use on the project site.

1. Upload and maintain electronic SDS documents on the Submittal Exchange® SDS tab.
2. SDS tab is organized by prime contracts. To be readily identified, name products with SDS by specification section number and product name.
3. Supply and maintain one hard copy of the appropriate SDS on the project site and one hard copy with the Facility’s Right-to-Know Information Officer.

1.12 ENVIRONMENTAL PRODUCT DECLARATION (EPD)

A. Provide EPDs for the specific material required by the Specifications, if available.

B. Manufacturer-provided EPDs must be Product Specific Type III (Third-Party Reviewed), in adherence with ISO 14025 Environmental labels and declarations, ISO 14044 Environmental management – Life cycle assessment, and ISO 21930 Core rules for environmental product declarations of construction products and services.

C. Include completed Environmental Product Declaration (EPD) Cover Form found on the OGS Web Site with the submission of each EPD.

D. Submit the product data through Submittal Exchange®. The EPD will be reviewed, and the review results will be posted on Submittal Exchange®. Contractor will receive email notice of completed review. If the review results in disposition of "DISAPPROVED" or "RETURNED FOR CORRECTION", promptly correct the deficiencies and resubmit the product data meeting Contract requirements.

1.13 QUALITY ASSURANCE

A. Provide quality assurance information in the format required by the Specifications, including supporting documentation as required.

B. Submit the quality assurance information through Submittal Exchange®. The quality assurance information will be reviewed and the review results will be posted on Submittal Exchange®. Contractor will receive email notice of completed review. If the review results in disposition of "DISAPPROVED" or "RETURNED FOR CORRECTION", promptly correct the deficiencies and resubmit the quality assurance information meeting Contract requirements.

1.14 SAMPLES

A. Submit 2 (unless a different number is specified) of each sample required by the Specifications.

B. Samples will become the property of the State when submitted and will not be incorporated in the Work unless specifically stated otherwise.

C. The electronic submittal process is not intended for color samples, color charts, or physical material samples.

D. Record transmittal of each sample required by the Specifications through Submittal Exchange®.

E. Consult with the Director's Representative for direction on where Samples will be sent for review.

F. The sample will be reviewed and the review results will be posted on Submittal Exchange®. Contractor will receive email notice of completed review.

1.15 REVIEW OF SUBMITTALS

A. Items submitted for review will be reviewed for compliance with the Contract Documents, based upon the information submitted. The items will be acted upon with the following dispositions:

1. Approved:

a. Where the submittal is marked “Approved”, the work covered by the submittal may proceed provided it complies with the Contract Documents. Final acceptance will depend on that compliance.

2. Approved as Noted:

a. Where the submittal is marked “Approved as Noted”, the work covered by the submittal may proceed provided it complies with the review comments noted on the submittal and the Contract Documents. Final acceptance will depend on that compliance.

3. Disapproved:

a. Where the submittal is marked “Disapproved”, do not proceed with the work covered by the submittal, including purchasing, fabrication, delivery or other activity for the item submitted. Prepare a new submittal according to the review comments noted on the submittal and meeting the Contract Documents.

4. Returned for Correction:

a. Where the submittal is marked “Returned for Correction”, do not proceed with the work covered by the submittal, including purchasing, fabrication, delivery or other activity for the item submitted. Revise or prepare a new submittal according to the review comments noted on the submittal and meeting the Contract Documents.

5. Acknowledged:

a. Where the submittal is marked “Acknowledged”, receipt of the submittal is acknowledged and has been recorded.

6. No Action:

a. Where the submittal is marked “No Action” or “No Action Taken”, no review was made of this item, see comments noted on submittal and take appropriate action.

7. Multi-Action:

a. Where the submittal is marked “Multi-Action”, separate dispositions were made for the items submitted, see the review comments for the disposition of each item submitted.

1.16 SCHEDULES AND RECORDS

A. Submit the following Schedules and Records information not later than 15 days after approval of the Contract unless the Contractor or the Director determines an earlier submission is required to properly schedule or progress the Work.

1. SCHEDULE OF SUBMITTALS (S.O.S.):

a. Follow the Instructions to the Contractor in the S.O.S (cover page of the Microsoft Excel form supplied by the State).
b. Confirm submittal items listed and indicate in the spaces following each item, the date the item will be submitted (Projected Transmittal Date).
c. Confirm critical submittals and long lead items identified by the Architect / Engineer. Identify and mark with "X" additional submittals deemed as critical or having long lead times. In addition to the date each item will be submitted, include the date approval is required (allow at least 3 weeks), and the date delivery of the material or equipment is necessary for timely completion of the Work in accordance with the Project Schedule.
d. Notify the Director's Representative of modifications and/or additional submittals necessary for the project prior to requesting revisions with Submittal Exchange®.

2. SUBMITTALS WEBSITE LOG:

a. The submittal website log will be populated by Submittal Exchange® by means of the S.O.S.
b. Review the log and verify that all long lead items and critical submittals are properly indicated according to the latest version of the S.O.S. For each item to be submitted indicate the following:

1) In the "Date Expected" column insert the date the item will be submitted for review and approval (this is the same date as the S.O.S "Projected Transmittal Date").
2) In the "Date Requested on Site" column insert the date the item will be delivered to the project site (this is the same date as the S.O.S "Projected Delivery Date").

c. The submission date that is entered shall provide sufficient time for the item to be reviewed, ordered, delivered and installed for timely completion of the Work in accordance with the Project Schedule. The date entered for submittal of each item is the last day a deviation will be considered.

1.17 TRANSMITTALS

A. Submittal Transmittal (Form BDC 42) accessible from the OGS Web Site:

1. Furnish separate Form BDC 42 for each submitted item sent to Submittal Exchange® for review.

a. Contractor may utilize their own Transmittal Form (or Transmittal Letter) in lieu of utilizing the Form BDC 42, contingent on the Contractor's Transmittal Form includes all information and certifications required by Form BDC 42.

2. Clearly identify applicable specification section number of submitted item (product data, shop drawing, etc.) on the Form BDC 42.

B. All Contracts:

1. Transmit items designated in the Schedule of Submittals (and project Specifications) to the Submittal Exchange®.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013300.0

SECTION 013350 - COMPUTER AIDED DESIGN COORDINATION DRAWINGS

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS AND INFORMATION SPECIFIED ELSEWHERE

A. Project Meetings: Section 013119.

B. Submittals: Section 013300.

C. Coordination of Trades: Work of different trades that interfere between mechanical, plumbing electrical, architectural, and structural work shall be avoided by the contractor, within the limits of the practical amount of space required for operation and service of equipment. Keep pipe, duct, conduit, and the like as close to ceiling slabs, walls, columns, etc. to assure maximum benefit of the minimal space allowed. Locate piping, ductwork, and equipment so they do not interfere with the intended use of the operational equipment, and architectural elements. Organize piping, conduit and ductwork in all areas neatly, in an organized arrangement in accordance with approved coordination drawing submittals, in straight, plumb layouts utilizing best quality workmanship for appearance, function and serviceability.

1.2 COORDINATION DRAWINGS

A. The Director's Representative will establish a CAD Administrator (CA) to administer and monitor progress of Coordination Drawings, coordinate and schedule review meetings and protocol for all contractors and distribute information as outlined in this section.

B. The "Base" architectural and structural background drawings will be provided as Computer Aided Design (CAD) files in Autodesk's AutoCAD 2004 or 2007 file format by the CA. The CA will meet with the contractors to determine which version of AutoCAD and which file format they will be using to produce drawings for this project. These "Base" background documents are to be provided to each Contractor in the coordination process to establish a common platform for each Contractor to use for their design drawings. This same information will be used to communicate their respective coordination with the other Contractors.

C. Each Contractor and all of their subcontractors shall prepare as part of its costs, shop drawings in compatible format which will be used for incorporation into the coordination drawings.

D. Work shall start on the coordination drawings within seven (7) days after the initial job meeting. The initial coordination drawing(s) shall be produced by the "C" Contractor starting with the "Base" CAD background drawing supplied by the Director's Representative. These backgrounds shall be updated and modified with integration and revision of CAD drawings for new construction to indicate conditions for approved final layouts for foundations, steel framing, concrete reinforcing, and access flooring approved rough-in layout plans. All building structural elements, walls, doors, windows, louvers, openings, ceiling layouts, access floor layouts and major equipment provided by the C contractor and other significant elements shall be shown on designated layers. Scheduled heights for finished ceilings above finished floor, and height above

finished floor of underside of concrete and metal decks and all beams and joists including provision for fireproofing and finished enclosures shall be indicated at all areas.

1. The "C" Contractor shall provide full size "CAD" files for each level, to be plotted at 3/8" or approved coordination scale as directed by the CA.

    a. All larger coordination drawings, broken up with match lines to correlate with phases and distinct plan areas with drawing designations, shall be supplied by the "C" Contractor and approved by the CA.
    b. All coordination drawings will have the location of plan view information the same. The CA shall establish a point of origin for each drawing and these X and Y positions will not be altered by any Contractor.

2. Each Contractor in the "CAD" Coordination process shall utilize prefixes as established by the CA. Examples of some of those prefixes to be used are as follows:

    a. "B" - Architectural Backgrounds.
    b. "SM" - HVAC Ductwork.
    c. "HV" - HVAC, Piping, Controls, etc.
    d. "PL" – Plumbing.
    e. "EL" – Electrical.
    f. "FP" - Fire Protection.
    g. "ST" – Structural.
    h. "RC" – Reflected Ceilings.
    i. "AF" – Access Flooring.

3. All fonts utilized shall be as found in the agreed upon version of AutoCAD software. If not as specified, the *.shx or *.ttf file shall be provided by the respective Contractor and approved by the Director's Representative. All text height shall be a minimum of 3/32" when plotted in scaled plans.

    a. Compatible hardware and software for completion of designated coordination drawings and communication to the CA is to be included into the bid price.
    b. It shall be the responsibility of each contractor to translate drawings submitted by sub-contractors that were created in alternate CAD programs to the correct format before submission to the CA.

4. Transferring of coordination information drawings from Contractor to Contractor will be by the use of the OGS Project FTP site. Instructions for access to the site will be provided after award of contracts.
5. The final "BASE" Architectural Background drawings will be provided to each Contractor in the coordination process on the FTP site by the "C" contractor. The coordination drawings on disks, including one original vellum and nine prints, shall be forwarded to the CA for approval at each stage in the process by the contractor making the latest modifications.
6. A cross-reference list of drawings shall be provided by each Contractor correlating the drawings list with the "CAD" file name.
7. All altered, changed and/or revised coordination drawings, after resolution of conflicts by the Contractors, shall be submitted via the FTP site.
8. Coordination drawings shall be prepared for the following areas:

a. All areas (above ceiling).
b. Below raised access floors, slab penetrations and inserts.

9. Separate coordination plans shall be prepared for the following areas:

a. Mechanical rooms.
b. Electronics rooms.
c. Electrical rooms.
d. Communications rooms.
e. Radio room.
f. UPS.

E. The sequence of drawings being passed on from one Contractor to another, and the responsibility of each shall be as follows:

1. The initial base Architectural Background drawing, including architectural elements as noted above, shall be placed on the FTP site for each Contractor to access. The CA shall be responsible for periodically updating the base drawings with approved architectural revisions. Each Contractor shall be responsible for submitting drawing files to the FTP site, in the same manner outlined and in the format outlined in this Section. It is the responsibility of each Contractor to check the FTP daily for updates to the drawing files.
2. Within 10 days from date of issue of the Architectural Background by the CA, the "C" Contractor will submit proposed plan layouts and drawing designations. The "C" Contractor will promptly update the backgrounds with detailed layout information based on verification of conditions and dimensions including but not limited to column and beam locations and clear height from finished floors to underside of structure indicating all permanent obstructions. The base drawings provided by the Director's Representative are drawings that were prepared for use in the printing of bid documents. While generally accurate, there is no guarantee of perfect dimensional accuracy of these initial CAD files. It is the responsibility of the "C" Contractor to verify conditions that may vary and to assure the accuracy of drawings showing new construction. The background drawings shall be further updated by the "C" contractor with detailed layout information based on approved shop drawing submittals for steel framing, decking and reinforcing, ceilings and access flooring. Within 60 days from award of contract the "C" Contractor will complete the final Architectural Backgrounds with information outlined above and post on the FTP site, and will notify the CA, the Director's Representative, and all other contractors. Shop drawing submittals must be expedited for all necessary components to complete this work in a timely manner. The "C" contractor will plot the final background drawings and submit 5 sets of prints for approval to the CA.
3. Within 21 days of date of issue of final background drawings by the "C" contractor, the "H" contractor will post updated drawings to the FTP site indicating accurate layouts for all his/her work including equipment size and locations, HVAC piping and ductwork indicating all sizes and height above finished floors, grilles, registers, diffusers, dampers, valves, equipment connections and all major components based on approved submittals, and will notify the CA, the Director's Representative, and all other contractors. Shop drawing submittals must be expedited for all necessary components to complete this work in a timely manner. HVAC ductwork shop drawing submittals and approvals must precede the application of this information to the coordination drawings and the addition of piping and other work. The "H" contractor will plot the updated background drawings and submit 5 sets of prints for approval to the CA.

4. Within 15 days from date of approval of updated backgrounds by the "H" contractor, the "P" contractor will post updated drawings to the FTP site indicating accurate layouts for all plumbing systems indicating sizes and height above finished floor at regular intervals, fixture locations and fire protection systems, and will notify the CA, the Director's Representative, and all other contractors.
5. Within 15 days from date of issue of updated backgrounds by the "P" contractor, the "E" contractor will post updated drawings to the FTP site indicating accurate layouts for all electrical equipment, conduit runs, all lighting fixtures and electrical devices indicating mounting locations and height above finished floor, and will notify the CA, the Director's Representative, and all other contractors.
6. Contractors may submit completed drawings to the FTP Site prior to the total duration established for each contractor. The CA will schedule the sequence for early submissions.

F. Computer Software/Hardware

1. Contractors shall produce their drawings using the agreed upon version of AutoCAD. Contractors may request to use other CAD software, but only with the understanding that they must submit drawings that follow the requirements outlined in this Section.
2. Contractors shall be equipped with a 56 Kbps or greater modem for file transfer with the FTP site, using Microsoft's Internet Explorer version 6.0 (service pack 2) or later for file transfer. Contractors shall be experienced in the use of that modem software before commencement of the drawing process outlined above.

G. Computer Drawings/Files

1. Each Contractor shall be assigned a "Contractor Code" that shall be used throughout the computer drawings in computer file names and drawing layer names. Those prefixes for example are assigned as follows:

CONTRACTOR	SUBCONTRACTOR CODE
C	ST - Structural
E	EL - Electrical
C	EV - Elevator
E	FA - Fire Alarm
P	FP - Fire Protection
H	HV - HVAC
P	PL - Plumbing
C	RC - Reflected Ceiling
H	SM - Sheet Metal
C	AF - Access Flooring

2. Each base drawing file shall be renumbered with each revision with the addition of the Contractor Code. The original drawing file names shall be issued by the "C" Contractor with the release of each approved final background drawing.
3. Each Contractor shall place their work on drawing layers starting with the two letter designations. A layer list will be issued at the initial coordination meeting.
4. Each Contractor shall be assigned a color for their layers to easily distinguish their work from the other Contractors. Contractors shall not deviate from that color without specific instructions.

5. Text size shall be a minimum of 8" in a 1/8" drawing. All text shall be on a separate layer. See attached layer list for each Contractors text layer. All text and callouts shall be located on drawing as not to interfere with other existing data. Contractors shall not deviate from the fonts assigned unless approved by the CA. If non-standard AUTOCAD fonts are used, Contractor shall supply fonts with drawing files.
6. All dimensions shall be placed on their own layer. See attached layer list for each Contractors dimension layer. Each Contractor shall have their own dimension style defined in the DIMS command as SM-DIMS, HV-DIMS, PL-DIMS etc.
7. Any and all blocks used in the drawings shall be created on layer 0 unless otherwise directed. Blocks can then be inserted on Contractor's layer.
8. All questions to be addressed by the Director's Representative shall be placed on the Contractors Questions layer.
9. All beam and slab penetrations shall be shown on the drawings on separate layers with special designations and unique colors to be determined.
10. When a revision is made to a drawing that has been previously issued, or when a specific question or problem area needs attention by others, it shall be clouded and referenced by the Contractor with a revision number. The revision number symbols shall be issued by the CA. The clouds shall be constructed with the cloud command list routine issued by the CA. Clouds and revision numbers shall be placed wherever an addition, deletion, or a change is made, or where an unresolved question remains. The Contractor shall be responsible for checking with the CA for the Revision number to be placed on any particular drawing, and the layer on which that revision number shall be placed.

H. Once the CA receives each final background drawing from the "C" Contractor, the "C", "H", "P", and "E" Contractors shall meet at a minimum weekly meetings to be held to review the status of the coordination process, and drawings which the foremen and/or Superintendent of each Contractor will be required to attend. Each Contractor will be required to bring at least one color plot of all areas to be coordinated of the most current version on the FTP site at that week's meeting. Each affected Contractor shall review, sign and date each updated coordinated drawing which will indicate their agreement that the coordination drawing(s) has (have) been fully coordinated and are void of all conflicts at each stage. Final completed coordination drawings (after submission by the "E" Contractor) shall be signed off by each Contractor, the Director's Representative, and the CA. Any work in place not in conformance with final approved coordination drawings will be required to be removed and relocated unless specific written approval has been obtained by the Director's Representative to proceed with certain specific work in advance of final approval.

I. Any conflicts, etc., discovered in the coordination stages prior to Contractor(s) sign-off which cannot be resolved by the Contractor(s) shall be brought to the attention of the Director's Representative for immediate resolution by the Director at no additional costs to the State. Contractors shall allow for a minimum of one coordination meeting per week.

J. Any conflicts, etc., discovered after coordination sign-off and during the installation of the Work will be the responsibility of the Contractor(s) to resolve with the approval of the Director. Additional costs, if any, for these resolutions shall be solely the responsibility of the Contractor(s).

K. It is the responsibility of the "C" Contractor to verify the accuracy of the final background drawings, and of each subsequent Contractor to verify the completeness and accuracy of the updated information of their own work and to confirm the absence of conflict with other work.

L. A coordination drawing schedule will be developed by the CA for tracking and reporting the status of coordination drawings with the overall project schedule to which all Contractors shall be responsible.

M. Work fabricated/installed prior to the completion of this process is performed at the Contractors own risk, and compensation of time/costs for corrections will not be allowed.

N. During the project these drawings shall be kept up do date by each prime contractor to reflect any and all changes due to field changes, change orders and field orders and shall be used as a basis of the required "As-Built" drawings. At the completion of the contract the construction contractor shall gather the latest information and turn over 5 paper sets and two CDs of the final updated Coordination drawings which is in addition to the specified trade "as-built" drawings for each prime contract

O. Each Contractor shall be responsible for timely updates to the coordination drawings to indicate as-built conditions for their own work. Updates are required to include all changes regardless of the source or reason for the change, including changes initiated by the Director or the Director's Representative. These "as-built" coordination drawing documents (diskettes, mylars, and prints) shall be turned over by each Contractor with certification as to their accuracy, to the Director's Representative upon substantial completion of the project.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013350

SECTION 014100.01 - REGULATORY REQUIREMENTS

PART 1 - GENERAL

1.1 COMPLIANCE

A. Comply with applicable regulatory requirements and various codes referenced in these specifications. Where conflicts exist between local, State, and/or Federal regulatory requirements, codes, or these specifications, advise the Director's Representative. The Director's Representative will assist in resolving the conflicts to the satisfaction of the regulatory agencies prior to commencing the Work.

1.2 UNIFORM CODE, ENERGY CODE, AND CONTRACTOR QUALIFICATIONS

A. All Work shall comply with OSHA (including site-specific safety plans required on all projects), and the New York State Uniform Fire Prevention and Building Code (the "Uniform Code"), which includes the publications incorporated by reference in Title 19 NYCRR Part 1219 through 1228:

1. 2020 Building Code of New York State (the "Building Code")
2. 2020 Mechanical Code of New York State (the "Mechanical Code")
3. 2020 Fuel Gas Code of New York State (the "Fuel Gas Code")
4. 2020 Fire Code of New York State (the "Fire Code")
5. 2020 Property Maintenance Code of New York State (the "Property Maintenance Code")
6. 2020 Existing Building Code of New York State (the "Existing Building Code")
7. All other standards referenced in 19 NYCRR Parts 1219 through 1228.

B. The contractor shall be aware of, and comply with, contractor requirements identified in the above-referenced codes and standards; for example, but not limited to:

1. OSHA (Occupational Safety and Health Administration).
2. 2020 Building Code Chapter 33 Safeguards During Construction.
3. 2020 Existing Building Code Chapter 15 Construction Safeguards.
4. 2020 Fire Code Chapter 33 Fire Safety During Construction and Demolition.
5. 2020 Fire Code Chapter 35 Welding and Other Hot Work (which governs safety during construction).

C. All Work shall comply with the 2020 Energy Conservation Construction Code of New York State ("Energy Code") promulgated pursuant to Article 11 of the New York State Energy Law. The Energy Code is contained in 19 NYCRR, Part 1240, and in the publications incorporated by reference in 19 NYCRR Part 1240. The publications incorporated by reference in 19 NYCRR Part 1240 include:

1. The publication entitled "2020 Energy Conservation Construction Code" published by International Code Council, Inc.

2. The publication entitled "ANSI / ASHRAE / IES Standard 90.1-2016, Energy Standard for Buildings Except Low-Rise Residential Buildings" published by American Society of Heating, Refrigeration and Air-Conditioning Engineers, Inc.
3. The other referenced standards mentioned and/or referred to in 19 NYCRR Part 1240.

D. Elevator Work; conform to:

1. Safety Code for Elevators and Escalators, ASME A17.1, as referenced in the Uniform Code.

1.3 STATE-REQUIRED PERMITS AND INSPECTIONS

A. No Work shall commence without a Construction Permit issued by the OGS Division of Codes and Construction Permitting. Contractors shall not file for and not pay for Construction Permits for Work located on New York State property.

1.4 LISTINGS

A. Equipment and materials for which Underwriters' Laboratories, Inc. (UL) provides product listing service, shall be listed and bear the listing mark.

1. Alternately, any product listed and bearing the mark from one of the other Nationally Recognized Testing Laboratories (NRTL – as recognized by OSHA) shall be an acceptable alternative to being UL listed and marked if the listed product has been tested to the applicable standard.

1.5 FIRE-RESISTANT CONSTRUCTION MATERIALS AND ASSEMBLIES

A. Conform to the fire rating classifications based upon the test methods and acceptance criteria in the "Standard for Fire Tests of Building Construction and Materials" for which Underwriters' Laboratories, Inc. (UL) provides listings.

1. Materials and assemblies shall comply with the acceptance criteria, detailed description of the assembly, its performance in the fire test, and other pertinent details such as specification of materials, Classification coverage, and alternate assembly details.
2. Alternatively, fire resistance rating classifications by other issuing organizations listed in the New York State Uniform Fire Prevention and Building Code are acceptable.

1.6 MATERIALS WITH TRACE AMOUNTS OF ASBESTOS

A. Perform Work required to remove, disturb, or repair any material that contains less than 1 percent by weight of asbestos (trace) in accordance with all applicable OSHA regulations (29 CFR Part 1926.1101).

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 014100.01

SECTION 014216 - DEFINITIONS

PART 1 - GENERAL

1.1 DEFINITIONS SPECIFIED ELSEWHERE

A. Other definitions are included in Article 2 of the General Conditions and in various sections of the Specifications.

1.2 DEFINITIONS

A. The following terms shall have the meanings ascribed to them in this Section, wherever they appear in the Contract Documents.

1. Air Handling Unit: Equipment in which air is heated, cooled, humidified, dehumidified, filtered, deodorized, sterilized, etc., and is moved by mechanical means either within the equipment or externally through ductwork.
2. Cold Water Inlet: That part of distribution piping beginning with a connection to the service piping, and which contains the main shut-off valve, strainer, pressure regulators, gages and appurtenances required for control of the distribution water system for the building. The cold water inlet is part of the distribution system.
3. Company Field Advisor: An employee of the Company which lists and markets the primary components of the system under their name who is certified in writing by the Company to be technically qualified in design, installation, and servicing of the required products or an employee of an organization certified by the foregoing Company to be technically qualified in design, installation and servicing of the required products. Personnel involved solely in sales do not qualify.
4. Drains: Piping connections and valves used for purpose of (a) determining operating conditions of water columns, gage glasses, piping to feedwater heater and other regulators, and (b) piping connections and valves used for removal of contents or sludge and other forms of deposits from tanks, heaters, regulator bodies, and low points in piping systems.
5. Drainage System: Piping and appurtenances required to convey sewage, storm water, and liquid waste from plumbing fixtures, equipment and drains to a point of discharge outside the building.
6. Ductwork, Concealed: Ductwork built into construction and not accessible without removal of construction Work such as masonry, plaster or other finishing material, and ductwork installed in floors, furred spaces, suspended ceilings and behind removable panels.
7. Ductwork Exposed: Ductwork directly accessible by normal accesses without the removal of any construction Work or material.
8. Headroom: Minimum clearance between the floor and the underside of the point of lowest installed mechanical construction above. In case of stairways and walkways, the minimum clearance between the step or surface of the walkway and lowest installed mechanical construction above the stairway or the walkway.
9. Location, Dry: Location not normally subject to dampness or wetness.
10. Location, Damp: Location subject to moderate degree of moisture, including:

a. Partially protected locations under canopies, marquees, roofed open porches, and like locations.
b. Installations in exterior walls.
c. Interior locations such as unheated basements, unheated barns, and cold-storage areas.

11. Location, Wet: Location subject to saturation with water or other liquids, including:

a. Installations underground.
b. Locations exposed to the weather and unprotected.
c. Installations in concrete slabs on grade (with or without vapor barrier between slab and grade).
d. Installations under concrete slabs on grade.
e. Installations in concrete or masonry walls in contact with the earth (with or without membrane waterproofing between wall and earth).
f. Vehicle washing areas and like locations.

12. Mechanical: General term applicable to HVAC, Plumbing, Sprinkler, Laboratory Equipment, Food Service Equipment, Laundry Equipment, and Refrigeration.
13. Piping: This term includes pipe, tube and appurtenant fittings, flanges, valves, traps, hangers and supports.
14. Piping, Concealed: Piping built into construction and not accessible without removal of construction Work such as masonry, plaster or other finishing material and piping installed in floors, furred spaces, suspended ceilings, non-walk-in tunnels, conduits, behind removable panels and cabinet doors.
15. Piping, Exposed: Piping directly accessible by normal accesses without the removal of construction Work or material.
16. Piping, Distribution: Domestic water supply piping, starting with a connection to service piping, and continuing throughout the building to point of connection to equipment and fixture supply piping.
17. Piping, Service: Underground domestic water supply piping starting with a connection to a water main or supply as noted and continuing to and into a building and terminating with the first exposed fitting inside the building.
18. Piping, Tunnel: Piping installed in walk-in or non-walk-in tunnels or conduits up to first shut-off valve inside of a building.
19. Space, Finished: A space which has a finishing material applied to walls or ceilings such as paint, plaster, ceramic tile, enamel glazing, face brick, vinyl wall covering, etc. to provide a finished appearance or which will have such finishes applied under a related Contract.
20. Space, Unfinished: A space which does not meet the definition of a finished space.
21. Steam, High Pressure (HPS): Steam at pressure higher than 125 psig.
22. Steam, Medium Pressure (MPS): Steam at pressure higher than 15 psig, and not more than 125 psig.
23. Steam, Low Pressure (LPS): Steam at a pressure of 15 psig and below.
24. Water, Chilled: Water cooled by refrigeration.
25. Water, Cold: Water with a temperature between 33 degrees F. and 80 degrees F. and which is neither cooled nor heated mechanically.
26. Water, Domestic: Water for use in buildings, except water used in connection with space heating and space cooling.
27. Water, High Temperature: Water with a supply water temperature above 350 degrees F.

28. Water, Hot: Water with a temperature above 80 degrees F.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 014216

SECTION 015000.02 - CONSTRUCTION FACILITIES & TEMPORARY CONTROLS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Provide the construction facilities and temporary controls necessary for the Work, unless otherwise indicated.

1. The construction facilities and temporary controls specified to be provided by a particular Contract shall be kept operational by that Contractor for the Work of all related Contracts at all times Work is being performed by a Contractor.
2. The construction facilities and temporary controls specified to be provided by a particular Contractor shall be installed as soon after award of the Contract as necessary to enable the Work of each Contract to proceed on schedule and maintained until completion of the Work of all related contracts unless otherwise directed in writing.
3. Any Contractor who requires additions to the construction facilities and temporary controls specified to be provided by another Contractor, shall provide and maintain them.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Disposal of Asbestos-Containing Materials: Section 028213.

1.3 TEMPORARY LIGHT AND POWER

A. Electrical energy for temporary light and power is available and will be made available without charge.

B. Extent of Temporary Wiring: Contractors may ascertain the extent of the temporary wiring provided under the Electrical Work Contract by examining the Electrical Drawings.

C. Electrical Work Contract:

1. During any shutdowns and during upgrades to the building electrical service, provide portable source of electricity for temporary light and power of adequate capacity to supply the needs of all contractors for the performance of their Work until the temporary electrical service can be utilized for temporary light and power.
2. Provide wiring and other equipment within the building for temporary light and power.

a. Wiring for temporary light and single phase power shall, in general, consist of 4 wire, 120/208 volt feeders, with branch circuits of #12 conductors minimum.

1) Install branch circuits with suitable fluorescent fixtures or incandescent lampholders for temporary lighting as required to maintain a minimum of 10 foot candles in the work areas. Equip fixtures and lampholders with guards.

Fixtures and lampholders installed in damp or wet locations shall be of the weatherproof type.

2) Install branch circuits with fused grounding type receptacle outlets for single phase power (for power tools, etc.).
3) Install 2 circuits with fluorescent fixtures or incandescent lampholders in corridors and stairs. Space fixtures or lampholders no more than 30 feet apart in corridors. Install fixture or lampholder at each stair landing. Also install one fixture or lampholder in each boiler room and mechanical equipment room (connect to the corridor and stair lighting circuits).
4) Keep the corridor and stair lighting maintained and energized 24 hours per day, 7 days per week.

a. Install wiring for 3 phase power for machines and other heavy electrical loads consisting of 3 phase, 3 wire, 600 volt feeder with fused disconnect switches as indicated. A maximum motor load will be coordinated with the Electrical Contractor on each feeder.

1) Provide a fused sealed service entrance switch for corridor and stair lighting circuits. Locate switch adjacent to and connect to line side of temporary light and power service entrance switch. Stencil cover "CORRIDOR AND STAIR LIGHTING".
2) Provide lamps and fuses including replacements required.

D. All Contracts:

1. Any Contractor requiring additional lighting shall provide additional fluorescent fixtures or incandescent lampholders (with lamps), but in no case shall the load on any branch circuit or feeder exceed its rated capacity.
2. Install materials for temporary light and power in conformance with the National Electrical Code.
3. Materials for temporary light and power need not be new if they are in satisfactory operating condition.
4. Provide ground-fault protection for personnel (such as portable plug-in type ground-fault circuit-interrupters) on single phase 15 and 20 ampere receptacle outlets which are in use.
5. Receptacle outlets, portable cord connectors and attachment plugs shall have standard NEMA configurations.
6. As the progress of the Work allows, and as approved, completed portions of the permanent wiring and electrical service may be utilized for temporary light and power.

1.4 TEMPORARY WATER

A. Water will be made available for the Work without charge at source or sources directed within the limits of the existing supply and usage.

B. Plumbing Work Contract:

1. Make arrangements and pay for water for temporary service.

2. Provide and maintain a temporary water system, of such size and capacity as to adequately supply the needs of all contractors during performance of their Work.
3. The permanent water lines may be used for temporary water service if potable water is carried in the lines.
4. Protect temporary lines against freezing.
5. Repair damages caused by installation of leaky, defective or broken piping, connections or other fittings.

C. All Contracts: Prevent waste of water.

1.5 TEMPORARY TOILETS

A. Construction Work Contract: Provide toilet facilities for Contractor's and subcontractors employees engaged on the Project, including employees of other contractors. Locate toilets where directed and maintain them in a sanitary condition.

NUMBER OF EMPLOYEES	MINIMUM NUMBER OF FACILITIES
20 or less	1 toilet
20 or more	1 toilet and 1 urinal per 40 employees
200 or more	1 toilet and 1 urinal per 50 employees

*Toilet/Urinal Combinations shall count as only one facility.

1. Where water and sewer connections are available, provide water closets, otherwise provide approved chemical or electric toilets.
2. Inside buildings, locate toilet facilities no more than 4 stories or 60 feet above or below, nor more than 500 feet travel on the same level from the work location of any person.
3. Locate toilet facilities no more than 1000 feet from any work location.

    a. Exception: Mobile crews having readily available transportation to nearby toilet facilities.

1.6 PROTECTION AND MAINTENANCE OF HVAC SYSTEM

A. HVAC Work Contract: Maintain the existing HVAC system as to adequately supply the needs of all contractors during performance of their Work and as approved to accomplish the following:

1. Protect materials and equipment being installed as part of the Contract from freezing.
2. Allow for a comfortable environment to enable workers to accomplish their respective tasks in a satisfactory manner.
3. Maintain construction schedules.

B. When, in the opinion of the Director's Representative, the construction is substantially complete, the Director's Representative will arrange for operation of the heating system in accordance with the provisions of Article 20 of the General Conditions concerning State occupation and operation. At such time, Contractor will be relieved of responsibility for temporary heat.

1. Clean and with the Director's Representative present, test existing HVAC system before arranging for State operation.

1.7 PROTECTION OF WORK AND EXISTING PROPERTY

A. Protect installed Work and existing property during performance of the Work.

B. Maintain the building in a watertight condition during performance of the Work.

C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.

D. Provide protective coverings at wall projections, jambs, sills, and soffit of openings.

E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, and movement of heavy objects by covering them with durable sheet materials.

F. Protect smoke detectors from airborne dust and debris.

1. At the beginning of each work day, provide protective coverings over smoke detectors in areas where airborne dust and debris will be generated by the Work.
2. At the end of the work day, clean the areas in which the smoke detectors are located by whatever means necessary to assure that airborne dust and debris will not contaminate the smoke detectors, then remove protective coverings.
3. Provide signs, instructions, and alternate methods for reporting a fire during the periods that the smoke detectors are covered.
4. Notify the Director's Representative and have procedures approved.

G. Prohibit traffic or storage upon waterproofed and roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.

H. Protect existing trees and plants during performance of the Work unless otherwise indicated. Box trees and plants within the grading limit lines. Do not deposit excavated materials or store building materials around trees or plants. Do not attach guy wires to trees.

I. Prohibit traffic from landscaped areas.

J. Cleaning tools of cementitious and other insoluble materials:

1. Do not wash tools in sinks or other sanitary drainage systems. Protect all drainage systems from debris that can clog or damage piping and fixtures.
2. Take all precautions necessary to prevent cementitious and other insoluble materials from flowing into floor drains.
3. Dispose of excess cementitious and other insoluble debris with the other rubbish.

1.8 BARRIERS AND ENCLOSURES

A. All Contracts: Provide barriers during performance of the Work to:

1. Prevent unauthorized entry to work areas.
2. Allow for State's occupancy of Site.
3. Protect existing facilities and adjacent properties from damage.

4. Protect vehicular and pedestrian traffic.

B. Construction Work Contract:

1. Temporary Partitions: Provide temporary partitions to form fire resistive barriers between work areas and areas occupied by State personnel. Construct the partitions of 3-5/8 inch width steel framing or 2 x 4 wood framing, with 5/8 inch thick Type X (ASTM C 36) gypsum board on both sides of partition. Secure the partitions in place without damaging existing construction. Seal joints on the State occupied side with joint tape and compound. Provide 1-3/4 inch thick solid core flush wood doors or 18 gage flush steel doors, and steel door frames. Equip doors with full mortise hinges and lockset. Furnish the Director's Representative with 2 keys for each lock.
2. Temporary Dust Barriers: Provide temporary dust barriers to prevent the spread of dust from the work areas. Construct the dust barriers of wood framing sheathed with 6 mil polyethylene film. Secure the dust barriers in place without damaging existing construction.
3. Scaffolding, Hoist, and Equipment Barriers: Provide temporary fence enclosures as required to prevent unauthorized persons from coming in contact with ground supported scaffolding, hoists, and equipment.

1.9 SECURITY

A. Key Deposits: A $25 deposit will be required for each key issued by the Facility. Deposits will be refunded upon return of the keys.

B. Facility Key Regulations:

1. Sign Facility keys out and in on a daily basis unless otherwise directed.
2. Keep keys on person at all times while on the premises. Do not loan or give keys to other persons.
3. Do not remove keys from the premises without written permission from the Director's Representative.
4. Report lost, missing, or stolen keys immediately to the Facility Safety/Security Department. Assume responsibility for cost of necessary key and lock replacement as a result of lost, missing, or stolen keys.

C. Identification Cards: Photo ID badges will be provided by the Contractor for all contractor employees. Badges will be held at the facility security desk and issued to authorized workers by the facility on a daily basis.

1. All Contractors, associated sub-contractor employees, and vendors shall provide all information required for background checks to meet installation access requirements to be accomplished by NYS DMNA/NYNG installation Security Office. Contractor workforce must comply with all personal identity verification requirements as directed by NYS DMNA/NYNG installation Security Office.
2. All contractor employees, including subcontractor employees and vendors who are not in possession of the appropriate security clearance, will be escorted in areas where they may be exposed to classified and/or sensitive materials.

3. In addition to the changes otherwise authorized by the changes clause of this contract, should the Force Protection condition (FPCON) at any individual facility or installation change, the Government may require changes in contactor security matters or process.

D. Promptly relock doors and security screens located in access routes, storage areas, and work areas after use.

E. Restore, by the end of each workday, existing in place safety/security items such as doors, screens, alarm systems components, that required removal, replacement, or adjustment to perform the Work, unless otherwise authorized in writing by the Director's Representative.

F. Remove all tools and materials from occupied work areas when the work areas are not attended by employees and at the end of each work day. Store tools in a locked tool box, cabinet, or shed. Store materials where directed.

G. Access and general protection/security policy and procedures:

1. Contractors, and all associated subcontractors and vendors (contractor workforce) shall provide a verified list of all scheduled and on-site employees to the facility/site force protection/security representative, daily.

1.10 WATER CONTROLS

A. Provide and maintain pumping equipment necessary to keep the work areas free from water. Discharge water into existing storm drainage systems or otherwise disperse as directed.

1.11 FIRE PREVENTION

A. Take precautions necessary to prevent fires.

B. Fuel for cutting and heating torches shall be acetylene or LP-gas only and shall be contained in Underwriters Laboratory or Federal Department of Transportation approved containers.

C. Furnish and maintain a currently inspected 20 pound capacity multi-class A:B:C fire extinguisher in the immediate vicinity where welding tools or torches are in use.

D. Furnish and maintain a currently inspected fire extinguisher of the appropriate class and size whenever the temporary storage of materials changes that areas classification of fire load or life safety.

E. Do not use flammable liquids, other than those specified, within a building without the written approval from the Director's Representative.

F. Tarpaulins shall be flameproof and shall be securely anchored when attached to scaffolding or when used to enclose any portion of a building.

G. If required by the nature of the work and facility regulations, the Contractor shall obtain from the facility and pay all costs associated with "Hot Work Permits" including fire watches to execute

the work of its contract. Perform hot work in accordance with the Fire Code of New York State and the Hot Work Program approved for the work. Prior to, during and after performing hot work, inspect the hot work area for compliance with the requirements of the permitted Hot Work Program.

1. Post signage "Caution: Hot Work In Progress - Stay Clear" in conspicuous locations warning others before they enter a hot work area where the area is accessible to persons other than the operator of the hot work equipment.

1.12 TEMPORARY FIRE PROTECTION

A. If the existing building is to be partially occupied during the course of the project, all existing exits, fire walls, fire barriers and fire protection systems shall be continuously maintained in the occupied phases in compliance with the Fire Code of New York State. Comply with NFPA 241 for items not specifically addressed in the Fire Code of New York State.

B. Those portions occupied by the facility must be available for their use 24 hours a day, seven days a week during the contract period unless otherwise scheduled in these documents.

C. Prior to removal of existing fire walls, fire barriers and fire protection systems, if such removal is part of the work, install equivalent temporary fire walls, fire barriers and fire protection systems as defined in these documents and as approved by the Director's Representative and/or the facilities representative.

D. The cost of all labor, fire watches, variances, materials, installations, maintenance and removal of such temporary fire protection systems or modifications to the existing systems are the responsibility of the Contractor. Install permanent fire walls, fire barriers and fire protection systems, if provided as part of the work, as soon as practical.

1.13 ACCESS ROADS

A. Routes of ingress and egress on the premises to the location of the Work shall be as directed.

B. Keep designated access roads clear of dirt and debris resulting from the Work.

C. All Contracts:

1. Park vehicles in areas where directed.
2. Keep designated parking areas clear of dirt and debris resulting from the Work.
3. If requested, register vehicles which are to be parked at the Facility with the Facility Safety/Security Department.
4. Remove ignition key from unattended vehicles and lock doors.

D. Construction Work Contract: Remove snow from parking areas allocated to all Contractors.

1.14 RUBBISH REMOVAL

A. Clean up and containerize the rubbish (refuse, debris, waste materials, and removed materials and equipment) resulting from the Work at least once a day and more often if the rubbish interferes with the work of others or presents a hazard. Leave work areas broom clean, except where more stringent cleaning is specified, at the end of each day. Locate containerized rubbish on the Site where directed.

B. Remove rubbish from State property at least once a week and more often if the rubbish presents a hazard. Properly dispose of rubbish.

C. Burning of rubbish will not be permitted.

1.15 RELOCATION AND REMOVALS

A. Should a change in location of any construction facilities and temporary controls be necessary in order to progress the Work properly, remove and relocate such items as directed.

1. Electrical Work Contract: Frequently relocate/revise the temporary lighting as Contractors progress the Work of their contracts causing changes to the condition of the building (installation or relocation of walls, partitions, ceilings, equipment, etc.). Keep pace with the changes and maintain a minimum of 10 foot candles in each recomposed work area.

B. Remove the construction facilities and temporary controls when they are no longer required. Restore permanent facilities used for or connected to temporary facilities to their original condition or better.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 015000

SECTION 016500 – MATERIALS AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS SPECIFIED ELSEWHERE

A. Specific requirements pertaining to materials and equipment specified elsewhere are additional to the provisions of this Section.

1.2 PRODUCT LABELS

A. When materials or equipment are specified to conform to ASTM, Federal or other reference specifications, the materials delivered to the site shall bear the manufacturer's printed labels stating that the materials meet the requirements of such referenced specifications.

1.3 TRANSPORTATION AND HANDLING

A. Deliver factory packaged materials and equipment in the manufacturer's original containers.

B. Transport and handle materials and equipment in such a manner as to prevent their damage.

C. Arrange for delivery of materials and equipment during the hours of the day established by the Director's Representative.

D. Have workers available to receive and unload materials and equipment delivered to the site. Do not deliver, or have delivered, any materials and equipment to the site unless such forces are available.

E. Facility personnel are not authorized to sign for receipt of Contractor's material or equipment.

1.4 STORAGE AND PROTECTION

A. Neatly pile, store, protect, and secure materials and equipment in locations where directed.

B. Protect materials and equipment subject to damage by temperature or other weather conditions.

C. Do not store volatile liquids in a State building.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 016500

SECTION 017329 – REMOVALS, CUTTING, AND PATCHING

PART 1 - GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

A. Rubbish Removal: Section 015000.

B. Asbestos Abatement: Section 028213.

C. Drawings and general provisions of the contract, including general and supplementary conditions and other Division 1 specification sections, apply to this section.

1. Refer to Division 1 for applicable local codes and regulations.

1.2 DEFINITIONS

A. Remove: Detach items from existing construction and dispose of them off-site unless indicated to remain the Property of the State.

1.3 PROJECT CONDITIONS

A. Existing Conditions: Do not disturb existing structures, construction, materials or equipment unless required by the Contract.

1. Do not cut, drill, or remove structural members such as joists, beams or columns supporting construction that is to remain unless expressly required by the Contract Documents.

B. Existing Paint: A lead survey was performed on existing surfaces for the presence of lead based paints. A list of the surfaces tested and the results of the survey are in Document 003126. Take precautions as required to prevent the spread of lead containing particles and dust.

1. Assume existing painted surfaces that have not been tested to contain lead based paint. Take precautions as required to prevent spread of lead containing particles and dust.

C. Items to Remain the Property of the State: The following items shall remain the property of the State and shall be stored at the site where directed:

1. HVAC Work Contract: VAV (Variable Air Volume) box.

1.4 DESCRIPTION OF WORK

A. This section includes the following:

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.
4. Temporary Shoring of the existing structure.

1.5 QUALITY ASSURANCE

A. Demolition Firm Qualifications: An experienced firm specializing in demolition work similar in material and extent of this project.

B. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

C. Standards: Comply with ANSI A10.6, OSHA Regulations, and NFPA 241.

D. Predemolition Conference: Hold a conference at project site to comply with requirements in Division 1 Section "Project Management and Coordination." Review methods and procedures related to selective demolition including the following:

1. Inspect and discuss condition of construction to be selectively demolished.
2. Finalize selective demolition schedule, and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
3. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
4. Review areas where existing construction is to remain and requires protection.

E. Structural Load Limitations of Existing Structure: Review load limitations of existing building structural framing system related to selective demolition including the following:

1. Original building Construction Drawings provided by Owner.
2. Condition of existing framing systems scheduled to remain prior to start of selective demolition and periodically during course of selective demolition.
3. Support requirements for proposed demolition equipment, including existing framing systems and temporary shoring and bracing requirements.

1.6 SUBMITTALS

A. Qualification Data: For demolition firm; Professional Engineer.

B. 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 Facility'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 stairs.
5. Locations of proposed dust- and noise-control temporary partitions and means of egress.
6. Coordination of Facility's continuing occupancy of portions of existing building and of Facility's partial occupancy of completed work.
7. Means of protection for items to remain and items in path of waste removal from building.
8. Verification by a New York State registered Professional Engineer that the existing building framing systems will safely support the demolition equipment proposed for use.

    a. Submit temporary shoring and bracing details if required for demolition equipment used in or adjacent to structure.
    b. Submit procedures used to protect adjacent properties from damage by demolition equipment.

9. Means and methods of temporary shoring stamped by a New York State registered Professional Engineer, including copies of calculations.

C. Predemolition photographs or video: Submit before work begins.

1.7 PROJECT CONDITIONS

A. Hazardous Materials: It is not expected that hazardous materials will be encountered in the work.

1. Hazardous materials will be removed under separate contract.
2. If materials suspected of containing hazardous materials are encountered, do not disturb. Immediately notify Director's Representative.
3. If materials suspected of containing hazardous materials are encountered, do not disturb. Immediately notify Director's Representative.

1.8 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition by methods and with materials so as not to void existing warranties. Notify warrantor before proceeding. Existing warranties include the following:

1. Roofing membrane.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Match the appearance and performance of existing corresponding materials as closely as practicable, unless otherwise indicated.

2.2 MINIMUM REQUIREMENTS FOR SHORING MATERIALS

A. Shoring components and materials that are damaged shall not be used. If damaged during use, replace.

B. Shoring components and materials shall be reviewed by a competent person prior to use

PART 3 - EXECUTION

3.1 EXAMINATION

A. Prior to cutting, drilling or removal, investigate both sides of the surface involved. Determine the exact location of structural members.

B. If unforeseen obstructions are encountered, take precautions necessary to prevent damage and obtain instructions from the Director's Representative before proceeding with the Work.

3.2 PREPARATION

A. Provide temporary shoring and other supports necessary to prevent settlement or other damage to existing construction which is to remain.

B. Prepare existing surfaces properly to receive and, where required, bond with the Work.

C. Site Access and Temporary Controls: Perform 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 Division 1 Section 015000 "Temporary Facilities and Controls."

D. Temporary Facilities: Provide temporary barricades and other protection

1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
2. Provide temporary weather protection during interval between selective demolition of existing construction on exterior surfaces and new construction to prevent water leakage and damage to structure and interior areas.
3. Provide secure barriers between existing construction scheduled to remain and selective demolition area to prevent unauthorized entry into occupied portions of building.
4. Protect walls, ceilings, floors, and other existing finish work to remain or are exposed during selective demolition operations.
5. Cover and protect furniture, furnishings, and equipment not removed.
6. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Division 1 Section 015000 "Temporary Facilities and Controls."

3.3 REMOVALS, CUTTING, AND ALTERING

A. In addition to the items indicated to be removed on the Drawings, remove existing construction superseded by the Work except items such as pipes, conduits, recessed boxes, and ducts which are built into existing construction that is to remain. Cut off and conceal such items at face of remaining construction. Provide cover plates on recessed boxes.

B. Remove and alter existing construction as required to install and connect the Work to adjacent construction in an approved manner.

C. Cut and alter existing materials as required to perform the Work. Limit cutting to the smallest amount necessary. Core drill round holes and saw cut other openings where possible.

D. Perform cutting, drilling, and removals in a manner which will prevent damage to construction which is to remain.

E. Perform removal of items to remain the property of the State with such care as necessary to prevent damage to these items.

3.4 PATCHING

A. Patch existing construction and finishes defaced, damaged, or left incomplete due to alterations and removals. Patching, except as otherwise indicated, shall be limited to the areas which have been cut or altered. Finish patched surfaces to match existing adjacent surfaces as closely as practicable.

B. Perform patching around items penetrating existing construction in a manner that will maintain the water and fire resistive capability of the existing construction.

C. Paint patched areas to match existing adjacent surfaces as closely as practicable using same type of paint. Painting, except as otherwise indicated, shall be limited to the areas which have been patched.

D. Where surfaces exposed by removals are to remain as exposed surfaces, paint such areas to match existing adjacent surfaces as closely as practicable using same type of paint.

3.5 CLEANING

A. After removals of ceiling systems and ceiling-related items, clean all remaining near ceiling items such as conduit, wiring, busways, piping, ductwork and all concrete surfaces.

3.6 REINSTALLATION

A. Where reinstallation of removed items is indicated, reinstall them to a condition equal to or better than their condition before removal.

3.7 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain. Protect against damage during selective demolition operations.

1. Comply with requirements for existing services/systems interruptions specified in Division 1 Section 011000 “Summary of the Work.”

B. Existing Service/System 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. Director’s Representative will arrange to shut off indicated services/systems when requested by Contractor.
2. Arrange to shut off indicated utilities with utility companies.
3. If services/systems are required to be removed, relocated, or abandoned, before proceeding with selective demolition provide temporary services/systems that bypass area of selective demolition and maintain continuity of services/systems to other parts of building.

C. Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing. Cut, remove and legally dispose of selected HVAC equipment, components, and materials as indicated, including, but not limited to removal of HVAC piping, heating units and trim and other HVAC items made obsolete by the new work.

3.8 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to extent required by construction and as indicated. Use methods required to complete 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 next lower level.
2. Neatly cut openings and holes plumb, square, and true 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 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 fire watch and portable fire-suppression devices during flame-cutting operations.
5. Maintain adequate ventilation when using cutting torches.
6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials. Promptly dispose off-site.

7. Remove structural framing members, and lower to ground by methods suitable to avoid free fall and to prevent ground impact or dust generation.
8. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
9. Dispose of demolished items and materials promptly.

    a. Do not bury waste materials from selective demolition activities.
    b. Do not dispose of waste materials resulting from selective demolition activities into watercourses, storm drainage system, or sanitary sewer system.
    c. Do not discharge water containing suspended materials into watercourses, storm drainage system, sanitary sewers, or onto adjacent property.

10. When unanticipated structural, mechanical, or electrical elements are encountered during demolition, contact the Director's Representative and report nature of unanticipated condition. Do not progress demolition until direction is provided by the Director's Representative.
11. Cover or dampen dry materials and waste sufficient to prevent blown dust or debris.

B. Do not demolish building elements beyond what is indicated in drawings without Director's Representative approval.

C. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by the Director's Representative, 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.

3.9 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

A. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals using power-driven saw. Remove concrete between saw cuts.

B. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain using power-driven saw. Remove masonry between saw cuts.

C. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished. 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."

E. Roofing: Remove no more existing roofing than what can be covered in one day by new roofing and so that building interior remains watertight and weathertight.

3.10 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Except for items or materials indicated to be reused, recycled, salvaged, reinstalled, or otherwise indicated to remain the State'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 manner that will prevent spillage on adjacent surfaces 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.

B. Burning: Do not burn demolished materials.

C. Disposal: Transport demolished materials off property and legally dispose.

3.11 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.

3.12 REPAIR OF ELEMENTS DAMAGED DURING DEMOLITION

A. Any element damaged during the demolition process is to be repaired to its original condition.

B. Submit a repair procedure for review. Repair procedures are to include analysis stamped and sealed by a professional engineer licensed in the State of New York.

END OF SECTION 017329

SECTION 017716 – CONTRACT CLOSEOUT

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS SPECIFIED ELSEWHERE

A. Other provisions pertaining to this Section are included in Article 9 of the General Conditions.

1.2 CONTRACT CLOSEOUT INSPECTIONS

A. The following 3 inspections will be made in addition to the normal inspections to ensure that all Contract requirements are met and that the Work is complete and acceptable. The purpose of each of these inspections is to furnish the Contractor a written list of Contract exceptions, omissions, and incompletions so that the Work can be progressed to timely completion in accordance with the Contract Documents.

1. Detailed Inspection: The "Detailed Inspection" will be made when the Work is substantially complete. A copy of the detailed inspection list will be furnished to the Contractor. When this inspection progresses over any length of time, copies of the list will be furnished as the inspection progresses so that the Contractor may proceed with the required Work without delay.
2. Final Inspection: The Contractor will be advised by letter of the date and time of final inspection. A copy of the final inspection list containing all incomplete or unsatisfactory items and the time allowed to complete the Work will be furnished to the Contractor.
3. Joint Inspection for Physical Completion: The joint inspection for physical completion may be made to verify completion of the exception items listed on the final inspection list so that the physical completion date (defined in the General Conditions) may be established.

1.3 FINAL CLEANING

A. Perform final cleaning prior to joint inspection for physical completion. Leave the premises in a neat, unobstructed condition, the work areas broom clean (except where more thorough cleaning is specified), and everything in perfect repair and adjustment.

B. Clean site; sweep paved areas, rake clean landscaped surfaces.

C. Remove tools, equipment, waste and surplus materials, rubbish, and construction facilities from the premises as soon as possible upon completion of the Work.

1.4 PROJECT RECORD DOCUMENTS

A. Maintain on site, 2 sets of the following record documents; record actual revisions to the Work.

1. Contract Drawings.

2. Project Manual.
3. Addenda.
4. Change Orders and other modifications to the Contract.
5. Reviewed shop drawings, product data, and samples.

B. Store record documents separate from documents used for construction.

C. Record information concurrent with construction progress.

D. Record Documents and Shop Drawings: Legibly mark each item to record actual construction including.

1. Measured depths of foundations in relation to finish (first) (main) floor datum.
2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
4. Field changes of dimension and detail.
5. Details not on original Contract Drawings.

E. Upon completion of the work, create electronic versions of the project record documents. Black and white documents are to be scanned into TIFF format using CCIT Group 4 compression. Documents with color, which include black line documents with color notations, are to be scanned into TIFF format using a minimum of 8 colors and "packbits" compression test.

1. The scanned images are to be put on a USB flash drive using NTFS/NTFS5 format. Name the electronic files with the same name as the drawing. Create a folder on the USB flash drive for each trade and one for Shop Drawings.
2. Label the USB flash drive with the project number, name, and title as it appears on the project manual cover. If there is more than one USB flash drive include notation to that effect on the label; i.e., 1 of 3, 2 of 3, 3 of 3. The project record documents, and USB flash drive(s) are to be turned over to the Director's Representative.

F. Applications for progress payments will not be approved if the record documents are not kept current. Application for final payment will not be approved until the project record documents are delivered to the Director's Representative.

1.5 OPERATION AND MAINTENANCE DATA

A. Prepare 2 sets comprised of 8-1/2 x 11 inch text pages bound in capacity expansion binders with durable plastic covers identified with printed title "OPERATION AND MAINTENANCE INSTRUCTIONS", title of project, and subject matter of binder when multiple binders are required. Prepare a printed Table of Contents for each volume, with each product or system description identified. Internally subdivide the binder contents with permanent page dividers, logically organized as described below, with tab titles clearly printed under reinforced laminated plastic tabs:

Part 1: Directory, listing names, addresses, and telephone numbers of Architect/Engineer, Contractor, subcontractors, and major equipment suppliers.

Part 2: Operation and maintenance instructions, arranged by system and subdivided by specification section. For each category, identify names, addresses, and telephone numbers of subcontractors and suppliers. Identify the following:

1. Significant design criteria.
2. List of equipment.
3. Parts list for each component.
4. Operating instructions.
5. Maintenance instructions for equipment and systems.
6. Maintenance instructions for finishes, including recommended cleaning methods and materials and special precautions identifying detrimental agents.

Part 3: Project documents and certificates, including the following:

1. Shop drawings and product data.
2. Air and water balance reports.
3. Certificates.
4. Photocopies of warranties.

B. Submit one copy of completed volumes in final form 15 days prior to final inspection. This copy will be returned after final inspection, with the Director's comments. Revise content of documents as required prior to final submittal.

C. Submit 2 volumes prior to final Application for Payment.

1.6 WARRANTIES

A. Furnish warranty certification and copies of warranties that extend beyond the one year period required by the General Conditions. Warranties submitted without warranty certification will not be accepted.

1. Warranty Certification: Written certification from the warrantor that invoices for installation, service, supplies, and warranty fees have been paid in full to persons or firms due payment, and that the warranty is in effect and non-retractable due to any of the specified conditions.

B. Prepare printed Table of Contents and assemble warranty certifications and warranty copies in a binder with a durable plastic cover.

C. Deliver the binder to the Director's Representative prior to final Application for Payment.

D. For items of Work delayed beyond date of Substantial Completion, provide updated submittal within 10 days after acceptance, indicating date of acceptance as start of warranty period.

E. Applications for final payment will not be approved until the warranty certification and warranty documents are delivered to the Director's Representative.

1.7 SPARE PARTS AND MAINTENANCE MATERIALS

A. Label and deliver spare parts, maintenance items, and extra materials to the Site. Place in locations as directed.

1. Include “NOT FOR WARRANTY REPAIRS” on the labels.
2. Obtain receipt prior to final payment.

B. Do not use the spare parts and maintenance materials required by the Contract Documents to remedy defects during the one-year period described in Paragraph 9.8 of the General Conditions except when approved otherwise by authorized Facility Representative. In such cases, replace items used.

C. Furnish the names, business addresses, and telephone numbers of fully equipped authorized service organizations to the Director’s Representative.

D. Applications for final payment will not be approved until these items are delivered to the Director’s Representative.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 017716

SECTION 017900.01 - VIDEO TRAINING PROGRAMS

PART 1 - GENERAL

1.1 DESCRIPTION

A. This Section includes administrative and procedural requirements for instructing the Owner's and operations and maintenance personnel, including the following:

1. Demonstration of operation of systems, subsystems, and equipment. Contractor shall develop training sessions for systems, subsystems, and equipment.
2. Training in operation and maintenance of systems, subsystems, and equipment.

B. Demonstration and training requirements are described in this section, Section 019100, and in the technical sections of Divisions 22, 23, and 26. The Contractor shall comply with the requirements for demonstration and training data described in all specification sections.

1.2 RELATED WORK

A. Specific commissioning requirements are given in the following sections of these specifications. All the following sections apply to the Work of this section:

1. Section 017716 – Contract Closeout.
2. Section 019113 – Commissioning.
3. Section 210800 - Commissioning of Fire Suppression.
4. Section 220800 - Commissioning of Plumbing.
5. Section 230800 - Commissioning of HVAC.
6. Section 260800 - Commissioning of Electrical.

1.3 SUBMITTALS

A. Instruction Program: No later than two (2) months following acceptance of equipment and system submittals, the responsible contractor shall submit written training plans to the CxA and State for review and approval per Section 019100 and this section.

B. Documentation: After each training session, submit the following:

1. Attendance Roster: Submit list of participants and length of instruction time.
2. Evaluations: For each participant and for each training session, submit results and documentation of performance-based test and student evaluations of training.

1.4 COORDINATION

A. Coordinate instruction schedule with Director’s Representative.

B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.

C. Coordinate content of training sessions with content of approved operation and maintenance manuals.

1.5 QUALITY ASSURANCE

A. Facilitator Qualifications: Training shall be facilitated by a firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.

B. Instructor Qualifications: Instructors shall be factory-authorized representatives experienced in operation and maintenance procedures and training.

C. Pre-instruction Conference: Conduct conference at project site. Review methods and procedures related to demonstration and training including, but not limited to, the following:

1. Inspect and discuss locations and other facilities required for instruction, including classroom training and field training.
2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, and audio/visual equipment.
3. Review required content of instruction.
4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

PART 2 - PRODUCTS

2.1 INSTRUCTION PROGRAM

A. Program Structure: Develop a comprehensive instruction program. Include individual training sessions for each system and equipment not part of a system as required by technical specification sections and the Cx Plan.

B. Training Sessions: Coordinate training with the CxA. Develop a learning objective and teaching outline for each system, subsystem, and product specified in Section 019100 and Divisions 22, 23, and 26. Include a description of specific skills and knowledge that participants are expected to learn.

C. The following list of topics should be applied to each training plan for each equipment or system being presented. Not all will apply, but each major category should be addressed in the training plan with a brief description of how it pertains to the particular training sessions.

1. Basis of System Design, Operational Requirements, and Criteria: Include the following:

a. System, subsystem, and equipment descriptions.
b. Performance requirements.
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. Operations manuals.
    b. Maintenance manuals.
    c. Project Record Documents.
    d. Identification systems.
    e. Warranties and bonds.
    f. Maintenance service agreements and similar continuing commitments.

3. Emergencies: Include the following:

    a. Instructions on meaning of warnings, trouble indications, and error messages.
    b. Instructions on stopping.
    c. Shutdown instructions for each type of emergency.
    d. Operating instructions for conditions outside normal operating limits.
    e. Sequences for electric or electronic systems.
    f. Special operating instructions and procedures.

4. Operations: Include the following:

    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, including lockout/tagout requirements.
    g. Instructions on stopping.
    h. Normal shutdown and restart instructions.
    i. Operating procedures for system, subsystem, or equipment failure.
    j. Seasonal and weekend operating instructions.
    k. Required sequences for electric or electronic systems.
    l. 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, Care and Cleaning: Include the following:

    a. Inspection procedures.
    b. Types of cleaning agents to be used and methods of cleaning.
    c. List of recommended cleaning agents and methods of cleaning and list of agents and cleaning methods detrimental to product.

d. Procedures for routine cleaning.
e. Procedures for preventive/predictive 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.

D. Training Shifts: Training shall be provided for one shift, unless otherwise noted. Training shall be accomplished during normal business hours.

E. Training Duration: Duration of training and demonstration is addressed in Section 019100. Training and demonstration duration for specific items within a training session may be adjusted with Facility's approval to meet the overall goals of the training session.

PART 3 - EXECUTION

3.1 PREPARATION

A. Assemble educational materials necessary for instruction, including documentation and training sessions. Assemble training sessions into a combined training manual.

B. Set up instructional equipment at instruction location.

3.2 INSTRUCTION

A. Scheduling: Provide instruction at mutually agreed-on times. For equipment that requires seasonal operation, provide instruction on actions necessary to prepare for and execute seasonal changeover.

1. Schedule training through the Facility with at least 30 days notice. This requirement for notice takes precedence over other advance notice requirements in the specification.

B. Quality and Contents of Training Sessions: Each training session shall include the following.

1. Training plan for each class. Training plan shall contain:

a. Class objectives (what the student will learn).
b. Script of lecture and demonstrations.
c. Duration of each instruction period.
d. Participant attendance roster.
e. Participant evaluation survey form.

2. Names of instructors, name of company where employed, their credentials and affiliation with product if applicable and their qualifications as instructor.
3. Name of company who will videotape the classes. Include video script coordination with instructor's syllabus.
4. Training session information shall be submitted to CxA for approval.

C. Evaluation: At conclusion of each training session, assess and document training.

1. Assess and document each participant's comprehension of session by use of an oral performance-based test.
2. Obtain each participant's evaluation of the training.

D. Cleanup: Collect used and leftover educational materials. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

E. Record of Training. Submit the attendance roster as part of the completed training plan upon successful completion of the training session.

END OF SECTION

SECTION 019113 - GENERAL COMMISSIONING REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section specifies the Contractor's responsibilities in the commissioning process. Commissioning requires the participation of the Contractor to ensure that all systems are operating in a manner consistent with the Contract Documents.

B. The commissioning process integrates the traditionally separate functions of system documentation, equipment startup, performance testing and training. Commissioning during the construction phase is intended to achieve the following specific objectives in accordance with the Contract Documents:

1. Verify and document that applicable equipment and systems are installed according to the manufacturer's recommendations, contract requirements, and industry standards and that they receive adequate operational checkout by installing contractors.
2. Verify and document proper performance of equipment and systems.
3. Verify and document that O&M documentation is complete.
4. Verify and document that the Facility operating personnel are properly trained.

C. The systems and equipment to be commissioned are listed in this Section. The Contractor's general commissioning requirements and coordination are detailed in this Section. Specific requirements for commissioning of each system or piece of equipment are detailed in the specification Section for the individual systems or pieces of equipment. A detailed description of the overall commissioning process is included in the appendix.

D. The commissioning process does not reduce the responsibility of the Contractor to provide finished and fully functional systems and equipment.

1.2 SYSTEMS TO BE COMMISSIONED

A. The following systems will be commissioned in this project. Specific requirements for the commissioning of each system are included in the related specification Section.

1. HVAC Work Contract:

a. HVAC Systems.
b. Building Controls.

2. Plumbing Work Contract:

a. Domestic Hot Water System.

3. Electrical Work Contract:

a. Lighting Controls.

B. Example Commissioning Documents: Example Pre-Functional Checklists and Functional Test Procedures are provided following the specification Sections of equipment and systems that are scheduled to be commissioned. These documents are included to provide the Contractor examples of the type of documentation that will be required as part of the commissioning process. Equipment and system specific Pre-Functional Checklists and Functional Test procedures will be developed by the Commissioning Authority based on approved submittals, and then will be provided to the Contractors.

1.3 DEFINITIONS

A. Acceptance Phase: Phase of construction after startup and initial checkout when functional performance tests, O&M documentation review and training occurs.

B. Approval: Acceptance that a piece of equipment or system has been properly installed and is functioning in the tested modes in accordance with the Contract Documents.

C. Commissioning authority (CA): An independent agent responsible for the direction and coordination of the commissioning activities. The CA responsible to the Director's Representative.

D. Commissioning Plan: An overall plan that provides the structure, schedule and coordination planning for the commissioning process.

E. Commissioning Team: The members of the commissioning team consist of the Commissioning Authority, the Director's Representative, the Contractor, the architect and design engineers. The owner and the building or plant operator/engineer also may be members of the commissioning team.

F. Deferred Functional Tests: Functional tests that are performed after substantial completion, due to partial occupancy, seasonal requirements, design or other site conditions that prevent the test from being performed prior to substantial completion.

G. Deficiency: A condition in the installation or function of a component, piece of equipment or system that is not in compliance with the Contract Documents.

H. Factory Testing: Testing of equipment on-site or at the factory by factory personnel.

I. Functional Performance Test (FT): Test of the dynamic function and operation of equipment and systems using manual (direct observation) or monitoring methods. Functional testing is the dynamic testing of systems (rather than just components) under full operation. Systems are tested under various modes, such as during low cooling or heating loads, high loads, component failures, unoccupied, varying outside air temperatures, fire alarm, power failure, etc. The CA develops the functional test procedures in sequential written form. The CA coordinates, oversees and documents the actual testing. The Contractor performs the functional tests. FTs are performed after prefunctional checklists and startup are complete.

J. Phased Commissioning: Commissioning that is completed in phases (by floors, for example) due to the size of the structure or other scheduling issues, in order to minimize the total construction time. Commissioning shall be provided for each phase according to the schedule for that phase. Some repetition and/or remobilization may be required.

K. Prefunctional Checklist (PC): A list of items to inspect and component tests to conduct to verify proper installation of equipment prior to initiating functional testing.

L. Startup: The initial starting or activating of dynamic equipment, including executing prefunctional checklists.

1.4 COORDINATION

A. The CA is hired by, and works for, the Director. The CA directs and coordinates the commissioning activities. All members of the commissioning team shall work together to fulfill their contractual responsibilities and meet the objectives of the Contract Documents.

B. The CA will work with the Contractor according to established protocols to schedule the commissioning activities. The Contractor shall integrate all commissioning activities into the approved progress schedule. All parties will address scheduling problems and make necessary notifications and changes in a timely manner in order to expedite the commissioning process and maintain the approved progress schedule.

1.5 COMMISSIONING PROCESS

A. Commissioning Plan. The commissioning plan provides guidance in the execution of the commissioning process. Following the initial commissioning scoping meeting the CA will update the plan which is then considered the "final" plan, although it may be revised as the project progresses.

B. Commissioning Process. The following narrative provides a brief overview of the typical commissioning tasks during construction and the general order in which they occur. A more detailed description of the commissioning process can be found in the Appendix.

1. Commissioning during construction begins with a scoping meeting conducted by the CA where the commissioning process is reviewed with the Commissioning Team.
2. Additional meetings will be required throughout construction, scheduled by the Director's Representative, to plan, scope, coordinate, and schedule future activities and to resolve problems. When possible, commissioning meetings will be scheduled immediately following construction meetings.
3. Equipment documentation is submitted to the CA during the submittal process, including detailed start-up procedures.
4. The CA works with the Contractor to develop startup activity lists and startup documentation. The CA provides prefunctional checklists to be completed by the Contractor during the startup process.
5. In general, the checkout and performance verification proceeds from simple to complex; from component level to equipment to systems and intersystem levels. In each case

prefunctional checklists are completed, submitted, and approved before functional testing begins.

6. The Contractor executes and documents the prefunctional checklists, and provides notification to the Director's Representative and the CA. The Contractor performs startup and initial checkout. The CA documents that the checklists and startup were completed according to the approved plans.
7. The CA develops specific equipment and system functional performance test procedures. The Contractor reviews the procedures and submits suggestions or comments. Procedures are finalized by the CA.
8. The procedures are executed by the Contractor, under the direction of the CA.
9. Items of non-compliance in material, workmanship, or setup are corrected and retested at the Contractor's expense. The Contractor is responsible for providing all resources, manpower, and materials necessary to rectify deficiencies as per requirements of the approved schedule.
10. The O&M documentation prepared by the Contractor is reviewed for completeness by the CA.
11. Commissioning is completed before Substantial Completion.
12. The CA reviews, pre-approves and coordinates the training provided by the Contractor and verifies that is was completed.
13. Deferred testing is conducted, as specified or required.

1.6 CONTRACTOR'S RESPONSIBILITIES

A. The Contractor's commissioning responsibilities are as follows (all references apply to commissioned systems and equipment only):

1. Construction and Acceptance Phase:

   a. Attend the commissioning scoping meeting and other necessary meetings scheduled by the Director's Representative to facilitate the commissioning process.
   b. Facilitate the coordination of the commissioning work by the CA, and with the CA ensure that commissioning activities are being scheduled into the approved progress schedule.
   c. Provide detailed manufacturer installation and start-up, operating, troubleshooting and maintenance procedures, factory test reports, and full warranty information, including all responsibilities of the Director to keep the warranty in force. The installation, start-up and checkout materials that are actually shipped with the equipment and the actual field checkout sheet forms to be used by the factory or field technicians shall be submitted to the CA. The CA may request further documentation necessary for the commissioning process.
   d. In each purchase order or subcontract written, include requirements for submittal data, O&M data, commissioning tasks and training.
   e. Ensure that all subcontractors execute their commissioning responsibilities according to the Contract Documents and approved progress schedule.
   f. Assist in the process of writing detailed test procedures by clarifying the operation and control of commissioned equipment.
   g. Review test procedures to ensure feasibility, safety and equipment protection and provide necessary written alarm limits to be used during the tests.

h. Develop a full start-up and testing plan using manufacturer's start-up procedures and the prefunctional checklists from the CA for all commissioned equipment. Submit to the CA for review and approval prior to startup.
i. During the startup and initial checkout process, execute all portions of the prefunctional checklists for all commissioned systems and equipment. Verify that system installations include all ports, gages, thermometers, access doors, valves, etc., required for specified functional performance testing.
j. Provide all special tools and instruments (only available from vendor, specific to a piece of equipment) required for testing equipment.
k. Perform and clearly document all completed startup and system operational checkout procedures, providing a copy to the CA.
l. Address incomplete Work before functional performance testing.
m. Provide skilled technicians to execute startup 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. Provide Manufacturer's Representative as required and as specified in the Specification. Assist the CA in interpreting the monitoring data, as necessary.
o. Correct deficiencies (differences between specified and observed performance) as directed by the Director's Representative.
p. Prepare O&M manuals according to the Contract Documents, including clarifying and updating the original sequences of operation to as-built conditions. Provide a copy of the O&M manuals and submittals of commissioned equipment to the CA for review and approval.
q. Provide training as specified.
r. 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 in accordance with 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.

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT

A. All standard testing equipment required to perform startup and initial checkout and required functional performance testing shall be provided by the Contractor.

B. Specified special equipment, tools and instruments (only available from vendor, specific to a piece of equipment) required for testing equipment shall be provided by the Contractor and turned over to the facility at the completion of the Work.

C. Datalogging equipment and software required to test equipment will be provided by the Contractor but shall not become the property of the Director's Representative.

D. All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified in the Specifications. All equipment shall be calibrated according to the manufacturer's recommended intervals. Calibration tags shall be affixed or certificates readily available.

PART 3 - EXECUTION

3.1 MEETINGS

A. Scoping Meeting. Prior to the commencement of construction, the CA will schedule, plan and conduct a commissioning scoping meeting with the Commissioning Team.

B. Miscellaneous Meetings. Other meetings will be planned and conducted by the CA as construction progresses. These meetings will cover coordination, deficiency resolution and planning issues with the Contractor, appropriate sub-contractors and suppliers, the Owner's Representative, and the Director's Representative.

3.2 START-UP, PREFUNCTIONAL CHECKLISTS, AND INITIAL CHECKOUT

A. Prefunctional checklists and initial checkout shall ensure that the equipment and systems are hooked up and operational. Each piece of equipment receives full prefunctional checkout. No sampling strategies are used. The prefunctional testing for a given system must be successfully completed prior to formal functional performance testing of systems or equipment.

B. Start-up and Initial Checkout Plan. The CA shall assist the commissioning team members responsible for startup of any equipment in developing detailed start-up plans for all equipment. The primary role of the CA in this process is to ensure that there is written documentation that each of the manufacturer's recommended procedures have been completed.

C. Execution of Prefunctional Checklists and Startup.

1. Four weeks prior to startup, the Contractor shall schedule startup and checkout with the Director's Representative.
2. The Contractor shall execute startup and provide the CA with a signed and dated copy of the completed start-up and prefunctional tests and checklists.

3.3 FUNCTIONAL PERFORMANCE TESTING

A. Development of Test Procedures. Using the requirements in the specifications, the CA shall develop specific test procedures and forms to verify and document proper operation of each piece of equipment and system. The Contractor shall provide assistance to the CA in developing the procedures. Prior to testing, the CA shall provide a copy of the test procedures to the Contractor who shall review the tests for feasibility, safety, equipment and warranty protection.

B. Functional performance testing shall document that each system is operating in accordance with the Contract Documents. During the testing process, areas of deficient performance shall be identified. Deficiencies shall be corrected by the Contractor and functional testing shall be re-scheduled. The Contractor shall be responsible for all costs associated with re-testing for functional performance.

C. Each system shall be operated through all modes of operation. Proper responses to such modes and conditions as power failure, freeze condition, low oil pressure, no flow, equipment failure, etc. shall also be tested.

D. Test Methods. Each function and test shall be performed under conditions that simulate actual conditions as closely as possible. The Contractor shall execute the test and shall provide all necessary materials, system modifications, etc. to produce the necessary flows, pressures, temperatures, etc. necessary to execute the test according to the specified conditions. At the completion of the test, the Contractor shall return all building equipment and systems affected by these temporary modifications to their pre-test condition.

3.4 OPERATION AND MAINTENANCE MANUALS

A. Standard O&M Manuals. The specific content and format requirements for the standard O&M manuals are detailed in Section 017716.

B. The Contractor shall compile and prepare commissioning documentation for all equipment and systems and include this information in the O&M manuals.

3.5 TRAINING

A. The Contractor shall be responsible for coordinating, scheduling, and documenting that all required training has been completed successfully.

B. The Contractor shall have the following training responsibilities:

1. Provide a training plan two weeks before the planned training.
2. Provide comprehensive orientation and training in the understanding of the systems and the operation and maintenance of each piece of equipment.
3. Training shall normally start with classroom sessions followed by hands-on training on each piece of equipment.
4. 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.
5. 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, 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.

3.6 DEFERRED TESTING

A. Unforeseen Deferred Tests. If any check or test cannot be completed due to project conditions, required occupancy condition or other deficiency, execution of checklists and functional testing may be delayed upon approval of the Director's Representative. These tests will be conducted in the same manner as the seasonal tests as soon as possible.

B. Seasonal Testing. Seasonal testing (tests delayed until weather conditions are closer to the system's design conditions) shall be completed as part of this contract. Make any final adjustments to the O&M manuals and as-builts resulting from information gained during testing.

END OF SECTION 019113

SECTION 230130.52 - EXISTING HVAC AIR DISTRIBUTION SYSTEM CLEANING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes cleaning existing HVAC air-distribution equipment, ducts, plenums, and system components.

1.3 DEFINITIONS

A. ACAC: American Council for Accredited Certification.

B. AIHA-LAP: American Industrial Hygiene Association Lab Accreditation Program

C. ASCS: Air systems cleaning specialist.

D. CESB: Council of Engineering and Scientific Specialty Boards.

E. CMI: Certified Microbial Investigator.

F. CMC: Certified Microbial Consultant.

G. CMR: Certified Microbial Remediator.

H. CMRS: Certified Microbial Remediation Supervisor.

I. EMLAP: Environmental Microbiology Laboratory Accreditation Program.

J. IEP: Indoor Environmental Professional.

K. IICRC: Institute of Inspection, Cleaning, and Restoration Certification.

L. NADCA: National Air Duct Cleaners Association.

1.4 ACTION SUBMITTALS

A. Product Data: Manufacturer’s catalog cuts, specifications, and MSDS sheets for cleaning chemicals and treatments.

B. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.

C. Manufacturer's installation instructions shall be provided along with product data.

D. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).

E. Product Data: Manufacturer's catalog cuts, specifications, and MSDS sheets for cleaning chemicals and treatments.

F. Quality Control Submittals:

1. Project Assessment Report and Work Plan:

    a. Detailed step-by-step procedure for ACS cleaning.
    b. Include locations and method of accessing ductwork; cleaning methods; vacuum equipment specifications, including particulate collection efficiency; intended cleaning sequence; methods of testing; method of resealing ductwork; and disposal of debris.
    c. Phasing plan showing sequencing of work and approximate days of work for each building.

2. Duct Cleaning Procedure:

    a. Detailed step-by-step procedure for duct and coil cleaning.
    b. Include locations and method of accessing ductwork; cleaning methods; vacuum equipment specifications, including particulate collection efficiency; intended cleaning sequence; methods of testing; method of resealing ductwork; and disposal of debris.

3. Duct Cleaning Contractor Qualifications Data:

    a. Names and addresses of 5 similar projects that the firm has worked on during the past 10 years.
    b. Copy of firm's NADCA certification.

4. Supervisor's Qualifications Data:

    a. Name of the person who will be supervising the Work and their employer's name, business address and telephone number.
    b. Names and addresses of 3 similar projects that the supervisor has worked on during the past 5 years.
    c. Copy of supervisor's NADCA certification.

5. Duct Cleaner's Qualifications Data:

    a. Name of the person who will be performing the Work and their employer's name, business address and telephone number.
    b. Names and addresses of 3 similar projects that each person has worked on during the past 5 years.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data:

1. For an ASCS.
2. For an IEP.
3. For a CMR and a CMRS.

B. Field Quality-Control Reports:

1. Project's existing conditions.
2. Evaluations and recommendations, including cleanliness verification.
3. Strategies and procedures plan.

1.6 CLOSEOUT SUBMITTALS

A. Contract Closeout Submittals:

1. Final Report consisting of the following information:

a. List locations of ACS components cleaned.
b. Report general conditions of the ducts (rusting steel, fiber delaminating, duct air leakage areas, duct sagging areas,etc.).
c. Visual verification report indicating inspection locations and conditions for complete ACS analysis with the Director's Representative signature.
d. Post-Cleaning Sample Analysis Report taken to verify that duct is clean per NADCA.
e. List locations of ACS components cleaned.
f. Report general conditions of the ducts (rusting steel, fiber delaminating, duct air leakage areas, duct sagging areas, etc).
g. Visual verification report indicating inspection locations and conditions for complete ACS analysis with the Director's Representative signature.
h. Post-Cleaning Sample Analysis Report taken to verify that duct is clean per NADCA.

1.7 QUALITY ASSURANCE

A. Duct Cleaning Contractor Qualifications: The firm performing the Work of this Section shall have been regularly engaged in duct cleaning for a minimum of 10 years, shall have completed 5 similar projects, and shall be a certified member of the National Air Duct Cleaners Association (NADCA).Duct Cleaner Qualifications: The persons performing the Work shall be personally experienced in duct cleaning and shall have been regularly employed by a Company performing duct cleaning for a minimum of 2 year.

C. Pre-Cleaning Conference:

1. Review methods and procedures related to HVAC air-distribution system cleaning, including, but not limited to, review of the cleaning strategies and procedures plan.
2. Before commencement of the duct cleaning Work, a conference will be held for the purpose of reviewing the Contract Documents and discussing existing conditions of ductwork and equipment to be cleaned, equipment to be used for the Work, impact on building and personnel during cleaning process, and requirements for the Work. The conference shall be attended by the Director's Representative, Facility Representatives, and Duct Cleaning Supervisor.
3. At the conclusion of the pre-cleaning conference, before the cleaning Work begins, prepare a detailed work plan. The work plan shall include, but not be limited to, work procedures, types of equipment to be used, and crew size.

1.8 SCOPE OF WORK

A. The cleaning work for each building is for the complete Air Conveyance System including, but not limited to the following components:

1. Air Handling Unit(s)Air Handling Unit(s).

    a. Unit enclosure.
    b. Coils.
    c. Fan assembly.
    d. Dampers.
    e. Condensate pan.
    f. Replacement of existing filters (furnished by facility).
    g. Outside air plenum(s).
    h. Outside air intake(s).

2. All supply ductwork, lined and unlined, including ductwork plenums, branches, risers, turning vanes, and accessories.
3. All associated air terminal devices, to include supply diffusers, dampeners and duct security devices.
4. Sound attenuators.
5. Exhaust/Return duct system and all associated registers.
6. Exhaust/Return fans.
7. Fire and fire/smoke dampers.
8. Control system sensors and airflow stations.

    a. Unit enclosure.
    b. Coils.
    c. Fan assembly.
    d. Dampers.
    e. Condensate pan.
    f. Replacement of existing filters (furnished by facility).
    g. Outside air plenum(s).
    h. Outside air intake(s).

9. All supply ductwork, lined and unlined, including ductwork plenums, branches, risers, turning vanes, and accessories.

10. All associated air terminal devices, to include supply diffusers, dampeners and duct security devices.
11. Sound attenuators.
12. Exhaust/Return duct system and all associated registers.
13. Exhaust/Return fans.
14. Fire and fire/smoke dampers.
15. Control system sensors and airflow stations.

B. Verify field conditions before start of work.

C. Repair and replace to match existing materials where access to walls or ceilings is made, or damage occurs, including but not limited for access to:

1. Ductwork and components.
2. Insulation.
3. Pneumatic and electric control components.
4. Air handling equipment panels.

D. On the basis of field inspections and review, determine the method of cleaning the HVAC systems and its components, to prevent any damage to the system and its operation. Proposed methods and their effects on the system shall be included in submittal.

E. Mark original position so that during the final inspection original settings can be field verified.

F. Report to Director's Representative any system defects discovered during the cleaning operation that will require repair to HVAC system (equipment, ductwork, dampers, registers, and other components).

G. Report to Director's Representative any system defects discovered during the cleaning operation that will require repair to HVAC system (equipment, ductwork, dampers, registers, and other components).

PART 2 - PRODUCTS

2.1 CLEANING METHODS

A. Non-Porous Surfaces: Use various mechanical cleaning methods which shall render the ACS components visibly clean and capable of non-porous surface cleaning verification.

B. Coils: Use mechanical cleaning methods complying with NADCA ACR Standard, Coil Surface Cleaning.

C. Do not use cleaning methods which could potentially damage components of the ACS or negatively alter the integrity of the system.

D. Do not use chemical cleaners that could potentially emit offensive odors and/or mist vapors.

2.2 DEBRIS COLLECTION EQUIPMENT

A. Equipment used shall be portable and sized to enter the areas easily. Electrical requirements shall be the responsibility of the Contractor and any costs incurred due to modifications to the electrical systems shall be at the Contractor's expense.

B. The collection systems shall be self-contained units, with the appropriate components to adequately collect dirt and debris loosened from the ductwork. Debris collection is to be performed by a high-powered vacuum system with three stages of filtration. The final stage shall be a HEPA filter. HEPA filter efficiency shall be 99.97% @ 0.3 micron.

C. The collection system shall be capable of producing a minimum of 2,500 cfm, 0.42" water gauge negative static pressure and 0.25" water gauge velocity pressure in the area of ductwork to be cleaned.

D. Where contact vacuuming is required, the equipment used shall be HEPA filtered vacuums. These vacuums shall be capable of at least 95 cfm at 88" water column. The vacuum shall have at least four (4) stages of filtration with the final stage being a HEPA filter.

2.3 AGITATION SYSTEM

A. Type: Collom Duct Cleaning System by Collum Enterprises, (716) 675-5144.

1. The system is capable of thoroughly cleaning (and sanitizing) to a distance of 60 lineal feet from access point. Exceptions to this requirement will apply when the removal of debris requires more aggressive agitation.
2. A minimum of 85 cubic feet. per minute (cfm) of compressed air to 110 pounds per square inch. (psi) must be supplied to the air tool or nozzle in order to effectively dislodge the built-up debris.
3. The air tool or nozzle shall be able to follow the contours of the ductwork, i.e. the tool must be able to come in contact with all sides/surfaces of the interior of the duct.
4. The air tool or nozzle shall be capable of dispensing coatings and sanitizing solutions to cover the entire interior surface areas of the ductwork without creating additional access openings in order to maintain the integrity of the ductwork.

2.4 CLEANING AGENTS

A. Cleaning agent equal to:

1. BBJ Environmental Solutions, www.bbjenviro.com.
2. Goodway Technologies Corporation, www.goodway.com.
3. Nu-Calgon, www.nucalgon.com.

B. Type: E.P.A. registered sanitizer that is specific for application inside HVAC/ductwork systems.

1. Do not apply to porous surfaces.

C. Description:

1. Formulated for each specific soiled coil condition that needs remedy.
2. Will not corrode or tarnish aluminum, copper, or other metals.

2.5 INSULATION REPAIR COATING

A. Type: Coating containing an anti-microbial agent, shall not affect the thermal or acoustic properties of the insulation, and shall conform to NFPA Standards 90A and 90B.

B. Acceptable Coating: Tough Coat by VAC Systems International, 1800 East Cliff Road, Burnsville, MN 55337, (952) 808-1616, www.vacsysint.com.

2.6 ANTIMICROBIAL SURFACE TREATMENT

A. Surface Treatment equal to:

1. Bio-Cide International, Inc., www.bio-cide.com.
2. Contec, www.contecprofessional.com,
3. Ecolab, Inc., www.ecolab.com/
4. Approved equivalent.

B. Description: Specific product selected shall be as recommended by the IEP based on the specific antimicrobial needs of the specific Project conditions.

1. Formulated to kill and inhibit growth of microorganisms.
2. EPA-registered for use in HVAC systems and for the specific application in which it will be used.
3. Have no residual action after drying, with zero VOC off-gassing.
4. OSHA compliant.
5. Treatment shall dry clear to allow continued visual observation of the treated surface.

PART 3 - EXECUTION

3.1 PREPARATION

A. Inspect HVAC air-distribution equipment, ducts, plenums, and system components to determine appropriate methods, tools, and equipment required for performance of the Work.

1. Defects are to be reported in writing to the Director's Representative and work will not proceed until all defects have been documented.
2. No cleaning is to be performed to ducts where the process has the capability of damaging the duct lining.
3. Include in documentation the location of all porous lining and porous duct lining material. If encapsulation or coating must be performed to protect these surfaces, an approved mechanical cleaning must be performed to these surfaces first. When using cleaning

methods in areas adjacent to these surfaces that are potentially damaging to such, encapsulate these surfaces prior to cleaning.

4. Removal and replacement of duct lining or porous material are not included in contract unless damaged under this contract.

B. Perform "Project Evaluation and Recommendation" according to NADCA ACR.

C. Cleaning Plan: Prepare a written plan for air-distribution system cleaning that includes strategies and step-by-step procedures. At a minimum, include the following:

1. Supervisor contact information.
2. Work schedule, including location, times, and impact on occupied areas.
3. Methods and materials planned for each HVAC component type.
4. Required support from other trades.
5. Equipment and material storage requirements.
6. Exhaust equipment setup locations.

D. Existing Conditions Report: Prepare a written report that documents existing conditions of the systems and equipment. Include documentation of existing conditions, including inspection results, photo images, laboratory results, and interpretations of the laboratory results by an IEP.

1. Prepare written report listing conditions detrimental to performance of the Work.

E. Proceed with work only after conditions detrimental to performance of the Work have been corrected.

1. Commencement of work will constitute acceptance of the conditions of the area to which the cleaning work is to be performed.

F. Use the existing service openings, as required for proper cleaning, at various points of the HVAC system for physical and mechanical entry and for inspection.

G. Comply with NADCA ACR, "Guidelines for Constructing Service Openings in HVAC Systems" Section.

H. Disassemble all removable items as required for access to work area.

1. Store the removed items in an approved storage area as directed until the completion of the cleaning work.

I. Provide temporary closures of metal or plastic sheeting where required to prevent dust from the cleaning process from dispersing throughout the Work area.

J. Fire protection devices (such as smoke detectors, panel and sensors) shall be protected prior to cleaning procedures. They are to be cleaned and tested at the conclusion of work.

K. Notify the Director’s Representative of any Fire System shutdown and reactivating of the fire alarm system in advance to avoid accidental alarms during the cleaning process and related work.

L. Mark the position of manual volume dampers and air-directional mechanical devices inside the system prior to cleaning.

M. Coordinate the shutdown of the air handling equipment with the Director's Representative before starting work, and shall conform to OSHA requirements regarding fan motor disconnect lock-out/tag-out.

3.2 CONTAINMENT

A. Provide containment per NADCA ACR - Assessment, Cleaning, and Restoration of HVAC Systems.

1. Collect debris removed during duct cleaning.
2. Take precautions to ensure that debris is not dispersed outside the ACS during the cleaning process.
3. Provide Barriers at all air outlet and inlet devices as required and directed.
4. After completion of ACS cleaning, restore areas affected by the cleaning work to a condition as clean or cleaner than their condition prior to the commencement of the cleaning operation.

3.3 CLEANING PROCEDURES

A. Visibly clean non-porous ACS surfaces in accordance with NADCA ACR Standard.

B. Particulate Collection:

1. Mechanical cleaning operations shall be undertaken only with Particulate Collection Equipment in place, including adequate filtration to control debris removed from the ductwork or ceiling plenum.
2. Where the particulate collection equipment is exhausting outside the building, mechanical cleaning operations shall be undertaken only with particulate collection equipment in place, including adequate filtration to contain debris removed from the ACS.
3. Provide adequate filtration to contain debris removed from the ACS.
4. Where the particulate collection equipment is exhausting outside the building, take precautions to ensure that exhausted air does not re-enter the building.

C. Filtration Integrity:

1. Where particulate collection equipment is exhausting inside the building, certify that equipment effectiveness of 99.97 percent collection efficiency for 0.3 micron size particles through DOP test results, from an independent testing agency, for collection devices used on the Project.
2. Equipment shall have inspection tags showing results and dates of the DOP test and is required before bringing equipment to work site and after equipment is moved to new work location, at the start of work or when requested by the Director's Representative. Include air monitoring at these locations.2.

D. Agitation Equipment:

1. Remove all debris from the inside surface areas being the top, bottom and sides of rectangular duct and the entire inside circumference of round and flat oval ductwork by

creating the least amount of access openings possible. The following restrictions for agitation tools shall be adhered to.

2. High power/volume vacuum alone is not an acceptable method of agitation.

E. Controlling Odors: Take all measures to control offensive odors and/or mist vapors during the cleaning process.

F. Components Cleaning: Employ cleaning methods to ensure that non-porous ACS surface components are visibly cleaned.

1. Upon completion, all components must be returned to those settings recorded just prior to cleaning operations.

G. Air-Volume Control Devices. Dampers and any air-directional mechanical devices inside the ductwork must have their position marked prior to cleaning, and upon completion, must be restored to their marked position.

H. Access Holes:

1. Repair access holes cut for the cleaning process to ensure that no significant alteration of airflow occurs.
2. Seal openings made to facilitate the cleaning with materials and practices specified in SMACNA's HVAC Duct Construction Standards and NADCA Standard ACR
3. Closure Panels shall be permanent. Seal openings per NADCA ACR Standard
4. Any access holes larger than a three-inch diameter shall be enlarged and fitted with an access door.
5. Tape is not to be used.

I. Coil and Fan Section of Air Handling Units:

1. Gently pressure wash and vacuum coils such that they are visibly clean and capable of passing Coil Cleaning Verification.
2. Subject coil drain pans to Non-Porous Surfaces Cleaning Certifications as per NADCA Standards.
3. The drain for the condensate drain pan shall be operational.
4. Cleaning methods shall not cause any appreciable damage to, displacement of, or erosion of the coil surface, and shall conform to coil manufacturer recommendations when available.

J. Verification of ACS cleanliness will be determined after completion of mechanical cleaning, and before the application of treatments or introduction of treatment-related substances to the ACS.

3.4 HEALTH AND SAFETY

A. Comply with all applicable federal, state and local requirements for protecting the safety of the Contractors' employees, building occupants, and the environment. In particular, all applicable standards of the Occupational Safety and Health Administration (OSHA) should be followed when working in accordance with this specification.

B. No processes or materials shall be employed in such a manner that they will create adverse health effects to the building occupants, cleaning contractors, or general public.

C. Disposal of Debris. All debris removed from the Air Conveyance System shall be disposed of in accordance with all applicable federal, state and local requirements.

3.5 MECHANICAL CLEANING

A. Interior Duct/Air Handling Unit Surfaces:

1. The interior of all ducts and air handling units shall be brushed, wiped, and mechanically vacuumed such that all metal surfaces are visibly clean and capable of Non-Porous Surfaces Cleaning Verification as described in the NADCA Standards.

    a. Internally lined ductwork shall be visibly clean but will not be subject to testing as per NADCA Standards.
    b. No cleaning method should be used which could potentially damage components of the ductwork or negatively alter the integrity of the system.

2. Air handling unit cleaning shall include plenums, filter section, coils, mixing boxes, return air fans, dampers and all other components within the airstream.
3. All air handling unit fiberglass lining shall be cleaned per NAIMA standards and recommendations.

B. Ceiling Plenums and Mechanical Rooms:

1. Remove all loose debris from the entire ceiling plenum including but not limited to duct exterior, walls, deck, top of ceiling tiles, structural steel, piping, conduit, light fixtures shall be mechanically vacuumed.
2. The Plenum and Mechanical Room shall be visibly clean but will not be subject to verification as per NADCA Standards.

C. Duct Reheat Coils:

1. Duct mounted coils shall be hand washed (air or water) on both coil faces.
2. Thoroughly clean coil faces ensuring the removal of debris while avoiding damage to the fins.
3. Remove corrosion from around the coil frames, and paint all corroded metal surfaces.
4. Perform pressure differential readings across the coil to verify cleanliness.
5. Final pressure differentials across the coil shall be within 10% of manufacturer's original ratings.

D. Volume, Fire and Zone Dampers:

1. Duct mounted volume, fire and zone damper sets are to be marked to their current setting, then inspected and cleaned if necessary.
2. External moving parts are to be treated with an approved dry lubricant material.
3. After cleaning, the dampers shall be repaired as necessary to ensure proper operation and returned to original settings.
4. Indicate locations of damaged and/or repaired dampers.

E. Grilles, Registers and Diffusers and Linear Diffusers:

1. Whenever the grilles, registers and diffusers (GRD) are not welded or permanently fastened to façade, they shall be removed, washed, dried, sanitized and replaced.
2. When the GRD are restricted by a façade or welded in place, hand vacuuming and cleaning are acceptable.
3. Avoid disturbing the existing volume damper settings.
4. Cleaning the debris built-up on the ceiling is not required under this contract.
5. Linear Diffusers that have plenums and are considered part of the duct and shall be cleaned per Paragraph A. above.

F. Visibly clean interior duct surfaces until capable of passing the NADCA Vacuum Test. Make visual inspections at each duct penetration. Use borescope, as required.

3.6 CLEANLINESS VERIFICATION

A. Verify cleanliness according to NADCA ACR, "Verification of HVAC System Cleanliness" Section.

B. Verify HVAC system cleanliness after mechanical cleaning and before applying any treatment or introducing any treatment-related substance to the HVAC system, including biocidal agents and coatings.

C. Surface-Cleaning Verification: Perform visual inspection for cleanliness. If no contaminants are evident through visual inspection, the HVAC system shall be considered clean. If visible contaminants are evident through visual inspection, those portions of the system where contaminants are visible shall be re-cleaned and subjected to re-inspection for cleanliness.

D. Verification of Coil Cleaning:

1. Measure static-pressure differential across each coil.
2. Coil will be considered clean if cleaning restored the coil static-pressure differential within 10 percent of the differential measured when the coil was first installed.

E. Verification of Coil Cleaning: Coil will be considered clean if the coil is free of foreign matter and chemical residue, based on a thorough visual inspection.

F. Additional Verification:

1. Perform surface comparison testing or NADCA vacuum test.
2. Conduct NADCA vacuum gravimetric test analysis for nonporous surfaces.

G. Prepare a written cleanliness verification report. At a minimum, include the following:

1. Written documentation of the success of the cleaning.
2. Site inspection reports, initialed by supervisor, including notation on areas of inspection, as verified through visual inspection.
3. Surface comparison test results if required.
4. Gravimetric analysis (nonporous surfaces only).
5. System areas found to be damaged.

3.7 SANITATION

A. A sanitizing agent shall be applied to all supply and return air metal only ductwork cleaned as part of this project. Application and preparation shall be as per manufacturer's recommendations.

B. Demonstrate to the Director's Representative how the application method is capable of dispensing the sanitizing solution to the entire surface areas of the ductwork.

3.8 REPORT

A. Submit three (3) copies of the final report to the Director's Representative outlining the conditions and work completed on each HVAC system.

B. The report shall contain a tabulation of the samples taken before and after the cleaning process.

1. Weight reported as ($mg/100cm^2$) of debris per NADCA Vacuum Test 12.3 of ACR Standard.

C. The report shall contain photographic or video documentation of representative areas of the ductwork systems cleaned as part of the project.

1. This photo documentation shall show both before and after pictures verifying visual inspection.
2. Require date stamped digital photos before and after at three locations per building. Director's Representative will choose locations.
3. Bid to include three locations for each building.

D. Submit report with results from each building, citing EPA/ASHRAE guidelines and standards, and any variances. Methods of testing must be consistent with applicable EPA methods.

3.9 RESTORATION

A. Reconnect ducts, replace straps or clamps and flexible duct. Replace flexible duct damaged during the cleaning process with matching material at no cost to the State.

B. Restore and repair HVAC air-distribution equipment, ducts, plenums, and components according to NADCA ACR, "Restoration and Repair of Mechanical Systems" Section.

C. Replace insulation damaged under this contract.

D. Ensure that closures do not hinder or alter airflow.

E. New closure materials, including insulation, shall match opened materials and shall have removable closure panels fitted with gaskets and fasteners.

F. Restore manual volume dampers and air-directional mechanical devices inside the system to their marked position on completion of cleaning.

G. Replace existing filters for each system with replacement filters furnished by the Facility.

H. Measure air flows through air-distribution system.

I. Measure static-pressure differential across each coil.

3.10 PROJECT CLOSEOUT

A. Perform final inspection in the presence of the Director’s Representative to ensure that no dust or debris remain on interior building furniture surfaces as a result of the cleaning and dismantling operations.

B. Post-Project Report:

1. Post-cleaning laboratory results if any.
2. Post-cleaning photo images.
3. Post-cleaning verification summary.

C. Drawings:

1. Deviations of existing system from Director’s Representative's record drawings.
2. Location of service openings.

END OF SECTION 230130.52

SECTION 230516 - EXPANSION FITTINGS AND LOOPS FOR HVAC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Packed expansion joints.
2. Grooved-joint expansion joints.
3. Alignment guides and anchors.

1.3 SUBMITTALS

A. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.

B. Manufacturer’s installation instructions shall be provided along with product data.

C. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).

D. Product Data: For each type of product.

E. Welding certificates.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For expansion joints to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Pipe and Pressure-Vessel Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Compatibility: Products shall be suitable for piping service fluids, materials, working pressures, and temperatures.

B. Capability: Products to absorb 200 percent of maximum axial movement between anchors.

2.2 PACKED EXPANSION JOINTS

A. Flexible, Ball-Joint Packed Expansion Joints:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Advanced Thermal Systems, Inc.
    b. Hyspan Precision Products, Inc.
    c. Mason Industries, Inc.
    d. Approved equivalent.

2. Standards: ASME Boiler and Pressure Vessel Code: Section II, "Materials"; ASME B31.9, "Building Services Piping," for materials and design of pressure-containing parts and bolting.
3. Material: Carbon-steel assembly with asbestos-free composition packing.
4. Design: Provide 360-degree rotation and angular deflection.
5. Minimum Pressure Rating: 250 psig at 400 deg FAngular Deflection for NPS 6 and Smaller: 30 degree minimum.
6. Angular Deflection for NPS 8and Larger: 15 degree minimum.
7. Seal Type: Two carbon steel and graphite seals suitable for continuous operation at temperature up to 650 deg F
8. Internal Ball: Plated with minimum 1-mil chrome cover.
9. Ball Socket: One- or two-piece design with integral socket/retainer.

    a. Stuffing Box: Incorporates containment seals and compression seals for containment of injectable packing.
    b. Packing Cylinders: Provides packing under full line pressure with check valves to prevent blowback.

10. End Connections for NPS 2 and Smaller: Threaded.
11. End Connections for NPS 2-1/2 and Larger: Flanged.

B. Slip-Joint Packed Expansion Joints:

1. Manufacturers: Subject to compliance with requirements, [provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

a. Advanced Thermal Systems, Inc.
b. Hyspan Precision Products, Inc.
c. Mason Industries, Inc.
d. Approved equivalent.

2. Standard: ASTM F1007.
3. Material: Carbon steel with asbestos-free PTFE packing.
4. Design: With internal guide and injection ports for repacking under full system pressure. Housing shall be furnished with drain ports and lifting ring. Include drip connection if used for steam piping.
5. Configuration: Single joint with base and double joint with base class(es), unless otherwise indicated.
6. Slip Tube for sizes NPS 1-1/2 through NPS 16 Schedule 80.
7. Slip Tube for sizes NPS 18 through NPS 24 Schedule 60.
8. Sliding Surface: 2 mil thick chrome finish.
9. End Connections: Flanged or welded ends to match piping system.

2.3 GROOVED-JOINT EXPANSION JOINTS

A. Product equal to:

1. Grinnell G-Fire by Johnson Controls Company, https://www.grinnell.com/,
2. Shurjoint-Apollo Piping Products USA Inc, http://www.shurjoint.com/eng/
3. Victaulic Company, https://www.victaulic.com/
4. Approved equivalent.

B. Description: Factory-assembled expansion joint made of several grooved-end pipe nipples, couplings, and grooved joints.

C. Standard: AWWA C606, for grooved joints.

D. Nipples: Galvanized, ASTM A53/A53M, Schedule 40, Type E or S, steel pipe with grooved ends.

E. Couplings: Seven, flexible type for steel-pipe dimensions. Include ferrous housing sections, ethylene-propylene-diene terpolymer rubber gasket suitable for cold and hot water, and bolts and nuts.

2.4 ALIGNMENT GUIDES AND ANCHORS

A. Alignment Guides.

1. Products equal to:

a. Flexicraft Industries, http://www.flexicraft.com.
b. Mason Industries, Inc, https://mason-ind.com.
c. Metraflex Company, https://www.metraflex.com.
d. Approved equivalent.

2. Description: Steel, factory-fabricated alignment guide, with bolted two-section outer cylinder and base for attaching to structure; with two-section guiding slider for bolting to pipe.

B. Anchor Materials:

1. Steel Shapes and Plates: ASTM A36/A36M.
2. Bolts and Nuts: ASME B18.10 or ASTM A183, steel hex head.
3. Washers: ASTM F844, steel, plain, flat washers.
4. Mechanical Fasteners: Insert-wedge-type stud with expansion plug anchor for use in hardened portland cement concrete, with tension and shear capacities appropriate for application.

    a. Stud: Threaded, zinc-coated carbon steel.
    b. Expansion Plug: Zinc-coated steel.
    c. Washer and Nut: Zinc-coated steel.

5. Chemical Fasteners: Insert-type stud, bonding-system anchor for use with hardened portland cement concrete, with tension and shear capacities appropriate for application.

    a. Bonding Material: ASTM C881/C881M, Type IV, Grade 3, two-component epoxy resin suitable for surface temperature of hardened concrete where fastener is to be installed.
    b. Stud: ASTM A307, zinc-coated carbon steel with continuous thread on stud, unless otherwise indicated.
    c. Washer and Nut: Zinc-coated steel.

PART 3 - EXECUTION

3.1 INSTALLATION OF EXPANSION JOINTS

A. Install expansion joints of sizes matching sizes of piping in which they are installed.

B. Install packed-type expansion joints with packing suitable for fluid service.

C. Install metal-bellows expansion joints according to EJMA's "Standards of the Expansion Joint Manufacturers Association, Inc."

D. Install grooved-joint expansion joints to grooved-end steel piping.

3.2 INSTALLATION OF PIPE LOOPS AND SWING CONNECTIONS

A. Install pipe loops cold-sprung in tension or compression as required to partly absorb tension or compression produced during anticipated change in temperature.

B. Connect risers and branch connections to mains with at least five pipe fittings, including tee in main.

C. Connect risers and branch connections to terminal units with at least four pipe fittings, including tee in riser.

D. Connect mains and branch connections to terminal units with at least four pipe fittings, including tee in main.

3.3 INSTALLATION OF ALIGNMENT GUIDES AND ANCHORS

A. Install alignment guides to guide expansion and to avoid end-loading and torsional stress.

B. Install two guide(s) on each side of pipe expansion fittings and loops. Install guides nearest to expansion joint not more than four pipe diameters from expansion joint.

C. Attach guides to pipe, and secure guides to building structure.

D. Install anchors at locations to prevent stresses from exceeding those permitted by ASME B31.9 and to prevent transfer of loading and stresses to connected equipment.

E. Anchor Attachments:

1. Anchor Attachment to Steel Pipe: Attach by welding. Comply with ASME B31.9 and ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
2. Anchor Attachment to Copper Tubing: Attach with pipe hangers. Use MSS SP-69, Type 24; U bolts bolted to anchor.

F. Fabricate and install steel anchors by welding steel shapes, plates, and bars. Comply with ASME B31.9 and AWS D1.1/D1.1M.

1. Anchor Attachment to Steel Structural Members: Attach by welding.
2. Anchor Attachment to Concrete Structural Members: Attach by fasteners. Follow fastener manufacturer's written instructions.

G. Use grout to form flat bearing surfaces for guides and anchors attached to concrete.

END OF SECTION 230516

SECTION 230517 - SLEEVES AND SLEEVE SEALS FOR HVAC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Sleeves.
2. Stack-sleeve fittings.
3. Sleeve-seal systems.
4. Sleeve-seal fittings.
5. Grout.
6. Silicone sealants.

1.3 SUBMITTALS

A. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions

B. Manufacturer's installation instructions shall be provided along with product data.

C. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).

D. Product Data: For each type of product.

E. Submit an Environmental Product Declaration (EPD) from the manufacturer for steel pipe sleeves within this specification section, if available. A statement of the contractor's good faith effort to obtain the EPD shall be provided if not available.

1. Manufacturer-provided EPDs must be Product Specific Type III (Third-Party Reviewed), in adherence with ISO 14025 *Environmental labels and declarations*, ISO 14044 *Environmental management – Life cycle assessment*, and *ISO 21930 Core rules for environmental product declarations of construction products and services*.

F. Field quality-control reports.

PART 2 - PRODUCTS

2.1 SLEEVES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Advance Products & Systems, Inc.
2. CALPICO, Inc.
3. GPT; an EnPro Industries Company.
4. Approved equivalent.

B. Cast-Iron Pipe Sleeves: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop collar.

C. Steel Pipe Sleeves: ASTM A53/A53M, Type E, Grade B, Schedule 40, anti-corrosion coatedorzinc coated, with plain ends and integral welded waterstop collar.

D. Galvanized-Steel Sheet Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

E. PVC Pipe Sleeves: ASTM D1785, Schedule 40.

F. Molded-PVC Sleeves: With nailing flange for attaching to wooden forms.

G. Molded-PE or -PP Sleeves: Removable, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.

2.2 STACK-SLEEVE FITTINGS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Jay R. Smith Mfg Co; a division of Morris Group International.
2. Zurn Industries, LLC.
3. Approved equivalent.

A. Description: Manufactured, galvanized cast-iron sleeve with integral cast flashing flange for use in waterproof floors and roofs. Include clamping ring, bolts, and nuts for membrane flashing.

1. Underdeck Clamp: Clamping ring with setscrews.

2.3 SLEEVE-SEAL SYSTEMS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Advance Products & Systems, Inc.

2. CALPICO, Inc.
3. GPT; an EnPro Industries Company.
4. Approved equivalent.

B. Description:

1. Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.
2. Designed to form a hydrostatic seal of 20-psig.
3. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size.
4. Pressure Plates: Carbon steel.
5. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, ASTM B633 of length required to secure pressure plates to sealing elements.

2.4 SLEEVE-SEAL FITTINGS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Advance Products & Systems, Inc.
2. CALPICO, Inc.
3. GPT; an EnPro Industries Company.
4. Approved equivalent.

B. Description:

1. Manufactured plastic, sleeve-type, waterstop assembly, made for imbedding in concrete slab or wall.
2. Plastic or rubber waterstop collar with center opening to match piping OD.

2.5 GROUT

A. Description: Nonshrink, recommended for interior and exterior sealing openings in nonfire-rated walls or floors.

B. Standard: ASTM C1107/C1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

2.6 SILICONE SEALANTS

A. Silicone, S, NS, 25, NT: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant, ASTM C920, Type S, Grade NS, Class 25, use NT.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Polymeric Systems, Inc.
    b. Sherwin-Williams Company (The).
    c. The Dow Chemical Company.
    d. Approved equivalent.

B. Silicone, S, P, 25, T, NT: Single-component, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade P, Class 25, Uses T and NT. Grade P Pourable (self-leveling) formulation is for opening in floors and other horizontal surfaces that are not fire rated.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. May National Associates, Inc.; a subsidiary of Sika Corporation.
    b. W.R. Meadows, Inc.
    c. Tremco CPG Inc.
    d. Approved equivalent.

C. Silicone Foam: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Smooth-On.
    b. Stockwell Elastomerics
    c. Approved equivalent.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION

A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.

B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs and walls.

1. Sleeves are not required for core-drilled holes.

C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.

1. Permanent sleeves are not required for holes in slabs formed by molded-PE or -PP sleeves.

2. Cut sleeves to length for mounting flush with both surfaces.

    a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level.

3. Using silicone sealant, seal space outside of sleeves in slabs and walls without sleeve-seal system.

D. Install sleeves for pipes passing through interior partitions.

1. Cut sleeves to length for mounting flush with both surfaces.
2. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
3. Seal annular space between sleeve and piping or piping insulation; use sealants appropriate for size, depth, and location of joint.

E. Fire-Resistance-Rated Penetrations, Horizontal Assembly Penetrations, and Smoke-Barrier Penetrations: Maintain indicated fire or smoke rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with fire- and smoke-stop materials. Comply with requirements for firestopping and fill materials specified in Section 078413 "Penetration Firestopping."

3.2 STACK-SLEEVE-FITTING INSTALLATION

A. Install stack-sleeve fittings in new slabs as slabs are constructed.

1. Install fittings that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
2. Secure flashing between clamping flanges for pipes penetrating floors with membrane waterproofing. Comply with requirements for flashing specified in Section 076200 "Sheet Metal Flashing and Trim."
3. Install section of cast-iron soil pipe to extend sleeve to 3 inches above finished floor level.
4. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
5. Using waterproof silicone sealant, seal space between top hub of stack-sleeve fitting and pipe.

B. Fire-Resistance-Rated, Horizontal Assembly, and Smoke Barrier Penetrations: Maintain indicated fire or smoke rating of floors at pipe penetrations. Seal pipe penetrations with fire- and smoke-stop materials. Comply with requirements for firestopping specified in Section 078413 "Penetration Firestopping."

3.3 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.

B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble

sleeve-seal-system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3.4 SLEEVE-SEAL-FITTING INSTALLATION

A. Install sleeve-seal fittings as new walls and slabs are constructed.

B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.

C. Secure nailing flanges to concrete forms.

D. Using silicone sealant, seal space around outside of sleeve-seal fittings.

3.5 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Leak Test: After allowing for a full cure, test sleeves and sleeve seals for leaks. Repair leaks and retest until no leaks exist.

B. Sleeves and sleeve seals will be considered defective if they do not pass tests and inspections.

3.6 SLEEVE AND SLEEVE-SEAL SCHEDULE

A. Use sleeves and sleeve seals for the following piping-penetration applications:

1. Exterior Concrete Walls Above Grade:

a. Piping Smaller Than NPS 6:Cast-iron sleeves
b. Piping NPS 6 and Larger: Steel pipe sleeves.

2. Exterior Concrete Walls Below Grade:

a. Piping Smaller Than NPS 6: Cast-iron pipe sleeves with sleeve-seal system.

1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

b. Piping NPS 6 and Larger: Steel pipe sleeves with sleeve-seal system.

1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

3. Concrete Slabs-on-Grade:

a. Piping Smaller Than NPS 6: Cast-iron pipe sleeves with sleeve-seal system.

1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

b. Piping NPS 6 and Larger: Steel pipe sleeves with sleeve-seal system.

1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

4. Concrete Slabs Above Grade:

a. Piping Smaller Than NPS 6] <Insert pipe size>: [Steel pipe sleeves] [PVC-pipe sleeves] [Stack-sleeve fittings] [Sleeve-seal fittings] [Molded-PE or -PP sleeves] [Molded-PVC sleeves] <Insert material>.
b. Piping [NPS 6] <Insert pipe size> and Larger: [Steel pipe sleeves] [PVC-pipe sleeves] [Stack-sleeve fittings] <Insert material>.

5. Interior Partitions:

a. Piping Smaller Than NPS 6: Steel pipe sleeves .
b. Piping NPS 6and Larger: Galvanized-steel sheet sleeves.

END OF SECTION 230517

SECTION 230519 - METERS AND GAGES FOR HVAC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Bimetallic-actuated thermometers.
2. Filled-system thermometers.
3. Liquid-in-glass thermometers.
4. Duct-thermometer mounting brackets.
5. Thermowells.
6. Dial-type pressure gages.
7. Gage attachments.
8. Test plugs.
9. Test-plug kits.
10. Sight flow indicators.

1.3 SUBMITTALS

A. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.

B. Manufacturer’s installation instructions shall be provided along with product data.

C. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).

D. Product Data: For each type of product.

E. Shop Drawings:

1. Include diagrams for power, signal, and control wiring.

F. Product Certificates: For each type of meter and gage.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For meters and gages to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 BIMETALLIC-ACTUATED THERMOMETERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Ashcroft Inc.
2. Marsh Bellofram.
3. Trerice, H. O. Co.
4. Approved equivalent.

B. Standard: ASME B40.200.

C. Case: Liquid-filled and sealed type(s); stainless steel with 3-inch nominal diameter.

D. Dial: Nonreflective aluminum with permanently etched scale markings and scales in deg F].

E. Connector Type(s): Union joint, adjustable angle rigid, back and rigid, bottom , with unified-inch screw threads.

F. Connector Size: 1/2 inch, with ASME B1.1 screw threads.

G. Stem: 0.25 or 0.375 inch in diameter; stainless steel.

H. Window: Plain glass.

I. Ring: Stainless steel.

J. Element: Bimetal coil.

K. Pointer: Dark-colored metal.

L. Accuracy: Plus or minus 1percent of scale range.

2.2 FILLED-SYSTEM THERMOMETERS

A. Direct-Mounted, Metal-Case, Vapor-Actuated Thermometers:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Ashcroft Inc.
b. Trerice, H. O. Co.
c. Weiss Instruments, Inc.
d. Approved equivalent.

2. Standard: ASME B40.200.
3. Case: Sealed type, cast aluminum or drawn steel; 4-1/2-inch nominal diameter.
4. Element: Bourdon tube or other type of pressure element.
5. Movement: Mechanical, dampening type, with link to pressure element and connection to pointer.
6. Dial: Nonreflective aluminum with permanently etched scale markings graduated in deg F.
7. Pointer: Dark-colored metal.
8. Window: Glass.
9. Ring: Metal.
10. Connector Type(s): Union joint, adjustable, 180 degrees in vertical plane, 360 degrees in horizontal plane, with locking device rigid, back and rigid, bottom; with ASME B1.1 screw threads.
11. Thermal System: Liquid-filled bulb in copper-plated steel, aluminum, or brass stem and of length to suit installation.

    a. Design for Air-Duct Installation: With ventilated shroud.
    b. Design for Thermowell Installation: Bare stem.

12. Accuracy: Plus or minus 1 percent of scale range.

B. Remote-Mounted, Metal-Case, Vapor-Actuated Thermometers:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Ashcroft Inc.
    b. Trerice, H. O. Co.
    c. Weiss Instruments, Inc.
    d. Approved equivalent.

2. Standard: ASME B40.200.
3. Case: Sealed type, cast aluminum or drawn steel; 4-1/2-inch nominal diameter with back flange and holes for panel mounting.
4. Element: Bourdon tube or other type of pressure element.
5. Movement: Mechanical, with link to pressure element and connection to pointer.
6. Dial: Nonreflective aluminum with permanently etched scale markings graduated in deg F.
7. Pointer: Dark-colored metal.
8. Window: Glass.
9. Ring: Metal.
10. Connector Type(s): Union joint, back with ASME B1.1 screw threads.
11. Thermal System: Liquid-filled bulb in copper-plated steel, aluminum, or brass stem and of length to suit installation.

    a. Design for Air-Duct Installation: With ventilated shroud.

b. Design for Thermowell Installation: Bare stem.

12. Accuracy: Plus or minus 1 percent of scale range.

2.3 LIQUID-IN-GLASS THERMOMETERS

A. Metal-Case, Compact-Style, Liquid-in-Glass Thermometers:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

   a. Trerice, H. O. Co.
   b. Approved equivalent.

2. Standard: ASME B40.200.
3. Case: Cast aluminum; 6-inch nominal size.
4. Case Form: Back angle unless otherwise indicated.
5. Tube: Glass with magnifying lens and blue or red organic liquid.
6. Tube Background: Nonreflective aluminum with permanently etched scale markings graduated in deg F.
7. Window: Glass or plastic.
8. Stem: Aluminum or brass and of length to suit installation.

   a. Design for Air-Duct Installation: With ventilated shroud.
   b. Design for Thermowell Installation: Bare stem.

9. Connector: 3/4 inch, with ASME B1.1 screw threads.
10. Accuracy: Plus or minus 1 percent of scale range or one scale division, to a maximum of 1.5 percent of scale range.

B. Metal-Case, Industrial-Style, Liquid-in-Glass Thermometers:

1. Standard: ASME B40.200.
2. Case: Cast aluminum; 7-inch (nominal size unless otherwise indicated.
3. Case Form: Adjustable angle unless otherwise indicated.
4. Tube: Glass with magnifying lens and blue or red organic liquid.
5. Tube Background: Nonreflective aluminum with permanently etched scale markings graduated in deg F.
6. Window: Glass.
7. Stem: Aluminum and of length to suit installation.

   a. Design for Air-Duct Installation: With ventilated shroud.
   b. Design for Thermowell Installation: Bare stem.

8. Connector: 1-1/4 inches (32 mm), with ASME B1.1 screw threads.
9. Accuracy: Plus or minus 1 percent of scale range or one scale division, to a maximum of 1.5 percent of scale range.

2.4 DUCT-THERMOMETER MOUNTING BRACKETS

A. Description: Flanged bracket with screw holes, for attachment to air duct and made to hold thermometer stem.

2.5 THERMOWELLS

A. Thermowells:

1. Standard: ASME B40.200.
2. Description: Pressure-tight, socket-type fitting made for insertion in piping tee fitting.
3. Material for Use with Copper Tubing: CUNI.
4. Material for Use with Steel Piping: CRES.
5. Type: Stepped shank unless straight or tapered shank is indicated.
6. External Threads: NPS 1/2, NPS 3/4, or NPS 1, ASME B1.20.1 pipe threads.
7. Internal Threads: 1/2, 3/4, and 1 inch, with ASME B1.1 screw threads.
8. Bore: Diameter required to match thermometer bulb or stem.
9. Insertion Length: Length required to match thermometer bulb or stem.
10. Lagging Extension: Include on thermowells for insulated piping and tubing.
11. Bushings: For converting size of thermowell's internal screw thread to size of thermometer connection.

B. Heat-Transfer Medium: Mixture of graphite and glycerin.

2.6 DIAL-TYPE PRESSURE GAGES

A. Direct-Mounted, Metal-Case, Dial-Type Pressure Gages:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Ashcroft Inc.
    b. Marsh Bellofram.
    c. Trerice, H. O. Co.
    d. Approved equivalent.

2. Standard: ASME B40.100.
3. Case: Sealed type(s); cast aluminum or drawn steel; 4-1/2-inchnominal diameter.
4. Pressure-Element Assembly: Bourdon tube unless otherwise indicated.
5. Pressure Connection: Brass, with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads and bottom-outlet type unless back-outlet type is indicated.
6. Movement: Mechanical, with link to pressure element and connection to pointer.
7. Dial: Nonreflective aluminum with permanently etched scale markings graduated in psi.
8. Pointer: Dark-colored metal.
9. Window: Glass.
10. Ring: Metal].
11. Accuracy: Grade A, plus or minus 1 percent of middle half of scale range.

B. Remote-Mounted, Metal-Case, Dial-Type Pressure Gages:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Ashcroft Inc.
    b. Marsh Bellofram.
    c. Trerice, H. O. Co.
    d. Approved equivalent.

2. Standard: ASME B40.100.
3. Case: Sealed type; cast aluminum or drawn steel; 4-1/2-inch nominal diameter with back flange and holes for panel mounting.
4. Pressure-Element Assembly: Bourdon tube unless otherwise indicated.
5. Pressure Connection: Brass, with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads and bottom-outlet type unless back-outlet type is indicated.
6. Movement: Mechanical, with link to pressure element and connection to pointer.
7. Dial: Nonreflective aluminum with permanently etched scale markings graduated in psi.
8. Pointer: Dark-colored metal.
9. Window: Glass.
10. Ring: Metal.
11. Accuracy: Grade A, plus or minus 1 percent of middle half of scale range.
12. Window: Glass.
13. Ring: Metal.
14. Accuracy: Grade A, plus or minus 1 percent of middle half of scale range.

2.7 GAGE ATTACHMENTS

A. Snubbers: ASME B40.100, brass; with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads and piston-type surge-dampening device. Include extension for use on insulated piping.

B. Siphons: Loop-shaped section of brass pipe with NPS 1/4 or NPS 1/2 pipe threads.

C. Valves: Brass ball, with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads.

2.8 TEST PLUGS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Peterson Equipment Co., Inc.
2. Trerice, H. O. Co.
3. Weiss Instruments, Inc.
4. Approved equivalent.

B. Description: Test-station fitting made for insertion in piping tee fitting.

C. Body: Brass or stainless steel with core inserts and gasketed and threaded cap. Include extended stem on units to be installed in insulated piping.

D. Thread Size: NPS 1/4, ASME B1.20.1 pipe thread.

E. Minimum Pressure and Temperature Rating: 500 psig at 200 deg F.

F. Core Inserts: Chlorosulfonated polyethylene synthetic and EPDM self-sealing rubber.

2.9 TEST-PLUG KITS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Peterson Equipment Co., Inc.
2. Trerice, H. O. Co.
3. Weiss Instruments, Inc.
4. Approved equivalent.

B. Furnish one test-plug kit(s) containing one thermometer(s), one pressure gage and adapter, and carrying case. Thermometer sensing elements, pressure gage, and adapter probes shall be of diameter to fit test plugs and of length to project into piping.

C. Low-Range Thermometer: Small, bimetallic insertion type with 1- to 2-inch-diameter dial and tapered-end sensing element. Dial range shall be at least 25 to 125 deg F.

D. High-Range Thermometer: Small, bimetallic insertion type with 1- to 2-inch- diameter dial and tapered-end sensing element. Dial range shall be at least 0 to 220 deg F.

E. Pressure Gage: Small, Bourdon-tube insertion type with 2- to 3-inch- diameter dial and probe. Dial range shall be at least 0 to 200 psig.

F. Carrying Case: Metal or plastic, with formed instrument padding.

2.10 SIGHT FLOW INDICATORS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. ARCHON Industries, Inc.
2. Dwyer Instruments, Inc.
3. Emerson Process Management; Rosemount Division.
4. Approved equivalent.

B. Description: Piping inline-installation device for visual verification of flow.

C. Construction: Bronze or stainless-steel body, with sight glass and ball, flapper, or paddle wheel indicator, and threaded or flanged ends.

D. Minimum Pressure Rating: 125 psig.

E. Minimum Temperature Rating: 200 deg F.

F. End Connections for NPS 2 and Smaller: Threaded.

G. End Connections for NPS 2-1/2 and Larger: Flanged.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install thermowells with socket extending one-third of pipe diameter] and in vertical position in piping tees.

B. Install thermowells of sizes required to match thermometer connectors. Include bushings if required to match sizes.

C. Install thermowells with extension on insulated piping.

D. Fill thermowells with heat-transfer medium.

E. Install direct-mounted thermometers in thermowells and adjust vertical and tilted positions.

F. Install remote-mounted thermometer bulbs in thermowells and install cases on panels; connect cases with tubing and support tubing to prevent kinks. Use minimum tubing length.

G. Install duct-thermometer mounting brackets in walls of ducts. Attach to duct with screws.

H. Install direct-mounted pressure gages in piping tees with pressure gage located on pipe at the most readable position.

I. Install remote-mounted pressure gages on panel.

J. Install valve and snubber in piping for each pressure gage for fluids (except steam).

K. Install valve and syphon fitting in piping for each pressure gage for steam.

L. Install test plugs in piping tees.

M. Install flow indicators in piping systems in accessible positions for easy viewing.

N. Assemble and install connections, tubing, and accessories between flow-measuring elements and flowmeters according to manufacturer's written instructions.

O. Install permanent indicators on walls or brackets in accessible and readable positions.

P. Install connection fittings in accessible locations for attachment to portable indicators.

Q. Mount thermal-energy meters on wall if accessible; if not, provide brackets to support meters.

R. Install thermometers in the following locations:

1. Inlet and outlet of each hydronic zone.
2. Inlet and outlet of each hydronic boiler.
3. Two inlets and two outlets of each chiller.
4. Inlet and outlet of each hydronic coil in air-handling units.
5. Two inlets and two outlets of each hydronic heat exchanger.
6. Inlet and outlet of each thermal-storage tank.
7. Outside-, return-, supply-, and mixed-air ducts.

S. Install pressure gages in the following locations:

1. Discharge of each pressure-reducing valve.
2. Inlet and outlet of each chiller chilled-water and condenser-water connection.
3. Suction and discharge of each pump.

3.2 CONNECTIONS

A. Install meters and gages adjacent to machines and equipment to allow space for service and maintenance of meters, gages, machines, and equipment.

B. Connect flowmeter-system elements to meters.

C. Connect flowmeter transmitters to meters.

D. Connect thermal-energy meter transmitters to meters.

3.3 ADJUSTING

A. After installation, calibrate meters according to manufacturer's written instructions.

B. Adjust faces of meters and gages to proper angle for best visibility.

3.4 THERMOMETER SCHEDULE

A. Thermometers at inlet and outlet of each hydronic zone shall be one of the following:

1. Sealed, bimetallic-actuated type.
2. Direct-mounted, metal-case, vapor-actuated type.
3. Industrial-style, liquid-in-glass type.

B. Thermometers at inlet and outlet of each hydronic boiler shall be one of the following:

1. Sealed, bimetallic-actuated type.
2. Direct mounted, metal -case, vapor-actuated type.
3. Industrial-style, liquid-in-glass type.

C. Thermometers at inlets and outlets of each chiller shall be one of the following:

1. Sealed, bimetallic-actuated type.
2. Direct-mounted, metal -case, vapor-actuated type.
3. Industrial-style, liquid-in-glass type.

D. Thermometers at inlet and outlet of each hydronic coil in air-handling units and built-up central systems shall be one of the following:

1. Sealed, bimetallic-actuated type.
2. Direct-mounted, metal -case, vapor-actuated type.
3. Industrial-style, liquid-in-glass type.

E. Thermometers at inlets and outlets of each hydronic heat exchanger shall be one of the following:

1. Sealed, bimetallic-actuated type.
2. Direct-mounted, metal -case, vapor-actuated type.
3. Industrial-style, liquid-in-glass type.

F. Thermometers at inlet and outlet of each hydronic heat-recovery unit shall be one of the following:

1. Sealed, bimetallic-actuated type.
2. Direct-mounted, metal -case, vapor-actuated type.
3. Industrial-style, liquid-in-glass type.

G. Thermometers at inlet and outlet of each thermal-storage tank shall be one of the following:

1. Sealed, bimetallic-actuated type.
2. Direct-mounted, metal -case, vapor-actuated type.
3. Industrial-style, liquid-in-glass type.

H. Thermometers at outside-, return-, supply-, and mixed-air ducts shall be one of the following:

1. Sealed, bimetallic-actuated type.
2. Direct-mounted, metal -case, vapor-actuated type.
3. Industrial-style, liquid-in-glass type.

I. Thermometer stems shall be of length to match thermowell insertion length.

3.5 THERMOMETER SCALE-RANGE SCHEDULE

A. Scale Range for Heating, Hot-Water Piping: 0 to 250 deg F.

B. Scale Range for Air Ducts: Minus 40 to plus 120 deg F.

3.6 PRESSURE-GAGE SCHEDULE

A. Pressure gages at discharge of each pressure-reducing valve shall be one of the following:

1. Sealed, direct -mounted, metal case.
2. Test plug with EPDM self-sealing rubber inserts.

B. Pressure gages at inlet and outlet of each chiller chilled-water and condenser-water connection shall be one of the following:

1. Sealed, direct -mounted, metal case.
2. Test plug with EPDM self-sealing rubber inserts.

C. Pressure gages at suction and discharge of each pump shall be one of the following:

1. Sealed, direct -mounted, metal case.
2. Test plug with EPDM self-sealing rubber inserts.

3.7 PRESSURE-GAGE SCALE-RANGE SCHEDULE

A. Scale Range for Heating, Hot-Water Piping: 30-in. Hg to 15 psi.

END OF SECTION 230519

SECTION 230523.11 - GLOBE VALVES FOR HVAC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Bronze angle valves.
2. Bronze globe valves.
3. Iron globe valves.

1.3 DEFINITIONS

A. CWP: Cold working pressure.

1.4 SUBMITTALS

A. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.

B. Manufacturer’s installation instructions shall be provided along with product data.

C. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).

D. Product Data: For each type of valve.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:

1. Protect internal parts against rust and corrosion.
2. Protect threads, flange faces, grooves, and weld ends.
3. Set angle and globe valves closed to prevent rattling.

B. Use the following precautions during storage:

1. Maintain valve end protection.

2. Store valves indoors and maintain at higher-than-ambient dew point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.

B. ASME Compliance:

1. ASME B1.20.1 for threads for threaded-end valves.
2. ASME B16.1 for flanges on iron valves.
3. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
4. ASME B31.1 for power piping valves.
5. ASME B31.9 for building services piping valves.

C. Refer to HVAC valve schedule articles for applications of valves.

D. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

E. Valve Sizes: Same as upstream piping unless otherwise indicated.

F. Valves in Insulated Piping: With 2-inch (50-mm) stem extensions.

G. Valves shall be first quality, free from all imperfections and defects, with body markings indicating manufacturer and rating.

H. Valve parts of same manufacturer, size and type shall be interchangeable.

I. Manually operated globe and angle valves shall be of rising stem type, unless otherwise specified.

J. Valves which use packing, shall be capable of being packed when wide open and under full working pressure.

2.2 BRONZE ANGLE VALVES

A. Bronze Angle Valves, Class 125:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Hammond Valve.
b. Milwaukee Valve Company.
c. NIBCO INC.
d. Approved equivalent.

2. Description:

a. Standard: MSS SP-80, Type 1.
b. CWP Rating: 200 psig (1380 kPa).
c. Body Material: ASTM B62, bronze with integral seat and screw-in bonnet.
d. Ends: Threaded.
e. Stem and Disc: Bronze.
f. Packing: Asbestos free.
g. Handwheel: Malleable iron, bronze.

B. Bronze Angle Valves, Class 150:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. KITZ Corporation.
b. Stockham; a Crane brand.
c. Approved equivalent.

2. Description:

a. Standard: MSS SP-80, Type 1.
b. CWP Rating: 300 psig (2070 kPa).
c. Body Material: ASTM B62, bronze with integral seat and union-ring bonnet.
d. Ends: Threaded.
e. Stem and Disc: Bronze.
f. Packing: Asbestos free.
g. Handwheel: Malleable iron, bronze, or .

2.3 BRONZE GLOBE VALVES

A. Bronze Globe Valves, Class 125:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Hammond Valve.
b. Milwaukee Valve Company.
c. NIBCO INC.
d. Approved equivalent.

2. Description:

a. Standard: MSS SP-80, Type 1.
b. CWP Rating: 200 psig (1380 kPa).
c. Body Material: ASTM B62, bronze with integral seat and screw-in bonnet.
d. Ends: Threaded.
e. Stem and Disc: Bronze.
f. Packing: Asbestos free.
g. Handwheel: Malleable iron, bronze.

B. Bronze Globe Valves, Class 150:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Hammond Valve.
b. Milwaukee Valve Company.
c. NIBCO INC.
d. Approved equivalent.

2. Description:

a. Standard: MSS SP-80, Type 2.
b. CWP Rating: 300 psig (2070 kPa).
c. Body Material: ASTM B62, bronze with integral seat and union-ring bonnet.
d. Ends: Threaded.
e. Stem: Bronze.
f. Disc: Bronze.
g. Packing: Asbestos free.
h. Handwheel: Malleable iron, bronze.

2.4 IRON GLOBE VALVES

A. Iron Globe Valves, Class 125:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Hammond Valve.
b. Milwaukee Valve Company.
c. NIBCO INC.
d. Approved equivalent.

2. Description:

a. Standard: MSS SP-85, Type I.
b. CWP Rating: 200 psig (1380 kPa).
c. Body Material: ASTM A126, gray iron with bolted bonnet.

d. Ends: Flanged.
e. Trim: Bronze.
f. Packing and Gasket: Asbestos free.
g. Operator: Handwheel.

B. Iron Globe Valves, Class 250:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Hammond Valve.
b. Milwaukee Valve Company.
c. NIBCO INC.
d. Approved equivalent.

2. Description:

a. Standard: MSS SP-85, Type I.
b. CWP Rating: 500 psig (3450 kPa).
c. Body Material: ASTM A126, gray iron with bolted bonnet.
d. Ends: Flanged.
e. Trim: Bronze.
f. Packing and Gasket: Asbestos free.
g. Operator: Handwheel.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.

C. Examine threads on valve and mating pipe for form and cleanliness.

D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.

E. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE INSTALLATION

A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

B. Locate valves for easy access and provide separate support where necessary.

C. Install valves in horizontal piping with stem at or above center of pipe.

D. Install valves in position to allow full stem movement.

E. Install valve tags. Comply with requirements in Section 230553 "Identification for HVAC Piping and Equipment" for valve tags and schedules.

3.3 ADJUSTING

A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.4 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

A. If valve applications are not indicated, use the following:

1. Throttling Service except Steam: Globe or angle valves.

B. If valves with specified CWP ratings are unavailable, the same types of valves with higher CWP ratings may be substituted.

C. Select valves with the following end connections:

1. For Copper Tubing, NPS 2 (DN 50) and Smaller: Threaded ends.
2. For Copper Tubing, NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Flanged ends except where threaded valve-end option is indicated in valve schedules.
3. For Copper Tubing, NPS 5 (DN 125) and Larger: Flanged ends.
4. For Steel Piping, NPS 2 (DN 50) and Smaller: Threaded ends.
5. For Steel Piping, NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Flanged ends except where threaded valve-end option is indicated in valve schedules.
6. For Steel Piping, NPS 5 (DN 125) and Larger: Flanged ends.

3.5 CONDENSER-WATER VALVE SCHEDULE

A. Pipe NPS 2-1/2 (DN 65) and Larger: Iron globe valves, Class 250, with flanged ends.

3.6 HEATING-WATER VALVE SCHEDULE

A. Pipe NPS 2 (DN 50) and Smaller: Bronze angle or globe valves, class 150, with bronze disc, and threaded ends.

B. Pipe NPS 2-1/2 (DN 65) and Larger: Iron globe valves, class 250, with flanged ends.

END OF SECTION 230523.11

SECTION 230523.14 - CHECK VALVES FOR HVAC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Bronze lift check valves.
2. Bronze swing check valves.

1.3 DEFINITIONS

A. CWP: Cold working pressure.

B. EPDM: Ethylene propylene copolymer rubber.

C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.

D. SWP: Steam working pressure.

1.4 SUBMITTALS

A. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.

B. Manufacturer’s installation instructions shall be provided along with product data.

C. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).

D. Product Data: For each type of valve.

E. Valve Schedule: List type of valve, manufacturer’s model number, and size for each service application.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:

1. Protect internal parts against rust and corrosion.
2. Protect threads, flange faces, grooves, and weld ends.
3. Block check valves in either closed or open position.

B. Use the following precautions during storage:

1. Maintain valve end protection.
2. Store valves indoors and maintain at higher than ambient dew point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.

B. ASME Compliance:

1. ASME B1.20.1 for threads for threaded-end valves.
2. ASME B16.1 for flanges on iron valves.
3. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
4. ASME B16.18 for solder joint.
5. ASME B31.1 for power piping valves.
6. ASME B31.9 for building services piping valves.

C. AWWA Compliance: Comply with AWWA C606 for grooved-end connections.

D. Bronze valves shall be made with dezincification-resistant materials. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc are not permitted.

E. Valve Pressure-Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

F. Valve Sizes: Same as upstream piping unless otherwise indicated.

G. Valve Bypass and Drain Connections: MSS SP-45.

H. Valves shall be first quality, free from all imperfections and defects, with body markings indicating manufacturer and rating.

I. Valve parts of same manufacturer, size and type shall be interchangeable.

2.2 BRONZE LIFT CHECK VALVES

A. Bronze Lift Check Valves with Bronze Disc, Class 125:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Crane; a Crane brand.
    b. Jenkins Valves; a Crane brand.
    c. Stockham; a Crane brand.
    d. Approved equivalent.

2. Description:

    a. Standard: MSS SP-80, Type 1.
    b. CWP Rating: 200 psig (1380 kPa).
    c. Body Design: Vertical flow.
    d. Body Material: ASTM B61 or ASTM B62, bronze.
    e. Ends: Threaded.
    f. Disc: Bronze.

2.3 BRONZE SWING CHECK VALVES

A. Bronze Swing Check Valves with Bronze Disc, Class 125:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Hammond Valve.
    b. Milwaukee Valve Company.
    c. NIBCO INC.
    d. Approved equivalent.

2. Description:

    a. Standard: MSS SP-80, Type 3.
    b. CWP Rating: 200 psig (1380 kPa).
    c. Body Design: Horizontal flow.
    d. Body Material: ASTM B62, bronze.
    e. Ends: Threaded.
    f. Disc: Bronze.

B. Bronze Swing Check Valves with Bronze Disc, Class 150:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Crane; a Crane brand.
b. Milwaukee Valve Company.
c. NIBCO INC.
d. Approved equivalent.

2. Description:

a. Standard: MSS SP-80, Type 3.
b. CWP Rating: 300 psig (2070 kPa).
c. Body Design: Horizontal flow.
d. Body Material: ASTM B62, bronze.
e. Ends: Threaded.
f. Disc: Bronze.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.

C. Examine threads on valve and mating pipe for form and cleanliness.

D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.

E. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE INSTALLATION

A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

B. Locate valves for easy access and provide separate support where necessary.

C. Install valves in horizontal piping with stem at or above center of pipe.

D. Install valves in position to allow full stem movement.

E. Install check valves for proper direction of flow and as follows:

1. Swing Check Valves: In horizontal position with hinge pin level.

2. Center-Guided and Plate-Type Check Valves: In horizontal or vertical position, between flanges.
3. Lift Check Valves: With stem upright and plumb.

F. Install valve tags. Comply with requirements for valve tags and schedules in Section 230553 "Identification for HVAC Piping and Equipment."

3.3 ADJUSTING

A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.4 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

A. If valve applications are not indicated, use the following:

1. Pump-Discharge Check Valves:

a. NPS 2 (DN 50) and Smaller: Bronze swing check valves with bronze disc.
b. NPS 2-1/2 (DN 65) and Larger: Iron swing check valves with lever and weight or with spring or iron, center-guided, metal-seat check valves.

B. If valves with specified SWP classes or CWP ratings are unavailable, the same types of valves with higher SWP classes or CWP ratings may be substituted.

C. Select valves, except wafer types, with the following end connections:

1. For Copper Tubing, NPS 2 (DN 50) and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules.
2. For Copper Tubing, NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Flanged ends except where threaded valve-end option is indicated in valve schedules.
3. For Copper Tubing, NPS 5 (DN 125) and Larger: Flanged ends.
4. For Steel Piping, NPS 2 (DN 50) and Smaller: Threaded ends.
5. For Steel Piping, NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Flanged ends except where threaded valve-end option is indicated in valve schedules.
6. For Steel Piping, NPS 5 (DN 125) and Larger: Flanged ends.
7. For Grooved-End Copper Tubing and Steel Piping except Steam and Steam Condensate Piping: Valve ends may be grooved.

3.5 CONDENSER-WATER VALVE SCHEDULE

A. Pipe NPS 2 (DN 50) and Smaller:

1. Bronze Valves: May be provided with solder-joint ends instead of threaded ends.
2. Bronze swing check valves with bronze disc, Class 150.

B. Pipe NPS 2-1/2 (DN 65) and Larger:

1. NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Iron valves may be provided with threaded ends instead of flanged ends.
2. NPS 2-1/2 to NPS 12 (DN 65 to DN 300): Iron swing check valves with lever and **spring** -closure control, Class 125.

3.6 HEATING-WATER VALVE SCHEDULE

A. Pipe NPS 2 (DN 50) and Smaller:

1. Bronze Valves: May be provided with solder-joint ends instead of threaded ends.
2. Bronze swing check valves with bronze disc, Class 150.

B. Pipe NPS 2-1/2 (DN 65) and Larger:

1. NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Iron valves may be provided with threaded ends instead of flanged ends.
2. NPS 2-1/2 to NPS 12 (DN 65 to DN 300): Iron swing check valves with lever and spring-closure control, Class 125.
3. NPS 3 to NPS 12 (DN 80 to DN 300): Iron, grooved-end check valves, 300 CWP.

END OF SECTION 230523.14

SECTION 230529 - HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Metal pipe hangers and supports.
2. Trapeze pipe hangers.
3. Fiberglass pipe hangers.
4. Metal framing systems.
5. Fiberglass strut systems.
6. Thermal-hanger shield inserts.
7. Fastener systems.
8. Pipe stands.
9. Equipment stands.
10. Equipment supports.

B. Related Requirements:

1. Section 055000 "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.
2. Section 230516 "Expansion Fittings and Loops for HVAC Piping" for pipe guides and anchors.
3. Section 230548.13 "Vibration Controls for HVAC" for vibration isolation devices.
4. Section 233113 "Metal Ducts" for duct hangers and supports.

1.3 SUBMITTALS

A. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.

B. Manufacturer’s installation instructions shall be provided along with product data.

C. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).

D. Product Data: For each type of product.

E. Shop Drawings: Show fabrication and installation details and for the following; include Product Data for components:

1. Trapeze pipe hangers.
2. Metal framing systems.
3. Fiberglass strut systems.
4. Pipe stands.
5. Equipment supports.

F. Welding certificates.

1.4 QUALITY ASSURANCE

A. Structural-Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code, Section IX.

C. Regulatory Requirements:

1. Comply with the applicable requirements of the ASME B31 Piping Codes.
2. Unless otherwise shown or specified, comply with the requirements of the Manufacturer's Standardization Society of the Valve and Fittings Industry (MSS) Standards SP-58, and SP-69.

PART 2 - PRODUCTS

2.1 METAL PIPE HANGERS AND SUPPORTS

A. Carbon-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Galvanized Metallic Coatings: Pregalvanized, hot-dip galvanized, or electro-galvanized.
3. Nonmetallic Coatings: Plastic coated, or epoxy powder-coated.
4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.

B. Stainless Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
3. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.

C. Copper Pipe and Tube Hangers:

1. Description: MSS SP-58, Types 1 through 58, copper-plated steel, factory-fabricated components.
2. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.

2.2 TRAPEZE PIPE HANGERS

A. Description: MSS SP-58, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

2.3 FIBERGLASS PIPE HANGERS

A. Clevis-Type, Fiberglass Pipe Hangers:

1. Description: Similar to MSS SP-58, Type 1, factory-fabricated steel pipe hanger except hanger is made of fiberglass or fiberglass-reinforced resin.
2. Hanger Rods: Continuous-thread rod, washer, and nuts made of stainless steel <Insert material>.
3. Flammability: ASTM D635, ASTM E84, and UL 94.

B. Strap-Type, Fiberglass Pipe Hangers:

1. Description: Similar to MSS SP-58, Type 9 or Type 10, steel pipe hanger except hanger is made of fiberglass-reinforced resin.

    a. Flammability: ASTM D635, ASTM E84, and UL 94.

2. Hanger Rod and Fittings: Continuous-thread rod, washer, and nuts made of stainless steel.

2.4 PLASTIC PIPE HANGERS

A. Description: Similar to MSS SP-58, Types 1 through 58, factory-fabricated steel pipe hanger except hanger is made of plastic.

B. Hanger Rods: Continuous-thread rod, nuts, and washer made of galvanized steel.

C. Flammability: ASTM D635, ASTM E84, and UL 94.

2.5 METAL FRAMING SYSTEMS

A. MFMA Manufacturer Metal Framing Systems:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. ABB (Electrification Products Division).
b. Flex-Strut Inc.
c. MIRO Industries.
d. Approved equivalent.

2. Description: Shop- or field-fabricated, pipe-support assembly made of steel channels, accessories, fittings, and other components for supporting multiple parallel pipes.
3. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
4. Channels: Continuous slotted carbon-steel channel with inturned lips.
5. Channel Width: Selected for applicable load criteria.
6. Channel Nuts: Formed or stamped nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
7. Hanger Rods: Continuous-thread rod, nuts, and washer made of galvanized steel.
8. Metallic Coating: Hot-dip galvanized.
9. Paint Coating: Green epoxy, acrylic, or urethane.
10. Plastic Coating: PVC.

B. Non-MFMA Manufacturer Metal Framing Systems:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Carpenter & Paterson, Inc.
b. MIRO Industries.
c. Rooftop Support Systems, a division of Eberl Iron Works, Inc.
d. Approved equivalent.

2. Description: Shop- or field-fabricated, pipe-support assembly made of steel channels, accessories, fittings, and other components for supporting multiple parallel pipes.
3. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
4. Channels: Continuous slotted carbon-steel channel with inturned lips.
5. Channel Width: Select for applicable load criteria.
6. Channel Nuts: Formed or stamped nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
7. Hanger Rods: Continuous-thread rod, nuts, and washer made of galvanized steel.
8. Metallic Coating: Hot-dip galvanized.
9. Paint Coating: Green epoxy, acrylic, or urethane.
10. Plastic Coating: PVC.

2.6 FIBERGLASS STRUT SYSTEMS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Atkore International (Unistrut).
2. Champion Fiberglass, Inc.
3. Fabco Plastics Wholesale Limited.
4. Approved equivalent.

B. Description: Structural-grade, factory-formed, glass-fiber-resin channels and angles for supporting multiple parallel pipes.

1. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
2. Channels: Continuous slotted fiberglass-reinforced plastic channel with inturned lips.
3. Channel Width: Selected for applicable load criteria.
4. Fittings and Accessories: Products provided by channel and angle manufacturer and designed for use with those items.
5. Fitting and Accessory Materials: Same as those for channels and angles, except metal items may be stainless steel.
6. Rated Strength: Selected to suit applicable load criteria.
7. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

2.7 THERMAL-HANGER SHIELD INSERTS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Carpenter & Paterson, Inc.
2. National Pipe Hanger Corporation.
3. Piping Technology & Products, Inc.
4. Approved equivalent.

B. Insulation-Insert Material for Cold Piping: ASTM C552, Type II cellular glass with 100-psi (688-kPa minimum compressive strength and vapor barrier.

C. Insulation-Insert Material for Hot Piping: Water-repellent-treated, ASTM C533, Type I calcium silicate with 100-psi (688-kPa) minimum compressive strength.

D. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

E. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

F. Insert Length: Extend 2 inches (50 mm) beyond sheet metal shield for piping operating below ambient air temperature.

2.8 FASTENER SYSTEMS

A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Hilti, Inc.
b. ITW Ramset/Red Head; Illinois Tool Works, Inc.

c. MKT Fastening, LLC.
d. Approved equivalent.

B. Mechanical-Expansion Anchors: Insert-wedge-type anchors for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

1. 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. Hilti, Inc.
b. ITW Ramset/Red Head; Illinois Tool Works, Inc.
c. MKT Fastening, LLC.
d. Approved equivalent.

2. Indoor Applications: stainless steel.
3. Outdoor Applications: Stainless steel.

2.9 PIPE STANDS

A. General Requirements for Pipe Stands: Shop- or field-fabricated assemblies made of manufactured corrosion-resistant components to support roof-mounted piping.

B. Compact Pipe Stand:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. MIRO Industries.
b. PHP Systems/Design.
c. Rooftop Support Systems, a division of Eberl Iron Works, Inc.
d. Approved equivalent.

2. Description: Single base unit with integral-rod roller, pipe clamps, or V-shaped cradle to support pipe, for roof installation without membrane penetration.
3. Base: Single, vulcanized rubber, molded polypropylene, or polycarbonate.
4. Hardware: Galvanized steel or polycarbonate.
5. Accessories: Protection pads.

C. Low-Profile, Single Base, Single-Pipe Stand:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. MIRO Industries.
b. PHP Systems/Design.
c. Rooftop Support Systems, a division of Eberl Iron Works, Inc.

d. Approved equivalent.

2. Description: Single base with vertical and horizontal members, and pipe support, for roof installation without membrane protection.
3. Base: Single, vulcanized rubber, molded polypropylene, or polycarbonate.
4. Vertical Members: Two, galvanized-steel, continuous-thread 1/2-inch (12-mm) rods.
5. Horizontal Member: Adjustable horizontal, galvanized-steel pipe support channels.
6. Pipe Supports: Roller.
7. Hardware: Galvanized steel.
8. Accessories: Protection pads.
9. Height: 12 inches (300 mm) above roof.

D. High-Profile, Single Base, Single-Pipe Stand:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

   a. MIRO Industries.
   b. PHP Systems/Design.
   c. Rooftop Support Systems, a division of Eberl Iron Works, Inc.
   d. Approved equivalent.

2. Description: Single base, vertical and horizontal members, and pipe support, for roof installation without membrane penetration.
3. Base: Single vulcanized rubber or molded polypropylene.
4. Vertical Members: Two, galvanized-steel, continuous-thread 1/2-inch (12-mm) rods.
5. Horizontal Member: One, adjustable height, galvanized--steel pipe support slotted channel or plate.
6. Pipe Supports: Swivel hanger.
7. Hardware: Galvanized steel.
8. Accessories: Protection pads, 1/2-inch (12-mm) continuous-thread galvanized-steel rod] .
9. Height: 36 inches (900 mm) above roof.

E. High-Profile, Multiple-Pipe Stand:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

   a. MIRO Industries.
   b. PHP Systems/Design.
   c. Rooftop Support Systems, a division of Eberl Iron Works, Inc.
   d. Approved equivalent.

2. Description: Assembly of bases, vertical and horizontal members, and pipe supports, for roof installation without membrane penetration.
3. Bases: Two or more; vulcanized rubber.
4. Vertical Members: Two or more, galvanized-steel channels.
5. Horizontal Members: One or more, adjustable height, galvanized-steel pipe support.

6. Pipe Supports: Swivel hanger.
7. Hardware: Galvanized steel.
8. Accessories: Protection pads, 1/2-inch (12-mm) continuous-thread rod.
9. Height: 36 inches (900 mm) above roof.

F. Curb-Mounted-Type Pipe Stands: Shop- or field-fabricated pipe supports made from structural-steel shapes, continuous-thread rods, and rollers, for mounting on permanent stationary roof curb.

2.10 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2.11 OUTDOOR EQUIPMENT STANDS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. MIRO Industries.
2. RectorSeal HVAC; a CSW Industrials Company.
3. Rooftop Support Systems, a division of Eberl Iron Works, Inc.
4. Approved equivalent.

2.12 MATERIALS

A. Aluminum: ASTM B221 (ASTM B221M).

B. Carbon Steel: ASTM A1011/A1011M.

C. Structural Steel: ASTM A36/A36M, carbon-steel plates, shapes, and bars; galvanized.

D. Stainless Steel: ASTM A240/A240M.

E. Threaded Rods: Continuously threaded. Zinc-plated or galvanized steel for indoor applications and stainless steel for outdoor applications. Mating nuts and washers of similar materials as rods.

F. Grout: ASTM C1107/C1107M, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Nonstaining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping materials and installation for penetrations through fire-rated walls, ceilings, and assemblies.

B. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb (90 kg).

3.2 HANGER AND SUPPORT INSTALLATION

A. Metal Pipe-Hanger Installation: Comply with MSS SP-58. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.

B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-58. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
2. Field fabricate from ASTM A36/A36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.

C. Fiberglass Pipe-Hanger Installation: Comply with applicable portions of MSS SP-58. Install hangers and attachments as required to properly support piping from building structure.

D. Metal Framing System Installation: Arrange for grouping of parallel runs of piping, and support together on field-assembled strut systems.

E. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

F. Space hangers or supports for horizontal piping on maximum center distances as listed below, except as otherwise specified, or noted on the Drawings.

PIPE MATERIAL	MAXIMUM SPACING (Feet)
Steel	12
Steel Tubing	8
Copper or Copper Alloy	12
Copper Tubing	8

1. For Directional Changes: Install a hanger or support close to the point of change of direction of all pipe runs in either a horizontal or vertical plane.
2. For Concentrated Loads: Install additional hangers or supports, spaced as required and directed, at locations where concentrated loads such as in-line pumps, valves, fittings or accessories occur, to support the concentrated loads.

3. For Branch Piping Runs and Runouts Over 5 feet In Length: Install a minimum of one hanger, and additional hangers if required by the hanger spacing schedules.
4. Parallel Piping Runs: Where several pipe lines run parallel in the same plane and in close proximity to each other, trapeze hangers may be submitted for approval. Base hanger spacing for trapeze type hangers on the smallest size of pipe being supported. Design the entire hanger assembly based on a safety factor of five, for the ultimate strength of the material being used.

G. Fastener System Installation:

1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches (100 mm) thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

H. Pipe Stand Installation:

1. Pipe Stand Types except Curb-Mounted Type: Assemble components and mount on smooth roof surface. Do not penetrate roof membrane.
2. Curb-Mounted-Type Pipe Stands: Assemble components or fabricate pipe stand and mount on permanent, stationary roof curb. See Section 077200 "Roof Accessories" for curbs.

I. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

J. Install lateral bracing with pipe hangers and supports to prevent swaying.

K. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 (DN 65)> and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

L. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

M. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

N. Insulated Piping:

1. Attach clamps and spacers to piping.

a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.

2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.

    a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 (DN 100) and larger if pipe is installed on rollers.

3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.

    a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 (DN 100) and larger if pipe is installed on rollers.

4. Shield Dimensions for Pipe: Not less than the following:

    a. NPS 1/4 to NPS 3-1/2 (DN 8 to DN 90): 12 inches (305 mm) long and 0.048 inch (1.22 mm) thick.
    b. NPS 4 (DN 100): 12 inches (305 mm) long and 0.06 inch (1.52 mm) thick.
    c. NPS 5 and NPS 6 (DN 125 and DN 150): 18 inches (457 mm) long and 0.06 inch (1.52 mm) thick.
    d. NPS 8 to NPS 14 (DN 200 to DN 350): 24 inches (610 mm) long and 0.075 inch (1.91 mm) thick.
    e. NPS 16 to NPS 24 (DN 400 to DN 600): 24 inches (610 mm) long and 0.105 inch (2.67 mm) thick.

5. Pipes NPS 8 (DN 200) and Larger: Include wood or reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.
6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.3 UPPER HANGER ATTACHMENTS

A. General:

1. Secure upper hanger attachments to overhead structural steel, steel bar joists, or other suitable structural members.
2. Do not attach hangers to steel decks that are not to receive concrete fill.
3. Do not attach hangers to precast concrete plank decks less than 2-3/4 inches thick.
4. Do not use flat bars or bent rods as upper hanger attachments.

B. Attachment to Steel Frame Construction: Provide intermediate structural steel members where required by pipe support spacing. Select steel members for use as intermediate supports based on a minimum safety factor of five.

1. Do not use drive-on beam clamps.
2. Do not support piping over 4 inches in size from steel bar joists. Secure upper hanger attachments to steel bar joists at panel points of joists.
3. Do not drill holes in main structural steel members.
4. Beam clamps, with tie rods as specified, may be used as upper hanger attachments for the support of piping, subject to clamp manufacturer’s recommended limits.

C. Attachment to Concrete Filled Steel Decks:

1. New Construction: Install metal deck ceiling bolts.
2. Existing Construction: Install welding studs (except at roof decks). Do not support a load in excess of 250 lbs from any single welded stud.
3. Do not attach hangers to decks less than 2-1/2 inches thick.

D. Attachment to Cast-In-Place Concrete: Secure to overhead construction by means of cast-in-place concrete inserts.

E. Attachment to Existing Cast-In-Place Concrete:

1. For piping up to a maximum of 4 inches in size, secure hangers to overhead construction with self-drilling type expansion shields and machine bolts.
2. Secure hangers to wall or floor construction with single unit expansion shields or self-drilling type expansion shields and machine bolts.

F. Attachment to Cored Precast Concrete Decks (Flexicore, Dox Plank, Spancrete, etc.): Toggle bolts may be installed in cells for the support of piping up to a maximum of 2-1/2 inches in size.

G. Attachment to Hollow Block or Hollow Tile Filled Concrete Decks:

1. New Construction: Omit block or tile and pour solid concrete with cast-in-place inserts.
2. Existing Construction: Break out block or tile to access, and install machine bolt anchors at highest practical point on side of web.

H. Attachment to Waffle Type Concrete Decks:

1. New Construction: Install cast-in-place inserts.
2. Existing Construction: Install machine bolt expansion anchors at highest practical point on side of web.

I. Attachment to Precast Concrete Tee Construction:

1. New Construction: Tee hanger inserts between adjacent flanges, except at roof deck without concrete fill.
2. Existing Construction: Dual unit expansion shields in webs of tees. Install shields as high as possible in the webs.

    a. Exercise extreme care in the field drilling of holes to avoid damage to reinforcing.
    b. Do not use powder driven fasteners.

J. Attachment to Wood Construction: Secure hangers to the sides (only) of wood members, by means of malleable iron side beam connectors, or malleable iron or steel side beam brackets. Do not secure hanger attachments to nailing strips resting on top of steel beams.

1. Secure side beam connectors to wood members with two No. 18 x 1-1/2 inch long wood screws, or two No. 16 x 1-1/2 inch long drive screws. Do not support piping over 1-1/2 inches in size from side beam connectors. Do not hammer in wood screws.
2. Secure side beam brackets to wood members with steel bolts or lag screws. Do not use lag screws in wooden members having a nominal thickness (beam face) under 2 inches in size.

Install bolts or lag screws, in the sides of a timber or a joist, at the mid-point or above, not less than 2-1/2 inches from the lower edge when supporting branch lines and not less than 3 inches from the lower edge when supporting mains. Install heavy gage steel washers under all nuts.

3. Secure side beam brackets to wooden beams or joists, with lag screws or bolts of size as follows:

PIPE SIZE (Inches)	LAG SCREW SIZE (Inches)	BOLT DIAMETER (Inches)
2 and under	3/8 diameter x 1-3/4	3/8
2-1/2 and 3	1/2 diameter x 2	1/2
4 and 5	Use Bolt	5/8

a. Do not support piping larger than 3 inches with lag screws. Pre-drill holes for lag screws 1/8 inch in diameter less than the root diameter of the lag screw thread.

b. The minimum width of the lower face of wood beams or joints in which lag screws of size as specified may be used is as follows:

LAG SCREW DIAMETER (Inches)	NOMINAL WIDTH OF BEAM FACE (Inches)
3/8	2
1/2	3

4. Do not secure hanger attachment to the diagonals or vertical members of the trusses.

3.4 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Grouting: Place grout under supports for equipment and make bearing surface smooth.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.5 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.6 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches (40 mm).

3.7 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils (0.05 mm).

B. Touchup: Comply with requirements in Section 0991143 "Exterior Painting" Section 099123 "Interior Painting" and Section 099600 "High-Performance Coatings" < for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A780/A780M.

3.8 HANGER AND SUPPORT SCHEDULE

A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.

B. Comply with MSS SP-58 for pipe-hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use carbon-steel pipe hangers and supports]metal framing systems and attachments for general service applications.

F. Use stainless steel pipe hangers attachments for hostile environment applications.

G. Use copper-plated pipe hangers and stainless steel attachments for copper piping and tubing.

H. Use padded hangers for piping that is subject to scratching.

I. Use thermal-hanger shield inserts for insulated piping and tubing.

J. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30 (DN 15 to DN 750).
2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of up to 1050 deg F (566 deg C), pipes NPS 4 to NPS 24 (DN 100 to DN 600), requiring up to 4 inches (100 mm) of insulation.
3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36 (DN 20 to DN 900), requiring clamp flexibility and up to 4 inches (100 mm) of insulation.
4. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes NPS 1/2 to NPS 24 (DN 15 to DN 600) if little or no insulation is required.
5. Pipe Hangers (MSS Type 5): For suspension of pipes NPS 1/2 to NPS 4 (DN 15 to DN 100), to allow off-center closure for hanger installation before pipe erection.
6. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of noninsulated, stationary pipes NPS 3/4 to NPS 8 (DN 20 to DN 200).
7. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8 (DN 15 to DN 200).
8. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8 (DN 15 to DN 200).
9. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8 (DN 15 to DN 200).
10. Split Pipe Ring with or without Turnbuckle Hangers (MSS Type 11): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 8 (DN 10 to DN 200).
11. Extension Hinged or Two-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 3 (DN 10 to DN 80).
12. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30 (DN 15 to DN 750).
13. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.
14. Pipe Saddle Supports (MSS Type 36): For support of pipes NPS 4 to NPS 36 (DN 100 to DN 900), with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.
15. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 36 (DN 100 to DN 900), with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.
16. Adjustable Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes NPS 2-1/2 to NPS 36 (DN 65 to DN 900) if vertical adjustment is required, with steel-pipe base stanchion support and cast-iron floor flange.
17. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30 (DN 25 to DN 750), from two rods if longitudinal movement caused by expansion and contraction might occur.

18. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes NPS 2-1/2 to NPS 24 (DN 65 to DN 600), from single rod if horizontal movement caused by expansion and contraction might occur.
19. Complete Pipe Rolls (MSS Type 44): For support of pipes NPS 2 to NPS 42 (DN 50 to DN 1050) if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is unnecessary.
20. Pipe Roll and Plate Units (MSS Type 45): For support of pipes NPS 2 to NPS 24 (DN 50 to DN 600) if small horizontal movement caused by expansion and contraction might occur and vertical adjustment is unnecessary.
21. Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes NPS 2 to NPS 30 (DN 50 to DN 750) if vertical and lateral adjustment during installation might be required in addition to expansion and contraction.

K. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24 (DN 24 to DN 600).
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 (DN 20 to DN 600) if longer ends are required for riser clamps.

L. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches (150 mm) for heavy loads.
2. Steel Clevises (MSS Type 14): For 120 to 450 deg F (49 to 232 deg C) piping installations.
3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F (49 to 232 deg C) piping installations.

M. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.
3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
6. C-Clamps (MSS Type 23): For structural shapes.
7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.

9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
11. Malleable-Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
12. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:

    a. Light (MSS Type 31): 750 lb (340 kg).
    b. Medium (MSS Type 32): 1500 lb (680 kg).
    c. Heavy (MSS Type 33): 3000 lb (1360 kg).

13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.

N. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

O. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Restraint-Control Devices (MSS Type 47): Where indicated to control piping movement.
2. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches (32 mm).
3. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41, roll hanger with springs.
4. Spring Sway Braces (MSS Type 50): To retard sway, shock, vibration, or thermal expansion in piping systems.
5. Variable-Spring Hangers (MSS Type 51): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from hanger.
6. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from base support.
7. Variable-Spring Trapeze Hangers (MSS Type 53): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from trapeze support.
8. Constant Supports: For critical piping stress and if necessary to avoid transfer of stress from one support to another support, critical terminal, or connected equipment. Include auxiliary stops for erection, hydrostatic test, and load-adjustment capability. These supports include the following types:

a. Horizontal (MSS Type 54): Mounted horizontally.
b. Vertical (MSS Type 55): Mounted vertically.
c. Trapeze (MSS Type 56): Two vertical-type supports and one trapeze member.

P. Comply with MSS SP-58 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.

Q. Comply with MFMA-103 for metal framing system selections and applications that are not specified in piping system Sections.

R. Use mechanical-expansion anchors instead of building attachments where required in concrete construction.

END OF SECTION 230529

SECTION 230548.13 - VIBRATION CONTROLS FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Elastomeric isolation pads.
2. Elastomeric isolation mounts.
3. Restrained elastomeric isolation mounts.
4. Open-spring isolators.
5. Housed-spring isolators.
6. Restrained-spring isolators.
7. Pipe-riser resilient support.
8. Resilient pipe guides.
9. Air-spring isolators.
10. Restrained-air-spring isolators.
11. Elastomeric hangers.
12. Spring hangers.
13. Restraints - rigid type.
14. Restraint accessories.
15. Restrained isolation roof-curb rails.

1.3 DEFINITIONS

A. IBC: International Building Code.

B. OSHPD: Office of Statewide Health Planning and Development (for the State of California owned and regulated medical facilities).

1.4 SUBMITTALS

A. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.

B. Manufacturer’s installation instructions shall be provided along with product data.

C. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals)

D. Product Data: For each type of product.

1. Include rated load, rated deflection, and overload capacity for each vibration isolation device.
2. Include load rating for each wind-force-restraint fitting and assembly.
3. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of vibration isolation device and wind-force-restraint component.
4. Annotate to indicate application of each product submitted and compliance with requirements.
5. Interlocking Snubbers: Include ratings for horizontal, vertical, and combined loads.

E. Shop Drawings:

1. Detail fabrication and assembly of equipment bases.
2. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.

F. Delegated-Design Submittal:

1. For each wind-load protection device that is required by this Section or is indicated on Drawings, submit the following:

a. Vibration Isolator and Wind-Load-Restraint Selection: Select vibration isolators, wind-load restraints, and vibration isolation bases complying with performance requirements, design criteria, and analysis data.
b. Riser Supports: Include riser diagrams and calculations showing anticipated expansion and contraction at each support point, initial and final loads on building structure, and spring deflection changes. Include certification by professional engineer that riser system was examined for excessive stress and that none exists.
c. Concrete Anchors and Inserts: Include calculations showing anticipated wind loads.
d. Wind-Load Design Calculations: Submit all static and dynamic loading calculations prepared under "Wind-Load Design Calculations" Paragraph in "Performance Requirements" Article.
e. Qualified Professional Engineer: All designated-design submittals for wind-restraint calculations are to be signed and sealed by qualified professional engineer responsible for their preparation.

2. Wind-Restraint Detail Drawing:

a. Design Analysis: To support selection and arrangement of wind restraints. Include calculations of combined tensile and shear loads.
b. Details: Indicate fabrication and arrangement. Detail attachments of restraints to restrained items and to the structure. Show attachment locations, methods, and

spacings. Identify components, list their strengths, and indicate directions and values of forces transmitted to the structure during wind events. Indicate association with vibration isolation devices.

c. Coordinate vibration isolation details with wind-restraint details required for equipment mounted outdoors. Comply also with requirements in other Sections for equipment mounted outdoors.

3. All delegated-design submittals for wind-restraint detail Drawings are to be signed and sealed by qualified professional engineer responsible for their preparation.
4. Product Listing, Preapproval, and Evaluation Documentation: By an agency acceptable to authorities having jurisdiction, showing maximum ratings of restraint items and basis for approval (tests or calculations).
5. Design Calculations for Vibration Isolation Devices: Calculate static and dynamic loading due to equipment weight and operating forces required to select proper vibration isolators, and to design vibration isolation bases.
6. Riser Supports: Include riser diagrams and calculations showing anticipated expansion and contraction at each support point, initial and final loads on building structure, and spring deflection changes. Include certification that riser system was examined for excessive stress and that none exists.

G. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions

H. Qualification Data: For testing agency.

I. Welding certificates.

J. Field quality-control reports.

K. Operation and Maintenance Data: For air-spring mounts and restrained-air-spring mounts to include in operation and maintenance manuals.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct testing indicated, be an NRTL as defined by OSHA in 29 CFR 1910.7 and be acceptable to authorities having jurisdiction.

B. Welding Qualifications: Qualify procedures and personnel in accordance with AWS D1.1/D1.1M, "Structural Welding Code - Steel."

C. Wind-Load-Restraint Device Load Ratings: Devices to be tested and rated in accordance with applicable code requirements and authorities having jurisdiction. Devices to be listed by a nationally recognized third party that requires periodic follow-up inspections and has a listing directory available to the public. Provide third-party listing by one or more of the following: an agency acceptable to authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design system.

1. Wind-Load Performance: Equipment shall withstand the effects of high wind events determined in accordance with ASCE/SEI 7-16.

B. Wind-Load Design Calculations:

1. Perform calculations to obtain force information necessary to properly select wind-load restraint devices, fasteners, and anchorage. Perform calculations using methods acceptable to applicable code authorities and as presented in ASCE/SEI 7-16. Where "ASCE/SEI 7" is used throughout this Section, it is to be understood that the edition referred to in this subparagraph is intended as referenced throughout the Section Text unless otherwise noted.

a. Factors indicated below that are specific to individual pieces of equipment must be obtained by Contractor and must be included in individual component submittal packages.
b. Coordinate design wind-load calculations with vibration isolation requirements. Comply with requirements in other Sections in addition to those in this Section for equipment mounted outdoors.

2. Design wind pressure "p" for external sidewall-mounted equipment such as louvers is to be calculated by Delegated-Design Contractor using methods in ASCE/SEI 7-16, Ch. 30. Perform calculations in accordance with one of the following, as appropriate:

a. PART 1: Low-Rise Buildings.
b. PART 2: Low-Rise Buildings (Simplified).
c. PART 3: Buildings with "h" less than 60 feet.

3. Design wind pressure "p" for rooftop equipment is to be calculated by Delegated-Design Contractor using methods in ASCE/SEI 7-16, Ch. 30, PART 6: Building Appurtenances and Rooftop Structures and Equipment.

a. Risk Category: II.
b. h = Mean Roof Height: 36ft.
c. V = Basic Wind Speed: 89 mph.
d. K_d = Wind Directionality Factor: 0.85.
e. Exposure Category: B.
f. K_{zt} = Topographic Factor: 1.
g. K_e = Ground Elevation Factor: Refer to S-001 drawings.
h. K_z = Velocity Pressure Exposure Coefficient (Evaluated at Height z): 89 mph.

i. K_h = Velocity Pressure Exposure Coefficient (Evaluated at Height h): 0.85.
j. q_z = Velocity Pressure: Value calculated by delegated wind-load design Contractor using methods detailed in ASCE/SEI 7-16 Section 26.10.1 or other source approved by authorities having jurisdiction.
k. q_h = Velocity Pressure: Value calculated by delegated wind-load design Contractor using methods detailed in ASCE/SEI 7-16 Section 26.10.1 or other source approved by authorities having jurisdiction.
l. G = Gust-Effect Factor: 0.85.
m. Enclosure Classification: Refer to S-001 drawings.
n. GC_{pi} = Internal Pressure Coefficient: +/-0.18.

4. Design wind pressure "p" for external sidewall-mounted equipment such as louvers are to be calculated by Delegated-Design Contractor using methods in ASCE/SEI 7-10, Ch. 30. Perform calculations in accordance with one of the following, as appropriate:

a. PART 1: Low-Rise Buildings.
b. PART 2: Low-Rise Buildings (Simplified).
c. PART 3: Buildings with "h" greater than 60 feet

5. Design wind pressure "p" for rooftop equipment is to be calculated by Delegated-Design Contractor using methods in ASCE/SEI 7-10, Ch. 30, PART 6: Building Appurtenances and Rooftop Structures and Equipment.

a. Risk Category: II.
b. h = Mean roof height: 36 ft.
c. V = Basic Wind Speed: 89 mph
d. K_d = Wind Directionality Factor: 0.85.
e. Exposure Category: B.
f. K_{zt} = Topographic Factor: 1.
g. K_z = Velocity Pressure Exposure Coefficient (Evaluated at Height z): <Insert coefficient>.
h. K_h = Velocity Pressure Exposure Coefficient (Evaluated at Height h): <Insert coefficient>.
i. q_z = Velocity Pressure at Height z: Value calculated by delegated wind-load design Contractor using methods detailed in ASCE/SEI 7-10 Section 26.10.1 or other source approved by authorities having jurisdiction.
j. q_h = Velocity Pressure at Height h: Value calculated by delegated wind-load design Contractor using methods detailed in ASCE/SEI 7-10 Section 26.10.1 or other source approved by authorities having jurisdiction.
k. G = Gust-Effect Factor: 0.85.
l. Enclosure Classification: <Insert classification>.
m. GC_{pi} = Internal Pressure Coefficient: +/- 0.18

6. Design wind force "F" for rooftop equipment and external sidewall-mounted equipment such as louvers is to be calculated by Delegated-Design Contractor using methods in ASCE/SEI 7-05, Ch. 6.

a. I = Importance Factor: 1.
b. h = Mean Roof Height: 36 ft.
c. V = Basic Wind Speed: 89 mph.
d. K_d = Wind Directionality Factor: 0.85.
e. Exposure Category: B.
f. K_{zt} = Topographic Factor: 1.
g. K_z = Velocity Pressure Exposure Coefficient (Evaluated at Height z): Refer to S001 drawings.
h. K_h = Velocity Pressure Exposure Coefficient (Evaluated at Height h): Refer to S001 drawings.
i. q_z = Velocity Pressure at Height z: Value calculated by delegated wind-load design Contractor using methods detailed in ASCE/SEI 7-05 Section 6.5.10 or other source approved by authorities having jurisdiction.
j. q_h = Velocity Pressure at Roof Height h: Value calculated by delegated wind-load design Contractor using methods detailed in ASCE/SEI 7-05 Section 6.5.10 or other source approved by authorities having jurisdiction.
k. G = Gust-Effect Factor: 0.85.
l. GC_{pi} = Internal Pressure Coefficient: +/- 0.18.
m. GC_p = External Pressure Coefficient: Refer to S-001 drawings.
n. C_f = Force Coefficient: Value determined by delegated wind-load design Contractor from ASCE/SEI 7-05, Figures 6-21 through 6-23 or other source approved by authorities having jurisdiction.
o. A_f = Projected Area Normal to the Wind: Except where "C_f" is specified for the actual surface area. Value determined by delegated wind-load design Contractor from equipment submittal or manufacturer.

C. Consequential Damage: Provide additional restraints for suspended HVAC components or anchorage of floor-, roof-, or wall-mounted HVAC components as indicated in ASCE/SEI 7-16 so that failure of a non-essential or essential HVAC component will not cause the failure of any other essential architectural, mechanical, or electrical building component.

D. Fire/Smoke Resistance: All components that are not constructed of ferrous metals must have a maximum flame-spread index of 25 and maximum smoke-developed index of 50 when tested by an NRTL in accordance with ASTM E84 or UL 723, and be so labeled.

E. Component Supports:

1. Load ratings, features, and applications of all reinforcement components must be based on testing standards of a nationally recognized testing agency.

2.2 ELASTOMERIC ISOLATION PADS

A. Elastomeric Isolation Pads:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Mason Industries, Inc.
    b. Vibration Eliminator Co., Inc.
    c. Vibration Mountings & Controls, Inc.
    d. Approved equivalent.

7. Fabrication: Single or multiple layers of sufficient durometer stiffness for uniform loading over pad area.
8. Size: Factory or field cut to match requirements of supported equipment.
9. Minimum deflection as indicated on Drawings.
10. Pad Material: Oil- and water-resistant rubber.
11. Infused nonwoven cotton or synthetic fibers.
12. Load-bearing metal plates adhered to pads.
13. Sandwich-Core Material: Resilient and elastomeric.

    a. Infused nonwoven cotton or synthetic fibers.

2.3 ELASTOMERIC ISOLATION MOUNTS

A. Elastomeric Isolation Mounts:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Mason Industries, Inc.
    b. Vibration Eliminator Co., Inc.
    c. Vibration Mountings & Controls, Inc.
    d. Approved equivalent.

2. Mounting Plates:

    a. Top Plate: Encapsulated steel load transfer top plates, factory drilled and threaded with threaded studs or bolts.
    b. Baseplate: Encapsulated steel bottom plates with holes provided for anchoring to support structure.

3. Minimum deflection as indicated on Drawings.
4. Elastomeric Material: Molded, oil-resistant rubber, neoprene, or other elastomeric material.

2.4 RESTRAINED ELASTOMERIC ISOLATION MOUNTS

A. Restrained Elastomeric Isolation Mounts:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Mason Industries, Inc.
    b. Vibration Eliminator Co., Inc.
    c. Vibration Mountings & Controls, Inc.
    d. Approved equivalent.

2. Description: All-directional isolator with restraints containing two separate and opposing elastomeric elements that prevent central threaded element and attachment hardware from contacting the housing during normal operation.

    a. Housing: Cast-ductile iron or welded steel.
    b. Elastomeric Material: Molded, oil-resistant rubber, neoprene, or other elastomeric material.

3. Minimum deflection as indicated on Drawings.

2.5 OPEN-SPRING ISOLATORS

A. Freestanding, Laterally Stable, Open-Spring Isolators:

1. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
2. Minimum Additional Travel: 50 percent of the required deflection at rated load.
3. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
4. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
5. Baseplates: Factory-drilled steel plate for bolting to structure with an elastomeric isolator pad attached to the underside. Baseplates shall limit floor load to 500 psi.
6. Top Plate and Adjustment Bolt: Threaded top plate with adjustment bolt and cap screw to fasten and level equipment.
7. Minimum deflection as indicated on Drawings.

2.6 RESTRAINED-SPRING ISOLATORS

A. Freestanding, Laterally Stable, Open-Spring Isolators with Vertical-Limit Stop Restraint:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Mason Industries, Inc.
    b. Vibration Eliminator Co., Inc.
    c. Vibration Mountings & Controls, Inc.
    d. Approved equivalent.

2. Housing: Steel housing with vertical-limit stops to prevent spring extension due to weight being removed.

    a. Base with holes for bolting to structure with an elastomeric isolator pad attached to the underside. Bases shall limit floor load to 500 psi 3447 kPa.
    b. Top plate with threaded mounting holes.
    c. Internal leveling bolt that acts as blocking during installation.

3. Restraint: Limit stop as required for equipment and authorities having jurisdiction.
4. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
5. Minimum Additional Travel: 50 percent of the required deflection at rated load.
6. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
7. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
8. Minimum deflection as indicated on Drawings.

2.7 HOUSED-RESTRAINED-SPRING ISOLATORS

A. Freestanding, Steel, Open-Spring Isolators with Vertical-Limit Stop Restraint in Two-Part Telescoping Housing:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Mason Industries, Inc.
    b. Vibration Eliminator Co., Inc.
    c. Vibration Mountings & Controls, Inc.
    d. Approved equivalent.

2. Two-Part Telescoping Housing: A steel top and bottom frame separated by an elastomeric material and enclosing the spring isolators. Housings are equipped with adjustable snubbers to limit vertical movement.

    a. Drilled base housing for bolting to structure with an elastomeric isolator pad attached to the underside. Bases shall limit floor load to 500 psi 3447 kPa.
    b. Threaded top housing with adjustment bolt and cap screw to fasten and level equipment.

3. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
4. Minimum Additional Travel: 50 percent of the required deflection at rated load.
5. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
6. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
7. Minimum deflection as indicated on Drawings.

2.8 PIPE-RISER RESILIENT SUPPORT

A. All-Directional, Acoustical Pipe Anchor Consisting of Two Steel Tubes Separated by a Minimum 1/2-inch-Thick Neoprene:

1. 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. Kinetics Noise Control, Inc.
b. Mason Industries, Inc.
c. Vibration Eliminator Co., Inc.
d. Approved equivalent.

2. Vertical-Limit Stops: Steel and neoprene vertical-limit stops arranged to prevent vertical travel in both directions.
3. Maximum Load Per Support: 500 psi on isolation material providing equal isolation in all directions.
4. Minimum deflection as indicated on Drawings.

2.9 RESILIENT PIPE GUIDES

A. Telescopic Arrangement of Two Steel Tubes or Post and Sleeve Arrangement Separated by a Minimum 1/2-inch- Thick Neoprene:

1. 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. Mason Industries, Inc.
b. Vibration Eliminator Co., Inc.
c. Vibration Mountings & Controls, Inc.
d. Approved equivalent.

2. Factory-Set Height Guide with Shear Pin: Shear pin shall be removable and reinsertable to allow for selection of pipe movement. Guides shall be capable of motion to meet location requirements.

2.10 AIR-SPRING ISOLATORS

A. Freestanding, Single or Multiple, Compressed-Air Bellows:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Mason Industries, Inc.

b. nVent (CADDY).
c. Vibration Management Corp.
d. Approved equivalent.

2. Bellows Assembly: Upper and lower powder-coated steel sections connected by a replaceable, flexible, nylon-reinforced neoprene bellows or similar elastomeric material.
3. Maximum Natural Frequency: 3 Hz.
4. Operating Pressure Range: 25 to 100 psi.
5. Burst Pressure: At least three times manufacturer's published maximum operating pressure.
6. Minimum deflection as indicated on Drawings.
7. Automatic leveling valve.

2.11 RESTRAINED-AIR-SPRING ISOLATORS

A. Freestanding, Single or Multiple, Compressed-Air Bellows with Vertical-Limit Stop Restraint:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Firestone Industrial Products Company.
b. Mason Industries, Inc.
c. nVent (CADDY).
d. Approved equivalent.

2. Housing: Steel housing with vertical-limit stops to prevent spring extension due to weight being removed.

a. Base with holes for bolting to structure with an elastomeric isolator pad attached to the underside. Bases shall limit floor load to 500 psi.
b. Top plate with threaded mounting holes.
c. Internal leveling bolt that acts as blocking during installation.

3. Restraint: Limit stop as required for equipment and authorities having jurisdiction.
4. Minimum deflection as indicated on Drawings.
5. Minimum Additional Travel: 50 percent of the required deflection at rated load.
6. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
7. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
8. Bellows Assembly: Upper and lower powder-coated steel sections connected by a replaceable, flexible, nylon-reinforced neoprene bellows or similar elastomeric material.
9. Maximum Natural Frequency: 3 Hz.
10. Operating Pressure Range: 25 to 100 psi.
11. Burst Pressure: At least three times manufacturer's published maximum operating pressure.
12. Automatic leveling valve.

2.12 ELASTOMERIC HANGERS

A. Elastomeric Mount in a Steel Frame with Upper and Lower Steel Hanger Rods:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Mason Industries, Inc.
    b. Vibration Eliminator Co., Inc.
    c. Vibration Mountings & Controls, Inc.
    d. Approved equivalent.

2. Frame: Steel, fabricated with a connection for an upper threaded hanger rod and an opening on the underside to allow for a maximum of 30 degrees of angular lower hanger-rod misalignment without binding or reducing isolation efficiency.
3. Damping Element: Molded, oil-resistant rubber, neoprene, or other elastomeric material with a projecting bushing for the underside opening preventing steel-to-steel contact.
4. Minimum deflection as indicated on Drawings.

2.13 SPRING HANGERS

A. Combination Coil-Spring and Elastomeric-Insert Hanger with Spring and Insert in Compression:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Mason Industries, Inc.
    b. Vibration Eliminator Co., Inc.
    c. Vibration Mountings & Controls, Inc.
    d. Approved equivalent.

2. Frame: Steel, fabricated for connection to threaded hanger rods and to allow for a maximum of 30 degrees of angular hanger-rod misalignment without binding or reducing isolation efficiency.
3. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
4. Minimum Additional Travel: 50 percent of the required deflection at rated load.
5. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
6. Minimum deflection as indicated on Drawings.
7. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
8. Elastomeric Element: Molded, oil-resistant rubber or neoprene. Steel-washer-reinforced cup to support spring and bushing projecting through bottom of frame.

9. Adjustable Vertical Stop: Steel washer with neoprene washer "up-stop" on lower threaded rod.
10. Self-centering hanger rod cap to ensure concentricity between hanger rod and support spring coil.

2.14 SNUBBERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Kinetics Noise Control, Inc.
2. Mason Industries, Inc.
3. Vibration Mountings & Controls, Inc.
4. Approved equivalent.

B. Description: Factory fabricated using welded structural-steel shapes and plates, anchor bolts, and replaceable resilient isolation washers and bushings.

1. Post-Installed Concrete Anchor Bolts: Secure to concrete surface with post-installed concrete anchors. Anchors to be prequalified in accordance with ACI 355.2 testing and designated in accordance with ACI 318-14 Ch. 17 for 2015 or 2018 IBC.
2. Preset Concrete Inserts: Prequalified in accordance with ICC-ES AC446 testing.
3. Anchors in Masonry: Design in accordance with TMS 402.
4. Resilient Isolation Washers and Bushings: Oil- and water-resistant neoprene.
5. Resilient Cushion: Maximum 1/4-inch air gap, and minimum 1/4 inch thick.

2.15 RESTRAINTS - RIGID TYPE

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Isolation Technology, Inc.
2. nVent (CADDY).
3. Vibration Mountings & Controls, Inc.
4. Approved equivalent.

B. Description: Shop- or field-fabricated bracing assembly made of AISI S110-07-S1 slotted steel channels, ANSI/ASTM A53/A53M steel pipe as per NFPA 13, or other rigid steel brace member. Includes accessories for attachment to braced component at one end and to building structure at the other end and other matching components and with corrosion-resistant coating; rated in tension, compression, and torsion forces.

2.16 RESTRAINT ACCESSORIES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Hilti, Inc.
2. Mason Industries, Inc.
3. nVent (CADDY).
4. Approved equivalent.

B. Hanger-Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections to hanger rod.

C. Hinged and Swivel Brace Attachments: Multifunctional steel connectors for attaching hangers to rigid channel bracings and restraint cables.

D. Bushings for Floor-Mounted Equipment Anchor Bolts: Neoprene bushings designed for rigid equipment mountings, and matched to type and size of anchor bolts and studs.

E. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for rigid equipment mountings, and matched to type and size of attachment devices used.

F. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.

2.17 VIBRATION ISOLATION EQUIPMENT BASES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Mason Industries, Inc.
2. Vibration Eliminator Co., Inc.
3. Vibration Mountings & Controls, Inc.
4. Approved equivalent.

B. Concrete Inertia Base: Factory-fabricated or field-fabricated, welded, structural-steel bases and rails ready for placement of cast-in-place concrete.

1. Design Requirements: Lowest possible mounting height with not less than 1-inch clearance above the floor. Include equipment anchor bolts and auxiliary motor slide bases or rails.

    a. Include supports for suction and discharge elbows for pumps.

2. Structural Steel: Steel shapes, plates, and bars complying with ASTM A36/A36M. Bases shall have shape to accommodate supported equipment.
3. Support Brackets: Factory-welded steel brackets on frame for outrigger isolation mountings and to provide for anchor bolts and equipment support.
4. Fabrication: Fabricate steel templates to hold equipment anchor-bolt sleeves and anchors in place during placement of concrete. Obtain anchor-bolt templates from supported equipment manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and equipment to receive vibration isolation and wind-load control devices for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in of reinforcement and cast-in-place anchors to verify actual locations before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLICATIONS

A. Multiple Pipe Supports: Secure pipes to trapeze member with clamps approved for application by agency acceptable to authorities having jurisdiction.

B. Hanger-Rod Stiffeners: Install hanger-rod stiffeners where indicated or scheduled on Drawings to receive them and where required to prevent buckling of hanger rods due to wind-load forces.

C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength is adequate to carry static and wind force loads within specified loading limits.

3.3 INSTALLATION OF VIBRATION AND WIND-LOAD CONTROL DEVICES

A. Provide vibration and wind-load control devices for systems and equipment where indicated in Equipment Schedules or Vibration-Control Device Schedules on Drawings, where Specifications indicate they are to be installed on specific equipment and systems, and where required by applicable codes.

B. Coordinate location of embedded connection hardware with supported equipment attachment and mounting points and with requirements for concrete reinforcement and formwork specified in Section 033000 "Cast-in-Place Concrete."

C. Installation of vibration isolators and wind-load restraints must not cause any change of position of equipment, piping, or ductwork resulting in stresses or misalignment.

D. Comply with requirements in Section 077200 "Roof Accessories" for installation of roof curbs, equipment supports, and roof penetrations. E. Equipment Restraints:

1. Install snubbers on HVAC equipment mounted on vibration isolators. Locate snubbers as close as possible to vibration isolators and bolt to equipment base and supporting structure.
2. Install resilient bolt isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch.

3. Install wind-load-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction that provides required submittals for component.

F. Piping Restraints:

1. Comply with requirements in MSS SP-127.
2. Space lateral supports a maximum of 40 feet o.c., and longitudinal supports a maximum of 80 feet o.c.
3. Brace a change of direction longer than 12 feet.

G. Install wind-load-restraint cables so they do not bend across edges of adjacent equipment or building structure.

H. Install wind-load-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction that provides required submittals for component.

I. Install bushing assemblies for anchor bolts for floor-mounted equipment, arranged to provide resilient media between anchor bolt and mounting hole in concrete base.

J. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.

K. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members. L. Post-Installed Concrete Anchors:

1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify Director’s Representative if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
3. Wedge-Type Anchor Bolts: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
4. Adhesive-Type Anchor Bolts: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.
5. Set anchors to manufacturer's recommended torque, using a torque wrench.
6. Install zinc-coated steel anchors for interior and stainless-steel anchors for exterior applications.

3.4 INSTALLATION OF AIR-SPRING ISOLATORS

A. Independent Isolator Installation:

1. Install automatic leveling valve into each air isolator.
2. Inflate each isolator to height and pressure specified on Drawings.

B. Pressure-Regulated Isolator Installation:

1. Coordinate the constant pressure-regulated air supply to air springs with requirements for piping and connections specified in Section 221513 "General-Service Compressed-Air Piping."
2. Connect all pressure regulators to a single dry, filtered facility air supply.
3. Inflate isolators to height and or pressure specified on Drawings.

3.5 ACCOMMODATION OF DIFFERENTIAL MOTION

A. Provide flexible connections in piping systems where they cross structural joints and other point where differential movement may occur. Provide adequate flexibility to accommodate differential movement as determined in accordance with ASCE/SEI 7. Comply with requirements in Section 232113 "Hydronic Piping" and Section 232116 "Hydronic Piping Specialties" for piping flexible connections.

3.6 INSTALLATION OF VIBRATION ISOLATION EQUIPMENT BASES

A. Coordinate location of embedded connection hardware with supported equipment attachment and mounting points and with requirements for concrete reinforcement and formwork specified in Section 033000 "Cast-in-Place Concrete."

B. Coordinate dimensions of equipment bases with requirements of isolated equipment specified in this and other Sections. Where dimensions of base are indicated on Drawings, they may require adjustment to accommodate isolated equipment.

3.7 VIBRATION ISOLATION SCHEDULE

A. Fans and Air Handling Units:

1. Equip fans and air handling units, located above the ground floor and not indicated to be provided with a concrete inertia block or be ceiling mounted or suspended with vibration elimination equipment as follows:

a. Provide an integral structural steel base with a common steel member running the full length of the fan and motor, with built-in motor slide rails, so as to form a common support for fan unit and motor, with spring type isolators, unless otherwise indicated.
b. Provide spring unit isolators, or steel rail type isolator bases with spring type isolators, for floor mounted units with motors mounted on the casings or frames.

2. Equip fans and handling units located on the ground floor, with the exception of medium or high pressure units not specified to be provided with a concrete inertia block, or be ceiling mounted or suspended, with unit isolators or steel rail type isolator bases.
3. Floor Mounted Utility Fan Sets:

    a. Provide unit isolators or steel rail type isolator bases.
    b. Utility Sets with Overhung Scrolls: Provide steel rail type isolator bases, with builtin reaction units to compensate for overhang.

4. Concrete Inertia Blocks for Fans and Air-Handling Units:

    a. Provide inertia blocks, 1-1/2 times the weight of supported equipment, motor and drive for the following:

        1) Fans and air handling units, operating at a static pressure up to 5 inches w.g., driven by electric motor 30 to 100 HP inclusive, or having wheel diameters 45 to 100 inches inclusive.
        2) Fans and air handling units, operating at a static pressure of 5 inches w.g. or more, driven by motors 30 to 60 HP inclusive.

    b. Provide inertia blocks, 2 times the weight of supported equipment, motor and drive for the following:

        1) Fans and air handling units, operating at a static pressure up to 5 inches w.g., driven by motors over 100 HP.
        2) Fans and air handling units, operating at a static pressure of 5 inches w.g. or more, driven by motors 75 HP and larger.

5. Ceiling Suspended Fans and Air Handling Units: Provide combination rubber and spring type isolators, designed for insertion in a split hanger rod. Provide isolators with an efficiency as specified under the paragraph entitled "APPLICATION" of this Section, with no deflection greater than 1-1/2 inches required.

B. Centrifugal Compressors, Evaporative Condensers and Packaged Cooling Towers: Provide housed spring type isolators, complete with vertical resilient limit stops, so as to prevent spring extension when equipment is unloaded. Approved isolators: Amber Booth Type CT, Korfund Type WSCL, Mason Industries Type SLR, Vibration Eliminator Type FRS, Vibration Mountings Type, designed for a minimum 3/4 inch static deflection.

C. Direct Connected Reciprocating Compressors and Packaged Chillers: Provide spring unit isolators or steel rail type isolator bases with spring isolators. Spring isolators: Complete with vertical hold down feature to limit upward travel, when equipment is unloaded.

D. Absorption Machines: Provide 1/2 inch thick rubber or neoprene pads.

E. Remote Installed Refrigerant Compressor Units, Self Contained Belt Driven or Direct Driven Condensing Units and Floor Mounted Product Coolers: Provide steel rail type bases with builtin, metal housed, rubber-in-shear unit isolators, permanently fixed in place and provided with

adjustable snubber devices. Provide rail bases on Ground Floor designed for 1/4 inch static deflection and above Ground Floor 1/2 inch static deflection.

F. Ceiling Suspended Product Coolers: Provide combination rubber and spring type isolators, designed for insertion in a split hanger rod. Provide isolators with an efficiency as specified under the paragraph entitled “APPLICATION” of this section, with no deflection greater than 1-1/2 inch required/

3.8 ADJUSTING

A. Adjust isolators after system is at operating weight.

B. Adjust limit stops on restrained-spring isolators to mount equipment at normal operating height. After equipment installation is complete, adjust limit stops so they are out of contact during normal operation.

3.9 FIELD QUALITY CONTROL

A. Testing Agency: Director’s Representative will engage a qualified testing agency to perform tests and inspections.

B. Manufacturer's Field Service: Engage a factory-authorized service representative company field advisor to test and inspect components, assemblies, and equipment installations, including connections.

C. Perform tests and inspections with the assistance of a factory-authorized service representative company field advisor.

D. Tests and Inspections:

1. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction.
2. Schedule test with Director’s Representative, through Director’s Representative, before connecting anchorage device to restrained component (unless post connection testing has been approved), and with at least seven days' advance notice.
3. Obtain Director’s Representative's approval before transmitting test loads to structure. Provide temporary load-spreading members.
4. Test at least four of each type and size of installed anchors and fasteners selected by Director’s Representative.
5. Test to 90 percent of rated proof load of device.
6. Measure isolator restraint clearance.
7. Measure isolator deflection.
8. Verify snubber minimum clearances.
9. Test and adjust restrained-air-spring isolator controls and safeties.

E. Remove and replace malfunctioning units and retest as specified above.

F. Prepare test and inspection reports.

END OF SECTION 230548.13

SECTION 230553 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Equipment labels.
2. Warning signs and labels.
3. Pipe labels.
4. Duct labels.
5. Stencils.
6. Valve tags.
7. Warning tags.

1.3 SUBMITTALS

A. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions

B. Manufacturer’s installation instructions shall be provided along with product data.

C. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).

D. Product Data: For each type of product.

E. Samples: For color, letter style, and graphic representation required for each identification material and device.

F. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.

G. Valve numbering scheme.

H. Valve Schedules: For each piping system to include in maintenance manuals.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Metal Labels for Equipment:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Brady Corporation.
    b. emedco.
    c. Seton Identification Products; a Brady Corporation company.
    d. Approved equivalent.

2. Material and Thickness: Brass, 0.032-inch, stainless steel, 0.025-inch, aluminum, 0.032-inch or anodized aluminum, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
3. Letter Color: Black.
4. Background Color: White.
5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
6. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.
7. Fasteners: Stainless-steel rivets or self-tapping screws.
8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Plastic Labels for Equipment:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Brady Corporation.
    b. emedco.
    c. Seton Identification Products; a Brady Corporation company.
    d. Approved equivalent.

2. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, and having predrilled holes for attachment hardware.
3. Letter Color: Black.
4. Background Color: White.
5. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
6. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
7. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for

greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.

8. Fasteners: Stainless-steel rivets or self-tapping screws.
9. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

C. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), and the Specification Section number and title where equipment is specified.

D. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number, and identify Drawing numbers where equipment is indicated (plans, details, and schedules) and the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 WARNING SIGNS AND LABELS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Brady Corporation.
2. emedco.
3. Seton Identification Products; a Brady Corporation company.
4. Approved equivalent.

B. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inchthick, and having predrilled holes for attachment hardware.

C. Letter Color: Black.

D. Background Color: White.

E. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

F. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

G. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.

H. Fasteners: Stainless-steel rivets or self-tapping screws.

I. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

J. Label Content: Include caution and warning information plus emergency notification instructions.

2.3 PIPE LABELS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Brady Corporation.
2. Emedco.
3. Seton Identification Products; a Brady Corporation company.
4. Approved equivalent.

B. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction according to ASME A13.1.

C. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to partially cover circumference of pipe and to attach to pipe without fasteners or adhesive.

D. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

E. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings; also include pipe size and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions or as separate unit on each pipe label to indicate flow direction.
2. Lettering Size: Size letters according to ASME A13.1 for piping.

2.4 DUCT LABELS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Brady Corporation.
2. Emedco.
3. Seton Identification Products; a Brady Corporation company.
4. Approved equivalent.

B. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, and having predrilled holes for attachment hardware.

C. Letter Color: Red.

D. Background Color: White.

E. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

F. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

G. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.

H. Fasteners: Stainless-steel rivets or self-tapping screws.

I. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

J. Duct Label Contents: Include identification of duct service using same designations or abbreviations as used on Drawings; also include duct size and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with duct system service lettering to accommodate both directions or as separate unit on each duct label to indicate flow direction.

2.5 STENCILS

A. Stencils for Piping:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Brimar Industries, Inc.
b. Craftmark Pipe Markers.
c. Kolbi Pipe Marker Co.
d. Approved equivalent.

2. Lettering Size: Size letters according to ASME A13.1 for piping.
3. Stencil Material: Aluminum.
4. Stencil Paint: Exterior, gloss, acrylic enamel in colors complying with recommendations in ASME A13.1 unless otherwise indicated. Paint may be in pressurized spray-can form.
5. Identification Paint: Exterior, acrylic enamelin colors according to ASME A13.1 unless otherwise indicated. Paint may be in pressurized spray-can form.

B. Stencils for Ducts:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Brimar Industries, Inc.
b. Craftmark Pipe Markers.
c. Kolbi Pipe Marker Co.
d. Approved equivalent.

2. Lettering Size: Minimum letter height of 1-1/4 inches for viewing distances up to 15 feet and proportionately larger lettering for greater viewing distances.
3. Stencil Material: Aluminum.
4. Stencil Paint: Exterior, gloss, acrylic enamel Paint may be in pressurized spray-can form.
5. Identification Paint: Exterior, acrylic enamel . Paint may be in pressurized spray-can form.

C. Stencils for Access Panels and Door Labels, Equipment Labels, and Similar Operational Instructions:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Brimar Industries, Inc.
    b. Craftmark Pipe Markers.
    c. Kolbi Pipe Marker Co.
    d. Approved equivalent.

2. Lettering Size: Minimum letter height of 1/2 inch for viewing distances up to 72 inches and proportionately larger lettering for greater viewing distances.
3. Stencil Material: Aluminum.
4. Stencil Paint: Exterior, gloss, acrylic enamel Paint may be in pressurized spray-can form.
5. Identification Paint: Exterior, acrylic enamel. Paint may be in pressurized spray-can form.

2.6 VALVE TAGS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Brady Corporation.
2. Emedco.
3. Seton Identification Products; a Brady Corporation company.
4. Approved equivalent.

B. Description: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers.

1. Tag Material: Brass, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
2. Fasteners: Brass wire-link chain or beaded chain or S-hook.

C. Valve Schedules: For each piping system, on 8-1/2-by-11-inch bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.

1. Valve-tag schedule shall be included in operation and maintenance data.

2.7 VALVE SERVICE IDENTIFICATION CHART FRAMES

A. Type: Satin finished extruded aluminum frame with rigid clear plastic glazing, size to fit 8-1/2-by-11 inches valve chart.

2.8 WARNING TAGS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Brady Corporation.
2. Emedco.
3. Seton Identification Products; a Brady Corporation company.
4. Approved equivalent.

B. Description: Preprinted or partially preprinted accident-prevention tags of plasticized card stock with matte finish suitable for writing.

1. Size: 3 by 5-1/4 inches minimum.
2. Fasteners: Brass grommet and wire.
3. Nomenclature: Large-size primary caption such as "DANGER," "CAUTION," or "DO NOT OPERATE."
4. Color: Safety-yellow background with black lettering.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 GENERAL INSTALLATION REQUIREMENTS

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

3.3 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

3.4 PIPE LABEL INSTALLATION

A. Piping Color Coding: Painting of piping is specified in Section 099123 "Interior Painting.".

B. Stenciled Pipe Label Option: Stenciled labels may be provided instead of manufactured pipe labels, at Installer's option. Install stenciled pipe labels, complying with ASME A13.1, with painted, color-coded bands or rectangles on each piping system.

1. Identification Paint: Use for contrasting background.

2. Stencil Paint: Use for pipe marking.

C. Pipe Label Locations: Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Near each valve and control device.
2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
3. Near penetrations and on both sides of through walls, floors, ceilings, and inaccessible enclosures.
4. At access doors, manholes, and similar access points that permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

D. Directional Flow Arrows: Arrows shall be used to indicate direction of flow in pipes, including pipes where flow is allowed in both directions.

E. Pipe Label Color Schedule:

1. Heating Water Piping: White letters on a safety-green background.
2. Refrigerant Piping: Black letters on a safety-orange background.

3.5 DUCT LABEL INSTALLATION

A. Install plastic-laminated self-adhesive duct labels with permanent adhesive on air ducts in the following color codes:

1. Blue: For cold-air supply ducts.
2. Yellow: For hot-air supply ducts.
3. Green: For exhaust-, outside-, relief-, return-, and mixed-air ducts.

B. Stenciled Duct Label Option: Stenciled labels showing service and flow direction may be provided instead of plastic-laminated duct labels, at Installer's option.

C. Locate labels near points where ducts enter into and exit from concealed spaces and at maximum intervals of 50 feet in each space where ducts are exposed or concealed by removable ceiling system.

3.6 VALVE-TAG INSTALLATION

A. Install tags on valves and control devices in piping systems, except check valves, valves within factory-fabricated equipment units, shutoff valves, faucets, convenience and lawn-watering hose connections, and HVAC terminal devices and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.

B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following subparagraphs:

1. Valve-Tag Size and Shape:

   a. Refrigerant: 2 inches, round.
   b. Hot Water: 2 inches, round.
   c. Gas: 2 inches, round.

2. Valve-Tag Colors:

   a. Toxic and Corrosive Fluids: Black letters on a safety-orange background.
   b. Flammable Fluids: Black letters on a safety-yellow background.
   c. Combustible Fluids: White letters on a safety-brown background.
   d. Potable and Other Water: White letters on a safety-green background.
   e. Compressed Air: White letters on a safety-blue background.
   f. Defined by User: White letters on a safety-purple background, black letters on a safety-white background, white letters on a safety-gray background, and white letters on a safety-black background.

C. Valve Service Identification Charts:

1. Provide 2 framed valve charts for each piping system specified to be provided with valve identification tags. Type charts on 8-1/2-by-11 inches heavy white bond paper, indicating valve number, service, and location.
2. Hang framed charts at locations as directed.

3.7 WARNING-TAG INSTALLATION

A. Write required message on and attach warning tags to equipment and other items where required.

END OF SECTION 230553

SECTION 230593 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Testing, Adjusting, and Balancing of Air Systems:

a. Constant-volume air systems.
b. Variable-air-volume systems.
c. Multizone systems.

2. Testing, Adjusting, and Balancing of Hydronic Piping Systems:

a. Constant-flow hydronic systems.
b. Variable-flow hydronic systems.
c. Primary-secondary hydronic systems.

3. Testing, adjusting, and balancing of fuel oil systems for HVAC.
4. Testing, adjusting, and balancing of steam and condensate piping systems.
5. Testing, adjusting, and balancing of equipment.
6. Testing, adjusting, and balancing of existing HVAC systems and equipment.
7. Procedures for exhaust hoods.
8. Sound tests.
9. Vibration tests.
10. Duct leakage tests verification.
11. Pipe leakage tests verification.
12. UFAD plenum leakage tests verification.
13. HVAC-control system verification.
14. Smoke-control system tests.

1.3 DEFINITIONS

A. AABC: Associated Air Balance Council.

B. NEBB: National Environmental Balancing Bureau.

C. TAB: Testing, adjusting, and balancing.

D. TABB: Testing, Adjusting, and Balancing Bureau.

E. TAB Specialist: An independent entity meeting qualifications to perform TAB work.

F. TDH: Total dynamic head.

G. UFAD: Underfloor air distribution.

1.4 PREINSTALLATION MEETINGS

A. TAB Conference: Conduct a TAB conference at Project site: NY National Guard Armory 2 Quincy Place Yonkers, NY <> after approval of the TAB strategies and procedures plan, to develop a mutual understanding of the details. Provide a minimum of 14 days' advance notice of scheduled meeting time and location.

1. Minimum Agenda Items:

a. The Contract Documents examination report.
b. The TAB plan.
c. Needs for coordination and cooperation of trades and subcontractors.
d. Proposed procedures for documentation and communication flow.

1.5 QUALITY ASSURANCE

A. TAB Specialists Qualifications, Certified by AABC:

1. TAB Field Supervisor: Employee of the TAB specialist and certified by AABC.
2. TAB Technician: Employee of the TAB specialist and certified by AABC.

B. TAB Specialists Qualifications, Certified by NEBB:

1. TAB Field Supervisor: Employee of the TAB specialist and certified by NEBB.
2. TAB Technician: Employee of the TAB specialist and certified by NEBB.

C. Instrumentation Type, Quantity, Accuracy, and Calibration: Comply with requirements in ASHRAE 111, Section 4, "Instrumentation."

D. ASHRAE/IES 90.1 Compliance: Applicable requirements in ASHRAE/IES 90.1, Section 6.7.2.3 - "System Balancing."

E. Code and AHJ Compliance: TAB is required to comply with governing codes and requirements of authorities having jurisdiction.

1.6 FIELD CONDITIONS

A. Full Owner Facility Occupancy: Owner Facility will occupy the site and existing building during entire TAB period. Cooperate with Director’s Representative Owner during TAB operations to minimize conflicts with Owner's Facility's operations.

B. Partial Facility Occupancy: Facility may occupy completed areas of building before Substantial Completion. Cooperate with Director's Representative during TAB operations to minimize conflicts with Facility's operations.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 TAB SPECIALISTS

A. Subject to compliance with requirements, engage one of the following available TAB specialists that may be engaged include, but are not limited to, the following:

1. John W. Danforth Company.
2. Airpath Testing Services, Inc.
3. Independent Testing & Balancing Corp.
4. B&L Testing and Balancing.

3.2 EXAMINATION

A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems designs that may preclude proper TAB of systems and equipment.

B. Examine installed systems for balancing devices, such as test ports, gauge cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are applicable for intended purpose and are accessible.

C. Examine the approved submittals for HVAC systems and equipment.

D. Examine design data, including HVAC system descriptions, statements of design assumptions for environmental conditions and systems output, and statements of philosophies and assumptions about HVAC system and equipment controls.

E. Examine ceiling plenums and underfloor air plenums used for HVAC to verify that they are properly separated from adjacent areas and sealed.

F. Examine equipment performance data, including fan and pump curves.

1. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
2. Calculate system-effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from the conditions used to rate equipment performance. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," or in SMACNA's "HVAC Systems - Duct Design." Compare results with the design data and installed conditions.

G. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.

H. Examine test reports specified in individual system and equipment Sections.

I. Examine HVAC equipment and verify that bearings are greased, belts are aligned and tight, filters are clean, and equipment with functioning controls is ready for operation.

J. Examine terminal units, such as variable-air-volume boxes, and verify that they are accessible and their controls are connected and functioning.

K. Examine temporary and permanent strainers. Verify that temporary strainer screens used during system cleaning and flushing have been removed and permanent strainer baskets are installed and clean.

L. Examine control valves for proper installation for their intended function of isolating, throttling, diverting, or mixing fluid flows.

M. Examine heat-transfer coils for correct piping connections and for clean and straight fins.

N. Examine system pumps to ensure absence of entrained air in the suction piping.

O. Examine operating safety interlocks and controls on HVAC equipment.

P. Examine control dampers for proper installation for their intended function of isolating, throttling, diverting, or mixing air flows.

Q. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.3 PREPARATION

A. Prepare a TAB plan that includes the following:

1. Equipment and systems to be tested.
2. Strategies and step-by-step procedures for balancing the systems.
3. Instrumentation to be used.
4. Sample forms with specific identification for all equipment.

B. Perform system-readiness checks of HVAC systems and equipment to verify system readiness for TAB work. Include, at a minimum, the following:

1. Airside:

a. Verify that leakage and pressure tests on air distribution systems have been satisfactorily completed.
b. Duct systems are complete with terminals installed.
c. Volume, smoke, and fire dampers are open and functional.
d. Clean filters are installed.

e. Fans are operating, free of vibration, and rotating in correct direction.
f. Variable-frequency controllers' startup is complete and safeties are verified.
g. Automatic temperature-control systems are operational.
h. Ceilings are installed.
i. Windows and doors are installed.
j. Suitable access to balancing devices and equipment is provided.

2. Hydronics:

a. Verify leakage and pressure tests on water distribution systems have been satisfactorily completed.
b. Piping is complete with terminals installed.
c. Water treatment is complete.
d. Systems are flushed, filled, and air purged.
e. Strainers are pulled and cleaned.
f. Control valves are functioning in accordance with the sequence of operation.
g. Shutoff and balance valves have been verified to be 100 percent open.
h. Pumps are started and proper rotation is verified.
i. Pump gauge connections are installed directly at pump inlet and outlet flanges or in discharge and suction pipe prior to valves or strainers.
j. Variable-frequency controllers' startup is complete and safeties are verified.
k. Suitable access to balancing devices and equipment is provided.

3.4 GENERAL PROCEDURES FOR TESTING AND BALANCING

A. Perform testing and balancing procedures on each system in accordance with the procedures contained in [ASHRAE 111 and in this Section.

B. Cut insulation, ducts, pipes, and equipment casings for installation of test probes to the minimum extent necessary for TAB procedures.

1. After testing and balancing, install test ports and duct access doors that comply with requirements in Section 233300 "Air Duct Accessories."
2. Where holes for probes are required in piping or hydronic equipment, install pressure and temperature test plugs to seal systems.
3. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish in accordance with Section 230713 "Duct Insulation," Section 230716 "HVAC Equipment Insulation," and Section 230719 "HVAC Piping Insulation."

C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.

D. Take and report testing and balancing measurements in inch-pound (IP).

3.5 TESTING, ADJUSTING, AND BALANCING OF HVAC EQUIPMENT

A. Test, adjust, and balance HVAC equipment indicated on Drawings, including, but not limited to,

the following:

1. Motors.
2. Pumps.
3. Fans and ventilators.
4. Terminal units.
5. Boilers.
6. Deaerators.
7. Furnaces.
8. Unit heaters.
9. Condensing units.
10. Condensers.
11. Energy-recovery units.
12. Air-handling units.
13. Heating and ventilating units.
14. Rooftop air-conditioning units.
15. Packaged air conditioners.
16. Split-system air conditioners.
17. Variable-refrigerant-flow systems.
18. Heat pumps.
19. Valance heating and cooling units.
20. Coils.
21. Fan coil units.
22. Unit ventilators.

3.6 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.

B. Prepare schematic diagrams of systems' Record drawings duct layouts.

C. For variable-air-volume systems, develop a plan to simulate diversity.

D. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.

E. Check airflow patterns from the outdoor-air louvers and dampers and the return- and exhaust-air dampers through the supply-fan discharge and mixing dampers.

F. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.

G. Verify that motor starters are equipped with properly sized thermal protection.

H. Check dampers for proper position to achieve desired airflow path.

I. Check for airflow blockages.

J. Check condensate drains for proper connections and functioning.

K. Check for proper sealing of air-handling-unit components.

3.7 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.

1. Measure total airflow.

    a. Set outside-air, return-air, and relief-air dampers for proper position that simulates minimum outdoor-air conditions.
    b. Where duct conditions allow, measure airflow by main Pitot-tube traverse. If necessary, perform multiple Pitot-tube traverses close to the fan and prior to any outlets, to obtain total airflow.
    c. Where duct conditions are unsuitable for Pitot-tube traverse measurements, a coil traverse may be acceptable.

2. Measure fan static pressures as follows:

    a. Measure static pressure directly at the fan outlet or through the flexible connection.
    b. Measure static pressure directly at the fan inlet or through the flexible connection.
    c. Measure static pressure across each component that makes up the air-handling system.
    d. Report artificial loading of filters at the time static pressures are measured.

3. Review Contractor-prepared shop drawings and Record drawings to determine variations in design static pressures versus actual static pressures. Calculate actual system-effect factors. Recommend adjustments to accommodate actual conditions.
4. Obtain approval from Owner's Representative for adjustment of fan speed higher or lower than indicated speed. Comply with requirements in HVAC Sections for air-handling units for adjustment of fans, belts, and pulley sizes to achieve indicated air-handling-unit performance.
5. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload occurs. Measure amperage in full-cooling, full-heating, economizer, and any other operating mode to determine the maximum required brake horsepower.

B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows.

1. Measure airflow of submain and branch ducts.
2. Adjust submain and branch duct volume dampers for specified airflow.
3. Re-measure each submain and branch duct after all have been adjusted.

C. Adjust air inlets and outlets for each space to indicated airflows.

1. Set airflow patterns of adjustable outlets for proper distribution without drafts.
2. Measure inlets and outlets airflow.
3. Adjust each inlet and outlet for specified airflow.

4. Re-measure each inlet and outlet after they have been adjusted.

D. Verify final system conditions.

1. Re-measure and confirm that minimum outdoor, return, and relief airflows are within design. Readjust to design if necessary.
2. Re-measure and confirm that total airflow is within design.
3. Re-measure all final fan operating data, speed, volts, amps, and static profile.
4. Mark all final settings.
5. Test system in economizer mode. Verify proper operation and adjust if necessary.
6. Measure and record all operating data.
7. Record final fan-performance data.

3.8 PROCEDURES FOR VARIABLE-AIR-VOLUME SYSTEMS

A. Adjust the variable-air-volume systems as follows:

1. Verify that the system static pressure sensor is located two-thirds of the distance down the duct from the fan discharge.
2. Verify that the system is under static pressure control.
3. Select the terminal unit that is most critical to the supply-fan airflow. Measure inlet static pressure, and adjust system static pressure control set point so the entering static pressure for the critical terminal unit is not less than the sum of the terminal-unit manufacturer's recommended minimum inlet static pressure plus the static pressure needed to overcome terminal-unit discharge system losses.
4. Calibrate and balance each terminal unit for maximum and minimum design airflow as follows:

    a. Adjust controls so that terminal is calling for maximum airflow. Some controllers require starting with minimum airflow. Verify calibration procedure for specific project.
    b. Measure airflow and adjust calibration factor as required for design maximum airflow. Record calibration factor.
    c. When maximum airflow is correct, balance the air outlets downstream from terminal units.
    d. Adjust controls so that terminal is calling for minimum airflow.
    e. Measure airflow and adjust calibration factor as required for design minimum airflow. Record calibration factor. If no minimum calibration is available, note any deviation from design airflow.
    f. On constant volume terminals, in critical areas where room pressure is to be maintained, verify that the airflow remains constant over the full range of full cooling to full heating. Note any deviation from design airflow or room pressure.

5. After terminals have been calibrated and balanced, test and adjust system for total airflow. Adjust fans to deliver total design airflows within the maximum allowable fan speed listed by fan manufacturer.

    a. Set outside-air, return-air, and relief-air dampers for proper position that simulates minimum outdoor-air conditions.

b. Set terminals for maximum airflow. If system design includes diversity, adjust terminals for maximum and minimum airflow, so that connected total matches fan selection and simulates actual load in the building.
c. Where duct conditions allow, measure airflow by main Pitot-tube traverse. If necessary, perform multiple Pitot-tube traverses close to the fan and prior to any outlets, to obtain total airflow.
d. Where duct conditions are unsuitable for Pitot-tube traverse measurements, a coil traverse may be acceptable.

6. Measure fan static pressures as follows:

a. Measure static pressure directly at the fan outlet or through the flexible connection.
b. Measure static pressure directly at the fan inlet or through the flexible connection.
c. Measure static pressure across each component that makes up the air-handling system.
d. Report any artificial loading of filters at the time static pressures are measured.

7. Set final return and outside airflow to the fan while operating at maximum return airflow and minimum outdoor airflow.

a. Balance the return-air ducts and inlets.
b. Verify that terminal units are meeting design airflow under system maximum flow.

8. Re-measure the inlet static pressure at the most critical terminal unit, and adjust the system static pressure set point to the most energy-efficient set point to maintain the optimum system static pressure. Record set point and give to controls Contractor.
9. Verify final system conditions as follows:

a. Re-measure and confirm that minimum outdoor, return, and relief airflows are within design. Readjust to match design if necessary.
b. Re-measure and confirm that total airflow is within design.
c. Re-measure final fan operating data, speed, volts, amps, and static profile.
d. Mark final settings.
e. Test system in economizer mode. Verify proper operation and adjust if necessary. Measure and record all operating data.
f. Verify tracking between supply and return fans.

3.9 PROCEDURES FOR MULTIZONE SYSTEMS

A. Position the unit's automatic zone dampers for maximum flow through the cooling coil.

B. The procedures for multizone systems will utilize the zone balancing dampers to achieve the indicated airflow within the zone.

C. After balancing, place the unit's automatic zone dampers for maximum heating flow. Retest zone airflows and record any variances.

D. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.

1. Measure total airflow.

    a. Set outside-air, return-air and relief-air dampers for proper position that simulates minimum outdoor air conditions.
    b. Where duct conditions allow, measure airflow by main Pitot-tube traverse. If necessary, perform multiple Pitot-tube traverses close to the fan and prior to any outlets, to obtain total airflow.
    c. Where duct conditions are unsuitable for Pitot-tube traverse measurements, a coil traverse may be acceptable.

2. Measure fan static pressures as follows:

    a. Measure static pressure directly at the fan outlet or through the flexible connection.
    b. Measure static pressure directly at the fan inlet or through the flexible connection.
    c. Measure static pressure across each component that makes up the air-handling system.
    d. Report artificial loading of filters at the time static pressures are measured.

3. Review Record drawings to determine variations in design static pressures versus actual static pressures. Calculate actual system-effect factors. Recommend adjustments to accommodate actual conditions.
4. Obtain approval from Owner's Representative for adjustment of fan speed higher or lower than indicated speed. Comply with requirements in HVAC Sections for air-handling units for adjustment of fans, belts, and pulley sizes to achieve indicated air-handling-unit performance.
5. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload occurs. Measure amperage in full-cooling, full-heating, economizer, and any other operating mode to determine the maximum required brake horsepower.

E. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows.

1. Measure airflow of submain and branch ducts.
2. Adjust submain and branch duct volume dampers for specified airflow.
3. Re-measure each submain and branch duct after all have been adjusted.

F. Adjust air inlets and outlets for each space to indicated airflows.

1. Set airflow patterns of adjustable outlets for proper distribution without drafts.
2. Measure inlet and outlet airflow.
3. Adjust each inlet and outlet for specified airflow.
4. Re-measure each inlet and outlet after they have been adjusted.

G. Verify final system conditions.

1. Re-measure and confirm that minimum outdoor, return, and relief airflows are within design. Readjust to match design if necessary.
2. Re-measure and confirm that total airflow is within design.
3. Re-measure all final fan operating data, speed, volts, amps, and static profile.

4. Mark all final settings.
5. Test system in economizer mode. Verify proper operation and adjust if necessary.
6. Measure and record all operating data.
7. Record final fan-performance data.

3.10 GENERAL PROCEDURES FOR HYDRONIC SYSTEMS

A. Prepare test reports for pumps, coils, and other equipment. Obtain approved submittals and manufacturer-recommended testing procedures. Crosscheck the summation of required coil and equipment flow rates with pump design flow rate.

B. Prepare schematic diagrams of systems' Record drawings piping layouts.

C. In addition to requirements in "Preparation" Article, prepare hydronic systems for testing and balancing as follows:

1. Check expansion tank for proper setting.
2. Check highest vent for adequate pressure.
3. Check flow-control valves for proper position.
4. Locate start-stop and disconnect switches, electrical interlocks, and motor controllers.
5. Verify that motor controllers are equipped with properly sized thermal protection.
6. Check that air has been purged from the system.

D. Measure and record upstream and downstream pressure of each piece of equipment.

E. Measure and record upstream and downstream pressure of pressure-reducing valves.

F. Check settings and operation of automatic temperature-control valves, self-contained control valves, and pressure-reducing valves. Record final settings.

1. Check settings and operation of each safety valve. Record settings.

3.11 PROCEDURES FOR CONSTANT-FLOW HYDRONIC SYSTEMS

A. Adjust pumps to deliver total design flow.

1. Measure total water flow.

a. Position valves for full flow through coils.
b. Measure flow by main flow meter, if installed.
c. If main flow meter is not installed, determine flow by pump TDH or known equipment pressure drop.

2. Measure pump TDH as follows:

a. Measure discharge pressure directly at the pump outlet flange or in discharge pipe prior to any valves.
b. Measure inlet pressure directly at the pump inlet flange or in suction pipe prior to any valves or strainers.

c. Convert pressure to head and correct for differences in gauge heights.
d. Verify pump impeller size by measuring the TDH with the discharge valve closed. Note the point on manufacturer's pump curve at zero flow, and verify that the pump has the intended impeller size.
e. With valves open, read pump TDH. Adjust pump discharge valve until design water flow is achieved. If excessive throttling is required to achieve desired flow, recommend pump impellers be trimmed to reduce excess throttling.

3. Monitor motor performance during procedures, and do not operate motor in an overloaded condition.

B. Adjust flow-measuring devices installed in mains and branches to design water flows.

1. Measure flow in main and branch pipes.
2. Adjust main and branch balance valves for design flow.
3. Re-measure each main and branch after all have been adjusted.

C. Adjust flow-measuring devices installed at terminals for each space to design water flows.

1. Measure flow at terminals.
2. Adjust each terminal to design flow.
3. Re-measure each terminal after it is adjusted.
4. Position control valves to bypass the coil, and adjust the bypass valve to maintain design flow.
5. Perform temperature tests after flows have been balanced.

D. For systems with pressure-independent valves at terminals:

1. Measure differential pressure and verify that it is within manufacturer's specified range.
2. Perform temperature tests after flows have been verified.

E. For systems without pressure-independent valves or flow-measuring devices at terminals:

1. Measure and balance coils by either coil pressure drop or temperature method.
2. If balanced by coil pressure drop, perform temperature tests after flows have been verified.

F. Verify final system conditions as follows:

1. Re-measure and confirm that total water flow is within design.
2. Re-measure final pumps' operating data, TDH, volts, amps, and static profile.
3. Mark final settings.

G. Verify that memory stops have been set.

3.12 PROCEDURES FOR VARIABLE-FLOW HYDRONIC SYSTEMS

A. Balance systems with automatic two- and three-way control valves by setting systems at maximum flow through heat-exchange terminals, and proceed as specified above for hydronic systems.

B. Adjust the variable-flow hydronic system as follows:

1. Verify that the pressure-differential sensor(s) is located as indicated.
2. Determine whether there is diversity in the system.

C. For systems with no flow diversity:

1. Adjust pumps to deliver total design flow.

    a. Measure total water flow.

        1) Position valves for full flow through coils.
        2) Measure flow by main flow meter, if installed.
        3) If main flow meter is not installed, determine flow by pump TDH or known equipment pressure drop.

    b. Measure pump TDH as follows:

        1) Measure discharge pressure directly at the pump outlet flange or in discharge pipe prior to any valves.
        2) Measure inlet pressure directly at the pump inlet flange or in suction pipe prior to any valves or strainers.
        3) Convert pressure to head and correct for differences in gauge heights.
        4) Verify pump impeller size by measuring the TDH with the discharge valve closed. Note the point on manufacturer's pump curve at zero flow, and verify that the pump has the intended impeller size.
        5) With valves open, read pump TDH. Adjust pump discharge valve or speed until design water flow is achieved. If excessive throttling is required to achieve desired flow, recommend pump impellers be trimmed to reduce excess throttling.

    c. Monitor motor performance during procedures, and do not operate motor in an overloaded condition.

2. Adjust flow-measuring devices installed in mains and branches to design water flows.

    a. Measure flow in main and branch pipes.
    b. Adjust main and branch balance valves for design flow.
    c. Re-measure each main and branch after all have been adjusted.

3. Adjust flow-measuring devices installed at terminals for each space to design water flows.

    a. Measure flow at terminals.
    b. Adjust each terminal to design flow.
    c. Re-measure each terminal after it is adjusted.
    d. Position control valves to bypass the coil, and adjust the bypass valve to maintain design flow.
    e. Perform temperature tests after flows have been balanced.

4. For systems with pressure-independent valves at terminals:

    a. Measure differential pressure and verify that it is within manufacturer's specified range.
    b. Perform temperature tests after flows have been verified.

5. For systems without pressure-independent valves or flow-measuring devices at terminals:

    a. Measure and balance coils by either coil pressure drop or temperature method.
    b. If balanced by coil pressure drop, perform temperature tests after flows have been verified.

6. Prior to verifying final system conditions, determine the system pressure-differential set point(s).
7. If the pump discharge valve was used to set total system flow with variable-frequency controller at 60 Hz, at completion, open discharge valve 100 percent, and allow variable-frequency controller to control system differential-pressure set point. Record pump data under both conditions.
8. Mark final settings and verify that all memory stops have been set.
9. Verify final system conditions as follows:

    a. Re-measure and confirm that total flow is within design.
    b. Re-measure final pumps' operating data, TDH, volts, amps, speed, and static profile.
    c. Mark final settings.

D. For systems with flow diversity:

1. Determine diversity factor.
2. Simulate system diversity by closing required number of control valves, as approved by Director’s Representative.
3. Adjust pumps to deliver total design flow.

    a. Measure total water flow.

        1) Position valves for full flow through coils.
        2) Measure flow by main flow meter, if installed.
        3) If main flow meter is not installed, determine flow by pump TDH or known equipment pressure drop.

    b. Measure pump TDH as follows:

        1) Measure discharge pressure directly at the pump outlet flange or in discharge pipe prior to any valves.
        2) Measure inlet pressure directly at the pump inlet flange or in suction pipe prior to any valves or strainers.
        3) Convert pressure to head and correct for differences in gauge heights.
        4) Verify pump impeller size by measuring the TDH with the discharge valve closed. Note the point on manufacturer's pump curve at zero flow, and verify that the pump has the intended impeller size.
        5) With valves open, read pump TDH. Adjust pump discharge valve or speed until design water flow is achieved. If excessive throttling is required to

achieve desired flow, recommend pump impellers be trimmed to reduce excess throttling.

c. Monitor motor performance during procedures, and do not operate motor in an overloaded condition.

4. Adjust flow-measuring devices installed in mains and branches to design water flows.

   a. Measure flow in main and branch pipes.
   b. Adjust main and branch balance valves for design flow.
   c. Re-measure each main and branch after all have been adjusted.

5. Adjust flow-measuring devices installed at terminals for each space to design water flows.

   a. Measure flow at terminals.
   b. Adjust each terminal to design flow.
   c. Re-measure each terminal after it is adjusted.
   d. Position control valves to bypass the coil, and adjust the bypass valve to maintain design flow.
   e. Perform temperature tests after flows have been balanced.

6. For systems with pressure-independent valves at terminals:

   a. Measure differential pressure, and verify that it is within manufacturer's specified range.
   b. Perform temperature tests after flows have been verified.

7. For systems without pressure-independent valves or flow-measuring devices at terminals:

   a. Measure and balance coils by either coil pressure drop or temperature method.
   b. If balanced by coil pressure drop, perform temperature tests after flows have been verified.

8. Open control valves that were shut. Close a sufficient number of control valves that were previously open to maintain diversity, and balance terminals that were just opened.
9. Prior to verifying final system conditions, determine system pressure-differential set point(s).
10. If the pump discharge valve was used to set total system flow with variable-frequency controller at 60 Hz, at completion, open discharge valve 100 percent, and allow variable-frequency controller to control system differential-pressure set point. Record pump data under both conditions.
11. Mark final settings and verify that memory stops have been set.
12. Verify final system conditions as follows:

    a. Re-measure and confirm that total water flow is within design.
    b. Re-measure final pumps' operating data, TDH, volts, amps, speed, and static profile.
    c. Mark final settings.

3.13 PROCEDURES FOR PRIMARY-SECONDARY HYDRONIC SYSTEMS

A. Balance the primary circuit flow first.

B. Balance the secondary circuits after the primary circuits are complete.

C. Adjust pumps to deliver total design flow.

1. Measure total water flow.

    a. Position valves for full flow through coils.
    b. Measure flow by main flow meter, if installed.
    c. If main flow meter is not installed, determine flow by pump TDH or known equipment pressure drop.

2. Measure pump TDH as follows:

    a. Measure discharge pressure directly at the pump outlet flange or in discharge pipe prior to any valves.
    b. Measure inlet pressure directly at the pump inlet flange or in suction pipe prior to any valves or strainers.
    c. Convert pressure to head and correct for differences in gauge heights.
    d. Verify pump impeller size by measuring the TDH with the discharge valve closed. Note the point on manufacturer's pump curve at zero flow, and verify that the pump has the intended impeller size.
    e. With valves open, read pump TDH. Adjust pump discharge valve or speed until design water flow is achieved. If excessive throttling is required to achieve desired flow, recommend pump impellers be trimmed to reduce excess throttling.

3. Monitor motor performance during procedures, and do not operate motor in an overloaded condition.

D. Adjust flow-measuring devices installed in mains and branches to design water flows.

1. Measure flow in main and branch pipes.
2. Adjust main and branch balance valves for design flow.
3. Re-measure each main and branch after all have been adjusted.

E. Adjust flow-measuring devices installed at terminals for each space to design water flows.

1. Measure flow at terminals.
2. Adjust each terminal to design flow.
3. Re-measure each terminal after it is adjusted.
4. Position control valves to bypass the coil, and adjust the bypass valve to maintain design flow.
5. Perform temperature tests after flows have been balanced.

F. For systems with pressure-independent valves at terminals:

1. Measure differential pressure and verify that it is within manufacturer's specified range.
2. Perform temperature tests after flows have been verified.

G. For systems without pressure-independent valves or flow-measuring devices at terminals:

1. Measure and balance coils by either coil pressure drop or temperature method.
2. If balanced by coil pressure drop, perform temperature tests after flows have been verified.

H. Verify final system conditions as follows:

1. Re-measure and confirm that total water flow is within design.
2. Re-measure final pumps' operating data, TDH, volts, amps, speed, and static profile.
3. Mark final settings.

I. Verify that memory stops have been set.

3.14 PROCEDURES FOR STEAM AND CONDENSATE SYSTEMS

A. Measure and record upstream and downstream pressure of each piece of equipment.

B. Measure and record upstream and downstream steam pressure of pressure-reducing valves.

C. Check settings and operation of automatic temperature-control valves, self-contained control valves, and pressure-reducing valves. Record final settings.

D. Check settings and operation of each safety valve. Record settings.

E. Verify the operation of each steam trap.

3.15 PROCEDURES FOR STEAM-TO-WATER HEAT EXCHANGERS

A. Adjust and record water flow to within specified tolerances.

B. Measure and record inlet and outlet water temperatures.

C. Measure and record inlet steam pressure and condensate outlet pressure.

D. Check and record settings and operation of safety and relief valves.

3.16 PROCEDURES FOR WATER-TO-WATER HEAT EXCHANGERS

A. Adjust and record water flow to within specified tolerances.

B. Measure and record inlet and outlet water temperatures.

C. Measure and record pressure drop.

D. Check and record settings and operation of safety and relief valves.

3.17 PROCEDURES FOR MOTORS

A. Motors 1/2 HP and Larger: Test at final balanced conditions and record the following data:

1. Manufacturer's name, model number, and serial number.
2. Motor horsepower rating.
3. Motor rpm.
4. Phase and hertz.
5. Nameplate and measured voltage, each phase.
6. Nameplate and measured amperage, each phase.
7. Starter size and thermal-protection-element rating.
8. Service factor and frame size.

B. Motors Driven by Variable-Frequency Controllers: Test manual bypass of controller to prove proper operation.

3.18 PROCEDURES FOR AIR-COOLED CONDENSING UNITS

A. Verify proper rotation of fan(s).

B. Measure and record entering- and leaving-air temperatures.

C. Measure and record entering and leaving refrigerant pressures.

D. Measure and record operating data of compressor(s), fan(s), and motors.

3.19 PROCEDURES FOR AIR-COOLED CONDENSERS

A. Verify proper rotation of fan(s).

B. Measure and record entering- and leaving-air temperatures.

C. Measure and record entering and leaving refrigerant pressures.

D. Measure and record operating data of fan(s) and motor(s).

3.20 PROCEDURES FOR BOILERS

A. Hydronic Boilers:

1. Measure and record entering- and leaving-water temperatures.
2. Measure and record water flow.
3. Measure and record pressure drop.
4. Measure and Record relief valve(s) pressure setting.
5. Capacity: Calculate in Btu/h (kW) of heating output.
6. Fuel Consumption: If boiler fuel supply is equipped with flow meter, measure and record consumption.
7. Efficiency: Calculate operating efficiency for comparison to submitted equipment.

8. Fan, motor, and motor controller operating data.

B. Boilers with Flue Gas Economizers:

1. Measure and record entering- and leaving-water temperature.
2. Measure and record water flow rate.
3. Measure and record water pressure drop.
4. Heat Recovered: Calculate in Btu/h (kW) of waste heat recovered.

3.21 PROCEDURES FOR HEAT-TRANSFER COILS

A. Measure, adjust, and record the following data for each hydronic coil:

1. Entering- and leaving-water temperature.
2. Water flow rate.
3. Water pressure drop.
4. Dry-bulb temperature of entering and leaving air.
5. Wet-bulb temperature of entering and leaving air for cooling coils.
6. Airflow.
7. Air pressure drop.

B. Measure, adjust, and record the following data for each electric heating coil:

1. Nameplate data.
2. Airflow.
3. Entering- and leaving-air temperature at full load.
4. Air pressure drop.
5. Voltage and amperage input of each phase at full load.
6. Calculated kilowatt at full load.
7. Fuse or circuit-breaker rating for overload protection.

C. Measure, adjust, and record the following data for each steam coil:

1. Dry-bulb temperature of entering and leaving air.
2. Airflow.
3. Inlet steam pressure.

D. Measure, adjust, and record the following data for each refrigerant coil:

1. Dry-bulb temperature of entering and leaving air.
2. Wet-bulb temperature of entering and leaving air.
3. Airflow.
4. Air pressure drop.
5. Entering and leaving refrigerant pressure and temperatures.

3.22 SOUND TESTS

A. After systems are balanced and Substantial Completion, measure and record sound levels at five locations as designated by the Director’s Representative.

B. Instrumentation:

1. The sound-testing meter shall be a portable, general-purpose testing meter consisting of a microphone, processing unit, and readout.
2. The sound-testing meter shall be capable of showing fluctuations at minimum and maximum levels, and measuring the equivalent continuous sound pressure level (L_{eq}).
3. The sound-testing meter must be capable of using one-third octave band filters to measure mid-frequencies from 31.5 Hz to 8000 Hz.
4. The accuracy of the sound-testing meter shall be plus or minus one decibel.

C. Test Procedures:

1. Perform test at quietest background noise period. Note cause of unpreventable sound that affects test outcome.
2. Equipment should be operating at design values.
3. Calibrate the sound-testing meter prior to taking measurements.
4. Use a microphone suitable for the type of noise levels measured that is compatible with meter. Provide a windshield for outside or in-duct measurements.
5. Record a set of background measurements in dBA and sound pressure levels in the eight unweighted octave bands 63 Hz to 8000 Hz (NC) with the equipment off.
6. Take sound readings in dBA and sound pressure levels in the eight unweighted octave bands 63 Hz to 8000 Hz (NC) with the equipment operating.
7. Take readings no closer than 36 inches36 inches (900 mm) from a wall or from the operating equipment and approximately 60 inches60 inches (1500 mm) from the floor, with the meter held or mounted on a tripod.
8. For outdoor measurements, move sound-testing meter slowly and scan area that has the most exposure to noise source being tested. Use A-weighted scale for this type of reading.

D. Reporting:

1. Report shall record the following:

    a. Location.
    b. System tested.
    c. dBA reading.
    d. Sound pressure level in each octave band with equipment on and off.

2. Plot sound pressure levels on Noise Criteria (NC) worksheet with equipment on and off.

3.23 VIBRATION TESTS

A. After systems are balanced and Substantially Completion, measure and record vibration levels on equipment having motor horsepower equal to or greater than 10.

B. Instrumentation:

1. Use portable, battery-operated, and microprocessor-controlled vibration meter with or without a built-in printer.
2. The meter shall automatically identify engineering units, filter bandwidth, amplitude, and frequency scale values.

3. The meter shall be able to measure machine vibration displacement in mils of deflection, velocity in inches per second, and acceleration in inches per second squared.
4. Verify calibration date is current for vibration meter before taking readings.

C. Test Procedures:

1. To ensure accurate readings, verify that accelerometer has a clean, flat surface and is mounted properly.
2. With the unit running, set up vibration meter in a safe, secure location. Connect transducer to meter with proper cables. Hold magnetic tip of transducer on top of the bearing, and measure unit in mils of deflection. Record measurement, then move transducer to the side of the bearing and record in mils of deflection. Record an axial reading in mils of deflection by holding nonmagnetic, pointed transducer tip on end of shaft.
3. Change vibration meter to velocity (inches per second) measurements. Repeat and record above measurements.
4. Record CPM or rpm.
5. Read each bearing on motor, fan, and pump as required. Track and record vibration levels from rotating component through casing to base.

D. Reporting:

1. Report shall record location and the system tested.
2. Include horizontal-vertical-axial measurements for tests.
3. Verify that vibration limits follow Specifications, or, if not specified, follow the General Machinery Vibration Severity Chart or Vibration Acceleration General Severity Chart from AABC's "National Standards for Total System Balance." Acceptable levels of vibration are normally "smooth" to "good."
4. Include in General Machinery Vibration Severity Chart, with conditions plotted.

3.24 DUCT LEAKAGE TESTS

A. Witness the duct leakage testing performed by Installer.

B. Verify that proper test methods are used and that leakage rates are within specified limits.

C. Report deficiencies observed.

3.25 PIPE LEAKAGE TESTS

A. Witness the pipe pressure testing performed by Installer.

B. Verify that proper test methods are used and that leakage rates are within specified limits.

C. Report deficiencies observed.

3.26 UFAD PLENUM LEAKAGE TESTS

A. Witness the UFAD plenum pressure testing performed by Installer.

B. Verify that proper test methods are used and that leakage rates are within specified limits.

C. Report deficiencies observed.

3.27 HVAC CONTROLS VERIFICATION

A. In conjunction with system balancing, perform the following:

B. Verify HVAC control system is operating within the design limitations.

C. Confirm that the sequences of operation are in compliance with Contract Documents.

D. Verify that controllers are calibrated and function as intended.

E. Verify that controller set points are as indicated.

F. Verify the operation of lockout or interlock systems.

G. Verify the operation of valve and damper actuators.

H. Verify that controlled devices are properly installed and connected to correct controller.

I. Verify that controlled devices travel freely and are in position indicated by controller: open, closed, or modulating.

J. Verify location and installation of sensors to ensure that they sense only intended temperature, humidity, or pressure.

K. Reporting: Include a summary of verifications performed, remaining deficiencies, and variations from indicated conditions.

3.28 PROCEDURES FOR SMOKE-CONTROL SYSTEM TESTING

A. Before testing smoke-control systems, review design documents to understand operating requirements and design intent:

1. Review boundaries of each smoke zone.
2. Review location, size, and operating characteristics of equipment, such as smoke and fire smoke dampers.
3. Review sequence of operation, operating status of equipment, and position of smoke and fire dampers for each smoke zone alarm condition.
4. Review location and type of alarm detection used to initiate smoke control for each smoke zone.
5. Review other smoke-control system attributes not listed but required for code compliance and acceptance by authorities having jurisdiction.

B. Before testing smoke-control systems, verify that construction is complete and verify the integrity of each smoke-control zone boundary.

1. Verify that windows, doors, walls, ceilings, and floors (six-sided boundary) are closed and that applicable safing, gasket, and firestops and sealants are installed.
2. Report deficiencies and postpone testing until after the reported deficiencies are corrected.

C. Measure and record barometric pressure, wind speed and direction, outdoor-air temperature, and relative humidity on each test day.

D. Measure, adjust, and record airflow of each smoke-control system, with all fans that are a part of system operating as intended by the design.

1. Measure, adjust, and record the airflow of each fan. For ducted systems, measure fan airflow by duct Pitot-tube traverse.
2. Measure, adjust, and record the airflow of each exhaust inlet and supply outlet.
3. Measure, adjust, and record airflow in main and branch ducts.

E. Smoke Control by Pressurization: After air balancing is complete, perform the following pressurization testing for each smoke-control zone in the system designed for isolation by using pressurization boundaries:

1. Verify the boundaries of each smoke-control zone.
2. With the HVAC systems in their normal mode of operation and smoke control not operating, measure and record the pressure difference across each smoke-control zone. Make measurements after closing doors that separate the zones. Make one measurement across each door. Clearly indicate the high- and low-pressure side of each door.
3. With the system operating in the smoke-control mode and with each separate zone in the smoke-control system activated, perform the following:

    a. Measure and record the pressure difference across each door that separates the smoke zone from adjacent zones.

        1) Make measurements with doors that separate the smoke zone from the other zones closed.
        2) Clearly indicate the high- and low-pressure side of the door.
        3) Doors that have a tendency to open slightly due to the pressure difference should have one pressure measurement made while held closed and another measurement made with the door open.

    b. Continue to activate each separate smoke zone within each smoke-control system, and make pressure-difference measurements.
    c. After testing a smoke zone's smoke-control system, deactivate the HVAC systems involved and return them to their normal operating mode before activating another zone's smoke-control system.
    d. Verify that controls necessary to prevent excessive pressure differences are functional and operating within design set points and limits.

F. Smoke-Control Systems for Atriums and Other Large-Volume Spaces: After air balancing is complete, perform the following testing for each smoke-control system serving atriums and other large-volume spaces:

1. Verify and document the boundaries served by each smoke-control system.

2. Identify and document closed doors, open doors, and other boundary openings to be left open to adjacent areas and that are to be protected by airflow alone.
3. With the HVAC systems in their normal mode of operation and smoke-control systems not operating, measure and record the following:

    a. Pressure difference across each door that separates the smoke-zone from adjacent zones.
    b. Velocity for each point in traverse across each boundary opening:

        1) Clearly indicate the direction of flow.
        2) Measure velocity across opening on 12-inch12-inch (300-mm) centers using a vane anemometer.
        3) Calculate and report airflow.

4. With system operating in the smoke-control mode, measure and record the following:

    a. Pressure difference across each door that separates the smoke-zone from adjacent zones.
    b. Velocity for each point in traverse across each opening:

        1) Clearly indicate the direction of flow.
        2) Measure velocity across opening on 12-inch12-inch (300-mm) centers using a vane anemometer.
        3) Calculate and report airflow.

5. Verify system operation and make adjustments to achieve design pressure differences and air velocities within design set points and upper operating limits.

G. Operational Tests:

1. Check the proper activation of each zone of each smoke-control system in response to all means of activation, both automatic and manual.
2. Check automatic activation in response to fire alarm signals received from the building's fire alarm system. Initiate a separate alarm for each means of activation to ensure that the proper operation of the correct zone of each smoke-control system occurs.
3. Check and record proper operation of fans, dampers, and related equipment for each separate zone of each smoke-control system:

    a. Zone in which a smoke-control system automatically activates.
    b. Type of signal that activates smoke-control system, such as sprinkler flow or smoke detector.
    c. Smoke zone(s) where maximum mechanical exhaust to the outside is implemented and no supply air is provided.
    d. Positive-pressure smoke-control zone(s) where maximum air supply is implemented and no exhaust to the outside is provided.
    e. Fan(s) "ON" as required to implement the smoke-control system. Multiple- or variable-speed fans should be further noted to verify that the intended control configuration is achieved.
    f. Fan(s) "OFF" as required to implement the smoke-control system.

g. Damper(s) "OPEN" or at an adjustable position where maximum airflow must be achieved.
h. Damper(s) "CLOSED" where no airflow should take place.
i. Auxiliary functions to achieve the smoke-control system configuration, such as changes or override of normal operating pressure and temperature-control set points.
j. If standby power is provided for the smoke-control system, test to verify that the system functions while operating under both normal and standby power.
k. Check operation in accordance with design indicated.

H. AHJ Tests: Conduct additional tests required by authorities having jurisdiction. Unless required by authorities having jurisdiction, perform testing without the use of smoke or products that simulate smoke.

I. Report: Prepare and submit a complete report of observations, measurements, and deficiencies. Include names and contact information of individuals conducting tests and of individuals witnessing tests.

3.29 PROCEDURES FOR TESTING, ADJUSTING, AND BALANCING EXISTING SYSTEMS

A. Perform a preconstruction inspection of existing equipment that is to remain and be reused.

1. Measure and record the operating speed, airflow, and static pressure of each fan and equipment with fan(s).
2. Measure and record flows, temperatures, and pressures of each piece of equipment in each hydronic system. Compare the values to design or nameplate information, where information is available.
3. Measure motor voltage and amperage. Compare the values to motor nameplate information.
4. Check the refrigerant charge.
5. Check the condition of filters.
6. Check the condition of coils.
7. Check the operation of the drain pan and condensate-drain trap.
8. Check bearings and other lubricated parts for proper lubrication.
9. Report on the operating condition of the equipment and the results of the measurements taken. Report deficiencies.

B. TAB After Construction: Before performing testing and balancing of renovated existing systems, inspect existing equipment that is to remain and be reused to verify that existing equipment has been cleaned and refurbished in accordance with renovation scope indicated by Contract Documents. Verify the following:

1. New filters are installed.
2. Coils are clean and fins combed.
3. Drain pans are clean.
4. Fans are clean.
5. Bearings and other parts are properly lubricated.
6. Deficiencies noted in the preconstruction report are corrected.

C. Perform testing and balancing of existing systems to the extent that existing systems are affected by the renovation work.

1. Compare the indicated airflow of the renovated work to the measured fan airflows, and determine the new fan speed and the face velocity of filters and coils.
2. Verify that the indicated airflows of the renovated work result in filter and coil face velocities and fan speeds that are within the acceptable limits defined by equipment manufacturer.
3. If calculations increase or decrease the airflow rates and water flow rates by more than 5 percent, make equipment adjustments to achieve the calculated rates. If increase or decrease is 5 percent or less, equipment adjustments are not required.
4. Balance each air outlet.

3.30 TOLERANCES

A. Set HVAC system's airflow rates and water flow rates within the following tolerances:

1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus or minus 5 percent. If design value is less than 100 cfm100 cfm (47 L/s), within 10 cfm10 cfm (4.7 L/s).
2. Air Outlets and Inlets: Plus or minus 10 percent. If design value is less than 100 cfm100 cfm (47 L/s), within 10 cfm10 cfm (4.7 L/s).
3. Heating-Water Flow Rate: Plus or minus 5 percent. If design value is less than 10 gpm10 gpm (0.63 L/s), within 10 percent.
4. Condenser-Water Flow Rate: Plus or minus 5 percent.

B. Maintaining pressure relationships as designed shall have priority over the tolerances specified above.

3.31 PROGRESS REPORTING

A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article, prepare a report on the adequacy of design for system-balancing devices. Recommend changes and additions to system-balancing devices, to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance-measuring and -balancing devices.

B. Status Reports: Prepare weekly progress reports to describe completed procedures, procedures in progress, and scheduled procedures. Include a list of deficiencies and problems found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

3.32 FINAL REPORT

A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.

1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.

2. Include a list of instruments used for procedures, along with proof of calibration.
3. Certify validity and accuracy of field data.

B. Final Report Contents: In addition to certified field-report data, include the following:

1. Pump curves.
2. Fan curves.
3. Manufacturers' test data.
4. Field test reports prepared by system and equipment installers.
5. Other information relative to equipment performance; do not include Shop Drawings and Product Data.

C. General Report Data: In addition to form titles and entries, include the following data:

1. Title page.
2. Name and address of the TAB specialist.
3. Project name.
4. Project location.
5. Architect's name and address.
6. Engineer's Director's Representative name and address.
7. Contractor's name and address.
8. Report date.
9. Signature of TAB supervisor who certifies the report.
10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
11. Summary of contents, including the following:

    a. Indicated versus final performance.
    b. Notable characteristics of systems.
    c. Description of system operation sequence if it varies from the Contract Documents.

12. Nomenclature sheets for each item of equipment.
13. Data for terminal units, including manufacturer's name, type, size, and fittings.
14. Notes to explain why certain final data in the body of reports vary from indicated values.
15. Test conditions for fans performance forms, including the following:

    a. Settings for outdoor-, return-, and exhaust-air dampers.
    b. Conditions of filters.
    c. Cooling coil, wet- and dry-bulb conditions.
    d. Heating coil, dry-bulb conditions.
    e. Face and bypass damper settings at coils.
    f. Fan drive settings, including settings and percentage of maximum pitch diameter.
    g. Variable-frequency controller settings for variable-air-volume systems.
    h. Settings for pressure controller(s).
    i. Other system operating conditions that affect performance.

16. Test conditions for pump performance forms, including the following:

    a. Variable-frequency controller settings for variable-flow hydronic systems.
    b. Settings for pressure controller(s).

c. Other system operating conditions that affect performance.

D. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present each system with single-line diagram and include the following:

1. Quantities of outdoor, supply, return, and exhaust airflows.
2. Water and steam flow rates.
3. Duct, outlet, and inlet sizes.
4. Pipe and valve sizes and locations.
5. Terminal units.
6. Balancing stations.
7. Position of balancing devices.

E. Air-Handling-Unit Test Reports: For air-handling units, include the following:

1. Unit Data:

a. Unit identification.
b. Location.
c. Make and type.
d. Model number and unit size.
e. Manufacturer's serial number.
f. Unit arrangement and class.
g. Discharge arrangement.
h. Sheave make, size in inches (mm), and bore.
i. Center-to-center dimensions of sheave and amount of adjustments in inches (mm).
j. Number, make, and size of belts.
k. Number, type, and size of filters.

2. Motor Data:

a. Motor make, and frame type and size.
b. Horsepower and speed.
c. Volts, phase, and hertz.
d. Full-load amperage and service factor.
e. Sheave make, size in inches (mm), and bore.
f. Center-to-center dimensions of sheave and amount of adjustments in inches (mm).

3. Test Data (Indicated and Actual Values):

a. Total airflow rate in cfm (L/s).
b. Total system static pressure in inches wg (Pa).
c. Fan speed.
d. Inlet and discharge static pressure in inches wg (Pa).
e. For each filter bank, filter static-pressure differential in inches wg (Pa).
f. Preheat-coil static-pressure differential in inches wg (Pa).
g. Cooling-coil static-pressure differential in inches wg (Pa).
h. Heating-coil static-pressure differential in inches wg (Pa).
i. List for each internal component with pressure-drop, static-pressure differential in inches wg (Pa).

j. Outdoor airflow in cfm (L/s).
k. Return airflow in cfm (L/s).
l. Outdoor-air damper position.
m. Return-air damper position.
n. [Vortex damper position].

F. Apparatus-Coil Test Reports:

1. Coil Data:

a. System identification.
b. Location.
c. Coil type.
d. Number of rows.
e. Fin spacing in fins per inch fins per inch (mm) o.c.
f. Make and model number.
g. Face area in sq. ft.sq. ft. (sq. m).
h. Tube size in NPSNPS (DN).
i. Tube and fin materials.
j. Circuiting arrangement.

2. Test Data (Indicated and Actual Values):

a. Airflow rate in cfm (L/s).
b. Average face velocity in fpm (m/s).
c. Air pressure drop in inches wg (Pa).
d. Outdoor-air, wet- and dry-bulb temperatures in deg F (deg C).
e. Return-air, wet- and dry-bulb temperatures in deg F (deg C).
f. Entering-air, wet- and dry-bulb temperatures in deg F (deg C).
g. Leaving-air, wet- and dry-bulb temperatures in deg F (deg C).
h. Water flow rate in gpm (L/s).
i. Water pressure differential in feet of head or psig feet of head or psig (kPa).
j. Entering-water temperature in deg F (deg C).
k. Leaving-water temperature in deg F (deg C).
l. Refrigerant expansion valve and refrigerant types.
m. Refrigerant suction pressure in psig (kPa).
n. Refrigerant suction temperature in deg F (deg C).

G. Gas- and Oil-Fired Heat Apparatus Test Reports: In addition to manufacturer's factory startup equipment reports, include the following:

1. Unit Data:

a. System identification.
b. Location.
c. Make and type.
d. Model number and unit size.
e. Manufacturer's serial number.
f. Fuel type in input data.
g. Output capacity in Btu/h (kW).

h. Ignition type.
i. Burner-control types.
j. Motor horsepower and speed.
k. Motor volts, phase, and hertz.
l. Motor full-load amperage and service factor.
m. Sheave make, size in inches (mm), and bore.
n. Center-to-center dimensions of sheave and amount of adjustments in inches (mm).

2. Test Data (Indicated and Actual Values):

a. Total airflow rate in cfm (L/s).
b. Entering-air temperature in deg F (deg C).
c. Leaving-air temperature in deg F (deg C).
d. Air temperature differential in deg F (deg C).
e. Entering-air static pressure in inches wg (Pa).
f. Leaving-air static pressure in inches wg (Pa).
g. Air static-pressure differential in inches wg (Pa).
h. Low-fire fuel input in Btu/h (kW).
i. High-fire fuel input in Btu/h (kW).
j. Manifold pressure in psig (kPa).
k. High-temperature-limit setting in deg F (deg C).
l. Operating set point in Btu/h (kW).
m. Motor voltage at each connection.
n. Motor amperage for each phase.
o. Heating value of fuel in Btu/h (kW).

H. Electric-Coil Test Reports: For electric furnaces, duct coils, and electric coils installed in central-station air-handling units, include the following:

1. Unit Data:

a. System identification.
b. Location.
c. Coil identification.
d. Capacity in Btu/h (kW).
e. Number of stages.
f. Connected volts, phase, and hertz.
g. Rated amperage.
h. Airflow rate in cfm (L/s).
i. Face area in sq. ft.sq. ft. (sq. m).
j. Minimum face velocity in fpm (m/s).

2. Test Data (Indicated and Actual Values):

a. Heat output in Btu/h (kW).
b. Airflow rate in cfm (L/s).
c. Air velocity in fpm (m/s).
d. Entering-air temperature in deg F (deg C).
e. Leaving-air temperature in deg F (deg C).
f. Voltage at each connection.

g. Amperage for each phase.

I. Fan Test Reports: For supply, return, and exhaust fans, include the following:

1. Fan Data:

a. System identification.
b. Location.
c. Make and type.
d. Model number and size.
e. Manufacturer's serial number.
f. Arrangement and class.
g. Sheave make, size in inches (mm), and bore.
h. Center-to-center dimensions of sheave and amount of adjustments in inches (mm).

2. Motor Data:

a. Motor make, and frame type and size.
b. Horsepower and speed.
c. Volts, phase, and hertz.
d. Full-load amperage and service factor.
e. Sheave make, size in inches (mm), and bore.
f. Center-to-center dimensions of sheave and amount of adjustments in inches (mm).
g. Number, make, and size of belts.

3. Test Data (Indicated and Actual Values):

a. Total airflow rate in cfm (L/s).
b. Total system static pressure in inches wg (Pa).
c. Fan speed.
d. Discharge static pressure in inches wg (Pa).
e. Suction static pressure in inches wg (Pa).

J. Round, Flat-Oval, and Rectangular Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:

1. Report Data:

a. System fan and air-handling-unit number.
b. Location and zone.
c. Traverse air temperature in deg F (deg C).
d. Duct static pressure in inches wg (Pa).
e. Duct size in inches (mm).
f. Duct area in sq. ft.sq. ft. (sq. m).
g. Indicated airflow rate in cfm (L/s).
h. Indicated velocity in fpm (m/s).
i. Actual airflow rate in cfm (L/s).
j. Actual average velocity in fpm (m/s).
k. Barometric pressure in psig (Pa).

K. Air-Terminal-Device Reports:

1. Unit Data:

a. System and air-handling unit identification.
b. Location and zone.
c. Apparatus used for test.
d. Area served.
e. Make.
f. Number from system diagram.
g. Type and model number.
h. Size.
i. Effective area in sq. ft.sq. ft. (sq. m).

2. Test Data (Indicated and Actual Values):

a. Airflow rate in cfm (L/s).
b. Air velocity in fpm (m/s).
c. Preliminary airflow rate as needed in cfm (L/s).
d. Preliminary velocity as needed in fpm (m/s).
e. Final airflow rate in cfm (L/s).
f. Final velocity in fpm (m/s).
g. Space temperature in deg F (deg C).

L. System-Coil Reports: For reheat coils and water coils of terminal units, include the following:

1. Unit Data:

a. System and air-handling-unit identification.
b. Location and zone.
c. Room or riser served.
d. Coil make and size.
e. Flowmeter type.

2. Test Data (Indicated and Actual Values):

a. Airflow rate in cfm (L/s).
b. Entering-water temperature in deg F (deg C).
c. Leaving-water temperature in deg F (deg C).
d. Water pressure drop in feet of head or psig feet of head or psig (kPa).
e. Entering-air temperature in deg F (deg C).
f. Leaving-air temperature in deg F (deg C).

M. Pump Test Reports: Calculate impeller size by plotting the shutoff head on pump curves, and include the following:

1. Unit Data:

a. Unit identification.
b. Location.
c. Service.

d. Make and size.
e. Model number and serial number.
f. Water flow rate in gpm (L/s).
g. Water pressure differential in feet of head or psig feet of head or psig (kPa).
h. Required net positive suction head in feet of head or psig feet of head or psig (kPa).
i. Pump speed.
j. Impeller diameter in inches (mm).
k. Motor make and frame size.
l. Motor horsepower and rpm.
m. Voltage at each connection.
n. Amperage for each phase.
o. Full-load amperage and service factor.
p. Seal type.

2. Test Data (Indicated and Actual Values):

a. Static head in feet of head or psig feet of head or psig (kPa).
b. Pump shutoff pressure in feet of head or psig feet of head or psig (kPa).
c. Actual impeller size in inches (mm).
d. Full-open flow rate in gpm (L/s).
e. Full-open pressure in feet of head or psig feet of head or psig (kPa).
f. Final discharge pressure in feet of head or psig feet of head or psig (kPa).
g. Final suction pressure in feet of head or psig feet of head or psig (kPa).
h. Final total pressure in feet of head or psig feet of head or psig (kPa).
i. Final water flow rate in gpm (L/s).
j. Voltage at each connection.
k. Amperage for each phase.

N. Instrument Calibration Reports:

1. Report Data:

a. Instrument type and make.
b. Serial number.
c. Application.
d. Dates of use.
e. Dates of calibration.

3.33 VERIFICATION OF TAB REPORT

A. The TAB specialist's test and balance engineer shall conduct the inspection in the presence of Owner’s Representative.

B. Owner’s Representative shall randomly select measurements, documented in the final report, to be rechecked. Rechecking shall be limited to the lesser of either 10 percent of the total measurements recorded or the extent of measurements that can be accomplished in a normal 8-hour business day.

C. If rechecks yield measurements that differ from the measurements documented in the final report by more than the tolerances allowed, the measurements shall be noted as "FAILED."

D. If the number of "FAILED" measurements is greater than 10 percent of the total measurements checked during the final inspection, the TAB shall be considered incomplete and shall be rejected.

E. If recheck measurements find the number of failed measurements noncompliant with requirements indicated, proceed as follows:

1. TAB specialists shall recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes; resubmit the final report and request a second final inspection. All changes shall be tracked to show changes made to previous report.
2. If the second final inspection also fails, Director’s Representative may pursue others Contract options to complete TAB work.

F. Prepare test and inspection reports.

3.34 ADDITIONAL TESTS

A. Within 90 days of completing TAB, perform additional TAB to verify that balanced conditions are being maintained throughout and to correct unusual conditions.

B. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional TAB during near-peak summer and winter conditions.

C. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional TAB during near-peak summer and winter conditions.

END OF SECTION 230593

SECTION 230713 - DUCT INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes insulating the following duct services:

1. Indoor, concealed supply and outdoor air.
2. Indoor, exposed supply and outdoor air.
3. Indoor, concealed return located in unconditioned space.
4. Indoor, exposed return located in unconditioned space.
5. Indoor, concealed, Type I, commercial, kitchen hood exhaust.
6. Indoor, exposed, Type I, commercial, kitchen hood exhaust.
7. Indoor, concealed exhaust between isolation damper and penetration of building exterior.
8. Indoor, exposed exhaust between isolation damper and penetration of building exterior.
9. Outdoor, concealed supply and return.
10. Outdoor, exposed supply and return.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E84, by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.5 COORDINATION

A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."

B. Coordinate clearance requirements with duct Installer for duct insulation application. Before preparing ductwork Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

C. Coordinate installation and testing of heat tracing.

1.6 SCHEDULING

A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Comply with requirements in "Duct Insulation Schedule, General," "Indoor Duct and Plenum Insulation Schedule," and "Aboveground, Outdoor Duct and Plenum Insulation Schedule" articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C871.

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C795.

E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

F. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C534, Type II for sheet materials.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Aeroflex USA.

b. Armacell LLC.
c. K-Flex USA.
d. Approved equivalent.

2.2 FIRE-RATED INSULATION SYSTEMS

A. Fire-Rated Board: Structural-grade, press-molded, xonolite calcium silicate, fireproofing board suitable for operating temperatures up to 1700 deg F1700 deg F (927 deg C). Comply with ASTM C656, Type II, Grade 6. Tested and certified to provide a 1-hour fire rating by an NRTL acceptable to authorities having jurisdiction.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Johns Manville; a Berkshire Hathaway company.
b. Approved equivalent.

B. Fire-Rated Blanket: High-temperature, flexible, blanket insulation with FSK jacket that is tested and certified to provide a 1-hour fire rating by an NRTL acceptable to authorities having jurisdiction.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. CertainTeed Corporation.
b. Johns Manville; a Berkshire Hathaway company.
c. Nelson Firestop; a brand of Emerson Industrial Automation.
d. Approved equivalent.

2.3 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.

B. Flexible Elastomeric and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I.

1. 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. Armacell LLC.
b. Foster Brand; H. B. Fuller Construction Products.
c. K-Flex USA.
d. Approved equivalent.

C. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Childers Brand; H. B. Fuller Construction Products.
    b. Foster Brand; H. B. Fuller Construction Products.
    c. Mon-Eco Industries, Inc.
    d. Approved equivalent.

D. ASJ Adhesive, and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

1. 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. Childers Brand; H. B. Fuller Construction Products.
    b. Foster Brand; H. B. Fuller Construction Products.
    c. Mon-Eco Industries, Inc.
    d. Approved equivalent.

E. PVC Jacket Adhesive: Compatible with PVC jacket.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Johns Manville; a Berkshire Hathaway company.
    b. P.I.C. Plastics, Inc.
    c. The Dow Chemical Company.
    d. Approved equivalent.

2.4 MASTICS AND COATINGS

A. Materials shall be compatible with insulation materials, jackets, and substrates.

B. Vapor-Retarder Mastic: Water based; suitable for indoor use on below ambient services.

1. 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. Childers Brand; H. B. Fuller Construction Products.
    b. Foster Brand; H. B. Fuller Construction Products.
    c. Knauf Insulation.
    d. Approved equivalent.

2. Water-Vapor Permeance: Comply with ASTM C755, Section 7.2.2, Table 2, for insulation type and service conditions.

3. Service Temperature Range: Minus 20 to plus 180 deg FMinus 20 to plus 180 deg F (Minus 29 to plus 82 deg C).
4. Comply with MIL-PRF-19565C, Type II, for permeance requirements, with supplier listing on DOD QPD - Qualified Products Database.
5. Color: White.

C. Vapor-Retarder Mastic: Solvent based; suitable for outdoor use on below ambient services.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Childers Brand; H. B. Fuller Construction Products.
b. Eagle Bridges - Marathon Industries.
c. Foster Brand; H. B. Fuller Construction Products.
d. Approved equivalent.

2. Water-Vapor Permeance: Comply with ASTM C755, Section 7.2.2, Table 2, for insulation type and service conditions.
3. Service Temperature Range: Minus 50 to plus 220 deg FMinus 50 to plus 220 deg F.
4. Color: White.

2.5 LAGGING ADHESIVES

A. Description: Comply with MIL-A-3316C, Class I, Grade A and shall be compatible with insulation materials, jackets, and substrates.

1. 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. Childers Brand; H. B. Fuller Construction Products.
b. Foster Brand; H. B. Fuller Construction Products.
c. Vimasco Corporation.
d. Approved equivalent.

2. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over duct insulation.
3. Service Temperature Range: 0 to plus 180 deg F0 to plus 180 deg F (Minus 18 to plus 82 deg C).
4. Color: White.

2.6 SEALANTS

A. FSK and Metal Jacket Flashing Sealants:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Childers Brand; H. B. Fuller Construction Products.
b. Foster Brand; H. B. Fuller Construction Products.
c. Mon-Eco Industries, Inc.
d. Approved equivalent.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F Minus 40 to plus 250 deg F (Minus 40 to plus 121 deg C).
5. Color: Aluminum.

B. ASJ Flashing Sealants, and Vinyl and PVC Jacket Flashing Sealants:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Childers Brand; H. B. Fuller Construction Products.
b. Approved equivalent.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F Minus 40 to plus 250 deg F (Minus 40 to plus 121 deg C).
5. Color: White.

2.7 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C1136, Type I.
2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C1136, Type I.
3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C1136, Type II.
4. FSP Jacket: Aluminum-foil, fiberglass-reinforced scrim with polyethylene backing; complying with ASTM C1136, Type II.
5. Vinyl Jacket: White vinyl with a permeance of 1.3 perms1.3 perms (0.86 metric perm) when tested according to ASTM E96/E96M, Procedure A, and complying with NFPA 90A and NFPA 90B.

2.8 FIELD-APPLIED FABRIC-REINFORCING MESH

A. Woven Glass-Fiber Fabric: Approximately.6 oz./sq. yd. (203 g/sq. m) with a thread count of 5 strands by 5 strands/sq. in. (2 strands by 2 strands/sq. mm) for covering ducts.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Childers Brand; H. B. Fuller Construction Products.
    b. Approved equivalent.

B. Woven Polyester Fabric: Approximately 1 oz./sq. yd. (34 g/sq. m) with a thread count of 10 strands by 10 strands/sq. in. (4 strands by 4 strands/sq. mm), in a Leno weave, for ducts.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Foster Brand; H. B. Fuller Construction Products.
    b. Vimasco Corporation.
    c. Approved equivalent.

2.9 FIELD-APPLIED CLOTHS

A. Woven Glass-Fiber Fabric: Comply with MIL-C-20079H, Type I, plain weave, and presized a minimum of 8 oz./sq. yd. (271 g/sq. m).

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Alpha Associates, Inc.
    b. Approved equivalent.

2.10 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C921, Type I, unless otherwise indicated.

B. FSK Jacket: Aluminum-foil-face, fiberglass-reinforced scrim with kraft-paper backing.

C. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.

1. 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. Johns Manville; a Berkshire Hathaway company.
    b. P.I.C. Plastics, Inc.
    c. Proto Corporation.
    d. Approved equivalent.

2. Adhesive: As recommended by jacket material manufacturer.
3. Color: Color-code jackets based on system. Color as selected by Director's Representative.

D. Metal Jacket:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

   a. ITW Insulation Systems; Illinois Tool Works, Inc.
   b. RPR Products, Inc.
   c. Approved equivalent.

2. Aluminum Jacket: Comply with ASTM B209ASTM B209 (ASTM B209M), Alloy 3003, 3005, 3105, or 5005, Temper H-14.

   a. Factory cut and rolled to size.
   b. Finish and thickness are indicated in field-applied jacket schedules.
   c. Moisture Barrier for Indoor Applications: 2.5-mil (0.063-mm-) thick polysurlyn.
   d. Moisture Barrier for Outdoor Applications: 2.5-mil (0.063-mm-) thick polysurlyn.

3. Stainless-Steel Jacket: ASTM A167 or ASTM A240/A240M.

   a. Factory cut and rolled to size.
   b. Material, finish, and thickness are indicated in field-applied jacket schedules.
   c. Moisture Barrier for Indoor Applications: 2.5-mil (0.063-mm-) thick polysurlyn.
   d. Moisture Barrier for Outdoor Applications: 2.5-mil (0.063-mm-) thick polysurlyn.

E. Self-Adhesive Outdoor Jacket: 60-mil (1.5-mm-) thick, laminated vapor barrier and waterproofing membrane for installation over insulation located aboveground outdoors; consisting of a rubberized bituminous resin on a cross laminated polyethylene film covered with white aluminum-foil facing.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

   a. Polyguard Products, Inc.
   b. Approved equivalent.

2.11 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C1136.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

   a. Compac Corporation.

b. Ideal Tape Co., Inc., an American Biltrite Company.
c. Knauf Insulation.
d. Approved equivalent.

2. Width: 3 inches (75 mm).
3. Thickness: 11.5 mils (0.29 mm).
4. Adhesion: 90 ounces force/inch (1.0 N/mm) in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch (7.2 N/mm) in width.
7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C1136.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Compac Corporation.
b. Ideal Tape Co., Inc., an American Biltrite Company.
c. Knauf Insulation.
d. Approved equivalent.

2. Width: 3 inches (75 mm).
3. Thickness: 6.5 mils (0.16 mm).
4. Adhesion: 90 ounces force/inch (1.0 N/mm) in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch (7.2 N/mm) in width.
7. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

C. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive; suitable for indoor and outdoor applications.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Compac Corporation.
b. Ideal Tape Co., Inc., an American Biltrite Company.
c. Venture Tape.
d. Approved equivalent.

2. Width: 2 inches (50 mm).
3. Thickness: 6 mils (0.15 mm).
4. Adhesion: 64 ounces force/inch (0.7 N/mm) in width.
5. Elongation: 500 percent.
6. Tensile Strength: 18 lbf/inch (3.3 N/mm) in width.

D. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Compac Corporation.
    b. Ideal Tape Co., Inc., an American Biltrite Company.
    c. Knauf Insulation.
    d. Approved equivalent.

2. Width: 2 inches (50 mm).
3. Thickness: 3.7 mils (0.093 mm).
4. Adhesion: 100 ounces force/inch (1.1 N/mm) in width.
5. Elongation: 5 percent.
6. Tensile Strength: 34 lbf/inch (6.2 N/mm) in width.

2.12 SECUREMENTS

A. Bands:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. ITW Insulation Systems; Illinois Tool Works, Inc.
    b. RPR Products, Inc.
    c. Approved equivalent.

2. Stainless Steel: ASTM A167 or ASTM A240/A240M, Type 316; 0.015 inch0.015 inch (0.38 mm) thick, 1/2 inch (13 mm)wide with wing seal or closed seal.
3. Aluminum: ASTM B209ASTM B209 (ASTM B209M), Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch (0.51 mm) thick, 1/2 inch (13 mm) wide with wing seal or closed seal.
4. Springs: Twin spring set constructed of stainless steel with ends flat and slotted to accept metal bands. Spring size determined by manufacturer for application.

B. Insulation Pins and Hangers:

1. Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch-0.106-inch- (2.6-mm-) diameter shank, length to suit depth of insulation indicated.

    a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

        1) AGM Industries, Inc.
        2) Gemco.
        3) Midwest Fasteners, Inc.
        4) Approved equivalent.

2. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch-0.106-inch- (2.6-mm-) diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch1-1/2-inch (38-mm) galvanized carbon-steel washer.

    a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

        1) AGM Industries, Inc.
        2) Gemco.
        3) Midwest Fasteners, Inc.
        4) Approved equivalent.

3. Metal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:

    a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

        1) AGM Industries, Inc.
        2) Gemco.
        3) Midwest Fasteners, Inc.
        4) Approved equivalent.

    b. Baseplate: Perforated, galvanized carbon-steel sheet, 0.030-inch (0.76 mm) thick by 2 inches (50 mm) square.
    c. Spindle: Copper- or zinc-coated, low-carbon steel, fully annealed, 0.106-inch (2.6-mm-) diameter shank, length to suit depth of insulation indicated.
    d. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.

4. Nonmetal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate fastened to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:

    a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

        1) Gemco.
        2) Midwest Fasteners, Inc.
        3) Approved equivalent.

    b. Baseplate: Perforated, nylon sheet, 0.030 inch (0.76 mm) thick by 1-1/2 inches (38 mm) in diameter.

c. Spindle: Nylon, 0.106-inch (2.6-mm-) diameter shank, length to suit depth of insulation indicated, up to 2-1/2 inches (63 mm).
d. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.

5. Self-Sticking-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:

a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1) AGM Industries, Inc.
2) Gemco.
3) Midwest Fasteners, Inc.
4) Approved equivalent.

b. Baseplate: Galvanized carbon-steel sheet, 0.030 inch (0.76 mm) thick by 2 inches (50 mm) square.
c. Spindle: Copper- or zinc-coated, low-carbon steel, fully annealed, 0.106-inch (2.6-mm-) diameter shank, length to suit depth of insulation indicated.
d. Adhesive-backed base with a peel-off protective cover.

6. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch (0.41-mm-) thick, galvanized-steel sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches (38 mm) in diameter.

a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1) AGM Industries, Inc.
2) Gemco.
3) Midwest Fasteners, Inc.
4) Approved equivalent.

b. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in exposed locations.

7. Nonmetal Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch (0.41-mm-) thick nylon sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches (38 mm) in diameter.

a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1) Gemco.
2) Midwest Fasteners, Inc.

3) Approved equivalent.

C. Staples: Outward-clinching insulation staples, nominal 3/4-inch (19-mm-) wide, stainless steel or Monel.

D. Wire: 0.062-inch (1.6-mm) soft-annealed, stainless steel.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. C & F Wire.
b. Approved equivalent.

2.13 CORNER ANGLES

A. PVC Corner Angles: 30 mils (0.8 mm) thick, minimum 1 by 1 inch (25 by 25 mm), PVC according to ASTM D1784, Class 16354-C. White or color-coded to match adjacent surface.

B. Aluminum Corner Angles: 0.040 inch (1.0 mm) thick, minimum 1 by 1 inch (25 by 25 mm), aluminum according to ASTM B209ASTM B209 (ASTM B209M), Alloy 3003, 3005, 3105, or 5005; Temper H-14.

C. Stainless-Steel Corner Angles: 0.024 inch (0.61 mm) thick, minimum 1 by 1 inch (25 by 25 mm), stainless steel according to ASTM A167 or ASTM A240/A240M, Type 316.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.

1. Verify that systems to be insulated have been tested and are free of defects.
2. Verify that surfaces to be insulated are clean and dry.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of ducts and fittings.

B. Install insulation materials, vapor barriers or retarders, jackets, and thicknesses required for each item of duct system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Keep insulation materials dry during application and finishing.

G. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

H. Install insulation with least number of joints practical.

I. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.

J. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

K. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3-inch (75-mm) wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches (100 mm) o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches (38 mm). Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches (50 mm) o.c.

    a. For below ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.

5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct flanges and fittings.

L. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

M. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

N. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches (100 mm) beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

3.4 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches (50 mm) below top of roof flashing.
4. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches (50 mm).
4. Seal jacket to wall flashing with flashing sealant.

C. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

D. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches2 inches (50 mm).

1. Comply with requirements in Section 078413 "Penetration Firestopping."

E. Insulation Installation at Floor Penetrations:

1. Duct: For penetrations through fire-rated assemblies, terminate insulation at fire damper sleeves and externally insulate damper sleeve beyond floor to match adjacent duct insulation. Overlap damper sleeve and duct insulation at least 2 inches (50 mm).
2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.5 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.6 INSTALLATION OF MINERAL-FIBER INSULATION

A. Blanket Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100percent coverage of duct and plenum surfaces.
2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:

    a. On duct sides with dimensions 18 inches (450 mm) and smaller, place pins along longitudinal centerline of duct. Space 3 inches (75 mm) maximum from insulation end joints, and 16 inches (400 mm) o.c.
    b. On duct sides with dimensions larger than 18 inches (450 mm), place pins 16 inches (400 mm) o.c. each way, and 3 inches (75 mm) maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
    c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
    d. Do not over compress insulation during installation.
    e. Impale insulation over pins and attach speed washers.
    f. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.

4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches (50 mm) from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch (13-mm) outward-clinching staples, 1 inch (25 mm) o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.

    a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
    b. Install vapor stops for ductwork and plenums operating below 50 deg (10 deg C) at 18-foot (5.5-m) intervals. Vapor stops shall consist of vapor-barrier mastic applied

in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches (75 mm).

5. Overlap unfaced blankets a minimum of 2 inches (50 mm) on longitudinal seams and end joints. At end joints, secure with steel bands spaced a maximum of 18 inches (450 mm) o.c.
6. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
7. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch (150-mm-) wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches (150 mm) o.c.

B. Board Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.
2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:

    a. On duct sides with dimensions 18 inches (450 mm) and smaller, place pins along longitudinal centerline of duct. Space 3 inches (75 mm) maximum from insulation end joints, and 16 inches (400 mm) o.c.
    b. On duct sides with dimensions larger than 18 inches (450 mm), space pins 16 inches (400 mm) o.c. each way, and 3 inches (75 mm) maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
    c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
    d. Do not over compress insulation during installation.
    e. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.

4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches (50 mm) from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch (13-mm) outward-clinching staples, 1 inch (25 mm) o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.

    a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
    b. Install vapor stops for ductwork and plenums operating below 50 deg F (10 deg C) at 18-foot (5.5-m) intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches (75 mm).

5. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Groove and score insulation to fit as closely as possible to outside and inside radius of elbows. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
6. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch (150-mm-) wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches (150 mm) o.c.

3.7 FIELD-APPLIED JACKET INSTALLATION

A. Where glass-cloth jackets are indicated, install directly over bare insulation or insulation with factory-applied jackets.

1. Draw jacket smooth and tight to surface with 2-inch (50-mm) overlap at seams and joints.
2. Embed glass cloth between two 0.062-inch (1.6-mm-) thick coats of lagging adhesive.
3. Completely encapsulate insulation with coating, leaving no exposed insulation.

B. Where FSK jackets are indicated, install as follows:

1. Draw jacket material smooth and tight.
2. Install lap or joint strips with same material as jacket.
3. Secure jacket to insulation with manufacturer's recommended adhesive.
4. Install jacket with 1-1/2-inch (38-mm) laps at longitudinal seams and 3-inch (75-mm-) wide joint strips at end joints.
5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.

C. Where PVC jackets are indicated, install with 1-inch (25-mm) overlap at longitudinal seams and end joints; for horizontal applications, install with longitudinal seams along top and bottom of tanks and vessels. Seal with manufacturer's recommended adhesive.

1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

D. Where metal jackets are indicated, install with 2-inc (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 FIRE-RATED INSULATION SYSTEM INSTALLATION

A. Where fire-rated insulation system is indicated, secure system to ducts and duct hangers and supports to maintain a continuous fire rating.

B. Insulate duct access panels and doors to achieve same fire rating as duct.

C. Install firestopping at penetrations through fire-rated assemblies. Fire-stop systems are specified in Section 078413 "Penetration Firestopping."

3.9 FINISHES

A. Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Section 0991143 "Exterior Painting" and Section 099123 "Interior Painting."

1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.

a. Finish Coat Material: Interior, flat, latex-emulsion size.

B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

C. Color: Final color as selected by Director’s Representative. Vary first and second coats to allow visual inspection of the completed Work.

D. Do not field paint aluminum or stainless-steel jackets.

3.10 FIELD QUALITY CONTROL

A. Testing Agency: Director’s Representative will engage a qualified testing agency to perform tests and inspections.

B. Perform tests and inspections.

C. Tests and Inspections:

1. Inspect ductwork, randomly selected by Director’s Representative, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to one location(s) for each duct system defined in the "Duct Insulation Schedule, General" Article.

D. \All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.11 DUCT INSULATION SCHEDULE, GENERAL

A. Plenums and Ducts Requiring Insulation:

1. Indoor, concealed supply and outdoor air.
2. Indoor, exposed supply and outdoor air.
3. Indoor, concealed return located in unconditioned space.
4. Indoor, exposed return located in unconditioned space.
5. Indoor, concealed, Type I, commercial, kitchen hood exhaust.
6. Indoor, exposed, Type I, commercial, kitchen hood exhaust.
7. Indoor, concealed oven and warewash exhaust.
8. Indoor, exposed oven and warewash exhaust.
9. Indoor, concealed exhaust between isolation damper and penetration of building exterior.

10. Indoor, exposed exhaust between isolation damper and penetration of building exterior.
11. Outdoor, concealed supply and return.
12. Outdoor, exposed supply and return.

B. Items Not Insulated:

1. Fibrous-glass ducts.
2. Metal ducts with duct liner of sufficient thickness to comply with energy code and ASHRAE/IESNA 90.1.
3. Factory-insulated flexible ducts.
4. Factory-insulated plenums and casings.
5. Flexible connectors.
6. Vibration-control devices.
7. Factory-insulated access panels and doors.

3.12 INDOOR DUCT AND PLENUM INSULATION SCHEDULE

A. Supply and return air ducts and plenums shall be insulated with not less than R-6 insulation where located in unconditioned spaces. Where located within a building envelope assembly, the duct or plenum shall be separated from the building exterior or unconditioned or exempt spaces by not less than R-8 insulation in climate zones 1 through 4 and not less than R-12 insulation in climate zones 5 through 8.

B. Concealed, round and flat-oval, supply-air duct insulation shall be one of the following:

1. Flexible Elastomeric: 1 inch (25 mm) thick.
2. Polyolefin: 1 inch (25 mm) thick.

C. Concealed, round and flat-oval, return-air duct insulation shall be one of the following:

1. Flexible Elastomeric: 1 inch (25 mm) thick.
2. Polyolefin: 1 inch (25 mm) thick.

D. Concealed, round and flat-oval, outdoor-air duct insulation shall be one of the following:

1. Flexible Elastomeric: 1 inch (25 mm) thick.
2. Polyolefin: 1 inch (25 mm) thick.

E. Concealed, round and flat-oval, exhaust-air duct insulation shall be one of the following:

1. Flexible Elastomeric: 1 inch (25 mm) thick.
2. Polyolefin: 1 inch (25 mm) thick.

F. Concealed, rectangular, supply-air duct insulation shall be one of the following:

1. Flexible Elastomeric: 1 inch (25 mm) thick.
2. Polyolefin: 1 inch (25 mm) thick.

G. Concealed, rectangular, return-air duct insulation shall be one of the following:

1. Flexible Elastomeric: 1 inch (25 mm) thick.
2. Polyolefin: 1 inch (25 mm) thick.

H. Concealed, rectangular, outdoor-air duct insulation shall be one of the following:

1. Flexible Elastomeric: 1 inch (25 mm) thick.
2. Polyolefin: 1 inch (25 mm) thick.

I. Concealed, rectangular, exhaust-air duct insulation between isolation damper and penetration of building exterior shall be one of the following:

1. Flexible Elastomeric: 1 inch (25 mm) thick.
2. Polyolefin: 1 inch (25 mm) thick.

J. Concealed, Type I, Commercial, Kitchen Hood Exhaust Duct and Plenum Insulation: Fire-rated blanket or board; thickness as required to achieve 2-hour fire rating.

K. Concealed, supply-air plenum insulation shall be one of the following:

1. Flexible Elastomeric: 1 inch (25 mm) thick.
2. Polyolefin: 1 inch (25 mm) thick.

L. Concealed, return-air plenum insulation shall be one of the following:

1. Flexible Elastomeric: 1 inch (25 mm) thick.
2. Polyolefin: 1 inch (25 mm) thick.

M. Concealed, exhaust-air plenum insulation shall be one of the following:

1. Mineral-Fiber Blanket: 3-lb/cu. ft. (48-kg/cu. m) nominal density.
2. Mineral-Fiber Board: 6-lb/cu. ft. (96-kg/cu. m) nominal density.

N. Exposed, round and flat-oval, supply-air duct insulation shall be one of the following:

1. Flexible Elastomeric: 1 inch (25 mm) thick.
2. Polyolefin: 1 inch thick.

O. Exposed, round and flat-oval, return-air duct insulation shall be one of the following:

1. Flexible Elastomeric: 1 inch (25 mm) thick.
2. Polyolefin: 1 inch thick.

P. Exposed, round and flat-oval, outdoor-air duct insulation shall be one of the following:

1. Flexible Elastomeric: 1 inch (25 mm) thick.
2. Polyolefin: 1 inch thick.

Q. Exposed, round and flat-oval, exhaust-air duct insulation shall be one of the following:

1. Flexible Elastomeric: 1 inch (25 mm) thick.
2. Polyolefin: 1 inch thick.

R. Exposed, rectangular, supply-air duct insulation shall be one of the following:

1. Flexible Elastomeric: 1 inch (25 mm) thick.
2. Polyolefin: 1 inch thick.

S. Exposed, rectangular, return-air duct insulation shall be one of the following:

1. Flexible Elastomeric: 1 inch (25 mm) thick.
2. Polyolefin: 1 inch thick.

T. Exposed, rectangular, outdoor-air duct insulation shall be one of the following:

1. Flexible Elastomeric: 1 inch (25 mm) thick.
2. Polyolefin: 1 inch thick.

U. Exposed, rectangular, exhaust-air duct insulation shall be one of the following:

1. Flexible Elastomeric: 1 inch (25 mm) thick.
2. Polyolefin: 1 inch thick.

V. Exposed, Type I, Commercial, Kitchen Hood Exhaust Duct and Plenum Insulation: Fire-rated blanket or board; thickness as required to achieve 2-hour fire rating.

W. Exposed, supply-air plenum insulation shall be one of the following:

1. Flexible Elastomeric: 1 inch (25 mm) thick.
2. Polyolefin: 1 inch thick.

X. Exposed, return-air plenum insulation shall be one of the following:

1. Flexible Elastomeric: 1 inch (25 mm) thick.
2. Polyolefin: 1 inch thick.

Y. Exposed, outdoor-air plenum insulation shall be one of the following:

1. Mineral-Fiber Blanket: 3-lb/cu. ft. (48-kg/cu. m) nominal density.
2. Mineral-Fiber Board6-lb/cu. ft. (96-kg/cu. m) nominal density.

Z. Exposed, exhaust-air plenum insulation shall be one of the following:

1. Mineral-Fiber Blanket: 3-lb/cu. ft. (48-kg/cu. m) nominal density.
2. Mineral-Fiber Board6-lb/cu. ft. (96-kg/cu. m) nominal density.

3.13 ABOVEGROUND, OUTDOOR DUCT AND PLENUM INSULATION SCHEDULE

A. Supply and return air ducts and plenums where located outside the building shall be insulated with not less than R-10 insulation in climate zones 1 through 4 and not less than R-12 insulation in climate zones 5 through 8.

B. Insulation materials and thicknesses are identified below. If more than one material is listed for a duct system, selection from materials listed is Contractor's option.

C. Concealed, round and flat-oval, supply-air duct insulation shall be one of the following:

1. Mineral-Fiber Blanket: 3-lb/cu. ft. ft. (48-kg/cu. m) nominal density.
2. Mineral-Fiber Board6-lb/cu. ft. (96-kg/cu. m) nominal density.

D. Concealed, round and flat-oval, return-air duct insulation shall be one of the following:

1. Mineral-Fiber Blanket: 3-lb/cu. ft. (48-kg/cu. m) nominal density.
2. Mineral-Fiber Board6-lb/cu. ft. (96-kg/cu. m) nominal density.

E. Concealed, round and flat-oval, outdoor-air duct insulation shall be one of the following:

1. Mineral-Fiber Blanket: 3-lb/cu. ft. (48-kg/cu. m) nominal density.
2. Mineral-Fiber Board6-lb/cu. ft. (96-kg/cu. m) nominal density.

F. Concealed, rectangular, supply-air duct insulation shall be one of the following:

1. Mineral-Fiber Blanket: 3-lb/cu. ft. (48-kg/cu. m) nominal density.
2. Mineral-Fiber Board6-lb/cu. ft. (96-kg/cu. m) nominal density.

G. Concealed, rectangular, return-air duct insulation shall be one of the following:

1. Mineral-Fiber Blanket: 3-lb/cu. ft.3-lb/cu. ft. (48-kg/cu. m) nominal density.
2. Mineral-Fiber Board6-lb/cu. ft.6-lb/cu. ft. (96-kg/cu. m) nominal density.

H. Concealed, supply-air plenum insulation shall be one of the following:

1. Mineral-Fiber Blanket: 3-lb/cu. ft. (48-kg/cu. m) nominal density.
2. Mineral-Fiber Board6-lb/cu. ft. (96-kg/cu. m) nominal density.

I. Concealed, return-air plenum insulation shall be one of the following:

1. Mineral-Fiber Blanket: 3-lb/cu. ft. (48-kg/cu. m) nominal density.
2. Mineral-Fiber Boardlb/cu. ft.6-lb/cu. ft. (96-kg/cu. m) nominal density.

J. Exposed, round and flat-oval, supply-air duct insulation shall be one of the following:

1. Mineral-Fiber Blanket: 3-lb/cu. ft.3-lb/cu. ft. (48-kg/cu. m) nominal density.
2. Mineral-Fiber Board6-lb/cu. ft.6-lb/cu. ft. (96-kg/cu. m) nominal density.

K. Exposed, round and flat-oval, return-air duct insulation shall be one of the following:

1. Mineral-Fiber Blanket: 3-lb/cu. ft. (48-kg/cu. m) nominal density.
2. Mineral-Fiber Board6-lb/cu. ft. (96-kg/cu. m) nominal density.

L. Exposed, rectangular, supply-air duct insulation shall be one of the following:

1. Mineral-Fiber Blanket: 3-lb/cu. ft. (48-kg/cu. m) nominal density.
2. Mineral-Fiber Board6-lb/cu. ft. (96-kg/cu. m) nominal density.

M. Exposed, rectangular, return-air duct insulation shall be one of the following:

1. Mineral-Fiber Blanket: 3-lb/cu. ft. (48-kg/cu. m) nominal density.
2. Mineral-Fiber Board6-lb/cu. ft. (96-kg/cu. m) nominal density.

N. Exposed, supply-air plenum insulation shall be one of the following:

1. Mineral-Fiber Blanket: 3-lb/cu. ft (48-kg/cu. m) nominal density.
2. Mineral-Fiber Board6-lb/cu. ft. (96-kg/cu. m) nominal density.

O. Exposed, return-air plenum insulation shall be one of the following:

1. Mineral-Fiber Blanket: 3-lb/cu. ft. (48-kg/cu. m) nominal density.
2. Mineral-Fiber Board6-lb/cu. ft. (96-kg/cu. m) nominal density.

3.14 INDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. If more than one material is listed, selection from materials listed is Contractor's option.

C. Ducts and Plenums, Concealed:

1. Aluminum, Smooth thick 0.024 inch.

D. Ducts and Plenums, Exposed:

1. Aluminum, Smooth thick 0.024 inch.

3.15 OUTDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. If more than one material is listed, selection from materials listed is Contractor's option.

C. Ducts and Plenums, Concealed:

1. Aluminum, Smooth.024 inch thick.

D. Ducts and Plenums, Exposed, up to 48 Inches in Diameter or with Flat Surfaces up to 72 Inches:

1. Aluminum, Smooth 0.024 inch thick.

E. Ducts and Plenums, Exposed, Larger Than 48 Inches in Diameter or with Flat Surfaces Larger Than 72 Inches:

1. Aluminum, Smooth 0.024 inch thick.

END OF SECTION 230713

SECTION 230719 - HVAC PIPING INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes insulation for HVAC piping systems.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products in accordance with ASTM E84, by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.5 COORDINATION

A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."

B. Coordinate clearance requirements with piping Installer for piping insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

C. Coordinate installation and testing of heat tracing.

1.6 SCHEDULING

A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALSINSULATION MATERIALS

A. Comply with requirements in "Piping Insulation Schedule, General," "Indoor Piping Insulation Schedule," "Outdoor, Aboveground Piping Insulation Schedule," and "Outdoor, Underground Piping Insulation Schedule" articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come into contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested in accordance with ASTM C871.

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable in accordance with ASTM C795.

E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

F. Calcium Silicate: Preformed Pipe Sections: Flat-, curved-, and grooved-block sections of noncombustible, inorganic, hydrous calcium silicate with a non-asbestos fibrous reinforcement. Comply with ASTM C533, Type I.

1. Prefabricated Fitting Covers: Comply with ASTM C450 and ASTM C585 for dimensions used in preforming insulation to cover valves, elbows, tees, and flanges.
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Johns Manville; a Berkshire Hathaway company.
    b. General Insulation Company Inc.
    c. American Mechanical Insulation Sales Inc.
    d. Approved equivalent.

G. Cellular Glass: Inorganic, incombustible, foamed or cellulated glass with annealed, rigid, hermetically sealed cells. Comply with ASTM C552.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Pittsburgh Corning Corporation.
b. Owens Corning.
c. McMaster-Carr.
d. Approved equivalent.

2. Preformed Pipe Insulation without Jacket: Type II, Class 1, without jacket.
3. Preformed Pipe Insulation with Jacket: Type II, Class 2, with factory-applied ASJ jacket.
4. Factory fabricate shapes in accordance with ASTM C450 and ASTM C585.
5. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

H. Flexible Elastomeric: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C534/C534M, Type I for tubular materials, Type II for sheet materials.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Aeroflex USA.
b. Armacell LLC.
c. K-Flex USA.
d. Approved equivalent.

I. Mineral-Fiber, Preformed Pipe: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C547.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Johns Manville; a Berkshire Hathaway company.
b. Knauf Insulation.
c. Manson Insulation Inc.
d. Approved equivalent.

2. Preformed Pipe Insulation: Type I, Grade A, with factory-applied ASJ.
3. 850 deg F.
4. Factory fabricate shapes in accordance with ASTM C450 and ASTM C585.
5. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

J. Mineral-Fiber, Pipe and Tank: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C1393.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Johns Manville; a Berkshire Hathaway company.
b. Knauf Insulation.
c. Manson Insulation Inc.
d. Approved equivalent.

2. Semirigid board material with factory-applied ASJ jacket.
3. Nominal density is 2.5 lb/cu. ft. (40 kg/cu. m) or more.
4. Thermal conductivity (k-value) at 100 deg F (55 deg C) is 0.29 Btu x in./h x sq. ft. x deg F (0.042 W/m x K) or less.
5. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

K. Phenolic: Preformed pipe insulation of rigid, expanded, closed-cell structure. Comply with ASTM C1126.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Resolco Inc.
    b. Johns Manville; a Berkshire Hathaway company.
    c. Polyguard Products.
    d. Approved equivalent.

2. Preformed Pipe Insulation: Type III, with factory-applied ASJ.
3. Factory fabricate shapes in accordance with ASTM C450 and ASTM C585.
4. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

L. Polyisocyanurate: Preformed, rigid cellular polyisocyanurate material intended for use as thermal insulation. Comply with ASTM C591.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. ITW Insulation Systems; Illinois Tool Works, Inc.
    b. Johns Manville; a Berkshire Hathaway company.
    c. GLT Products.
    d. Approved equivalent.

2. Preformed insulation, with factory-applied ASJ.
3. Type IV, except thermal conductivity (k-value) shall not exceed 0.19 Btu x in./h x sq. ft. x deg F (0.027 W/m x K) at 75 deg F after 180 days of aging.
4. Flame-spread index shall be 25 or less, and smoke-developed index shall be 50 or less for thicknesses of up to 1 inch (25 mm) as tested in accordance with ASTM E84.
5. Fabricate shapes in accordance with ASTM C450 and ASTM C585.
6. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

M. Polyolefin: Unicellular, polyethylene thermal plastic insulation. Comply with ASTM C534/C534M or ASTM C1427, Type I, Grade 1, for tubular materials and with Type II, Grade 1, for sheet materials.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Armacell LLC.

b. Approved equivalent.

N. Polystyrene: Rigid, extruded cellular polystyrene intended for use as thermal insulation. Comply with ASTM C578, Type IV or Type XIII, except thermal conductivity (k-value) shall not exceed 0.26 Btu x in./h x sq. ft. x deg F (0.038 W/m x K) after 180 days of aging. Fabricate shapes in accordance with ASTM C450 and ASTM C585.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. ITW Insulation Systems; Illinois Tool Works, Inc.
b. Johns Manville.
c. PermaTherm Pipe Insulation Systems.
d. Approved equivalent.

2.2 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.

B. Calcium Silicate Adhesive: Fibrous, sodium-silicate-based adhesive with a service temperature range of 50 to 800 deg F.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Childers Brand; H. B. Fuller Construction Products.
b. Foster Brand; H. B. Fuller Construction Products.
c. Mon-Eco Industries, Inc.
d. Approved equivalent.

C. Cellular-Glass Adhesive: Two-component, thermosetting urethane adhesive containing no flammable solvents, with a service temperature range of minus 100 to plus 200 deg F.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Foster Brand; H. B. Fuller Construction Products.
b. Owens Corning.
c. GLT Products.
d. Approved equivalent.

D. Phenolic and Polyisocyanurate Adhesive: Solvent-based resin adhesive, with a service temperature range of minus 75 to plus 300 deg F (minus 59 to plus 149 deg C).

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Childers Brand; H. B. Fuller Construction Products.
    b. Foster Brand; H. B. Fuller Construction Products.
    c. Bostik.
    d. Approved equivalent.

E. Flexible Elastomeric and Polyolefin Adhesive: Solvent-based adhesive.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Armacell LLC.
    b. Foster Brand; H. B. Fuller Construction Products.
    c. K-Flex USA.
    d. Approved equivalent.

2. Flame-spread index shall be 25 or less and smoke-developed index shall be 50 or less as tested in accordance with ASTM E84.
3. Wet Flash Point: Below 0 deg F.
4. Service Temperature Range: 40 to 200 deg F.
5. Color: Black.

F. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Childers Brand; H. B. Fuller Construction Products.
    b. Foster Brand; H. B. Fuller Construction Products.
    c. Mon-Eco Industries, Inc.
    d. Approved equivalent.

G. Polystyrene Adhesive: Solvent- or water-based, synthetic resin adhesive with a service temperature range of minus 20 to plus 140 deg F.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Childers Brand; H. B. Fuller Construction Products.
    b. Foster Brand; H. B. Fuller Construction Products.
    c. 3M.
    d. Approved equivalent.

H. ASJ Adhesive and FSK and PVDC Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A, for bonding insulation jacket lap seams and joints.

1. 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. Childers Brand; H. B. Fuller Construction Products.
    b. Foster Brand; H. B. Fuller Construction Products.
    c. Mon-Eco Industries, Inc.
    d. Approved equivalent.

I. PVC Jacket Adhesive: Compatible with PVC jacket.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Johns Manville; a Berkshire Hathaway company.
    b. P.I.C. Plastics, Inc.
    c. Speedline Corporation.
    d. Approved equivalent.

2.3 MASTICS AND COATINGS

A. Materials shall be compatible with insulation materials, jackets, and substrates.

B. Vapor-Retarder Mastic, Water Based: Suitable for indoor use on below-ambient services.

1. 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. Childers Brand; H. B. Fuller Construction Products.
    b. Foster Brand; H. B. Fuller Construction Products.
    c. Knauf Insulation.
    d. Approved equivalent.

2. Water-Vapor Permeance: Comply with ASTM E96/E96M or ASTM F1249.
3. Service Temperature Range: Minus 20 to plus 180 deg F.
4. Comply with MIL-PRF-19565C, Type II, for permeance requirements, with supplier listing on DOD QPD - Qualified Products Database.
5. Color: White.

C. Vapor-Retarder Mastic, Solvent Based, Indoor Use: Suitable for indoor use on below-ambient services.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Childers Brand; H. B. Fuller Construction Products.
    b. Foster Brand; H. B. Fuller Construction Products.

c. Mon-Eco Industries, Inc.
d. Approved equivalent.

2. Water-Vapor Permeance: Comply with ASTM E96/E96M or ASTM F1249.
3. Service Temperature Range: 0 to 180 deg F.
4. Color: White.

D. Vapor-Retarder Mastic, Solvent Based, Outdoor Use: Suitable for outdoor use on below-ambient services.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Childers Brand; H. B. Fuller Construction Products.
b. Foster Brand; H. B. Fuller Construction Products.
c. Stego Industries.
d. Approved equivalent.

2. Water-Vapor Permeance: Comply with ASTM E96/E96M or ASTM F1249.
3. Service Temperature Range: Minus 50 to plus 220 deg F.
4. Color: White.

E. Breather Mastic: Water based; suitable for indoor and outdoor use on above-ambient services.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Childers Brand; H. B. Fuller Construction Products.
b. Foster Brand; H. B. Fuller Construction Products.
c. Mon-Eco Industries, Inc.
d. Approved equivalent.

2. Water-Vapor Permeance: ASTM E96/E96M, greater than 1.0 perm (0.66 metric perm) at manufacturer's recommended dry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F.
4. Color: White.

2.4 LAGGING ADHESIVES

A. Adhesives shall comply with MIL-A-3316C, Class I, Grade A, and shall be compatible with insulation materials, jackets, and substrates.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Childers Brand; H. B. Fuller Construction Products.
b. Foster Brand; H. B. Fuller Construction Products.

c. Vimasco Corporation.
d. Approved equivalent.

2. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over pipe insulation.
3. Service Temperature Range: 20 to plus 180 deg F.
4. Color: White.

2.5 SEALANTS

A. Materials shall be as recommended by the insulation manufacturer and shall be compatible with insulation materials, jackets, and substrates.

B. Joint Sealants:

1. 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. Childers Brand; H. B. Fuller Construction Products.
b. Foster Brand; H. B. Fuller Construction Products.
c. Mon-Eco Industries, Inc.
d. Approved equivalent.

2. Permanently flexible, elastomeric sealant.

a. Service Temperature Range: Minus 100 to plus 300 deg F Minus 100 to plus 300 deg F.
b. Color: White or gray.

C. FSK and Metal Jacket Flashing Sealants:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Childers Brand; H. B. Fuller Construction Products.
b. Foster Brand; H. B. Fuller Construction Products.
c. Mon-Eco Industries, Inc.
d. Approved equivalent.

2. Fire- and water-resistant, flexible, elastomeric sealant.
3. Service Temperature Range: Minus 40 to plus 250 deg F.
4. Color: Aluminum.

D. ASJ Flashing Sealants and PVDC and PVC Jacket Flashing Sealants:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Childers Brand; H. B. Fuller Construction Products.
b. Foster Brand; H. B. Fuller Construction Products.
c. Insultherm.
d. Approved equivalent.

2. Fire- and water-resistant, flexible, elastomeric sealant.
3. Service Temperature Range: Minus 40 to plus 250 deg F.
4. Color: White.

2.6 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C1136, Type I.
2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C1136, Type I.
3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C1136, Type II.

2.7 FIELD-APPLIED REINFORCING MESH

A. Woven Glass-Fiber Mesh: Approximately 2 oz./sq. yd. with a thread count of 10 strands by 10 strands/sq. in. for covering pipe and pipe fittings.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Childers Brand; H. B. Fuller Construction Products.
b. Foster Brand; H. B. Fuller Construction Products.
c. ACP Composites.
d. Approved equivalent.

B. Woven Polyester Mesh: Approximately 1 oz./sq. yd. with a thread count of 10 strands by 10 strands/sq. in., in a Leno weave, for pipe.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Foster Brand; H. B. Fuller Construction Products.
b. Vimasco Corporation.
c. ARDEX Americas.
d. Approved equivalent.

2.8 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C1136, Type I, unless otherwise indicated.

B. FSK Jacket: Aluminum-foil-face, fiberglass-reinforced scrim with kraft-paper backing.

C. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.

1. 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. Airex Manufacturing.
b. Johns Manville; a Berkshire Hathaway company.
c. P.I.C. Plastics, Inc.
d. Approved equivalent.

2. Adhesive: As recommended by jacket material manufacturer.
3. Color: Color-code jackets based on system. Color as selected by Director's Representative.
4. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.

a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.

D. Metal Jacket:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. ITW Insulation Systems; Illinois Tool Works, Inc.
b. RPR Products, Inc.
c. Johns Manville; a Berkshire Hathaway company.
d. Approved equivalent.

2. Aluminum Jacket: Comply with ASTM B209ASTM B209 (ASTM B209M), Alloy 3003, 3005, 3105, or 5005, Temper H-14.

a. Sheet and roll stock ready for shop or field sizing.
b. Finish and thickness are indicated in field-applied jacket schedules.
c. Moisture Barrier for Indoor Applications: 3-mil, heat-bonded polyethylene and kraft paper.
d. Moisture Barrier for Outdoor Applications: 3-mil, heat-bonded polyethylene and kraft paper.
e. Factory-Fabricated Fitting Covers:

1) Same material, finish, and thickness as jacket.

2) Preformed two-piece or gore, 45- and 90-degree, short- and long-radius elbows.
3) Tee covers.
4) Flange and union covers.
5) End caps.
6) Beveled collars.
7) Valve covers.
8) Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

3. Stainless Steel Jacket: ASTM A240/A240M.

a. Sheet and roll stock ready for shop or field sizing.
b. Material, finish, and thickness are indicated in field-applied jacket schedules.
c. Moisture Barrier for Indoor Applications: 3-mil (0.075-mm-) thick, heat-bonded polyethylene and kraft paper.
d. Moisture Barrier for Outdoor Applications: 3-mil, heat-bonded polyethylene and kraft paper.
e. Factory-Fabricated Fitting Covers:

1) Same material, finish, and thickness as jacket.
2) Preformed two-piece or gore, 45- and 90-degree, short- and long-radius elbows.
3) Tee covers.
4) Flange and union covers.
5) End caps.
6) Beveled collars.
7) Valve covers.
8) Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

E. Self-Adhesive Outdoor Jacket: 60-mil thick, laminated vapor barrier and waterproofing membrane for installation over insulation located aboveground outdoors; consisting of a rubberized bituminous resin on a cross-laminated polyethylene film covered with stucco-embossed aluminum-foil facing.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Polyguard Products, Inc.
b. 3M.
c. FlexClad.
d. Approved equivalent.

F. PVDC Jacket for Indoor Applications: 4-mil thick, white PVDC biaxially oriented barrier film with a permeance at 0.02 perm when tested in accordance with ASTM E96/E96M and with a flame-spread index of 10 and a smoke-developed index of 20 when tested in accordance with ASTM E84.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. ITW Insulation Systems; Illinois Tool Works, Inc.
    b. Johns Manville; a Berkshire Hathaway company.
    c. FlexClad.
    d. Approved equivalent.

G. PVDC Jacket for Outdoor Applications: 6-mil thick, white PVDC biaxially oriented barrier film with a permeance at 0.01 perm when tested in accordance with ASTM E96/E96M and with a flame-spread index of 25 and a smoke-developed index of 50 when tested in accordance with ASTM E84.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. ITW Insulation Systems; Illinois Tool Works, Inc.
    b. Johns Manville; a Berkshire Hathaway company.
    c. FlexClad.
    d. Approved equivalent.

H. PVDC-SSL Jacket: PVDC jacket with a self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. ITW Insulation Systems; Illinois Tool Works, Inc.
    b. Johns Manville; a Berkshire Hathaway company.
    c. FlexClad.
    d. Approved equivalent.

2.9 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C1136.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. 3M Industrial Adhesives and Tapes Division.
    b. Ideal Tape Co., Inc., an American Biltrite Company.
    c. Knauf Insulation.
    d. Approved equivalent.

2. Width: 3 inches.

3. Thickness: 11.5 mils.
4. Adhesion: 90 ounces force/inch in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch in width.
7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C1136.

1. 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. 3M Industrial Adhesives and Tapes Division.
    b. Ideal Tape Co., Inc., an American Biltrite Company.
    c. Knauf Insulation.
    d. Approved equivalent.

2. Width: 3 inches.
3. Thickness: 6.5 mils.
4. Adhesion: 90 ounces force/inch in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch in width.
7. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

C. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive; suitable for indoor and outdoor applications.

1. 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. 3M Industrial Adhesives and Tapes Division.
    b. Ideal Tape Co., Inc., an American Biltrite Company.
    c. Johns Manville; a Berkshire Hathaway company.
    d. Approved equivalent.

2. Width: 2 inches.
3. Thickness: 6 mils.
4. Adhesion: 64 ounces force/inch in width.
5. Elongation: 500 percent.
6. Tensile Strength: 18 lbf/inch in width.

D. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. 3M Industrial Adhesives and Tapes Division.
    b. Ideal Tape Co., Inc., an American Biltrite Company.

c. Knauf Insulation.
d. Approved equivalent.

2. Width: 2 inches.
3. Thickness: 3.7 mils.
4. Adhesion: 100 ounces force/inch width.
5. Elongation: 5 percent.
6. Tensile Strength: 34 lbf/inch in width.

E. PVDC Tape for Indoor Applications: White vapor-retarder PVDC tape with acrylic adhesive.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. ITW Insulation Systems; Illinois Tool Works, Inc.
b. Johns Manville; a Berkshire Hathaway company.
c. SARANEX.
d. Approved equivalent.

2. Width: 3 inches.
3. Film Thickness: 2 mils.
4. Adhesive Thickness: 1.5 mils.
5. Elongation at Break: 120 percent.
6. Tensile Strength: 20 psi in width.

F. PVDC Tape for Outdoor Applications: White vapor-retarder PVDC tape with acrylic adhesive.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. ITW Insulation Systems; Illinois Tool Works, Inc.
b. Johns Manville; a Berkshire Hathaway company.
c. SARANEX.
d. Approved equivalent.

2. Width: 3 inches.
3. Film Thickness: 6 mils.
4. Adhesive Thickness: 1.5 mils.
5. Elongation at Break: 145 percent.
6. Tensile Strength: 55 psi in width.

2.10 SECUREMENTS

A. Bands:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. ITW Insulation Systems; Illinois Tool Works, Inc.
b. RPR Products, Inc.
c. McMaster Carr.
d. Approved equivalent.

2. Stainless Steel: ASTM A240/A240M, Type 304 or Type 316; 0.015 inch thick, 3/4 inch wide with wing seal or closed seal.
3. Aluminum: ASTM B209ASTM B209 (ASTM B209M), Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 3/4 inch wide with wing seal or closed seal.
4. Springs: Twin spring set constructed of stainless steel, with ends flat and slotted to accept metal bands. Spring size is determined by manufacturer for application.

B. Staples: Outward-clinching insulation staples, nominal 3/4 inch (19 mm) wide, stainless steel or Monel.

C. Wire: 0.062-inch soft-annealed, galvanized steel.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. C & F Wire.
b. American Wire Works.
c. Gerard Daniel Worldwide.
d. Approved equivalent.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.

1. Verify that systems to be insulated have been tested and are free of defects.
2. Verify that surfaces to be insulated are clean and dry.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

B. Clean and prepare surfaces to be insulated. Before insulating, apply a corrosion coating to insulated surfaces as follows:

1. Stainless Steel: Coat 300 series stainless steel with an epoxy primer 5 mils thick if operating in a temperature range between 140 and 300 deg F. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
2. Carbon Steel: Coat carbon steel operating at a service temperature of between 32 and 300 deg F with an epoxy coating. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.

C. Coordinate insulation installation with the tradesman installing heat tracing. Comply with requirements for heat tracing that apply to insulation.

D. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless steel surfaces, use demineralized water.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping, including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and of thicknesses required for each item of pipe system, as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

G. Keep insulation materials dry during storage, application, and finishing. Replace insulation materials that get wet.

H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

I. Install insulation with least number of joints practical.

J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends attached to structure with vapor-barrier mastic.
3. Install insert materials and insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.

4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

L. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3-inch wide strips, of same material as insulation jacket. Secure strips with adhesive and outward-clinching staples along both edges of strip, spaced 4 inches o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward-clinching staples along edge at 2 inches o.c.

    a. For below-ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape, in accordance with insulation material manufacturer's written instructions, to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.

M. Cut insulation in a manner to avoid compressing insulation more than 25 percent of its nominal thickness.

N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches in similar fashion to butt joints.

P. For above-ambient services, do not install insulation to the following:

1. Vibration-control devices.
2. Testing agency labels and stamps.
3. Nameplates and data plates.

3.4 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.

3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches2 inches (50 mm) below top of roof flashing.
4. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.

C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
4. Seal jacket to wall flashing with flashing sealant.

D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

E. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.

1. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping and fire-resistive joint sealers.

F. Insulation Installation at Floor Penetrations:

1. Pipe: Install insulation continuously through floor penetrations.
2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.5 GENERAL PIPE INSULATION INSTALLATION

A. Requirements in this article generally apply to all insulation materials, except where more specific requirements are specified in various pipe insulation material installation articles.

B. Insulation Installation on Fittings, Valves, Strainers, Flanges, Mechanical Couplings, and Unions:

1. Install insulation over fittings, valves, strainers, flanges, mechanical couplings, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as that of adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.

3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as that used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as that used for adjacent pipe. Overlap adjoining pipe insulation by not less than 2 times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as that used for adjacent pipe. Overlap adjoining pipe insulation by not less than 2 times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers, so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.
6. Insulate flanges, mechanical couplings, and unions using a section of oversized preformed pipe insulation to fit. Overlap adjoining pipe insulation by not less than 2 times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Stencil or label the outside insulation jacket of each union with the word "union" matching size and color of pipe labels.
7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
8. For services not specified to receive a field-applied jacket, except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing, using PVC tape.

C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

D. Install removable insulation covers at locations indicated. Installation shall conform to the following:

1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as that of adjoining pipe insulation.
2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union at least 2 times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless steel or aluminum bands. Select band material compatible with insulation and jacket.
3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.
4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on

each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.

5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.6 INSTALLATION OF CALCIUM SILICATE INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure single-layer insulation with stainless steel bands at 12-inch intervals, and tighten bands without deforming insulation materials.
2. Install two-layer insulation with joints tightly butted and staggered at least 3 inches. Secure inner layer with wire spaced at 12-inch intervals. Secure outer layer with stainless steel bands at 12-inch intervals.
3. Apply a skim coat of mineral-fiber, hydraulic-setting cement to insulation surface. When cement is dry, apply flood coat of lagging adhesive and press on one layer of glass cloth or tape. Overlap edges at least 1 inch. Apply finish coat of lagging adhesive over glass cloth or tape. Thin finish coat to achieve smooth, uniform finish.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of block insulation of same material and thickness as that of pipe insulation.
4. Finish flange insulation same as pipe insulation.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as that of straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
2. When preformed insulation sections of insulation are not available, install mitered sections of calcium silicate insulation. Secure insulation materials with wire or bands.
3. Finish fittings insulation same as pipe insulation.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install mitered segments of calcium silicate insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
2. Install insulation to flanges as specified for flange insulation application.
3. Finish valve and specialty insulation same as pipe insulation.

3.7 INSTALLATION OF CELLULAR-GLASS INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of insulation to pipe with wire or bands, and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient services, secure laps with outward-clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below-ambient services, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive, as recommended by insulation material manufacturer, and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of cellular-glass block insulation of same thickness as that of pipe insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as that of straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
2. When preformed sections of insulation are not available, install mitered sections of cellular-glass insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of cellular-glass insulation to valve body.
2. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.

3.8 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

B. Insulation Installation on Pipe Flanges:

1. Install pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.

3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as that of pipe insulation.
4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install mitered sections of pipe insulation.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed valve covers manufactured of same material as that of pipe insulation when available.
2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.
4. Secure insulation to valves and specialties, and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.9 INSTALLATION OF MINERAL-FIBER INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of preformed pipe insulation to pipe with wire or bands, and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient surfaces, secure laps with outward-clinched staples at 6 inches (150 mm) o.c.
4. For insulation with factory-applied jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive, as recommended by insulation material manufacturer, and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch (25 mm), and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as that of straight segments of pipe insulation when available.
2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as that of straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

3.10 INSTALLATION OF FIELD-APPLIED JACKETS

A. Where glass-cloth jackets are indicated, install directly over bare insulation or insulation with factory-applied jackets.

1. Draw jacket smooth and tight to surface with 2-inch overlap at seams and joints.
2. Embed glass cloth between two 0.062-inch thick coats of lagging adhesive.
3. Completely encapsulate insulation with coating, leaving no exposed insulation.

B. Where FSK jackets are indicated, install as follows:

1. Draw jacket material smooth and tight.
2. Install lap or joint strips with same material as jacket.
3. Secure jacket to insulation with manufacturer's recommended adhesive.
4. Install jacket with 1-1/2-inch laps at longitudinal seams and 3-inch wide joint strips at end joints.
5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.

C. Where PVC jackets are indicated and for horizontal applications, install with 1-inch1-inch (25-mm) overlap at longitudinal seams and end joints. Seal with manufacturer's recommended adhesive.

1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

D. Where metal jackets are indicated, install with 2-inch 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 o.c. and at end joints.

E. Where PVDC jackets are indicated, install as follows:

1. Apply three separate wraps of filament tape per insulation section to secure pipe insulation to pipe prior to installation of PVDC jacket.
2. Wrap factory-presized jackets around individual pipe insulation sections, with one end overlapping the previously installed sheet. Install presized jacket with an approximate overlap at butt joint of 2 inches over the previous section. Adhere lap seal using adhesive or SSL, and then apply 1-1/4 circumferences of appropriate PVDC tape around overlapped butt joint.
3. Continuous jacket can be spiral-wrapped around a length of pipe insulation. Apply adhesive or PVDC tape at overlapped spiral edge. When electing to use adhesives, refer to manufacturer's written instructions for application of adhesives along this spiral edge to maintain a permanent bond.
4. Jacket can be wrapped in cigarette fashion along length of roll for insulation systems with an outer circumference of 33-1/2 inches (850 mm) or less. The 33-1/2-inch (850-mm-) circumference limit allows for 2-inch (50-mm-) overlap seal. Using the length of roll allows for longer sections of jacket to be installed at one time. Use adhesive on the lap seal. Visually inspect lap seal for "fish mouthing," and use PVDC tape along lap seal to secure joint.
5. Repair holes or tears in PVDC jacket by placing PVDC tape over the hole or tear and wrapping a minimum of 1-1/4 circumferences to avoid damage to tape edges.

3.11 FINISHES

A. Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Section 0991143 "Exterior Painting" and Section 099123 "Interior Painting."

1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.

    a. Finish Coat Material: Interior, flat, latex-emulsion size.

B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

C. Color: Final color as selected by Director’s Representative. Vary first and second coats to allow visual inspection of the completed Work.

D. Do not field paint aluminum or stainless-steel jackets.

3.12 FIELD QUALITY CONTROL

E. Director’s Representative will engage a qualified testing agency to perform tests and inspections.

A. Engage a qualified testing agency to perform tests and inspections.

B. Manufacturer's Field Service: Engage a factory-authorized service company field advisor to test and inspect components, assemblies, and equipment installations, including connections.

C. Perform tests and inspections with the assistance of a factory-authorized service company field advisor.

D. Tests and Inspections: Inspect pipe, fittings, strainers, and valves, randomly selected by Director's Representative, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three locations of straight pipe, three locations of threaded fittings, three locations of welded fittings, two locations of threaded strainers, two locations of welded strainers, three locations of threaded valves, and three locations of flanged valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.

E. All insulation applications will be considered defective if they do not pass tests and inspections.

F. Prepare test and inspection reports.

3.13 PIPING INSULATION SCHEDULE, GENERAL

A. Insulation conductivity and thickness per pipe size shall comply with schedules in this Section or with requirements of authorities having jurisdiction, whichever is more stringent.

B. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

C. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:

1. Underground piping.
2. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.14 INDOOR PIPING INSULATION SCHEDULE

A. Condensate and Equipment Drain Water below 60 Deg F:

1. All Pipe Sizes: Insulation shall be one of the following:

a. Cellular Glass: 1-1/2 inches.
b. Flexible Elastomeric: 1 inch thick.
c. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

B. Condenser-Water Supply and Return:

1. NPS 1-1/42NPS 12 and Smaller: Insulation shall be one of the following:

a. Cellular Glass: 2 inches thick.
b. Flexible Elastomeric: 1 inch thick.
c. Mineral-Fiber, Preformed Pipe Insulation, Type I: 2 inches thick.

C. Heating-Hot-Water Supply and Return, 200 Deg F 200 Deg F (93 Deg C) and Below:

1. NPS 1-1/42NPS 12 (DN 300) and Smaller: Insulation shall be one of the following:

a. Cellular Glass: 2 inches thick.
b. Mineral-Fiber, Preformed Pipe, Type I: 2 inches thick.

D. Refrigerant Suction and Hot-Gas Piping:

1. All Pipe Sizes: Insulation shall be one of the following:

a. Cellular Glass: 1-1/2 inches thick.
b. Flexible Elastomeric: 1 inch thick.
c. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

E. Polyolefin: 1 inch1 inch thick.

F. Refrigerant Suction and Hot-Gas Flexible Tubing:

1. All Pipe Sizes: Insulation shall be one of the following:

a. Flexible Elastomeric: 2 inches thick.

G. Polyolefin: 2 inches thick.

H. Refrigerant Liquid Piping:

1. All Pipe Sizes: Insulation shall be one of the following:

a. Cellular Glass: 1-1/2 inches thick.
b. Flexible Elastomeric: 1 inch thick.
c. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

I. Polyolefin: 1 inch1 inch thick.

J. Heat-Recovery Piping:

1. All Pipe Sizes: Insulation shall be one of the following:

a. Cellular Glass: 1-1/2 inches thick.
b. Flexible Elastomeric: 1 inch thick.
c. Mineral-Fiber, Preformed Pipe Insulation, Type I or Pipe and Tank Insulation: 1 inch1 inch thick.

3.15 INDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. If more than one material is listed, selection from materials listed is Contractor's option.

C. Piping, Concealed:

1. PVC, Color-Coded by System: 30 mils thick.

2. Aluminum, Corrugated 0.040 inch thick.

D. Piping, Exposed:

1. PVC, Color-Coded by System: 30 mils thick.
2. Aluminum, Corrugated 0.040 inch thick.

3.16 OUTDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. If more than one material is listed, selection from materials listed is Contractor's option.

C. Piping, Concealed:

1. PVC, Color-Coded by System: 30 mils thick.
2. Aluminum, Corrugated 0.040 inch thick.
3. Painted Aluminum, Corrugated 0.032 inch thick.

D. Piping, Exposed:

1. PVC: 40 mils thick.
2. Painted Aluminum, Corrugated with Z-Shaped Locking Seam: 0.040 inch thick.

END OF SECTION 230719

SECTION 230800 - COMMISSIONING OF HVAC

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Description.

B. Responsibilities.

C. Related Work.

D. Test Equipment.

1.2 DESCRIPTION

A. The purpose of this section is to specify Division 23 responsibilities in the commissioning process.

B. The systems to be commissioned are listed in Section 019113.

C. Commissioning requires the participation of the Division 23 Contractor to ensure that all systems are operating in a manner consistent with the Contract Documents. The general commissioning requirements and coordination are detailed in Section 019113. Division 23 Contractor shall be familiar with all parts of Section 019113 and shall execute all commissioning responsibilities assigned to them in the Contract Documents.

1.3 RESPONSIBILITIES

A. Refer to Section 019113.

1.4 RELATED WORK

A. Specific commissioning requirements are given in the following sections of these specifications. All the following sections apply to the Work of this section.

1. Section 017823 - Operations and Maintenance.
2. Section 017900 - Demonstration and Training.
3. Section 019113 – Commissioning.
4. Section 210800 - Commissioning of Fire Suppression.
5. Section 220800 - Commissioning of Plumbing.
6. Section 260800 - Commissioning of Electrical.

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT

A. The Contractor shall provide (as required) all test equipment necessary to fulfill the testing requirements of this Division. This equipment includes, but is not limited to, the following:

1. Handheld temperature and relative humidity meter.
2. Infrared thermometer gun.
3. Analog differential pressure gauge and associated tubing.
4. Portable computer with access to the building automation system.

B. All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified in the related specifications. If not otherwise noted, the following minimum requirements apply:

1. Temperature sensors and digital thermometers shall have a certified calibration within the past year to an accuracy of 0.5F and a resolution of +/- 0.1F.
2. Pressure sensors shall have an accuracy of +/- 2.0% of the value range being measured (not full range of meter) and have been calibrated within the last year.
3. All equipment shall be calibrated according to the manufacturer's recommended intervals and when dropped or damaged. Calibration tags shall be affixed or certificates readily available.

C. Commissioned HVAC systems shall include:

1. Heat Pump Roof Top Air Handling Units with Gas furnace (RTU-1, RTU-2).
2. Indoor DX AHU with split condenser on roof (HVAC-1).
3. VRF Indoor Air Conditioning Cassette Units (4 Ceiling - 1 Wall mounted).
4. Roof Mounted VRF Condensing Units.
5. Variable Air Volume Boxes and controls.
6. Constant Air Volume Boxes and controls Heating ventilator (HV-2).
7. Pumps (P-1, P-2).
8. Exhaust Fans.
9. Electric Unit Heaters and Controls. Associated piping and components Testing and balancing results.
10. Review Building Management Systems Programming and Graphics.

D. Refer to Section 019113 for additional Division 23 requirements.

PART 3 - EXECUTION

A. Refer to Section 019113.

END OF SECTION

SECTION 230923.11 - CONTROL VALVES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes control valves and actuators for DDC systems.

1.3 DEFINITIONS

A. Cv: Design valve coefficient.

B. DDC: Direct-digital control.

C. NBR: Nitrile butadiene rubber.

D. PTFE: Polytetrafluoroethylene

E. RMS: Root-mean-square value of alternating voltage, which is the square root of the mean value of the square of the voltage values during a complete cycle.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For control valves to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. ASME Compliance: Fabricate and label products to comply with ASME Boiler and Pressure Vessel Code where required by authorities having jurisdiction.

C. Ground Fault: Products shall not fail due to ground fault condition when suitably grounded.

D. Backup Power Source: Systems and equipment served by a backup power source shall have associated control valve actuators served from a backup power source.

E. Environmental Conditions:

1. Provide electric control valve actuators, with protective enclosures satisfying the following minimum requirements unless more stringent requirements are indicated. Electric control valve actuators not available with integral enclosures, complying with requirements indicated, shall be housed in protective secondary enclosures.

    a. Hazardous Locations: Explosion-proof rating for condition.

F. Determine control valve sizes and flow coefficients by ISA 75.01.01.

G. Control valve characteristics and rangeability shall comply with ISA 75.11.01.

H. Selection Criteria:

1. Control valves shall be suitable for operation at following conditions:
    a. Heating Hot Water: 75 PSI and 200 F.

2. Control valve shutoff classifications shall be FCI 70-2, Class IV or better unless otherwise indicated.
3. Valve pattern, three-way or straight through, shall be as indicated on Drawings.
4. Modulating straight-through pattern control valves shall have equal percentage flow-throttling characteristics unless otherwise indicated.
5. Modulating three-way pattern water valves shall have linear flow-throttling characteristics. The total flow through the valve shall remain constant regardless of the valve's position.
6. Modulating butterfly valves shall have linearflow-throttling characteristics.
7. Fail positions unless otherwise indicated:
    a. Heating Hot Water: Close.

8. Globe-type control valves shall pass the design flow required with not more than 95 percent of stem lift unless otherwise indicated.
9. Rotary-type control valves, such as ball and butterfly valves, shall have Cv falling between 65 and 75 degrees of valve full open position and minimum valve Cv between 15 and 25 percent of open position.
10. Selection shall consider viscosity, flashing, and cavitation corrections.
11. Valves shall have stable operation throughout full range of operation, from design to minimum Cv.
12. Minimum Cv shall be calculated at 10 percent of design flow, with a coincident pressure differential equal to the system design pump head.
13. In water systems, select modulating control valves at terminal equipment for a design Cv based on a pressure drop of 5 psig (34 kPa) at design flow unless otherwise indicated.

14. Two-position control valves shall be line size unless otherwise indicated.
15. In water systems, use ball- or globe-style control valves for two-position control for valves NPS 2 (DN 50) and smaller and butterfly style for valves larger than NPS 2 (DN 50).

2.2 BALL-STYLE CONTROL VALVES

A. Ball Valves with Single Port and Characterized Disk:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

    a. Belimo Aircontrols (USA), Inc.
    b. Bray Commercial Division, Inc.
    c. Techmait.
    d. Schneider Electric.
    e. Approved equivalent.

2. Pressure Rating for NPS 1 (DN 25) and Smaller: Nominal 600 WOG.
3. Pressure Rating for NPS 1-1/2 (DN 38) through NPS 2 (DN 50): Nominal 400 WOG.
4. Close-off Pressure: 200 psig (1379 kPa).
5. Process Temperature Range: Zero to 212 deg F (Minus 18 to plus 100 deg C).
6. Body and Tail Piece: Cast bronze ASTM B61, ASTM B62, ASTM B584, or forged brass with nickel plating.
7. End Connections: Threaded (NPT) ends.
8. Ball: Chrome-plated brass or bronze or 300 series stainless steel.
9. Stem and Stem Extension:

    a. Material to match ball.
    b. Blowout-proof design.
    c. Sleeve or other approved means to allow valve to be opened and closed without damaging the insulation or the vapor barrier seal.

10. Ball Seats: Reinforced PTFE.
11. Stem Seal: Reinforced PTFE packing ring with a threaded packing ring follower to retain the packing ring under design pressure with the linkage removed. Alternative means, such as EPDM O-rings, are acceptable if an equivalent cycle endurance can be demonstrated by testing.
12. Flow Characteristic: Equal percentage.

B. Ball Valves with Two Ports and Characterized Disk:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

    a. Belimo Aircontrols (USA), Inc.
    b. Bray Commercial Division, Inc.
    c. Techmaitc.
    d. Schneider Electric.
    e. Approved equivalent.

2. Pressure Rating for NPS 1 (DN 25) and Smaller: Nominal 600 WOG.
3. Pressure Rating for NPS 1-1/2 (DN 38) through NPS 2 (DN 50): Nominal 400 WOG.
4. Close-off Pressure: 200 psig (1379 kPa).
5. Process Temperature Range: Zero to 212 deg F (Minus 18 to plus 100 deg C).

6. Body and Tail Piece: Cast bronze ASTM B61, ASTM B62, ASTM B584, or forged brass with nickel plating.
7. End Connections: Threaded (NPT) ends.
8. Ball: Chrome-plated brass or bronze.
9. Stem and Stem Extension:

    a. Material to match ball.
    b. Blowout-proof design.
    c. Sleeve or other approved means to allow valve to be opened and closed without damaging the insulation or the vapor barrier seal.

10. Ball Seats: Reinforced PTFE.
11. Stem Seal: Reinforced PTFE packing ring with a threaded packing ring follower to retain the packing ring under design pressure with the linkage removed. Alternative means, such as EPDM O-rings, are acceptable if an equivalent cycle endurance can be demonstrated by testing.
12. Flow Characteristics for A-Port: Equal percentage.
13. Flow Characteristics for B-Port: Modified for constant common port flow.

C. Ball Valves with Single Port and Segmented Ball:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

    a. Bray Commercial Division, Inc.
    b. Emmerson.
    c. Valve Solutions, Inc.

2. Approved equivalent.Performance:

    a. Process Temperature Rating: Minus 20 to plus 450 deg F (Minus 29 to plus 232 deg C).
    b. ASME B16.34, Class 300.
    c. Leakage: FCI 70-2, Class IV.
    d. Rangeability: 300 to 1.
    e. Rotation: Zero to 90 degrees.
    f. Equal percentage flow characteristic.

3. ASME B16.10 face-to-face dimensions.
4. Valves NPS 2 (DN 50) and Smaller: Threaded (NPT) ends.
5. Valves NPS 2-1/2 (DN 65) through NPS 6 (DN 150): Flanged ends suitable for mating to ASME B16.5 flanges.
6. Body: stainless steel.
7. Ball and Shaft: Stainless steel.
8. Shaft and Segmented Ball: Pinned and welded.
9. Ball Seat: Graphite.
10. Packing: PTFE V-rings and graphite packing follower.
11. Replaceable seat, ball, and shaft packing.
12. Label each valve with following:

a. Manufacturer's name, model number, and serial number.
b. Body size.
c. Flow directional arrow.

D. Ball Valves with Segmented Ball, Three-Way Pattern:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Bray Commercial Division, Inc.
b. Emmerson.
c. Valve Solutions, Inc.
d. Approved equivalent.

2. Arrangement: Two single-port valves mated to a fabricated tee with interconnecting mechanical linkage.
3. Performance:

a. Process Temperature Rating: Minus 20 to plus 450 deg F (Minus 29 to plus 232 deg C).
b. ASME B16.34, Class 300.
c. Leakage: FCI 70-2, Class IV.
d. Rangeability: 300 to 1.
e. Rotation: Zero to 90 degrees.
f. Equal percentage flow characteristic.

4. Face-to-Face Dimensions: ASME B16.10.
5. Valves NPS 3 (DN 80) through NPS 6 (DN 150): Flanged ends suitable for mating to ASME B16.5 flanges.
6. Body: stainless steel.
7. Ball and Shaft: Stainless steel.
8. Shaft and Segmented Ball: Pinned and welded.
9. Ball Seat: Graphite.
10. Packing: PTFE V-rings and graphite packing follower.
11. Replaceable seat, ball, and shaft packing.
12. Label each valve with following:

a. Manufacturer's name, model number, and serial number.
b. Body size.
c. Flow directional arrow.

E. Ball Valves with Full Ball and Characterized V-Notch:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Bray Commercial Division, Inc.
b. Flow-Tek, Inc.
c. Valve Solutions, Inc.
d. Approved equivalent.

2. Performance:

    a. Process Temperature Rating: Minus 20 to plus 500 deg F (Minus 29 to plus 232 deg C).
    b. ASME B16.34, Class 600 for NPS 2 (DN 50) and smaller; Class 300 for larger than NPS 2 (DN 50).
    c. Leakage: FCI 70-2, Class VI, bi-directional.
    d. Rangeability: Varies from 200 to 1 up to 800 to 1 based on notch pattern of ball.
    e. Rotation: Zero to 90 degrees.
    f. Equal percentage flow characteristic.
    g. Full port.

3. Face-to-Face Dimension: ASME B16.10 long pattern.
4. Valves NPS 2 (DN 50) and Smaller: ASME B1.20.1 threaded (NPT) ends and three-piece body.
5. Valves NPS 2-1/2 (DN 65) through NPS 12 (DN 300): Flanged ends suitable for mating to ASME B16.5 flanges and two-piece body.
6. Hole in the stem slot of each ball equalizes pressure between the body cavity and the line media flow.
7. Replaceable seat, ball, and shaft packing.
8. Body: stainless steel.
9. Ball and Shaft: Stainless steel.
10. Ball Seat: RPTFE.
11. Stem Seals for Valves NPS 2 (DN 50) and Smaller: Live-loaded, self-adjusting, primary and secondary sealing using belleville washers.

    a. Primary Seal: Combination of thrust washer and thrust washer protector.
    b. Secondary Seal: Adjustable stem packing composed of RPTFE V-rings.

12. Stem Seals for Valves Larger than NPS 2 (DN 50): Independent packing gland, adjusted without removing mounting hardware or operator, and contoured to uniformly distribute load across packing.

    a. Primary Seal: Combination of thrust washer and thrust washer protector.
    b. Secondary Seal: Adjustable stem packing composed of RPTFE V-rings.

13. Label each valve with following:

    a. Manufacturer's name, model number, and serial number.
    b. Body size.
    c. Flow directional arrow.

2.3 GLOBE-STYLE CONTROL VALVES

A. General Globe-Style Valve Requirements:

1. Globe-style control valve body dimensions shall comply with ISA 75.08.01.
2. Construct the valves to be serviceable from the top.
3. For cage guided valves, trim shall be field interchangeable for different valve flow characteristics, such as equal percentage, linear, and quick opening.

4. Reduced trim for one nominal size smaller shall be available for industrial valves NPS 1 and larger.
5. Replaceable seats and plugs.
6. Furnish each control valve with a corrosion-resistant nameplate indicating the following:

    a. Manufacturer's name, model number, and serial number.
    b. Body and trim size.
    c. Arrow indicating direction of flow.

B. Two-Way Globe Valves NPS 2 (DN 50) and Smaller:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

    a. Johnson Controls, Inc.
    b. NIBCO.
    c. Siemens Industry, Inc., Building Technologies Division.
    d. Approved equivalent.

2. Globe Style: Single port.
3. Body: Cast bronze or forged brass with ASME B16.5, Class 250 rating.
4. End Connections: Threaded.
5. Bonnet: Screwed.
6. Packing: PTFE V-ring.
7. Plug: Top guided.
8. Plug, Seat, and Stem: Brass.
9. Process Temperature Range: 35 to 248 deg F (2 to 120 deg C).
10. Ambient Operating Temperature: 35 to 150 deg F (2 to 65 deg C).
11. Leakage: FCI 70-2, Class IV.
12. Rangeability: 25 to 1.
13. Equal percentage flow characteristic.

C. Three-Way Globe Valves NPS 2 (DN 50) and Smaller:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

    a. Johnson Controls, Inc.
    b. NIBCO.
    c. Siemens Industry, Inc., Building Technologies Division.
    d. Approved equivalent.

2. Globe Style: Mix flow pattern.
3. Body: Cast bronze or forged brass with ASME B16.5, Class 250 rating.
4. End Connections: Threaded.
5. Bonnet: Screwed.
6. Packing: PTFE V-ring.
7. Plug: Top guided.
8. Plug, Seat, and Stem: Brass.
9. Process Temperature Range: 35 to 248 deg F (2 to 120 deg C).

10. Ambient Operating Temperature: 35 to 150 deg F (2 to 65 deg C).
11. Leakage: FCI 70-2, Class IV.
12. Rangeability: 25 to 1.
13. Linear flow characteristic.

D. Two-Way Globe Valves NPS 2-1/2 to NPS 6 (DN 65 to DN 150):

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

    a. Johnson Controls, Inc.
    b. NIBCO.
    c. Siemens Industry, Inc., Building Technologies Division.
    d. Approved equivalent.

2. Globe Style: Single port.
3. Body: Cast iron complying with ASME B61.1, Class 125.
4. End Connections: Flanged, suitable for mating to ASME B16.5, Class 150 flanges.
5. Bonnet: Bolted.
6. Packing: PTFE cone-ring.
7. Plug: Top or bottom guided.
8. Plug, Seat, and Stem: Brass or stainless steel.
9. Process Temperature Rating: 35 to 281 deg F (2 to 138 deg C).
10. Leakage: 0.1 percent of maximum flow.
11. Rangeability: Varies with valve size between 6 and 10 to 1.
12. Modified linear flow characteristic.

2.4 ELECTRIC AND ELECTRONIC CONTROL VALVE ACTUATORS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Belimo Aircontrols (USA), Inc.
2. Honeywell.
3. Johnson Controls, Inc.
4. Siemens Industry, Inc., Building Technologies Division.
5. Valve Solutions, Inc.
6. Schneider Electric.
7. Approved equivalent.

B. Actuators for Hydronic Control Valves: Capable of closing valve against system pump shutoff head.

C. Position indicator and graduated scale on each actuator.

D. Type: Motor operated, with or without gears, electric and electronic.

E. Voltage: 24-V ac.

F. Deliver torque required for continuous uniform movement of controlled device from limit to limit when operated at rated voltage.

G. Function properly within a range of 85 to 120 percent of nameplate voltage.

H. Construction:

1. For Actuators Less Than 100 W: Fiber or reinforced nylon gears with steel shaft, copper alloy or nylon bearings, and pressed steel enclosures.
2. For Actuators from 100 to 400 W: Gears ground steel, oil immersed, shaft hardened steel running in bronze, copper alloy or ball bearings. Operator and gear trains shall be totally enclosed in dustproof cast-iron, cast-steel or cast-aluminum housing.
3. For Actuators Larger Than 400 W: Totally enclosed reversible induction motors with auxiliary hand crank and permanently lubricated bearings.

I. Field Adjustment:

1. Spring Return Actuators: Easily switchable from fail open to fail closed in the field without replacement.
2. Gear Type Actuators: External manual adjustment mechanism to allow manual positioning when the actuator is not powered.

J. Two-Position Actuators: Single direction, spring return or reversing type.

K. Modulating Actuators:

1. Operation: Capable of stopping at all points across full range, and starting in either direction from any point in range.
2. Control Input Signal:

    a. Three Point, Tristate, or Floating Point: Clockwise and counter-clockwise inputs. One input drives actuator to open position and other input drives actuator to close position. No signal of either input remains in last position.
    b. Proportional: Actuator drives proportional to input signal and modulates throughout its angle of rotation. Suitable for zero- to 10-V dc and 4- to 20-mA signals.
    c. Pulse Width Modulation (PWM): Actuator drives to a specified position according to pulse duration (length) of signal from a dry contact closure, triac sink, or source controller.
    d. Programmable Multi-Function:

        1) Control Input, Position Feedback, and Running Time: Factory or field programmable.
        2) Diagnostic: Feedback of hunting or oscillation, mechanical overload, mechanical travel, and mechanical load limit.
        3) Service Data: Include, at a minimum, number of hours powered and number of hours in motion.

L. Position Feedback:

1. Equip two-position actuators with limits switches or other positive means of a position indication signal for remote monitoring of open and close position.
2. Equip modulating actuators with a position feedback through current or voltage signal for remote monitoring.

3. Provide a position indicator and graduated scale on each actuator indicating open and closed travel limits.

M. Fail-Safe:

1. Where indicated, provide actuator to fail to an end position.
2. Internal spring return mechanism to drive controlled device to an end position (open or close) on loss of power.
3. Batteries, capacitors, and other non-mechanical forms of fail-safe operation are acceptable only where uniquely indicated.

N. Integral Overload Protection:

1. Provide against overload throughout the entire operating range in both directions.
2. Electronic overload, digital rotation sensing circuitry, mechanical end switches, or magnetic clutches are acceptable methods of protection.

O. Valve Attachment:

1. Unless otherwise required for valve interface, provide an actuator designed to be directly coupled to valve shaft without the need for connecting linkages.
2. Attach actuator to valve drive shaft in a way that ensures maximum transfer of power and torque without slippage.
3. Bolt and set screw method of attachment is acceptable only if provided with at least two points of attachment.

P. Temperature and Humidity:

1. Temperature: Suitable for operating temperature range encountered by application with minimum operating temperature range of minus 20 to plus 120 deg F (minus 29 to plus 49 deg C).
2. Humidity: Suitable for humidity range encountered by application; minimum operating range shall be from 5 to 95 percent relative humidity, non-condensing.

Q. Enclosure:

1. Suitable for ambient conditions encountered by application.
2. NEMA 250, Type 2 for indoor and protected applications.
3. NEMA 250, Type 4 or Type 4X for outdoor and unprotected applications.
4. Provide actuator enclosure with heater and control where required by application.

R. Stroke Time:

1. Operate valve from fully closed to fully open within 15 seconds.
2. Operate valve from fully open to fully closed within 15 seconds.
3. Move valve to failed position within 5seconds.
4. Select operating speed to be compatible with equipment and system operation.

S. Sound:

1. Spring Return: 62 dBA.

2. Non-Spring Return: 45 dBA.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for valves installed in piping to verify actual locations of piping connections before installation.

C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 CONTROL VALVE APPLICATIONS

A. Control Valves:

1. Select from valves specified in "Control Valves" Article to achieve performance requirements and characteristics indicated while subjected to full range of system operation encountered.
2. Heating Hydronic System, Two-Way Applications Controlled by Flow Globe-style, two-way valves.

3.3 INSTALLATION, GENERAL

A. Furnish and install products required to satisfy most stringent requirements indicated.

B. Install products level, plumb, parallel, and perpendicular with building construction.

C. Properly support instruments, tubing, piping, wiring, and conduits to comply with requirements indicated. Brace all products to prevent lateral movement and sway or a break in attachment when subjected to a force.

D. Provide ceiling, floor, roof, and wall openings and sleeves required by installation. Before proceeding with drilling, punching, or cutting, check location first for concealed products that could potentially be damaged. Patch, flash, grout, seal, and refinish openings to match adjacent condition.

E. Firestop penetrations made in fire-rated assemblies and seal penetrations made in acoustically rated assemblies.

F. Fastening Hardware:

1. Stillson wrenches, pliers, and other tools that will cause injury to or mar surfaces of rods, nuts, and other parts are prohibited for assembling and tightening nuts.
2. Tighten bolts and nuts firmly and uniformly. Do not overstress threads by excessive force or by oversized wrenches.
3. Lubricate threads of bolts, nuts, and screws with graphite and oil before assembly.

G. Install products in locations that are accessible and that will permit calibration and maintenance from floor, equipment platforms, or catwalks. Where ladders are required for Director's Representative's access, confirm unrestricted ladder placement is possible under occupied condition.

H. Corrosive Environments:

1. Use products that are suitable for environment to which they will be subjected.
2. If possible, avoid or limit use of materials in corrosive environments, including. but not limited to, the following:

    a. Laboratory exhaust airstreams.
    b. Process exhaust airstreams.

3. Use Type 316 stainless-steel tubing and fittings when in contact with a corrosive environment.
4. When conduit is in contact with a corrosive environment, use Type 316 stainless-steel conduit and fittings or conduit and fittings that are coated with a corrosive-resistant coating that is suitable for environment.
5. Where control devices are located in a corrosive environment and are not corrosive resistant from manufacturer, field install products in a NEMA 250, Type 4X enclosure constructed of Type 316L stainless steel.

3.4 ELECTRIC POWER

A. Furnish and install electrical power to products requiring electrical connections.

B. Furnish and install circuit breakers. Comply with requirements in Section 262816 "Enclosed Switches and Circuit Breakers."

C. Furnish and install power wiring. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

D. Furnish and install raceways. Comply with requirements in Section 260533 "Raceways and Boxes for Electrical Systems."

3.5 CONTROL VALVES

A. Install pipe reducers for valves smaller than line size. Position reducers as close to valve as possible but at distance to avoid interference and impact to performance. Install with manufacturer-recommended clearance.

B. Install flanges or unions to allow drop-in and -out valve installation.

C. Install pressure temperature taps in piping upstream and downstream of each control valve larger than NPS 1 (DN 25).

D. Valve Orientation:

1. Where possible, install globe and ball valves installed in horizontal piping with stems upright and not more than 15 degrees off of vertical, not inverted.
2. Install valves in a position to allow full stem movement.
3. Where possible, install butterfly valves that are installed in horizontal piping with stems in horizontal position and with low point of disc opening with direction of flow.

E. Clearance:

1. Locate valves for easy access and provide separate support of valves that cannot be handled by service personnel without hoisting mechanism.
2. Install valves with at least 12 inches (300 mm) of clear space around valve and between valves and adjacent surfaces.

F. Threaded Valves:

1. Note internal length of threads in valve ends, and proximity of valve internal seat or wall, to determine how far pipe should be threaded into valve.
2. Align threads at point of assembly.
3. Apply thread compound to external pipe threads, except where dry seal threading is specified.
4. Assemble joint, wrench tight. Apply wrench on valve end as pipe is being threaded.

G. Flanged Valves:

1. Align flange surfaces parallel.
2. 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 with a torque wrench.

3.6 CONNECTIONS

A. Connect electrical devices and components to electrical grounding system. Comply with requirements in Section 260526 "Grounding and Bonding for Electrical Systems."

3.7 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Each piece of wire, cable, and tubing shall have the same designation at each end for operators to determine continuity at points of connection. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

B. Install engraved phenolic nameplate with valve identification on valve and on face of ceiling directly below valves concealed above ceilings.

3.8 CLEANING

A. Remove grease, mastic, adhesives, dust, dirt, stains, fingerprints, labels, and other foreign materials from exposed interior and exterior surfaces.

B. Wash and shine glazing.

C. Polish glossy surfaces to a clean shine.

3.9 CHECKOUT PROCEDURES

A. Control Valve Checkout:

1. Check installed products before continuity tests, leak tests, and calibration.
2. Check valves for proper location and accessibility.
3. Check valves for proper installation for direction of flow, elevation, orientation, insertion depth, or other applicable considerations that will impact performance.
4. For pneumatic products, verify air supply for each product is properly installed.
5. For pneumatic valves, verify that pressure gauges are provided in each air line to valve actuator and positioner.
6. Verify that control valves are installed correctly for flow direction.
7. Verify that valve body attachment is properly secured and sealed.
8. Verify that valve actuator and linkage attachment are secure.
9. Verify that actuator wiring is complete, enclosed, and connected to correct power source.
10. Verify that valve ball, disc, and plug travel are unobstructed.
11. After piping systems have been tested and put into service, but before insulating and balancing, inspect each valve for leaks. Adjust or replace packing to stop leaks. Replace the valve if leaks persist.

3.10 ADJUSTMENT, CALIBRATION, AND TESTING

A. Stroke and adjust control valves following manufacturer's recommended procedure, from 100 percent open to 100 percent closed back to 100 percent open.

B. Stroke control valves with pilot positioners. Adjust valve and positioner following manufacturer's recommended procedure, so valve is 100 percent closed, 50 percent closed, and 100 percent open at proper air pressures.

C. Check and document open and close cycle times for applications with a cycle time of less than 30 seconds.

D. For control valves equipped with positive position indication, check feedback signal at multiple positions to confirm proper position indication.

END OF SECTION 230923.11

SECTION 230923.12 - CONTROL DAMPERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes the following types of control dampers and actuators for DDC systems:

1. Rectangular control dampers.
2. Round control dampers.
3. General control-damper actuator requirements.
4. Electric and electronic actuators.

1.3 DEFINITIONS

A. DDC: Direct-digital control.

B. RMS: Root-mean-square value of alternating voltage, which is the square root of the mean value of the square of the voltage values during a complete cycle.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For control dampers to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. ASME Compliance: Fabricate and label products to comply with ASME Boiler and Pressure Vessel Code where required by authorities having jurisdiction.

C. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to size products where indicated as delegated design.

D. Ground Fault: Products shall not fail due to ground fault condition when suitably grounded.

E. Backup Power Source: Systems and equipment served by a backup power source shall have associated control damper actuators served from a backup power source.

F. Environmental Conditions:

1. Provide electric control-damper actuators, with protective enclosures satisfying the following minimum requirements unless more stringent requirements are indicated. Electric control-damper actuators not available with integral enclosures, complying with requirements indicated, shall be housed in protective secondary enclosures.

a. Hazardous Locations: Explosion-proof rating for condition.

G. Selection Criteria:

1. Fail positions unless otherwise indicated:

a. Supply Air: Last Position.
b. Return Air: Last Position.
c. Outdoor Air: Last Position.
d. Mixed Air: Last Position.
e. Exhaust Air: Last Position.

2. Dampers shall have stable operation throughout full range of operation, from design to minimum airflow over varying pressures and temperatures encountered.
3. Select modulating dampers for a pressure drop of 5 percent of fan total static pressure unless otherwise indicated.
4. Two-position dampers shall be full size of duct or equipment connection unless otherwise indicated.
5. Control-damper, electric/electronic-control signal shall not exceed 200 feet (60 m). For longer distances, provide an electric/electronic control signal to the damper and an electric solenoid valve or electro-pneumatic transducer at the damper to convert the control signal to pneumatic.

2.2 RECTANGULAR CONTROL DAMPERS

A. General Requirements:

1. Unless otherwise indicated, use parallel blade configuration for two-position control, equipment isolation service, and when mixing two airstreams. For other applications, use opposed blade configuration.
2. Factory assemble multiple damper sections to provide a single damper assembly of size required by the application.
3. Damper actuator shall be factory installed by damper manufacturer as integral part of damper assembly. Coordinate actuator location and mounting requirements with damper manufacturer.

B. Rectangular Dampers with Aluminum Airfoil Blades:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. ABI.
b. Arrow United Industries.
c. Ruskin Company.
d. Approved equivalent.

2. Performance:

a. Leakage: AMCA 511, Class 1A. Leakage shall not exceed 3 cfm/sq. ft. against 1-in. wg differential static pressure.
b. Pressure Drop: 0.05-in. wg at 1500 fpm across a 24-by-24-inch damper when tested according to AMCA 500-D, figure 5.3.
c. Velocity: Up to 6000 fpm.
d. Temperature: Minus 40 to plus 185 deg F.
e. Pressure Rating: Damper close-off pressure equal to fan shutoff pressure with a maximum blade deflection of 1/200 of blade length.
f. Damper shall have AMCA seal for both air leakage and air performance.

3. Construction:

a. Frame:

1) Material: ASTM B211, Alloy 6063 T5 extruded-aluminum profiles, 0.07 inch (1.8 mm) thick.
2) Hat-shaped channel with integral flange(s). Mating face shall be a minimum of 1 inch.
3) Width not less than 5 inches.

b. Blades:

1) Hollow, airfoil, extruded aluminum.
2) Parallel or opposed blade configuration as required by application.
3) Material: ASTM B211, Alloy 6063 T5 aluminum, 0.07 inch thick.
4) Width not to exceed 6 inches.
5) Length as required by close-off pressure, not to exceed 48 inches.

c. Seals:

1) Blades: Replaceable, mechanically attached extruded silicone, vinyl, or plastic composite.
2) Jambs: Stainless steel, compression type.

d. Axles: 0.5-inch- diameter plated or stainless steel, mechanically attached to blades.
e. Bearings:

1) Molded synthetic or stainless-steel sleeve mounted in frame.
2) Where blade axles are installed in vertical position, provide thrust bearings.

f. Linkage:

1) Concealed in frame.
2) Constructed of aluminum and plated or stainless steel.

3) Hardware: Stainless steel.

g. Transition:

1) For round and flat oval duct applications, provide damper assembly with integral transitions to mate to adjoining field connection.
2) Factory mount damper in a sleeve with a close transition to mate to field connection.
3) Damper size and sleeve shall be connection size plus 2 inches.
4) Sleeve length shall be not less than 12 inches for dampers without jackshafts and shall be not less than 16 inches for dampers with jackshafts.
5) Sleeve material shall match adjacent duct.

h. Additional Corrosion Protection for Corrosive Environments:

1) Provide anodized finish for aluminum surfaces in contact with airstream. Anodized finish shall be a minimum of 0.0007 inch thick.
2) Axles, damper linkage, and hardware shall be constructed of Type 316L stainless steel.

4. Airflow Measurement:

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) Ebtron, Inc.
2) Ruskin Company.
3) PCE Instruments.
4) Approved equivalent.

b. Where indicated, provide damper assembly with integral airflow monitoring.
c. Zero- to 10-V dc or 4- to 20-mA scaled output signal for remote monitoring of actual airflow.
d. Accuracy shall be within 5 percent of the actual flow rate between the range of minimum and design airflow. For applications with a large variation in range between the minimum and design airflow, configure the damper sections and flow measurement assembly as required to comply with the stated accuracy over the entire modulating range.
e. Provide a straightening device as part of the flow measurement assembly to achieve the specified accuracy with configuration indicated.
f. Suitable for operation in untreated and unfiltered air.
g. Provide temperature and altitude compensation and correction to maintain accuracy over temperature range encountered at site altitude.
h. Provide automatic zeroing feature.

5. Airflow Control:

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) Ebtron, Inc.

2) Ruskin Company.
3) Systemair.
4) Approved equivalent.

b. Where indicated, provide damper assembly with integral airflow measurement and control.
c. A factory-furnished and -calibrated controller shall be programmed, in nonvolatile EPROM, with application-specific airflow set point and range.
d. The controller and actuator shall communicate to control the desired airflow.
e. The controller shall receive a zero- to 10-V dc input signal and report a zero- to 20-mA output signal that is proportional to the airflow.
f. Airflow measurement and control range shall be suitable for operation between 150 to 2000 fpm (0.8 to 10 m/s).
g. Ambient Operating Temperature Range: Minus 40 to plus 140 deg F (Minus 40 to plus 60 deg C).
h. Ambient Operating Humidity Range: 5 to 95 percent relative humidity, non-condensing.
i. Provide unit with control transformer rated for not less than 85 VA. Provide transformer with primary and secondary protection and primary disconnecting means. Coordinate requirements with field power connection.
j. Provide screw terminals for interface to field wiring.
k. Factory mount electronics within a NEMA 250, Type 1 painted steel enclosure.

C. Rectangular Dampers with Steel Airfoil Blades:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Greenheck.
b. Ruskin Company.
c. United Enertech.
d. Approved equivalent.

2. Performance:

a. Leakage: AMCA 511, Class 1A. Leakage shall not exceed 3 cfm/sq. ft. against 1-in. wg differential static pressure.
b. Pressure Drop: 0.06-in. wg at 1500 fpm across a 24-by-24-inch damper when tested according to AMCA 500-D, figure 5.3.
c. Velocity: Up to 6000 fpm.
d. Temperature: Minus 40 to plus 185 deg F.
e. Pressure Rating: Damper close-off pressure equal to fan shutoff pressure with a maximum blade deflection of 1/200 of blade length.
f. Damper shall have AMCA seal for both air leakage and air performance.

3. Construction:

a. Frame:

1) Material: ASTM A653/A653M galvanized-steel profiles, 0.06 inch (1.6 mm) thick.
2) Hat-shaped channel with integral flanges. Mating face shall be a minimum of 1 inch.
3) Width not less than 5 inches.

b. Blades:

1) Hollow, airfoil, galvanized steel.
2) Parallel or opposed blade configuration as required by application.
3) Material: ASTM A653/A653M galvanized steel, 0.05 inch thick.
4) Width not to exceed 6 inches.
5) Length as required by close-off pressure, not to exceed 48 inches.

c. Seals:

1) Blades: Replaceable, mechanically attached extruded silicone, vinyl, or plastic composite.
2) Jambs: Stainless steel, compression type.

d. Axles: 0.5-inch- diameter plated or stainless steel, mechanically attached to blades.
e. Bearings:

1) Stainless steel mounted in frame.
2) Where blade axles are installed in vertical position, provide thrust bearings.

f. Linkage:

1) Concealed in frame.
2) Constructed of aluminum and plated or stainless steel.
3) Hardware: Stainless steel.

g. Transition:

1) For round and flat oval duct applications, provide damper assembly with integral transitions to mate to adjoining field connection.
2) Factory mount damper in a sleeve with a close transition to mate to field connection.
3) Damper size and sleeve shall be connection size plus 2 inches.
4) Sleeve length shall be not less than 12 inches for dampers without jackshafts and shall be not less than 16 inches for dampers with jackshafts.
5) Sleeve material shall match adjacent duct.

h. Additional Corrosion Protection for Corrosive Environments:

1) Provide epoxy finish for surfaces in contact with airstream.
2) Axles, damper linkage, and hardware shall be constructed of Type 316L stainless steel.

D. Industrial-Duty Rectangular Dampers with Steel Airfoil Blades:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Arrow United Industries.
    b. Ruskin Company.
    c. Nailor.
    d. Approved equivalent.

2. Performance:

    a. Leakage: Leakage shall not exceed 3 cfm/sq. ft. against 1-in. wg (250-Pa) differential static pressure.
    b. Pressure Drop: 0.06-in. wg at 2000 fpm across a 48-by-48-inch damper when tested according to AMCA 500-D, figure 5.3.
    c. Velocity: Up to 4000 fpm.
    d. Temperature: Minus 40 to plus 250 deg F.
    e. Pressure Rating: Damper close-off pressure equal to fan shutoff pressure with a maximum blade deflection of 1/200 of blade length, minimum 10-in. wg.

3. Construction:

    a. Frame:

        1) Material: Galvanized or stainless steel, 0.11 inch thick.
        2) C-shaped channel. Mating face shall be a minimum of 1 inch.
        3) Width not less than 3 inches.

    b. Blades:

        1) Hollow, airfoil, galvanized stainless steel.
        2) Parallel or opposed blade configuration as required by application.
        3) Material: Galvanized steel, 0.06 inch thick.
        4) Width not to exceed 8 inches.
        5) Length not to exceed 48 inches.

    c. Seals:

        1) Blades: Replaceable, mechanically attached EPDM or extruded silicone.
        2) Jambs: Stainless steel, double compression type.

    d. Axles: 0.5- or 0.75-inch- diameter plated or stainless steel, mechanically attached to blades and continuous from end to end.

    e. Bearings:

        1) Stainless-steel sleeve type mounted in frame.
        2) Where blade axles are installed in vertical position, provide thrust bearings.

    f. Linkage:

        1) Face linkage exposed to airstream.

2) Constructed of plated or stainless steel.
3) Hardware: Stainless steel.

E. Rectangular Dampers with Aluminum Flat Blades:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Arrow United Industries.
b. Greenheck.
c. Ruskin Company.
d. Approved equivalent.

2. Performance:

a. Leakage: Leakage shall not exceed 3.2 cfm/sq. ft. against 1-in. wg differential static pressure.
b. Pressure Drop: 0.07-in. wg at 1500 fpm across a 24-by-24-inch damper when tested according to AMCA 500-D, figure 5.3.
c. Velocity: Up to 2000 fpm.
d. Temperature: Minus 50 to plus 250 deg F.
e. Pressure Rating: Damper close-off pressure equal to fan shutoff pressure with a maximum blade deflection of 1/200 of blade length, not to exceed 3-in. wg.
f. Damper shall have AMCA seal for both air leakage and air performance.

3. Construction:

a. Frame:

1) Material: ASTM B211, Alloy 6063 T5 extruded-aluminum profiles, 0.12 inch (3.2 mm) thick.
2) Hat-shaped channel with integral flanges.
3) Width not less than 5 inches.

b. Blades:

1) Flat blades of extruded aluminum.
2) Parallel or opposed blade configuration as required by application.
3) Material: ASTM B211, Alloy 6063 T5 extruded-aluminum profiles, 0.12 inch thick.
4) Width not to exceed 6 inches.
5) Length as required by close-off pressure, not to exceed 48 inches.

c. Seals:

1) Blades: Replaceable, mechanically attached extruded silicone, vinyl or plastic composite.
2) Jambs: Stainless steel, compression type.

d. Axles: 0.5-inch-diameter plated or stainless steel, mechanically attached to blades.
e. Bearings:

1) Molded-synthetic sleeve, mounted in frame.
2) Where blade axles are installed in vertical position, provide thrust bearings.

f. Linkage:

1) Concealed in frame.
2) Constructed of plated or stainless steel.
3) Hardware: Stainless steel.

g. Transition:

1) For round and flat oval duct applications, provide damper assembly with integral transitions to mate to adjoining field connection.
2) Factory mount damper in a sleeve with a close transition to mate to field connection.
3) Damper size and sleeve shall be connection size plus 2 inches (50 mm).
4) Sleeve length shall be not less than 12 inches (300 mm) for dampers without jackshafts and shall be not less than 16 inches (450 mm) for dampers with jackshafts.
5) Sleeve material shall match adjacent duct.

h. Additional Corrosion Protection for Corrosive Environments:

1) Provide anodized finish for aluminum surfaces in contact with airstream. Anodized finish shall be a minimum of 0.0007 inch (0.018 mm) thick.
2) Axles, damper linkage, and hardware shall be constructed of Type 316L stainless steel.

F. Rectangular Dampers with Steel Flat Blades:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Arrow United Industries.
b. Greenehck.
c. Ruskin Company.
d. Approved equivalent.

2. Performance:

a. Leakage: Leakage shall not exceed 4.8 cfm/sq. ft. against 1-in. wg differential static pressure.
b. Pressure Drop: 0.1-in. wg at 1500 fpm across a 24-by-24-inch damper when tested according to AMCA 500-D, figure 5.3.
c. Velocity: Up to 1500 fpm.
d. Temperature: Minus 25 to plus 180 deg F.
e. Pressure Rating: Damper close-off pressure equal to fan shutoff pressure with a maximum blade deflection of 1/200 of blade length, not to exceed 4-in. wg.
f. Damper shall have AMCA seal for both air leakage and air performance.

3. Construction:

a. Frame:

1) Material: Galvanized or stainless steel, 0.06 inch thick.
2) Hat-shaped channel with integral flanges.
3) Width not less than 5 inches.

b. Blades:

1) Flat blades with multiple grooves positioned axially for reinforcement.
2) Parallel or opposed blade configuration as required by application.
3) Material: Galvanized or stainless steel, 0.06 inch thick.
4) Width not to exceed 6 inches.
5) Length as required by close-off pressure, not to exceed 48 inches.

c. Seals:

1) Blades: Replaceable, mechanically attached, PVC-coated polyester.
2) Jambs: Stainless steel, compression type.

d. Axles: 0.5-inch- diameter plated or stainless steel, mechanically attached to blades.
e. Bearings:

1) Molded-synthetic sleeve, mounted in frame.
2) Where blade axles are installed in vertical position, provide thrust bearings.

f. Linkage:

1) Concealed in frame.
2) Constructed of plated or stainless steel.
3) Hardware: Stainless steel.

G. Insulated Rectangular Dampers:

1. Performance:

a. Leakage: AMCA 511, Class 1A. Leakage shall not exceed 3 cfm/sq. ft. against 1-in. wg differential static pressure and shall not exceed 4.9 cfm/sq. ft. against 4-in. wg differential static pressure at minus 40 deg F.
b. Pressure Drop: 0.1-in. wg at 1500 fpm across a 24-by-24-inch damper when tested according to AMCA 500-D, figure 5.3.
c. Velocity: Up to 4000 fpm.
d. Temperature: Minus 100 to plus 185 deg F.
e. Pressure Rating: Damper close-off pressure equal to fan shutoff pressure with a maximum blade deflection of 1/200 of blade length.
f. Damper shall have AMCA seal for both air leakage and air performance.

2. Construction:

a. Frame:

1) Material: ASTM B211, Alloy 6063 T5 extruded-aluminum profiles, 0.08 inch thick.
2) C-shaped channel with integral flange(s). Mating face shall be a minimum of 1 inch.
3) Width not less than 4 inches.
4) Entire frame shall be thermally broken by means of polyurethane resin pockets, complete with thermal cuts.
5) Damper frame shall be insulated with polystyrofoam on four sides.

b. Blades:

1) Hollow shaped, extruded aluminum.
2) Blades shall be internally insulated with expanded polyurethane foam and shall be thermally broken. Complete blade shall have an insulating factor of R-2.29 and a temperature index of 55.
3) Parallel or opposed blade configuration as required by application.
4) Material: ASTM B211, Alloy 6063 T5 aluminum, 0.08 inch thick.
5) Width not to exceed 6 inches.
6) Length as required by close-off pressure, not to exceed 48 inches.

c. Seals: Blade and frame seals shall be of flexible silicone and secured in an integral slot within the aluminum extrusions.
d. Axles: 0.44-inch- diameter plated or stainless steel, mechanically attached to blades.
e. Bearings:

1) Bearings shall be composed of a Celcon inner bearing fixed to axle, rotating within a polycarbonate outer bearing inserted in the frame, resulting in no metal-to-metal or metal-to-plastic contact.
2) Where blade axles are installed in vertical position, provide thrust bearings.

f. Linkage:

1) Concealed in frame.
2) Constructed of aluminum and plated or stainless steel.
3) Hardware: Stainless steel.

g. Transition:

1) For round and flat oval duct applications, provide damper assembly with integral transitions to mate to adjoining field connection.
2) Factory mount damper in a sleeve with a close transition to mate to field connection.
3) Damper size and sleeve shall be connection size plus 2 inches.
4) Sleeve length shall be not less than 12 inches for dampers without jackshafts and shall be not less than 16 inches for dampers with jackshafts.
5) Sleeve material shall match adjacent duct.

h. Additional Corrosion Protection for Corrosive Environments:

1) Provide anodized finish for aluminum surfaces in contact with airstream. Anodized finish shall be a minimum of 0.0007 inch thick.

2) Axles, damper linkage, and hardware shall be constructed of Type 316L stainless steel.

2.3 ROUND CONTROL DAMPERS

A. Round Dampers, Sleeve Type:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

   a. Ruskin Company.
   b. The Duct Shop.
   c. Nailor.
   d. Approved equivalent.

2. Performance:

   a. Leakage: Leakage shall not exceed 0.15 cfm/in. of perimeter blade at 4-in.wg differential static pressure.
   b. Pressure Drop: 0.02-in. wg at 1500 fpm across a 12-inch damper when tested according to AMCA 500-D, figure 5.3.
   c. Velocity: Up to 4000 fpm.
   d. Temperature: Minus 25 to plus 200 deg F.
   e. Pressure Rating: 8-in. wg for sizes through 12 inches, 6-in. wg for larger sizes.

3. Construction:

   a. Frame:

      1) Material: Galvanized or stainless steel, 0.04 in thick.
      2) Outward rolled stiffener beads positioned approximately 1 inch inboard of each end.
      3) Sleeve-type connection for mating to adjacent ductwork.
      4) Size Range: 4 to 24 inches.
      5) Length not less than 7 inches.
      6) Provide 2-inch sheet metal stand-off for mounting actuator.

   b. Blade: Double-thickness circular flat blades sandwiched together and constructed of galvanized or stainless steel.
   c. Blade Seal: Polyethylene foam seal sandwiched between two sides of blades and fully encompassing blade edge.
   d. Axle: 0.5-inch- diameter plated or stainless steel, mechanically attached to blade.
   e. Bearings: Stainless-steel sleeve pressed into frame.

B. Round Dampers, Flanged Type:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Arrow United Industries.

b. Greenheck.
c. Ruskin Company.
d. Approved equivalent.

2. Performance:

a. Leakage: Leakage shall not exceed 0.15 cfm/in. of perimeter blade at 4-in. wg differential static pressure.
b. Pressure Drop: 0.03-in. wg at 1500 fpm across a 12-inch damper when tested according to AMCA 500-D, figure 5.3.
c. Velocity: Up to 4000 fpm.
d. Temperature: Minus 25 to plus 250 deg F.
e. Pressure Rating: 8-in. wg for sizes through 36 inches in diameter, 6-in. wg for larger sizes.

3. Construction:

a. Frame:

1) Size Range: 4 to 60 inches.
2) Material: Galvanized or stainless steel.

a) Sizes through 24 Inches in Diameter: 0.15 inch thick.
b) Sizes 26 through 48 Inches in Diameter: 0.25 inch thick.
c) Larger Sizes: 0.31 inch thick.

3) Flanges:

a) Outward rolled with bolt holes on each end of frame for mating to adjacent ductwork.
b) Face: Not less than 1.25 inch for damper sizes through 12 inches in diameter, 1.5 inch for damper sizes 14 through 24 inches in diameter, and 2 inches for larger sizes.

4) Length (Flange Face to Face): Not less than 8 inches.
5) Provide 3-inch sheet metal stand-off for mounting actuator.

b. Blade: Reinforced circular flat blade constructed of galvanized or stainless steel.

1) Sizes through 24 Inches: 0.15 inch thick.
2) Sizes 26 through 48 Inches: 0.19 inch thick.
3) Larger Sizes: 0.25 inch thick.

c. Blade Stop: Full circumference, located in airstream, minimum 0.5 by 0.25 inch galvanized-steel bar.
d. Blade Seal: Neoprene, mechanically attached to blade and fully encompassing blade edge.
e. Axle: Plated or stainless steel, mechanically attached to blade.

1) Sizes through 14 Inches: 0.5 inch in diameter.
2) Sizes 16 through 42 Inches: 0.75 inch in diameter.

3) Larger Sizes: 1 inch in diameter.

f. Bearings: Stainless-steel sleeve pressed into frame.

2.4 GENERAL CONTROL-DAMPER ACTUATORS REQUIREMENTS

A. Actuators shall operate related damper(s) with sufficient reserve power to provide smooth modulating action or two-position action and proper speed of response at velocity and pressure conditions to which the damper is subjected.

B. Actuators shall produce sufficient power and torque to close off against the maximum system pressures encountered. Actuators shall be sized to close off against the fan shutoff pressure as a minimum requirement.

C. The total damper area operated by an actuator shall not exceed 80 percent of manufacturer's maximum area rating.

D. Provide one actuator for each damper assembly where possible. Multiple actuators required to drive a single damper assembly shall operate in unison.

E. Avoid the use of excessively oversized actuators which could overdrive and cause linkage failure when the damper blade has reached either its full open or closed position.

F. Use jackshafts and shaft couplings in lieu of blade-to-blade linkages when driving axially aligned damper sections.

G. Provide mounting hardware and linkages for connecting actuator to damper.

H. Select actuators to fail in desired position in the event of a power failure.

I. Actuator Fail Positions: As indicated below:

1. Exhaust Air: Last position.
2. Outdoor Air: Last position.
3. Supply Air: Last position.
4. Return Air: Last position.

2.5 ELECTRIC AND ELECTRONIC ACTUATORS

A. Type: Motor operated, with or without gears, electric and electronic.

B. Voltage:

1. Voltage selection is delegated to professional designing control system.
2. Actuator shall deliver torque required for continuous uniform movement of controlled device from limit to limit when operated at rated voltage.
3. Actuator shall function properly within a range of 85 to 120 percent of nameplate voltage.

C. Construction:

1. Less Than 100 W: Fiber or reinforced nylon gears with steel shaft, copper alloy or nylon bearings, and pressed steel enclosures.
2. 100 up to 400 W: Gears ground steel, oil immersed, shaft-hardened steel running in bronze, copper alloy, or ball bearings. Operator and gear trains shall be totally enclosed in dustproof cast-iron, cast-steel, or cast-aluminum housing.
3. Greater Than 400 W: Totally enclosed reversible induction motors with auxiliary hand crank and permanently lubricated bearings.

D. Field Adjustment:

1. Spring return actuators shall be easily switchable from fail open to fail closed in the field without replacement.
2. Provide gear-type actuators with an external manual adjustment mechanism to allow manual positioning of the damper when the actuator is not powered.

E. Two-Position Actuators: Single direction, spring return or reversing type.

F. Modulating Actuators:

1. Capable of stopping at all points across full range, and starting in either direction from any point in range.
2. Control Input Signal:

    a. Three Point, Tristate, or Floating Point: Clockwise and counter-clockwise inputs. One input drives actuator to open position, and other input drives actuator to close position. No signal of either input remains in last position.
    b. Proportional: Actuator drives proportional to input signal and modulates throughout its angle of rotation. Suitable for 2- to 10-V dc and 4- to 20-mAsignals.
    c. Pulse Width Modulation (PWM): Actuator drives to a specified position according to a pulse duration (length) of signal from a dry-contact closure, triac sink or source controller.
    d. Programmable Multi-Function:

        1) Control input, position feedback, and running time shall be factory or field programmable.
        2) Diagnostic feedback of hunting or oscillation, mechanical overload, mechanical travel, and mechanical load limit.
        3) Service data, including at a minimum, number of hours powered and number of hours in motion.

G. Position Feedback:

1. Where indicated, equip two-position actuators with limits switches or other positive means of a position indication signal for remote monitoring of open and close position.
2. Equip modulating actuators with a position feedback through current signal for remote monitoring.
3. Provide a position indicator and graduated scale on each actuator indicating open and closed travel limits.

H. Fail-Safe:

1. Where indicated, provide actuator to fail to an end position.
2. Internal spring return mechanism to drive controlled device to an end position (open or close) on loss of power.
3. Batteries, capacitors, and other non-mechanical forms of fail-safe operation are acceptable only where uniquely indicated.

I. Integral Overload Protection:

1. Provide against overload throughout the entire operating range in both directions.
2. Electronic overload, digital rotation sensing circuitry, mechanical end switches, or magnetic clutches are acceptable methods of protection.

J. Damper Attachment:

1. Unless otherwise required for damper interface, provide actuator designed to be directly coupled to damper shaft without need for connecting linkages.
2. Attach actuator to damper drive shaft in a way that ensures maximum transfer of power and torque without slippage.
3. Bolt and set screw method of attachment is acceptable only if provided with at least two points of attachment.

K. Temperature and Humidity:

1. Temperature: Suitable for operating temperature range encountered by application with minimum operating temperature range of minus 20 to plus 120 deg F.
2. Humidity: Suitable for humidity range encountered by application; minimum operating range shall be from 5 to 95 percent relative humidity, non-condensing.

L. Enclosure:

1. Suitable for ambient conditions encountered by application.
2. NEMA 250, Type 2 for indoor and protected applications.
3. NEMA 250, Type 4 or Type 4X for outdoor and unprotected applications.
4. Provide actuator enclosure with a heater and controller where required by application.

M. Stroke Time:

1. Operate damper from fully closed to fully open within 60 seconds.
2. Operate damper from fully open to fully closed within 60 seconds.
3. Move damper to failed position within 15 seconds.
4. Select operating speed to be compatible with equipment and system operation.
5. Actuators operating in smoke control systems comply with governing code and NFPA requirements.

N. Sound:

1. Spring Return: 62 dBA.
2. Non-Spring Return: 45 dBA.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for dampers and instruments installed in duct systems to verify actual locations of connections before installation.

C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 CONTROL-DAMPER APPLICATIONS

A. Control Dampers:

B. Select from damper types indicated in "Control Dampers" Article to achieve performance requirements and characteristics indicated while subjected to full range of system operation encountered.

1. Rectangular Exhaust Air Duct Applications with SMACNA Construction Class 2 and Velocities to 2500 fpm: Rectangular dampers with steel airfoil blades.
2. Round Exhaust Air Duct Applications with SMACNA Construction Class 2 and Velocities to 2500 fpm: Round dampers, flange type.
3. Rectangular Outdoor Air Duct Applications with SMACNA Construction Class 2 and Velocities to 2500 fpm: Industrial-duty rectangular dampers with steel airfoil blades
4. Rectangular Return Air Duct Applications with SMACNA Construction Class 2 and Velocities to 1800 fpm: Rectangular dampers with steel flat blades, Insulated rectangular dampers, Round dampers, sleeve type.
5. Round Return Air Duct Applications with SMACNA Construction Class Construction Class 2 and Velocities to 1800 fpm: Rectangular dampers with steel flat blades, Insulated rectangular dampers, Round dampers, sleeve type.
6. Rectangular Supply Air Duct Applications with SMACNA Construction Class 2 and Velocities to 1500 fpm: Rectangular dampers with steel flat blades, Insulated rectangular dampers, Round dampers, sleeve type, Round dampers, flange type.
7. Round/Flat Oval Supply Air Duct Applications with SMACNA Construction Class 2 and Velocities to 1500 fpm: Rectangular dampers with steel flat blades, Insulated rectangular dampers, Round dampers, sleeve type, Round dampers, flange type.

3.3 INSTALLATION, GENERAL

A. Furnish and install products required to satisfy most stringent requirements indicated.

B. Properly support dampers and actuators, tubing, wiring, and conduit to comply with requirements indicated. Brace all products to prevent lateral movement and sway or a break in attachment when subjected to a force.

C. Provide ceiling, floor, roof, and wall openings and sleeves required by installation. Before proceeding with drilling, punching, or cutting, check location first for concealed products that could potentially be damaged. Patch, flash, grout, seal, and refinish openings to match adjacent condition.

D. Seal penetrations made in fire-rated and acoustically rated assemblies.

E. Fastening Hardware:

1. Stillson wrenches, pliers, or other tools that will cause injury to or mar surfaces of rods, nuts, and other parts are prohibited for assembling and tightening nuts.
2. Tighten bolts and nuts firmly and uniformly. Do not overstress threads by excessive force or by oversized wrenches.
3. Lubricate threads of bolts, nuts, and screws with graphite and oil before assembly.

F. Install products in locations that are accessible and that will permit calibration and maintenance from floor, equipment platforms, or catwalks. Where ladders are required for Director's Representative's access, confirm unrestricted ladder placement is possible under occupied condition.

G. Corrosive Environments:

1. Use products that are suitable for environment to which they will be subjected.
2. If possible, avoid or limit use of materials in corrosive environments, including, but not limited to, the following:

    a. Kitchen exhaust airstreams.

3. Use Type 316 stainless-steel tubing and fittings when in contact with a corrosive environment.
4. When conduit is in contact with a corrosive environment, use Type 316 stainless-steel conduit and fittings or conduit and fittings that are coated with a corrosive-resistant coating that is suitable for environment.
5. Where actuators are located in a corrosive environment and are not corrosive resistant from manufacturer, field install products in a NEMA 250, Type 4X enclosure constructed of Type 316L stainless steel.

3.4 ELECTRIC POWER

A. Furnish and install electrical power to products requiring electrical connections.

B. Furnish and install circuit breakers. Comply with requirements in Section 262816 "Enclosed Switches and Circuit Breakers."

C. Furnish and install power wiring. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

D. Furnish and install raceways. Comply with requirements in Section 260533 "Raceways and Boxes for Electrical Systems."

3.5 CONTROL DAMPERS

A. Install smooth transitions, not exceeding 30 degrees, to dampers smaller than adjacent duct. Install transitions as close to damper as possible but at distance to avoid interference and impact to performance. Consult manufacturer for recommended clearance.

B. Clearance:

1. Locate dampers for easy access and provide separate support of dampers that cannot be handled by service personnel without hoisting mechanism.
2. Install dampers with at least 24 inches (600 mm) of clear space on sides of dampers requiring service access.

C. Service Access:

1. Dampers and actuators shall be accessible for visual inspection and service.
2. Install access door(s) in duct or equipment located upstream of damper to allow service personnel to hand clean any portion of damper, linkage, and actuator. Comply with requirements in Section 233300 "Air Duct Accessories."

D. Install dampers straight and true, level in all planes, and square in all dimensions. Install supplementary structural steel reinforcement for large multiple-section dampers if factory support alone cannot handle loading.

E. Attach actuator(s) to damper drive shaft.

F. For duct-mounted and equipment-mounted dampers installed outside of equipment, install a visible and accessible indication of damper position from outside.

3.6 CONNECTIONS

A. Connect electrical devices and components to electrical grounding system. Comply with requirements in Section 260526 "Grounding and Bonding for Electrical Systems."

3.7 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Each piece of wire, cable, and tubing shall have the same designation at each end for operators to determine continuity at points of connection. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

B. Install engraved phenolic nameplate with damper identification on damper and on face of ceiling where damper is concealed above ceiling.

3.8 CHECKOUT PROCEDURES

A. Control-Damper Checkout:

1. Check installed products before continuity tests, leak tests, and calibration.
2. Check dampers for proper location and accessibility.
3. Check instrument tubing for proper isolation, fittings, slope, dirt legs, drains, material, and support.
4. For pneumatic products, verify air supply for each product is properly installed.
5. For pneumatic dampers, verify that pressure gages are provided in each air line to damper actuator and positioner.
6. Verify that control dampers are installed correctly for flow direction.
7. Verify that proper blade alignment, either parallel or opposed, has been provided.
8. Verify that damper frame attachment is properly secured and sealed.
9. Verify that damper actuator and linkage attachment are secure.
10. Verify that actuator wiring is complete, enclosed, and connected to correct power source.
11. Verify that damper blade travel is unobstructed.

3.9 ADJUSTMENT, CALIBRATION, AND TESTING:

A. Stroke and adjust control dampers following manufacturer's recommended procedure, from 100 percent open to 100 percent closed back to 100 percent open.

B. Stroke control dampers with pilot positioners. Adjust damper and positioner following manufacturer's recommended procedure, so damper is 100 percent closed, 50 percent closed, and 100 percent open at proper air pressure.

C. Check and document open and close cycle times for applications with a cycle time of less than 30 seconds.

D. For control dampers equipped with positive position indication, check feedback signal at multiple positions to confirm proper position indication.

END OF SECTION 230923.12

SECTION 230924 MODIFICATIONS TO DIRECT DIGITAL BUILDING CONTROL SYSTEM

PART 1 GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

A. Basic Electrical Materials and Methods for Direct Digital Building Control System: Section 260502.

B. General Commissioning Requirements: Section 019113.

C. Commissioning Process: Section AGCP in Appendix.

1.2 ALLOWANCES

A. An allowance for the following portions of the Work of this Section is included in Section 012100:

1. Services of the Company Field Advisor as described in QUALITY ASSURANCE.
2. All items listed in SUBMITTALS.
3. Engineering and reprogramming associated with the installation of the new equipment and updating existing information.
4. All products listed in PART 2 of this Section except:

a. Piping.
b. Dampers.
c. Electric switching relays.
d. Markers and nameplates.
e. Labor for installation of the materials shall be included in the Contract Sum (not the allowance).

1.3 DESCRIPTION OF EXISTING SYSTEM

A. The existing system is a TRANE system.

1.4 MODIFICATIONS TO EXISTING SYSTEM

A. Add control and monitoring of primary hot water circulation pumps serving water heater in the building.

B. Add monitoring of tempered domestic hot water from water heater in the building.

C. Add control of primary hot water heating pumps in the building.

D. Add differential pressure monitoring of primary hot water heating piping in the building.

E. Add DCP in the building. Modify existing controls.

1.5 SUBMITTALS

A. Waiver of Submittals: The "Waiver of Certain Submittal Requirements" in Section 013300 does not apply to this Section.

B. Preliminary Submittal: Existing system test report.

C. Submittals Package: Submit the shop drawings, product data, and quality control submittals specified below at the same time as a package.

D. Shop Drawings:

1. Composite wiring and/or schematic diagrams of the modifications as proposed to be installed (standard diagrams will not be acceptable).

E. Product Data:

1. Catalog sheets, specifications and installation instructions.
2. Bill of materials.
3. Detailed description of system operation.

F. Quality Control Submittals:

1. Company Field Advisor Data:

a. Name, business address and telephone number of Company Field Advisor secured for the required services.
b. Certified statement from the Company listing the qualifications of the Company Field Advisor.
c. Services and each product for which authorization is given by the Company, listed specifically for this project.

G. Contract Closeout Submittals:

1. System acceptance test report.
2. Certificate: Affidavit, signed by the Company Field Advisor and notarized, certifying that the system meets the contract requirements and is operating properly.
3. Operation and Maintenance Data:

a. Deliver 2 copies, covering the installed products, to the Director's Representative:

1) Operation and maintenance data for each product.
2) Complete point to point wiring diagrams of entire system as installed. Number all conductors and show all terminations and splices. (Numbers shall correspond to markers installed on each conductor.)

1.6 QUALITY ASSURANCE

A. Company Field Advisor: Secure the services of a Company Field Advisor from the Company of the existing system for a minimum of 24 working hours for the following:

1. Render advice and witness test of existing system.
2. Render advice regarding modifications to the system.
3. Assist in reprogramming of the system.
4. Witness final system test and then certify with an affidavit that the modifications were installed in accordance with the contract documents and are operating properly.

PART 2 - PRODUCTS

2.1 CONTROL COMPONENTS

A. Electronic Analog Sensors: (Parts by allowance)

Quantity	Part Number	Description	Manufacturer
2	**544-577-25**	**Temperature Sensor**	**Siemens**
3	**QBE3190UD25**	**Differential Pressure Sensor**	**Siemens**

B. Field Panels and Points:

Quantity	Part Number	Description	Manufacturer
4	**A&F30057268**	**Transformer**	**Functional Devises, Inc.**
4	**RIBUIC**	**Relay**	**Functional Devises, Inc.**

2.2 MARKERS AND NAMEPLATES

A. Markers: Premarked self-adhesive; W.H. Brady Co.'s B940, Thomas and Betts Co.'s E-Z Code WSL self-laminating, Ideal Industries' Mylar/Cloth wire markers, or Markwick Corp.'s permanent wire markers.

B. Nameplates: Precision engrave letters and numbers with uniform margins, character size minimum 3/16 inch high.

1. Phenolic: Two color laminated engraver's stock, 1/16-inch minimum thickness, machine engraved to expose inner core color (white).
2. Aluminum: Standard aluminum alloy plate stock, minimum .032 inches thick, engraved areas enamel filled, or background enameled with natural aluminum engraved characters.
3. Materials for Outdoor Applications: As recommended by nameplate manufacturer to suit environmental conditions.

2.3 WIRING

A. See Electrical Specifications.

2.4 ACCESSORIES

A. Include accessories required for the modifications to perform the functions specified and indicated on the drawings.

PART 3 - EXECUTION

3.1 VERIFICATION OF CONDITIONS

A. Test of Existing System:

1. Prior to modifying the system, test portions of the existing system to ascertain their operating condition. Specifically, test:

a. Active points which will be modified.
b. Primary operators station (POS) and distributed control processor (DCP) functions associated with the modifications.

2. Prepare a written report for the Director's Representative indicating the repairs required, if any, to make the existing system function properly.
3. Repairs to the existing system are not included in the Work unless requested by Order on Contract.

3.2 INTERRUPTIONS TO EXISTING SYSTEM

A. Maintain the existing system in its present condition to the extent possible while installing new Work.

B. Prior to making changes relative to the existing system, notify the Director's Representative and have procedures approved.

3.3 INSTALLATION

A. Install the Work in accordance with the Company's printed instructions unless otherwise indicated.

B. Reprogram the system to include new sensor and control points and update existing system program to include changes and additions requested by facility.

1. Obtain from the facility personnel through the Director's Representative, a list of desired system program changes, additions, etc.

C. Identification, Labeling, Marking:

1. Identification of Circuits: Identify wires, cables, and tubing by system and function in interconnection cabinets, POSs and DCPs to which they connect with premarked, self-adhesive, wraparound type markers. Designations shall correspond with point-to-point wiring diagrams.

3.4 FIELD QUALITY CONTROL

A. Preliminary System Test:

1. Preparation: Have the Company Field Advisor adjust the completed system and then operate it long enough to assure that it is performing properly.
2. Run a preliminary test for the purpose of:

   a. Determining whether the system is in a suitable condition to conduct an acceptance test.
   b. Checking and adjusting equipment.

B. System Acceptance Test:

1. Preparation: Notify the Director's Representative at least 3 working days prior to the test so arrangements can be made to have a Facility Representative witness the test.
2. Make the following tests:

   a. Test system operational functions associated with the modifications.
   b. Test each monitor and control device connected or added under this project.

3. Supply all equipment necessary for system adjustment and testing.
4. Submit written report of test results signed by Company Field Advisor and the Director's Representative. Mount a copy of the written report in a Plexiglas enclosed frame assembly adjacent to the POS.

3.5 POINT DESCRIPTION, PROGRAM LIST AND SEQUENCES

A. AC- 1-4:

1. Point:

Points List - AC - 1 - 4 (Qty. 4)

Point Name	POINTS	ALARMS

	GRAPHIC	ANALOG HARDWARE INPUT (AI)	BINARY HARDWARE INPUT (BI)	ANALOG HARDWARE OUTPUT (AO)	BINARY HARDWARE OUTPUT (BO)	SOFTWARE POINT (SFT)	HARDWARE INTERLOCK (HDW)	WIRELESS (WLS)	NETWORK (NET)	HIGH ANALOG LIMIT	LOW ANALOG LIMIT	BINARY	LATCH DIAGNOSTIC	SENSOR FAIL	COMMUNICATION FAIL
CONDENSATE OVERFLOW DETECTION LOCAL **CND OVRFL**			X										X		
FAN SPEED STATUS **SAF STS**			X												
SPACE TEMPERATURE LOCAL **SPT**	X	X													
SPACE TEMPERATURE SETPOINT LOCAL **SPT SP**	X	X													
SPACE TEMPERATURE (TH1) **SPT**		X													
SUPPLY FAN SPEED **SAF**				X											
VANE DIRECTION **VN DIR**	X			X											
ALARM CODE **ALM**						X									
ALARM MESSAGE **ALM MSG**						X									
BAS COMMUNICATION STATE **BAS COM**						X									X
EXPANSION VALVE STATE **XV RATE**						X									
FILTER TIMER HOURS **FIL HRS**						X									
GAS PIPE TEMPERATURE (TH3) **VAPT**						X									
GAS PIPE TEMPERATURE (TH4) **VAPT**						X									
HEAT / COOL MODE REQUEST						X									
INDOOR LEV RATE **LEV RATE**						X									
LIQUID PIPE TEMPERATURE (TH2) **LIQT**						X									
OCCUPIED COOLING SETPOINT **OCC CLG SP**						X									
OCCUPIED HEATING SETPOINT **OCC HTG SP**						X									
SUBCOOL (SC) **SC**						X									
SUPERHEAT (SH) **SH**						X									

UNOCCUPIED COOLING SETPOINT **UNOCC CLG SP**						X									
UNOCCUPIED HEATING SETPOINT **UNOCC HTG SP**						X									

Points List - CU - 1

Point Name	POINTS									ALARMS					
	GRAPHIC	ANALOG HARDWARE INPUT (AI)	BINARY HARDWARE INPUT (BI)	ANALOG HARDWARE OUTPUT (AO)	BINARY HARDWARE OUTPUT (BO)	SOFTWARE POINT (SFT)	HARDWARE INTERLOCK (HDW)	WIRELESS (WLS)	NETWORK (NET)	HIGH ANALOG LIMIT	LOW ANALOG LIMIT	BINARY	LATCH DIAGNOSTIC	SENSOR FAIL	COMMUNICATION FAIL
COMPRESSOR DISCHARGE TEMPERATURE **CMP DT**		X													
COMPRESSOR OUTPUT(S) **CMP OUT**				X											
DEMAND (EMERGENCY) STOP **CMP ES**			X												
HIGH SIDE SATURATION TEMPERATURE **HSAT TEMP**		X													
INVERTER HEAT SINK TEMPERATURE **IVR TEMP**		X													
LOW SIDE SATURATION TEMPERATURE **LSAT TEMP**		X													
OUTDOOR AIR TEMPERATURE **OAT**		X													
OUTDOOR UNIT FAN OUTPUT(S) **OFN SPD**				X											
POWER 3PH BUT ONLY MEASURING ONE LEG CURRENT (PH-A) **CMP PHA**		X													
POWER 3PH BUT ONLY MEASURING ONE LEG CURRENT (PH-C) **CMP PHC**		X													
REFRIGERANT HIGH SIDE PRESSURE **HPRESS**		X													
REFRIGERANT LOW SIDE PRESSURE **LPRESS**		X													
SUCTION LINE TEMPERATURE **SUC TEMP**		X													

ALARM CODE **ALM**						X									
ALARM MESSAGE **ALM MSG**						X									
COMPRESSOR OPERATION STATUS **CMP STS**						X									
LOW AMBIENT CAPACITY CONTROL **LAMB CAP**						X									
OPERATING SPEED OF THE MAIN ODU **CMP FQ**						X									
OPERATIONAL MODE STATUS **MOD STS**						X									
OUTDOOR UNIT FAN STATE **OFN STS**						X									
POWER LINE FREQUENCY **PWR FQ**						X									
REVERSING VALVE POSITION **REV VLV POS**						X									

2. Sequences:

Sequence of Operation: AC - 1 - 4 (Qty. 4)

Building Automation System Interface:

The Building Automation System (BAS) shall allow the user to monitor the status of Variable Refrigerant Flow (VRF) terminal units, outdoor units, and secondary VRF equipment, and modify control parameters of terminal units and secondary VRF equipment as necessary to maintain the desired space conditions.

If communication between the VRF equipment and the BAS is lost, the VRF system shall continue to operate using the current control parameters stored within the equipment to maintain the desired space conditions.

External Control Device:

In this specification the term 'external control device' is used to denote one or more user interface control devices that may be present in the system. The control devices that may be present are a Local Control device, VRF System Control device, or a Building Automation System. When more than one external control device is present in the control system, the last command or configuration value received by the indoor unit governs indoor unit operation.

There may be other means to provide commands and configuration parameters to the VRF system, such as hardwired control inputs. However, these are not considered the typical system control use case and the specification does not address them as written.

Zone Temperature Setpoint Control:

AC - 1, 2, 3: One zone air temperature setpoint is present. When VAVs served by HVAC - 1 cannot satisfy heating or cooling setpoints for 15 minutes (adj.), AC unit shall enable heating or cooling mode as a second stage of heat/cool and control the zone air temperature value to the Zone Temperature Setpoint value.

AC - 4: One zone air temperature setpoint is present. During cooling mode, AC-4 shall operate to satisfy cooling setpoint as the primary source of cooling; the fan shall operate in one speed at ____CFM (adj.). During heating mode, AC-4 shall operate in fan only mode when HV-2; the fan shall also operate in one speed at ____CFM (adj.).

On/Off Mode:

The terminal unit has two modes that drive the overall operation of the unit, On and Off mode.

On. The internal algorithm shall control the unit to maintain the desired zone air temperature.

Off. The internal algorithm shall NOT control the unit to maintain the desire zone air temperature. The algorithm shall control components internal to the unit to minimize energy consumption and isolate it from VRF system refrigerant circuit. The zone air temperature sensor in use shall be monitored to allow the Zone Air Temperature Value to be displayed at an External Control Device(s).

Operation Mode:

Operation mode is the primary control parameter of the indoor unit when it is in the On state. The operation mode command provided to the indoor unit from an eternal control device shall determine the base HVAC control function the indoor unit is providing. Available modes of operation are Cool, Dry, Fan, Heat, Setback, and Auto.

Cool. When the terminal unit Operation Mode is the Cool state, liquid refrigerant is provided to the terminal unit. The amount of refrigerant entering the evaporator coil is regulated by the Linear Expansion Valve. The position of LEV is determined by an algorithm internal to the terminal unit. The algorithm calculates the temperature difference value between the measured zone air temperature value and the Cooling Temperature Setpoint value. When a large difference value exists, the LEV is driven open to allow more refrigerant into the evaporator coil. As the zone air temperature decreases the difference value becomes less. The algorithm shall respond and drive the LEV to more closed position reducing the amount of refrigerant entering into the evaporator coil. As the difference value approaches zero, the system stabilizes and the amount of LEV modulation is minimal.

Dry. When the terminal unit Operation Mode is the Dry state, liquid refrigerant is provided to the terminal unit. The amount of refrigerant entering the evaporator coil is regulated by the Linear Expansion Valve. The goal in Dry mode is to remove water vapor from the air, not control the zone air temperature value to a zone temperature setpoint. When the terminal unit is commanded to the Dry state, an algorithm internal to the terminal unit drives the LEV to an open position. It is assumed that the position of the valve allows a sufficient amount of refrigerant to enter the coil, to cause the surface temperature of the coil fins to fall below the dew point temperature. The result is condensation that removes water vapor from the air passing through the coil.

When the zone air temperature value is greater than or equal to the Cooling Temperature Setpoint, Dry state is beneficial from both a humidity and zone temperature perspective because water vapor is being removed from the air in the zone and the difference value between the zone air temperature value and the Cooling Temperature Setpoint value is reduced.

Continued dehumidification shall cause the zone air temperature value to become less than the Cooling Temperature Setpoint, which is undesirable. To combat the effect, the algorithm calculates the temperature difference value between the zone air temperature value and Cooling Temperature Setpoint. Based on the difference value, the algorithm uses a sliding time scale method to modulate the LEV between the open position and the fully closed position for a variable length of time. It is assumed that when the LEV is in the fully closed position latent heat within the zone shall cause the zone air temperature value to increase. The method allows some dehumidification to take place without significantly lowering the air temperature in the zone below the Cooling Temperature Setpoint.

Fan. When the terminal unit Operation Mode is the Fan state, the LEV is closed and the terminal unit does not attempt regulate the air temperature in the zone. The temperature of the air in the zone may change due to latent heat within the zone. With the use of an external user interface, the speed of the fan may be modulated between the discrete states supported by the terminal unit.

Heat. When the terminal unit Operation Mode is the Heat state, hot gas refrigerant is provided to the terminal unit. The amount of refrigerant entering the evaporator coil is regulated by the Linear Expansion Valve. The position of LEV is determined by an algorithm internal to the terminal unit. The algorithm calculates the temperature difference value between the measured zone air temperature value and the Heating Temperature Setpoint value. When a large difference value exists, the LEV is driven open to allow more refrigerant into the evaporator coil. As the zone air temperature increases the difference value becomes less. The algorithm shall respond and drive the LEV to more closed position reducing the amount of refrigerant entering into the evaporator coil. As the difference value approaches zero, the system stabilizes and the amount of LEV modulation is minimal.

Setback. Some terminal units may not support the Setback state. When the terminal unit Operation Mode transitions to Setback state, the LEV is driven closed and the zone air temperature is allowed to drift. The amount of drift is bounded by the Setback Cooling Temperature Setpoint and the Setback Heating Temperature Setpoint.

When the Heat Pump system mode is Cool. If the zone air temperature value is greater than the Setback Cooling Temperature Setpoint, the terminal unit shall execute the setback cool algorithm. The algorithm modulates the LEV to maintain the zone temperature to the Setback Cooling Temperature Setpoint.

When the Heat Pump system mode is Heat, cooling the zone is not possible. If the zone air temperature value is greater than the Setback Cooling Temperature Setpoint, the terminal unit shall not execute the setback cool algorithm and the LEV shall remain closed.

When the Heat Pump system mode is Heat. If the zone air temperature value is less than the Setback Heating Temperature Setpoint, the terminal unit shall execute the setback heat algorithm. The algorithm modulates the LEV to maintain the zone temperature to the Setback Heating Temperature Setpoint.

When the Heat Pump system mode is Cool, heating the zone is not possible. If the zone air temperature value is less than the Setback Heating Temperature Setpoint, the terminal unit shall not execute the setback heat algorithm and the LEV shall remain closed.

Fan Control. When the indoor unit is in the Off state, the fan is controlled to the minimum speed required to measure zone air temperature at the return air temperature sensor. This allows zone air temperature to be accurately measured while the indoor unit is in the Off state.

Upon transition from the Off state to the On state, the RPM of the fan is governed to match a manufacture specified, RPM value assigned to the each discrete fan speed state available in the unit. The number of distinct fan speed states and the fan RPM value for each state varies by manufacture and model of indoor unit. The fan speed state is controlled by one of two methods, automatic fan speed control or manual fan speed control. The choice of control method is made by a user of the system.

Upon indoor unit transition from the On state to the Off state, the fan transitions to the state described when the indoor unit is in the Off state.

Manual Fan Speed Control. A user of the system selects a desired fan speed state. The fan speed RPM shall change to match the manufacture specified RPM value and maintain the RMP value until a different fan speed state is selected or a change is made to another control parameter of the indoor unit that causes the fan to change to a different state.

Automatic Fan Speed Control. When a user of the system selects the fan speed state Auto, an algorithm internal to the indoor unit controls the selection of the fan speed state. The algorithm calculates the temperature difference value between the measured zone air temperature value and the zone temperature setpoint value in use. When a large difference value exists, the fan state selected shall have a highest fan speed RPM value. As the difference value is reduced, the algorithm shall change the fan speed in use to a state with a smaller RPM value.

Vane Direction:

The terminal unit has movable air vanes to change the direction of air flow from the unit. Three air vane control modes are available: Auto, Swing, and Manual. The external user interface is used to select the air vane position in use.

Auto. When the Operation Mode is Cool state, the air vanes modulate to direct airflow parallel to the ceiling. When the Operation Mode is Heat state, the air vanes modulate to direct airflow perpendicular to the ceiling.

Swing. Regardless of Operation Mode state, the air vanes continuously modulate between parallel and perpendicular flow to the ceiling in a periodic manner.

Manual. Regardless of Operation Mode state, the air vanes are fixed at a position. The number of individual positions available varies by manufacturer and model type. Typically, two to five fixed positions are supported.

Condensate Overflow Monitoring:

The unit shall be equipped with a condensate drain pan level sensor to protect against drain pan overflow. If the sensor detects a high condensate level in the drain pan, the control shall shut down the indoor unit before an overflow can occur and a condensate alarm diagnostic shall annunciate at the BAS.

B. AC- 5:

1. Point:

Points List - AC-5

Point Name	POINTS									ALARMS					
	GRAPHIC	ANALOG HARDWARE INPUT (AI)	BINARY HARDWARE INPUT (BI)	ANALOG HARDWARE OUTPUT (AO)	BINARY HARDWARE OUTPUT (BO)	SOFTWARE POINT (SFT)	HARDWARE INTERLOCK (HDW)	WIRELESS (WLS)	NETWORK (NET)	HIGH ANALOG LIMIT	LOW ANALOG LIMIT	BINARY	LATCH DIAGNOSTIC	SENSOR FAIL	COMMUNICATION FAIL
CONDENSATE OVERFLOW DETECTION LOCAL **CND OVRFL**			X										X		
FAN SPEED STATUS **SAF STS**			X												
SPACE TEMPERATURE LOCAL **SPT**	X	X													
SPACE TEMPERATURE SETPOINT LOCAL **SPT SP**	X	X													
SPACE TEMPERATURE (TH1) **SPT**		X													
SUPPLY FAN SPEED **SAF**				X											
VANE DIRECTION **VN DIR**	X			X											
ALARM CODE **ALM**						X									
ALARM MESSAGE **ALM MSG**						X									
BAS COMMUNICATION STATE **BAS COM**						X									X
EXPANSION VALVE STATE **XV RATE**						X									
FILTER TIMER HOURS **FIL HRS**						X									
GAS PIPE TEMPERATURE (TH3) **VAPT**						X									
GAS PIPE TEMPERATURE (TH4) **VAPT**						X									
HEAT / COOL MODE REQUEST						X									
INDOOR LEV RATE **LEV RATE**						X									

LIQUID PIPE TEMPERATURE (TH2) **LIQT**						X									
OCCUPIED COOLING SETPOINT **OCC CLG SP**						X									
OCCUPIED HEATING SETPOINT **OCC HTG SP**						X									
SUBCOOL (SC) **SC**						X									
SUPERHEAT (SH) **SH**						X									
UNOCCUPIED COOLING SETPOINT **UNOCC CLG SP**						X									
UNOCCUPIED HEATING SETPOINT **UNOCC HTG SP**						X									

Points List – CU-2

Point Name	POINTS									ALARMS					
	GRAPHIC	ANALOG HARDWARE INPUT (AI)	BINARY HARDWARE INPUT (BI)	ANALOG HARDWARE OUTPUT (AO)	BINARY HARDWARE OUTPUT (BO)	SOFTWARE POINT (SFT)	HARDWARE INTERLOCK (HDW)	WIRELESS (WLS)	NETWORK (NET)	HIGH ANALOG LIMIT	LOW ANALOG LIMIT	BINARY	LATCH DIAGNOSTIC	SENSOR FAIL	COMMUNICATION FAIL
COMPRESSOR DISCHARGE TEMPERATURE **CMP DT**		X													
COMPRESSOR OUTPUT(S) **CMP OUT**				X											
DEMAND (EMERGENCY) STOP **CMP ES**			X												
HIGH SIDE SATURATION TEMPERATURE **HSAT TEMP**		X													
INVERTER HEAT SINK TEMPERATURE **IVR TEMP**		X													
LOW SIDE SATURATION TEMPERATURE **LSAT TEMP**		X													
OUTDOOR AIR TEMPERATURE **OAT**		X													
OUTDOOR UNIT FAN OUTPUT(S) **OFN SPD**				X											

POWER 3PH BUT ONLY MEASURING ONE LEG CURRENT (PH-A) **CMP PHA**		X													
POWER 3PH BUT ONLY MEASURING ONE LEG CURRENT (PH-C) **CMP PHC**		X													
REFRIGERANT HIGH SIDE PRESSURE **HPRESS**		X													
REFRIGERANT LOW SIDE PRESSURE **LPRESS**		X													
SUCTION LINE TEMPERATURE **SUC TEMP**		X													
ALARM CODE **ALM**						X									
ALARM MESSAGE **ALM MSG**						X									
COMPRESSOR OPERATION STATUS **CMP STS**						X									
LOW AMBIENT CAPACITY CONTROL **LAMB CAP**						X									
OPERATING SPEED OF THE MAIN ODU **CMP FQ**						X									
OPERATIONAL MODE STATUS **MOD STS**						X									
OUTDOOR UNIT FAN STATE **OFN STS**						X									
POWER LINE FREQUENCY **PWR FQ**						X									
REVERSING VALVE POSITION **REV VLV POS**						X									

2. Sequences:

Building Automation System Interface: The Building Automation System (BAS) shall allow the user to monitor the status of Variable Refrigerant Flow (VRF) terminal units, outdoor units, and secondary VRF equipment, and modify control parameters of terminal units and secondary VRF equipment as necessary to maintain the desired space conditions.

If communication between the VRF equipment and the BAS is lost, the VRF system shall continue to operate using the current control parameters stored within the equipment to maintain the desired space conditions.

External Control Device:

In this specification the term ‘external control device’ is used to denote one or more user interface control devices that may be present in the system. The control devices that may be present are a Local Control device, VRF System Control device, or a Building Automation System. When more than one external control device is present in the control system, the last command or configuration value received by the indoor unit governs indoor unit operation.

There may be other means to provide commands and configuration parameters to the VRF system, such as hardwired control inputs. However, these are not considered the typical system control use case and the specification does not address them as written.

Zone Temperature Setpoint Control:

Single Setpoint. One zone air temperature setpoint is present. When the terminal unit is in a heating or cooling mode, it shall control the zone air temperature value to the Zone Temperature Setpoint value.

On/Off Mode:

The terminal unit has two modes that drive the overall operation of the unit, On and Off mode.

On. The internal algorithm shall control the unit to maintain the desired zone air temperature.

Off. The internal algorithm shall NOT control the unit to maintain the desire zone air temperature. The algorithm shall control components internal to the unit to minimize energy consumption and isolate it from VRF system refrigerant circuit. The zone air temperature sensor in use shall be monitored to allow the Zone Air Temperature Value to be displayed at an External Control Device(s).

Operation Mode:

Operation mode is the primary control parameter of the indoor unit when it is in the On state. The operation mode command provided to the indoor unit from an eternal control device shall determine the base HVAC control function the indoor unit is providing. Available modes of operation are Cool, Dry, Fan, Heat, Setback, and Auto.

Cool. When the terminal unit Operation Mode is the Cool state, liquid refrigerant is provided to the terminal unit. The amount of refrigerant entering the evaporator coil is regulated by the Linear Expansion Valve. The position of LEV is determined by an algorithm internal to the terminal unit. The algorithm calculates the temperature difference value between the measured zone air temperature value and the Cooling Temperature Setpoint value. When a large difference value exists, the LEV is driven open to allow more refrigerant into the evaporator coil. As the zone air temperature decreases the difference value becomes less. The algorithm shall respond and drive the LEV to more closed position reducing the amount of refrigerant entering into the evaporator coil. As the difference value approaches zero, the system stabilizes and the amount of LEV modulation is minimal

Dry. When the terminal unit Operation Mode is the Dry state, liquid refrigerant is provided to the terminal unit. The amount of refrigerant entering the evaporator coil is regulated by the Linear Expansion Valve. The goal in Dry mode is to remove water vapor from the air, not control the zone air temperature value to a zone temperature setpoint. When the terminal unit is commanded to the Dry state, an algorithm internal to the terminal unit drives the LEV to an open position. It is assumed that the position of the valve allows a sufficient amount of refrigerant to enter the coil, to cause the surface temperature of the coil fins to fall below the dew point temperature. The result is condensation that removes water vapor from the air passing through the coil.

When the zone air temperature value is greater than or equal to the Cooling Temperature Setpoint, Dry state is beneficial from both a humidity and zone temperature perspective because water vapor is being removed from the air in the zone and the difference value between the zone air temperature value and the Cooling Temperature Setpoint value is reduced.

Continued dehumidification shall cause the zone air temperature value to become less than the Cooling Temperature Setpoint, which is undesirable. To combat the effect, the algorithm calculates the temperature difference value between the zone air temperature value and Cooling Temperature Setpoint. Based on the difference value, the algorithm uses a sliding time scale method to modulate the LEV between the open position and the fully closed position for a variable length of time. It is assumed that when the LEV is in the fully closed position latent heat within the zone shall cause the zone air temperature value to increase. The method allows some dehumidification to take place without significantly lowering the air temperature in the zone below the Cooling Temperature Setpoint.

Fan. When the terminal unit Operation Mode is the Fan state, the LEV is closed and the terminal unit does not attempt regulate the air temperature in the zone. The temperature of the air in the zone may change due to latent heat within the zone. With the use of an external user interface, the speed of the fan may be modulated between the discrete states supported by the terminal unit.

Heat. When the terminal unit Operation Mode is the Heat state, hot gas refrigerant is provided to the terminal unit. The amount of refrigerant entering the evaporator coil is regulated by the Linear Expansion Valve. The position of LEV is determined by an algorithm internal to the terminal unit. The algorithm calculates the temperature difference value between the measured zone air temperature value and the Heating Temperature Setpoint value. When a large difference value exists, the LEV is driven open to allow more refrigerant into the evaporator coil. As the zone air temperature increases the difference value becomes less. The algorithm shall respond and drive the LEV to more closed position reducing the amount of refrigerant entering into the evaporator coil. As the difference value approaches zero, the system stabilizes and the amount of LEV modulation is minimal.

Setback. Some terminal units may not support the Setback state. When the terminal unit Operation Mode transitions to Setback state, the LEV is driven closed and the zone air temperature is allowed to drift. The amount of drift is bounded by the Setback Cooling Temperature Setpoint and the Setback Heating Temperature Setpoint.

When the Heat Pump system mode is Cool. If the zone air temperature value is greater than the Setback Cooling Temperature Setpoint, the terminal unit shall execute the setback cool algorithm. The algorithm modulates the LEV to maintain the zone temperature to the Setback Cooling Temperature Setpoint.

When the Heat Pump system mode is Heat, cooling the zone is not possible. If the zone air temperature value is greater than the Setback Cooling Temperature Setpoint, the terminal unit shall not execute the setback cool algorithm and the LEV shall remain closed.

When the Heat Pump system mode is Heat. If the zone air temperature value is less than the Setback Heating Temperature Setpoint, the terminal unit shall execute the setback heat algorithm. The algorithm modulates the LEV to maintain the zone temperature to the Setback Heating Temperature Setpoint.

When the Heat Pump system mode is Cool, heating the zone is not possible. If the zone air temperature value is less than the Setback Heating Temperature Setpoint, the terminal unit shall not execute the setback heat algorithm and the LEV shall remain closed.

Fan Control. When the indoor unit is in the Off state, the fan is controlled to the minimum speed required to measure zone air temperature at the return air temperature sensor. This allows zone air temperature to be accurately measured while the indoor unit is in the Off state.

Upon transition from the Off state to the On state, the RPM of the fan is governed to match a manufacture specified, RPM value assigned to the each discrete fan speed state available in the unit. The number of distinct fan speed states and the fan RPM value for each state varies by manufacture and model of indoor unit. The fan speed state is controlled by one of two methods, automatic fan speed control or manual fan speed control. The choice of control method is made by a user of the system.

Upon indoor unit transition from the On state to the Off state, the fan transitions to the state described when the indoor unit is in the Off state.

Manual Fan Speed Control. A user of the system selects a desired fan speed state. The fan speed RPM shall change to match the manufacture specified RPM value and maintain the RMP value until a different fan speed state is selected or a change is made to another control parameter of the indoor unit that causes the fan to change to a different state.

Automatic Fan Speed Control. When a user of the system selects the fan speed state Auto, an algorithm internal to the indoor unit controls the selection of the fan speed state. The algorithm calculates the temperature difference value between the measured zone air temperature value and the zone temperature setpoint value in use. When a large difference value exists, the fan state selected shall have a highest fan speed RPM value. As the difference value is reduced, the algorithm shall change the fan speed in use to a state with a smaller RPM value

Vane Direction:

The terminal unit has movable air vanes to change the direction of air flow from the unit. Three air vane control modes are available: Auto, Swing, and Manual. The external user interface is used to select the air vane position in use.

Auto. When the Operation Mode is Cool state, the air vanes modulate to direct airflow parallel to the ceiling. When the Operation Mode is Heat state, the air vanes modulate to direct airflow perpendicular to the ceiling.

Swing. Regardless of Operation Mode state, the air vanes continuously modulate between parallel and perpendicular flow to the ceiling in a periodic manner.

Manual. Regardless of Operation Mode state, the air vanes are fixed at a position. The number of individual positions available varies by manufacturer and model type. Typically, two to five fixed positions are supported.

Condensate Overflow Monitoring:

The unit shall be equipped with a condensate drain pan level sensor to protect against drain pan overflow. If the sensor detects a high condensate level in the drain pan, the control shall shut down the indoor unit before an overflow can occur and a condensate alarm diagnostic shall annunciate at the BAS.

C. HVAC-1:

1. Point:

Points List - HVAC - 1

Point Name	POINTS									ALARMS					
	GRAPHIC	ANALOG HARDWARE INPUT (AI)	BINARY HARDWARE INPUT (BI)	ANALOG HARDWARE OUTPUT (AO)	BINARY HARDWARE OUTPUT (BO)	SOFTWARE POINT (SFT)	HARDWARE INTERLOCK (HDW)	WIRELESS (WLS)	NETWORK (NET)	HIGH ANALOG LIMIT	LOW ANALOG LIMIT	BINARY	LATCH DIAGNOSTIC	SENSOR FAIL	COMMUNICATION FAIL
AIR CLEANING ACCESS DOOR INTERLOCK **CACS INTLK**							X								
AIR CLEANING ACCESS DOOR INTERLOCK **UV INTLK**							X								
CHANGEOVER COIL LEAVING AIR TEMPERATURE LOCAL **H/C LAT**	X	X								X	X			X	
COIL LEAVING AIR LOW TEMP CUTOUT ALARM **LLT**			X										X		
COMPRESSOR 1 COMMAND **CMP1**	X				X										
COMPRESSOR 2 COMMAND **CMP2**	X				X										

COMPRESSOR 3 COMMAND **CMP3**	X				X										
COMPRESSOR 4 COMMAND **CMP4**	X				X										
CONDENSATE OVERFLOW DETECTION LOCAL **CND OVRFL**	X		X									X	X		
COOLING COIL LEAVING TEMPERATURE **CC LAT**	X	X								X	X			X	
DISCHARGE AIR TEMPERATURE **DAT**	X	X								X	X			X	
ENERGY WHEEL SPEED COMMAND **EW SPD**	X			X											
EXHAUST AIR FLOW MEASURING STATION **EAFMS**		X													
FINAL FILTER STATUS **FIL**	X		X									X			
HIGH STATIC ALARM **HSP ALM**	X		X									X	X		
HIGH STATIC ALARM INTERLOCK **HSP INTLK**							X								
MIXED AIR DAMPER COMMAND **MAD**	X			X											
MIXED AIR LOW TEMPERATURE CUTOUT ALARM **MA LLT**			X										X		
MIXED AIR TEMPERATURE LOCAL **MAT**	X	X									X			X	
OUTSIDE AIR FLOW MEASURING STATION **OAFMS**		X													
PREHEAT LEAVING COIL TEMPERATURE LOCAL **PH LAT**	X	X												X	
PREHEAT OUTPUT COMMAND **PH**	X			X											
RETURN AIR CO2 LOCAL **RA CO2**	X	X								X					
RETURN AIR TEMPERATURE LOCAL **RAT**	X	X													
SUPPLY FAN AIR FLOW LOCAL **SF FLW**	X	X													
SUPPLY FAN SPEED COMMAND **SAF**	X			X											
SUPPLY FAN START STOP COMMAND **SAF**	X				X										
SUPPLY FAN STATUS **SAF**	X		X												
BAS COMMUNICATION STATE **BAS COM**						X									X
DISCHARGE AIR COOLING SETPOINT **DA CL SP**						X									
DISCHARGE AIR HEATING SETPOINT **DA HT SP**						X									
MAINTENANCE REQUIRED **MNT REQ**						X						X			
MIXED AIR TEMPERATURE LOW LIMIT SETPOINT **MA LLT STPT**						X									
OCCUPIED COOLING SETPOINT **OCC CLG STPT**	X					X									
OCCUPIED HEATING SETPOINT **OCC HTG STPT**	X					X									

SUPPLY FAN FAILURE **SF FAIL**	X					X						X			
UNOCCUPIED COOLING SETPOINT **UNOCC CLG STPT**	X					X									
UNOCCUPIED HEATING SETPOINT **UNOCC HTG STPT**	X					X									
LEAVING PREHEAT WATER TEMPERATURE **PHW T**	X	X													
LEAVING REHEAT WATER TEMPERATURE **RHW T**	X	X													

Sequences:

Sequence of Operation: HVAC - 1
Building Automation System Interface:

The Building Automation System (BAS) shall send the controller Occupied Bypass, Pre-Cool, Occupied/Unoccupied and Heat/Cool modes. The BAS shall also send the discharge air temperature setpoint and the duct static pressure setpoint. If a BAS is not present, or communication is lost with the BAS the controller shall operate using default modes and setpoints.

Occupied:

During occupied periods, the supply fan shall run continuously and the mixed air dampers shall open to maintain minimum ventilation requirements. In the cooling mode the DX coil shall stage the compressors In the heating mode the hot water valve shall modulate the supply fan shall be disabled, the DX cooling should be disabled, the heating valve should close, the outdoor air should close, and an alarm should annunciate at the BAS.

Unoccupied:

During the unoccupied periods, the supply fan shall be disabled, the outside air damper shall close, the mechanical cooling shall be disabled, the mechanical heating shall be disabled, to conserve energy.

Morning Warm-Up Mode:

During optimal start, if the average space temperature is below the occupied heating setpoint a morning warm-up mode shall be activated. The outside air damper shall remain closed.

Daytime Warm-Up Control:

During Occupied periods, when the space temperature is below the Daytime Warm-up Initiate setpoint, a daytime warm-up sequence shall be activated. The outside air damper shall modulate to maintain minimum ventilation requirements, and the heating shall enable to maintain the discharge air temperature heating setpoint. Daytime Warm-up shall terminate when the average space temperature reaches the Occupied heating setpoint.

Supply Fan:

The supply fan shall be off in the unoccupied mode. The supply fan shall be on if the control is heating or cooling in the unoccupied mode. When the controller is in the occupied mode, the supply fan shall operate continuously. The supply fan speed shall be modulated to maintain the duct static pressure setpoint. The duct static pressure setpoint shall be sent by the BAS and is reset between the minimum and maximum static pressure limits to maintain the critical zone VAV air damper in a position between 65% and 75% open. If the supply fan fails to prove status for 30 seconds (adj.), the fan shall be commanded off, the outside air damper shall close, cooling shall be disabled, all heating shall be disabled, and an alarm shall annunciate at the BAS. A manual reset shall be required to restart the fan.
A hardwired, high static pressure cut-off switch shall be electrically interlocked with the variable speed drive. If the high static pressure cut-off switch is tripped the fan shall be commanded off, heating shall be disabled, cooling should be disabled, and an alarm shall annunciate at the BAS. A manual reset of the high static pressure cut-off switch shall be required to restart the fan.

Exhaust Damper:

Normal Operation: New field installed exhaust damper shall modulate directly proportional to HVAC-1 outside air damper. Economizing: During economizing mode, exhaust damper shall be fully open.

Preheat Control:

When the fan is off, if the outdoor air temperature is below 40.0 deg. F (adj.) or the outdoor air temperature sensor is failed, the preheat valve shall modulate to maintain a preheat leaving coil temperature of 45.0 deg. F (adj.).

If the preheat temperature sensor fails and the mixed air temperature is below 45.0 deg. F (adj.) the preheat valve shall be 100% open (adj.). If the preheat temperature sensor fails and the mixed air temperature is above 50.0 deg. F (adj.) the preheat valve shall be commanded closed. An alarm shall annunciate at the BAS if the leaving preheat temperature sensor, the mixed air temperature sensor or the outside air temperature sensor are failed.

Mixed Air Low Limit:

The initial damper opening rate shall be limited to 2% per minute (adj.) until the damper has reached its minimum ventilation position. The outside air damper shall modulate to a position less than the minimum damper position if the mixed air temperature drops below 50.0 deg. F (adj.). If the mixed air temperature sensor fails an alarm shall annunciate at the BAS and the outside air damper shall return to the minimum position.

Economizing:

The outside air (OA) temperature shall be compared with space temperature. The economizer shall enable when OA temperature is less than space temperature - 2.0 deg. F. The economizer shall disable when OA temperature is greater than space temperature.

When economizing is enabled and the unit is operating in the cooling mode, the economizer damper shall be modulated between its minimum position and 100% open to maintain the space temperature setpoint. The economizer damper shall modulate toward minimum position in the event the mixed air temperature falls below the low temperature limit setting.

Freeze Protection:

A hardwired, low limit temperature switch shall be electrically interlocked with the variable speed drive. If the low limit temperature switch is tripped 38.0 deg. F (adj.), the fan shall be commanded off and the outside air damper shall close. All valves shall be commanded open to 100% open (adjust per climate). The DX cooling shall be disabled. An alarm shall annunciate at the BAS and manual reset of the low limit temperature switch shall be required to restart the fan.

Demand Control Ventilation:

Using a return CO2 input (local sensor or network communicated value), the controller shall monitor and compare the measured return CO2 to the return CO2 concentration setpoint (adj.). When the measured return CO2 concentration reaches the setpoint (adj.), the outside air damper shall modulate open incrementally until the return air CO2 level is satisfied or the outside air damper reaches the full open position. If the measured CO2 concentration falls, the outside air damper shall modulate toward minimum outdoor air position setpoint. If the mixed air temperature drops below the mixed air low limit setpoint the CO2 sensor input is overridden and the outside air damper shall be modulated closed to maintain the mixed air temperature low limit setpoint. When the mixed air temperature rises above the mixed air low limit setpoint, CO2 operation is restored.

Condensate Overflow Monitoring:

If the condensate level reaches the trip point, a condensate overflow diagnostic shall annunciate at the BAS. To prevent the condensate drain pan from overflowing and causing water damage to the building the fan shall be disabled and the DX cooling shall be disabled.

Filter Status:

A differential pressure switch shall monitor the differential pressure across the filter(s) when the fan is running. If the switch closes during normal operation a dirty filter alarm shall annunciate at the BAS.

Smoke Detector Shut Down

The unit shall shut down in response to a signal from the smoke detector indicating the presence of smoke and an alarm shall annunciate at the BAS. The smoke detector shall be interlocked to the unit through the dry contacts of the smoke detector. A manual reset of the smoke detector shall be required to restart the unit.

D. HV-2 :

Points List - HV-2

Point Name	POINTS									ALARMS					
	GRAPHIC	ANALOG HARDWARE INPUT (AI)	BINARY HARDWARE INPUT (BI)	ANALOG HARDWARE OUTPUT (AO)	BINARY HARDWARE OUTPUT (BO)	SOFTWARE POINT (SFT)	HARDWARE INTERLOCK (HDW)	WIRELESS (WLS)	NETWORK (NET)	HIGH ANALOG LIMIT	LOW ANALOG LIMIT	BINARY	LATCH DIAGNOSTIC	SENSOR FAIL	COMMUNICATION FAIL
COIL LEAVING AIR LOW TEMP CUTOUT ALARM **LLT**			X										X		
DISCHARGE AIR TEMPERATURE **DAT**	X	X								X	X			X	
DISCHARGE AIR STATIC PRESSURE LOCAL **DA SP**	X	X								X			X	X	
ENERGY WHEEL SPEED COMMAND **EW SPD**	X			X											
FILTER STATUS **FIL**	X		X									X			
HEATING OUTPUT COMMAND **HTG**	X			X											
HIGH STATIC ALARM **HSP ALM**	X		X									X	X		
HIGH STATIC ALARM INTERLOCK **HSP INTLK**							X								
MIXED AIR DAMPER COMMAND **MAD**	X			X											
MIXED AIR LOW TEMPERATURE CUTOUT ALARM **MA LLT**			X										X		
MIXED AIR TEMPERATURE LOCAL **MAT**	X	X									X			X	
OUTDOOR AIR DAMPER COMMAND **OAD**	X			X											
OUTDOOR AIR FLOW **OA FLW**	X	X													
OUTDOOR AIR RELATIVE HUMIDITY LOCAL **OAH**	X	X													
OUTDOOR AIR TEMPERATURE LOCAL **OAT**	X	X													

REHEAT LEAVING COIL TEMPERATURE LOCAL **RH LAT**	X	X								X	X			X	
REHEAT OUTPUT COMMAND **RH**	X			X											
RELIEF AIR FAN STATUS **RLF**	X		X												
RETURN AIR DAMPER COMMAND **RAD**	X			X											
RETURN AIR TEMPERATURE LOCAL **RAT**	X	X													
RETURN SMOKE DETECTOR INPUT **RA SD**							X								
SPACE HUMIDITY LOCAL **SPH**	X							X						X	
SPACE STATIC PRESSURE LOCAL **SPP**	X	X								X	X				
SUPPLY FAN AIR FLOW LOCAL **SF FLW**	X	X													
SUPPLY FAN SPEED COMMAND **SAF**	X			X											
SUPPLY FAN START STOP COMMAND **SAF**	X				X										
SUPPLY FAN STATUS **SAF**	X		X												
SUPPLY SMOKE DETECTOR INPUT **SA SD**							X								
BAS COMMUNICATION STATE **BAS COM**						X									X
DISCHARGE AIR COOLING SETPOINT **DA CL SP**						X									
DISCHARGE AIR HEATING SETPOINT **DA HT SP**						X									
MAINTENANCE REQUIRED **MNT REQ**						X						X			
MIXED AIR TEMPERATURE LOW LIMIT SETPOINT **MA LLT STPT**						X									
OCCUPIED HEATING SETPOINT **OCC HTG STPT**	X					X									
RELIEF AIR FAN FAILURE **RLF FAIL**	X					X						X			
SUPPLY FAN FAILURE **SF FAIL**	X					X						X			
UNOCCUPIED HEATING SETPOINT **UNOCC HTG STPT**	X					X									
LEAVING PREHEAT WATER TEMPERATURE **PHW T**	X	X													
LEAVING REHEAT WATER TEMPERATURE **RHW T**	X	X													

Sequence of Operation: HV - 1
Building Automation System Interface:

The Building Automation System (BAS) shall send the controller Occupied Bypass, Morning Warm-up, Occupied/Unoccupied and Heat/Cool modes. The BAS shall also send the discharge air temperature setpoint and the duct static pressure setpoint. If a BAS is not present, or communication is lost with the BAS the controller shall operate using default modes and setpoints.

Occupied:

During occupied periods, the supply fan shall run continuously and the mixed air dampers shall open to maintain minimum ventilation requirements. In the heating mode the hot water valve shall modulate to control the discharge air setpoint. If the discharge air temperature sensor fails, shall fallback to control to the active space temperature setpoint and an alarm shall be annunciated at the BAS. shall fallback to control to the discharge air temperature setpoint of 70 deg F (adj.) and an alarm shall be annunciated at the BAS. If the discharge air temperature sensor fails, and the space temperature sensor fails, the supply fan shall be disabled, the heating valve should close, the outdoor air should close, and an alarm should annunciate at the BAS.

Unoccupied:

During the unoccupied periods, the supply fan shall be disabled, the relief fan shall be disabled, the outside air damper shall close, the mechanical heating shall be disabled, to conserve energy. the outdoor damper shall modulate if economizing is enabled and remain closed if not economizing,

Optimal Start:

The BAS shall monitor the scheduled occupied time, occupied space setpoints and space temperature to calculate when the optimal start occurs.

Occupied Bypass:

The BAS shall monitor the status of the ON and CANCEL buttons of the space temperature sensor. When an occupied bypass request is received from a space sensor, the unit shall transition from its current occupancy mode to occupied bypass mode and the unit shall maintain the space temperature to the occupied setpoints (adj.).

Heat Mode:

When the space temperature falls below the occupied heating setpoint of 76-deg. F. (adj.) the mode shall transition to heating. When the space temperature is above the occupied heating setpoint the mode shall remain in its last state. If the space temperature sensor fails, the mode shall default to heating and an alarm shall annunciate at the BAS.

Morning Warm-Up Mode:

During optimal start, if the average space temperature is below the occupied heating setpoint a morning warm-up mode shall be activated. When morning warm-up is initiated the unit shall enable the heating and fan(s). The outside air damper shall remain closed. When the space temperature reaches the occupied heating setpoint (adj.), the unit shall transition to the occupied mode.

Daytime Warm-Up Control:

During Occupied periods, when the space temperature is below the Daytime Warm-up Initiate setpoint, a daytime warm-up sequence shall be activated. The outside air damper shall modulate to maintain minimum ventilation requirements, and the heating shall enable to maintain the discharge air temperature heating setpoint. Daytime Warm-up shall terminate when the average space temperature reaches the Occupied heating setpoint.

Supply Fan:

The supply fan shall be off in the unoccupied mode. The supply fan shall be on if the control is heating or cooling in the unoccupied mode. When the controller is in the occupied mode, the supply fan shall operate continuously. The supply fan speed shall be modulated to maintain the duct static pressure setpoint. The duct static pressure setpoint shall be sent by the BAS and is reset between the minimum and maximum static pressure limits to maintain the critical zone VAV air damper in a position between 65% and 75% open. If the supply fan fails to prove status for 30 seconds (adj.), the fan shall remain commanded on, the outside air damper shall close, all heating shall be disabled, and an alarm shall annunciate at the BAS. Once the fan status is proven on, the alarm on the supply fan shall clear. A hardwired, high static pressure cut-off switch shall be electrically interlocked with the variable speed drive. If the high static pressure cut-off switch is tripped the fan shall be commanded off, heating shall be disabled, the outside air damper shall close,
and an alarm shall annunciate at the BAS. A manual reset of the high static pressure cut-off switch shall be required to restart the fan.

Kitchen Exhaust Fan

Refer to KEF sequence.

Low Limit Temperature Control:

The initial damper opening rate shall be limited to 2% per minute (adj.) until the damper has reached its minimum ventilation position. The outside air damper shall modulate to a position less than the minimum damper position if the mixed air temperature drops below 45.0 deg. F (adj.). If the mixed air temperature sensor fails an alarm shall annunciate at the BAS and the outside air damper shall close.

Discharge Air Temperature Control:

The discharge air temperature setpoint shall be reset to the optimal setpoint communicated by the BAS. The Space Temperature BAS and the Space Temperature Setpoint BAS shall be communicated to the unit controller by the BAS. The discharge air temperature setpoint shall be reset based upon the deviation of the Space Temperature BAS from the Space Temperature Setpoint BAS.

The BAS shall override the reset function to the minimum discharge air temperature setpoint when:

- Outdoor dew point is higher than 60.0 deg. F (adj.)

If the discharge air temperature rises above the maximum limit, a high temperature alarm shall annunciate to the BAS. If the discharge air temperature drops below the minimum limit, a low temperature alarm shall annunciate to the BAS.

Freeze Protection:

A hardwired, low limit temperature switch shall be electrically interlocked with the variable speed drive. If the low limit temperature switch is tripped 38.0 deg. F (adj.), the fan shall be commanded off and the outside air damper shall close. All valves shall be commanded open to 100% open (adjust per climate). An alarm shall annunciate at the BAS and manual reset of the low limit temperature switch shall be required to restart the fan.

Filter Status:

A differential pressure switch shall monitor the differential pressure across the filter(s) when the fan is running. If the switch closes during normal operation a dirty filter alarm shall annunciate at the BAS.

Smoke Detector Shutdown:

The unit shall shut down in response to a signal from the smoke detector indicating the presence of smoke. The smoke detector shall be interlocked to the unit through the dry contacts of the smoke detector. A manual reset of the smoke detector shall be required to restart the unit.

E. RTU-1 :

Points List - RTU - 1

Point Name	POINTS									ALARMS					
	GRAPHIC	ANALOG HARDWARE INPUT (AI)	BINARY HARDWARE INPUT (BI)	ANALOG HARDWARE OUTPUT (AO)	BINARY HARDWARE OUTPUT (BO)	SOFTWARE POINT (SFT)	HARDWARE INTERLOCK (HDW)	WIRELESS (WLS)	NETWORK (NET)	HIGH ANALOG LIMIT	LOW ANALOG LIMIT	BINARY	LATCH DIAGNOSTIC	SENSOR FAIL	COMMUNICATION FAIL
BUILDING STATIC PRESSURE LOCAL **SP P**	X	X								X	X			X	
COMPRESSOR 1 MODULATION COMMAND **CMP1**	X			X											
COMPRESSOR 2 COMMAND **CMP2**	X				X										
CONDENSATE OVERFLOW DETECTION LOCAL **CND OVRFL**	X		X									X			
COOLING OUTPUT COMMAND **CLG**	X			X											
DISCHARGE AIR STATIC PRESSURE LOCAL **DA SP**		X								X	X		X		
DISCHARGE AIR TEMPERATURE **DAT**	X	X												X	
DX COIL FROST STAT **FROSTAT**	X		X									X			
ENERGY WHEEL COMMAND **EW**	X				X										
ENERGY WHEEL LEAVING OUTDOOR AIR HUMIDITY **EW OA LAH**	X	X												X	
ENERGY WHEEL LEAVING OUTDOOR AIR TEMPERATURE **EW OA LAT**	X	X												X	
ENERGY WHEEL LEAVING RELIEF AIR TEMPERATURE **EW RLF LAT**	X	X												X	
ENERGY WHEEL RELIEF AIR BYPASS DAMPER COMMAND **EW RLF BYPD**	X			X											
ENERGY WHEEL OUTDOOR AIR BYPASS DAMPER COMMAND **EW OA BYPD**	X			X											

ENERGY WHEEL OUTDOOR AIR FILTER STATUS LOCAL **EW OA FIL**	X		X									X			
GAS HEAT OUTPUT COMMAND **GH**	X			X											
HEATING OUTPUT COMMAND **HTG**	X			X											
HOT GAS REHEAT VALVE COMMAND **HGRH**	X			X											
OUTSIDE AIR DAMPER COMMAND **OAD**	X			X											
OUTSIDE AIR HUMIDITY LOCAL **OAH**	X	X												X	
OUTSIDE AIR TEMPERATURE LOCAL **OAT**	X	X												X	
PRIMARY FILTER STATUS LOCAL **FIL**	X		X									X			
REFRIGERANT LFL CONCENTRATION ALARM THRESHOLD SENSOR A **R ALM A**		X													
REFRIGERANT LFL CONCENTRATION ALARM THRESHOLD SENSOR B **R ALM B**		X													
REFRIGERANT LFL CONCENTRATION ALARM THRESHOLD SENSOR C **R ALM C**		X													
REFRIGERANT LFL CONCENTRATION ALARM THRESHOLD SENSOR D **R ALM D**		X													
REFRIGERANT CONCENTRATION BAS **R PPM**				X											
REFRIGERANT HIGH SIDE PRESSURE (63HS1) **R HI**		X													
REFRIGERANT LOW SIDE PRESSURE (63LS) **R LO**		X													
DUCT REFRIGERANT MONITOR **R PPM**		X													
REFRIGERANT LEAK DETECTION SYSTEM INPUT **R IN**			X												
REFRIGERANT LEAK SENSOR COMMUNICATION STATUS SENSOR A **R STS A**						X									
REFRIGERANT LFL CONCENTRATION SENSOR A **R PPM A**		X													
REFRIGERANT LFL CONCENTRATION SENSOR B **R PPM B**		X													
REFRIGERANT LFL CONCENTRATION SENSOR C **R PPM C**		X													
REFRIGERANT LFL CONCENTRATION SENSOR D **R PPM D**		X													
REFRIGERANT MITIGATION ACTIVE **R MGT**			X												
REFRIGERANT TYPE **R TYPE**						X									
RELIEF AIR FAN SPEED **RLF**	X			X											

RELIEF AIR FAN START/STOP **RLF**	X				X										
RELIEF AIR FAN STATUS LOCAL **RLF**	X		X												
RETURN AIR DAMPER COMMAND **RAD**	X			X											
RETURN AIR HUMIDITY LOCAL **RAH**	X	X												X	
RETURN AIR SMOKE DETECTION LOCAL **RA SD**							X								
RETURN AIR TEMPERATURE LOCAL **RAT**	X	X												X	
RETURN AIR WHEEL BYPASS DAMPER COMMAND **RA EW BYPD**	X			X											
REVERSING VALVE **REV VLV**	X				X										
SUPPLY FAN SPEED **SAF**				X											
SUPPLY FAN START/STOP **SAF**	X				X										
SUPPLY FAN STATUS LOCAL **SAF**	X		X												
APPLICATION MODE **APP MODE**						X									
BAS COMMUNICATION STATE **BAS COM**						X									X
COMPRESSOR ENABLE **CMP ENA**	X					X									
COMPRESSOR LOCKOUT STATUS **CMP LCK**						X									
COOL OUTPUT **CLG**						X									
DISCHARGE AIR STATIC PRESSURE SETPOINT **DA SP SPT**	X					X									
FAN MODE COMMAND **FAN MODE**						X									
FILTER TIMER HOURS **FIL HRS**						X									
HEAT / COOL MODE REQUEST **H/C REQ**	X					X									
HEAT OUTPUT **HTG**						X									
OCCUPANCY **OCC**	X					X									
OCCUPIED COOLING SETPOINT **OCC CLG SP**	X					X									
SUPPLY AIR HEATING/COOLING SETPOINT **SA H/C SP**						X									
TIMED OVERRIDE STATUS **TOV**						X									
UNOCCUPIED COOLING SETPOINT **UNOCC CLG SP**	X					X									
UNOCCUPIED HEATING SETPOINT **UNOCC HTG SP**	X					X									

Sequence of Operation: RTU - 1

Building Automation System Interface:

The Building Automation System (BAS) shall send the controller Occupied Bypass, Morning Warm-up/Pre-Cool, Occupied/Unoccupied and Heat/Cool modes. The BAS shall also send the discharge air temperature setpoint and the duct static pressure setpoint. If a BAS is not present, or communication is lost with the BAS the controller shall operate using default modes and setpoints.

Occupied:

During occupied periods, the supply fan shall run continuously. The unit controller shall control the supply fan speed to maintain the current supply duct static pressure setpoint (adj.). Upon a call for DX heating or cooling, the unit controller shall enable the variable speed compressor. If the variable speed compressor cannot satisfy the load conditions, the unit controller shall start a fixed speed compressor. The variable speed compressor shall modulate to maintain the active discharge air temperature setpoint. This process shall repeat until all of the fixed speed compressors have been started or until the load conditions can be satisfied.

Optimal Start:

The BAS shall monitor the scheduled occupied time, occupied space setpoints and space temperature to calculate when the optimal start occurs.

Morning Warm-Up Mode:

During optimal start, if the average space temperature is below the occupied heating setpoint a morning warm-up mode shall be activated. When morning warm-up is initiated the unit shall enable the heating and fan(s). When the space temperature reaches the occupied heating setpoint (adj.), the unit shall transition to the occupied mode.

Occupied Bypass:

The BAS shall monitor the status of the ON and CANCEL buttons of the space temperature sensors. When an occupied bypass request is received from a space sensor, the unit shall transition from its current occupancy mode to occupied bypass mode and the unit shall maintain the space temperature to the occupied setpoints (adj.).

Heat/Cool Mode:

COOLING: The unit controller shall use the discharge air temperature sensor and discharge air temperature cooling setpoint to determine when to initiate requests for cooling. Discharge air setpoint shall be maintained by controlling the cooling as required.

HEATING: The unit controller shall use the discharge air temperature sensor and discharge air temperature heating setpoint to determine when to initiate requests for heating. Discharge air setpoint shall be maintained by controlling the heating to 72-deg. F. (adj.) as required. During Unoccupied Heating or Morning Warm-Up Mode, the unit heat request shall be communicated to the system VAVs prior to commencing heating operation to allow VAV units to open. The variable frequency drive shall be commanded to 100% and the heat shall be staged on and off to satisfy the zone temperature setpoint.

Dehumidification:

MULTI-CIRCUIT UNITS: On a call for dehumidification, the hot gas reheat valve in circuit 1 shall energize and the compressor(s) shall enable. When the humidity control setpoint is satisfies, the valve shall be de-energized and the compressor(s) in circuit 1 shall be disabled. If there is a call for 1st stage cooling while in the dehumidification mode, no action shall take place. If there is a call for 2nd stage cooling, the hot gas reheat valve shall be de-energized, and the unit shall revert to the cooling mode. If 2nd stage cooling is satisfied and there is still a call for dehumidification, the hot gas reheat valve shall once again be energized.

Energy Recovery Wheel Operation:

When the outside air enthalpy is higher than the return air enthalpy, the wheel shall be turned on and both outside air and relief air bypass dampers shall be closed. When the outside air enthalpy is less than the return air enthalpy and the RTU is cooling (or airside economizing), the wheel shall be turned off and both outside air and relief air bypass dampers shall be open. When the RTU is heating, the wheel shall be turned on as the first stage of heat, the outside air bypass damper shall be closed, and the relief air bypass damper shall modulate (as necessary) to maintain discharge air temperature at setpoint (adj.). If the outside air temperature drops below the frost threshold setpoint (adj.), the outside air bypass damper shall modulate to maintain the relief-side leaving temperature at setpoint.

Supply Fan:

The supply fan shall be enabled while in the occupied mode and cycled on during the unoccupied mode.

Supply Duct Static Pressure Control:

During the occupied mode the unit controller shall modulate the output to the variable frequency drive as required to maintain the supply duct static pressure setpoint of 1.5 inches of W.C. (adj.). If the supply duct static pressure falls below 1.3 inches of W.C. (adj.) the unit controller shall increase the output to the variable frequency drive to maintain setpoint. If the supply duct static pressure rises above 1.7 inches of W.C. (adj.) the unit controller shall decrease the output to the variable frequency drive to maintain setpoint. Upon a call for heating or cooling in the unoccupied mode the unit controller shall modulate the speed of the variable frequency drive to 100%.

Static Pressure High Limit:

If for any reason the supply air pressure exceeds the supply air pressure high limit, the supply fan shall shut down. The unit shall be allowed to restart three times after a 15 minute off period. If the overpressurization condition occurs on the fourth restart, the unit shall shut down and a manual reset diagnostic is displayed at the remote panel and/or the BAS system. If for any reason the supply air pressure exceeds the fixed supply air pressure limit of 3.5 inches of W.C. the supply fan shall shut down. The unit shall be allowed to restart three times. If the over pressurization condition occurs on the fourth restart, the unit shall shut down and a manual reset diagnostic is displayed at the remote panel and/or the BAS system.

Relief Air and Building Pressure Control:

A differential pressure transducer shall actively monitor the difference in pressure between the building (indoors) and outdoors. If the building pressure increases above the differential pressure setpoint, the unit controller shall open the relief air damper, turn on the relief air fan and modulate the relief air fan variable frequency drive to control building pressure to the differential pressure setpoint. If the building pressure decreases below the differential pressure setpoint, the associated controller shall deactivate the relief air fan variable frequency drive.

Filter Status:

A differential pressure switch shall monitor the differential pressure across the filter(s) when the fan is running. If the switch closes during normal operation a dirty filter alarm shall annunciate at the BAS.

Economizing:

The outside air (OA) temperature shall be compared with space temperature. The economizer shall enable when OA temperature is less than space temperature - 2.0 deg. F. The economizer shall disable when OA temperature is greater than space temperature.

When economizing is enabled and the unit is operating in the cooling mode, the economizer damper shall be modulated between its minimum position and 100% open to maintain the space temperature setpoint. The economizer damper shall modulate toward minimum position in the event the mixed air temperature falls below the low temperature limit setting.

Smoke Detector Shutdown:

The unit shall shut down in response to a signal from the smoke detector indicating the presence of smoke and an alarm shall annunciate at the BAS. The smoke detector shall be interlocked to the unit through the dry contacts of the smoke detector. A manual reset of the smoke detector shall be required to restart the unit.

Condensate Overflow Shutdown:

The unit shall shut down in response to a signal from the condensate overflow sensor. The sensor shall be interlocked to the unit cooling controller for immediate shutdown of cooling.

Refrigerant Mitigation Mode:

The unit controller shall monitor the leak detection system, when a leak is detected, an alarm shall promptly alert the BAS via BACnet Change-of-Value (COV) and mitigation shall be activated.

In occupied mode, the supply fan shall remain operational, and the compressor(s), electric heating, fuel-fired heating, electrostatic devices, and any other ignition device starters shall be disabled, and activate mechanical ventilation (if it's required by Section 7.6.4 of the ASRAE standard). for the duration of the mitigation process plus an additional 5 minutes.

In unoccupied mode, the supply fan shall remain operational, and the compressor(s), electric heating, fuel-fired heating, electrostatic devices, and any other ignition device starters shall be disabled, and activate mechanical ventilation (if it's required by Section 7.6.4 of the ASRAE standard). for the duration of the mitigation process plus an additional 5 minutes.

F. RTU-2 :

Points List - RTU-2

Point Name	POINTS									ALARMS					
	GRAPHIC	ANALOG HARDWARE INPUT (AI)	BINARY HARDWARE INPUT (BI)	ANALOG HARDWARE OUTPUT (AO)	BINARY HARDWARE OUTPUT (BO)	SOFTWARE POINT (SFT)	HARDWARE INTERLOCK (HDW)	WIRELESS (WLS)	NETWORK (NET)	HIGH ANALOG LIMIT	LOW ANALOG LIMIT	BINARY	LATCH DIAGNOSTIC	SENSOR FAIL	COMMUNICATION FAIL
ACCORDIAN DOOR STATUS **ADS**			X												
COMPRESSOR 1 MODULATION COMMAND **CMP1**	X			X											
COMPRESSOR 2 COMMAND **CMP2**	X				X										
CONDENSATE OVERFLOW DETECTION LOCAL **CND OVRFL**	X		X									X			
COOLING OUTPUT COMMAND **CLG**	X			X											
DISCHARGE AIR STATIC PRESSURE LOCAL **DA SP**		X								X	X		X		
DISCHARGE AIR TEMPERATURE **DAT**	X	X												X	
DX COIL FROST STAT **FROSTAT**	X		X									X			
ENERGY WHEEL COMMAND **EW**	X				X										
ENERGY WHEEL LEAVING OUTDOOR AIR HUMIDITY **EW OA LAH**	X	X												X	
ENERGY WHEEL LEAVING OUTDOOR AIR TEMPERATURE **EW OA LAT**	X	X												X	
ENERGY WHEEL LEAVING RELIEF AIR TEMPERATURE **EW RLF LAT**	X	X												X	

ENERGY WHEEL RELIEF AIR BYPASS DAMPER COMMAND **EW RLF BYPD**	X			X											
ENERGY WHEEL OUTDOOR AIR BYPASS DAMPER COMMAND **EW OA BYPD**	X			X											
ENERGY WHEEL OUTDOOR AIR FILTER STATUS LOCAL **EW OA FIL**	X		X									X			
GAS HEAT OUTPUT COMMAND **GH**	X			X											
HEATING OUTPUT COMMAND **HTG**	X			X											
HOT GAS REHEAT VALVE COMMAND **HGRH**	X			X											
OUTSIDE AIR DAMPER COMMAND **OAD**	X			X											
OUTSIDE AIR HUMIDITY LOCAL **OAH**	X	X												X	
OUTSIDE AIR TEMPERATURE LOCAL **OAT**	X	X												X	
PRIMARY FILTER STATUS LOCAL **FIL**	X		X									X			
REFRIGERANT LFL CONCENTRATION ALARM THRESHOLD SENSOR A **R ALM A**		X													
REFRIGERANT LFL CONCENTRATION ALARM THRESHOLD SENSOR B **R ALM B**		X													
REFRIGERANT LFL CONCENTRATION ALARM THRESHOLD SENSOR C **R ALM C**		X													
REFRIGERANT LFL CONCENTRATION ALARM THRESHOLD SENSOR D **R ALM D**		X													
REFRIGERANT CONCENTRATION BAS **R PPM**				X											
REFRIGERANT HIGH SIDE PRESSURE (63HS1) **R HI**		X													
REFRIGERANT LOW SIDE PRESSURE (63LS) **R LO**		X													
DUCT REFRIGERANT MONITOR **R PPM**		X													
REFRIGERANT LEAK DETECTION SYSTEM INPUT **R IN**			X												
REFRIGERANT LEAK SENSOR COMMUNICATION STATUS SENSOR A **R STS A**						X									
REFRIGERANT LFL CONCENTRATION SENSOR A **R PPM A**		X													
REFRIGERANT LFL CONCENTRATION SENSOR B **R PPM B**		X													
REFRIGERANT LFL CONCENTRATION SENSOR C **R PPM C**		X													
REFRIGERANT LFL CONCENTRATION SENSOR D **R PPM D**		X													

REFRIGERANT MITIGATION ACTIVE **R MGT**			X												
REFRIGERANT TYPE **R TYPE**						X									
RELIEF AIR FAN START/STOP **RLF**	X				X										
RELIEF AIR FAN STATUS LOCAL **RLF**	X		X												
RETURN AIR DAMPER COMMAND **RAD**	X			X											
RETURN AIR HUMIDITY LOCAL **RAH**	X	X												X	
RETURN AIR SMOKE DETECTION LOCAL **RA SD**							X								
RETURN AIR TEMPERATURE LOCAL **RAT**	X	X												X	
RETURN AIR WHEEL BYPASS DAMPER COMMAND **RA EW BYPD**	X			X											
REVERSING VALVE **REV VLV**	X				X										
SPACE HUMIDITY LOCAL (WIRED) **SPH**	X	X								X				X	
SPACE TEMPERATURE LOCAL (WIRED) **SPT**	X	X								X	X				
SUPPLY FAN SPEED **SAF**				X											
SUPPLY FAN START/STOP **SAF**	X				X										
SUPPLY FAN STATUS LOCAL **SAF**	X		X												
APPLICATION MODE **APP MODE**						X									
BAS COMMUNICATION STATE **BAS COM**						X									X
COMPRESSOR ENABLE **CMP ENA**	X					X									
COMPRESSOR LOCKOUT STATUS **CMP LCK**						X									
COOL OUTPUT **CLG**						X									
DISCHARGE AIR STATIC PRESSURE SETPOINT **DA SP SPT**	X					X									
FAN MODE COMMAND **FAN MODE**						X									
FILTER TIMER HOURS **FIL HRS**						X									
HEAT / COOL MODE REQUEST **H/C REQ**	X					X									
HEAT OUTPUT **HTG**						X									
OCCUPANCY **OCC**	X					X									
OCCUPIED COOLING SETPOINT **OCC CLG SP**	X					X									
SPACE TEMPERATURE SETPOINT ACTIVE **SPT SP ACT**	X					X									

TIMED OVERRIDE STATUS **TOV**						X									
UNOCCUPIED COOLING SETPOINT **UNOCC CLG SP**	X					X									
UNOCCUPIED HEATING SETPOINT **UNOCC HTG SP**	X					X									
COOLING COIL LEAVING TEMPERATURE **CCT**	X	X													

Sequence of Operation: RTU-2

Building Automation System Interface:

The Building Automation System (BAS) shall send the controller Occupied Bypass, Morning Warm-up/Pre-Cool, Occupied/Unoccupied and Heat/Cool modes. If a BAS is not present, or communication is lost with the BAS the controller shall operate using default modes and setpoints.

Occupied:

During occupied periods, the supply fan shall run continuously. Upon a call for DX heating or cooling, the unit controller shall enable the variable speed compressor. If the variable speed compressor cannot satisfy the load conditions, the unit controller shall start a fixed speed compressor. The variable speed compressor shall modulate to maintain the active space temperature setpoint. This process shall repeat until all of the fixed speed compressors have been started or until the load conditions can be satisfied. The gas heat shall be enabled and controlled to maintain the active space temperature setpoint. The discharge air temperature setpoint shall be dynamically reset based on the deviation of actual space temperature from the active space temperature setpoint.

Unoccupied:

During the unoccupied periods, the supply fan shall be disabled, the relief fan shall be disabled, the mechanical cooling shall be disabled, the mechanical heating shall be disabled, to conserve energy.

When the space temperature is above the unoccupied cooling setpoint of 85.0 deg. F (adj.) the supply fan and exhaust fan shall be commanded on, and the mechanical cooling shall be enabled. When the space temperature falls below the unoccupied cooling setpoint of 85.0 deg. F (adj.) minus the unoccupied differential of 4.0 deg. F (adj.)
the supply fan and the exhaust fan shall be commanded off, and the mechanical cooling shall be disabled.

When the space temperature is below the unoccupied heating setpoint of 60.0 deg. F (adj.) the supply fan and exhaust fan shall be commanded on, and the mechanical heating shall be enabled. When the space temperature rises above the unoccupied heating setpoint of 60.0 deg. F (adj.) plus the unoccupied differential of 4.0 deg. F (adj.) the supply fan and exhaust fan shall be commanded off, the mechanical heating shall be disabled.

Accordion Door Operation:

When door is closed, RTU-2 shall operate normally.

When door is open via manual switch, if the unit is in cooling mode, the DX coil and compressors shall be disabled, and the unit shall run in fan-only mode. If the unit is in heating mode when the door is open, the unit shall maintain normal operation. Once the door is shut, the unit shall go back to normal cooling and heating operation.

Optimal Start:

The BAS shall monitor the scheduled occupied time, occupied space setpoints and space temperature to calculate when the optimal start occurs.

Morning Warm-Up Mode:

During optimal start, if the space temperature is below the occupied heating setpoint a morning warm-up mode shall be activated. When morning warm-up is initiated the unit shall enable the heating and fan(s). When the space temperature reaches the occupied heating setpoint (adj.), the unit shall transition to the occupied mode.

Occupied Bypass:

The BAS shall monitor the status of the ON and CANCEL buttons of the space temperature sensor. When an occupied bypass request is received from a space sensor, the unit shall transition from its current occupancy mode to occupied bypass mode and the unit shall maintain the space temperature to the occupied setpoints (adj.).

Heat/Cool Mode:

When the space temperature rises above the occupied cooling setpoint of 76-deg. F. (adj.) the mode shall transition to cooling. When the space temperature falls below the occupied heating setpoint of 68-deg. F. (adj.) the mode shall transition to heating. When the space temperature is above the occupied cooling setpoint or below the occupied heating setpoint the mode shall remain in its last state. If the space temperature sensor fails the mode shall remain in its last state and an alarm shall annunciate at the BAS. If the local and communicated setpoints fail the controller shall disable the supply fan and an alarm shall annunciate at the BAS.

Dehumidification:

MULTI-CIRCUIT UNITS: On a call for dehumidification, the hot gas reheat valve in circuit 1 shall energize and the compressor(s) shall enable. When the humidity control setpoint is satisfies, the valve shall be de-energized and the compressor(s) in circuit 1 shall be disabled. If there is a call for 1st stage cooling while in the dehumidification mode, no action shall take place. If there is a call for 2nd stage cooling, the hot gas reheat valve shall be de-energized, and the unit shall revert to the cooling mode. If 2nd stage cooling is satisfied and there is still a call for dehumidification, the hot gas reheat valve shall once again be energized.

Economizing:

The outside air (OA) temperature shall be compared with space temperature. The economizer shall enable when OA temperature is less than space temperature - 2.0 deg. F. The economizer shall disable when OA temperature is greater than space temperature.

When economizing is enabled and the unit is operating in the cooling mode, the economizer damper shall be modulated between its minimum position and 100% open to maintain the space temperature setpoint. The economizer damper shall modulate toward minimum position in the event the mixed air temperature falls below the low temperature limit setting.

Energy Recovery Wheel Operation:

When the outside air enthalpy is higher than the return air enthalpy, the wheel shall be turned on and both outside air and relief air bypass dampers shall be closed. When the outside air enthalpy is less than the return air enthalpy and the RTU is cooling (or airside economizing), the wheel shall be turned off and both outside air and relief air bypass dampers shall be open. When the RTU is heating, the wheel shall be turned on as the first stage of heat, the outside air bypass damper shall be closed, and the relief air bypass damper shall modulate (as necessary) to maintain discharge air temperature at setpoint (adj.). If the outside air temperature drops below the frost threshold setpoint (adj.), the outside air bypass damper shall modulate to maintain the relief-side leaving temperature at setpoint.

Supply Fan:

The unit controller shall vary the supply fan speed to optimize minimum fan speed in all cooling and heating modes.

Supply Duct Static Pressure Control:

The unit controller shall modulate the supply fan output as required to maintain the supply duct static pressure setpoint. If the supply duct static pressure falls below the supply air static setpoint + deadband, the unit controller shall increase the output to the supply fan to maintain setpoint. If the supply duct static pressure rises above the supply air static setpoint + deadband, the unit controller shall decrease the output to the supply fan to maintain setpoint.

Relief Air and Building Pressure Control:

The relief air fan shall enable when the economizer damper position is equal to or greater than the relief air fan setpoint.

Filter Status:

A differential pressure switch shall monitor the differential pressure across the filter(s) when the fan is running. If the switch closes during normal operation a dirty filter alarm shall annunciate at the BAS.

Smoke Detector Shutdown:

The unit shall shut down in response to a signal from the smoke detector indicating the presence of smoke and an alarm shall annunciate at the BAS. The smoke detector shall be interlocked to the unit through the dry contacts of the smoke detector. A manual reset of the smoke detector shall be required to restart the unit.

Condensate Overflow Shutdown:

The unit shall shut down in response to a signal from the condensate overflow sensor. The sensor shall be interlocked to the unit cooling controller for immediate shutdown of cooling.

Refrigerant Mitigation Mode:

The unit controller shall monitor the leak detection system, when a leak is detected, an alarm shall promptly alert the BAS via BACnet Change-of-Value (COV) and mitigation shall be activated.

In occupied mode, the supply fan shall remain operational, and the compressor(s), electric heating, fuel-fired heating, electrostatic devices, and any other ignition device starters shall be disabled, and activate mechanical ventilation (if it's required by Section 7.6.4 of the ASRAE standard). for the duration of the mitigation process plus an additional 5 minutes.

In unoccupied mode, the supply fan shall remain operational, and the compressor(s), electric heating, fuel-fired heating, electrostatic devices, and any other ignition device starters shall be disabled, and activate mechanical ventilation (if it's required by Section 7.6.4 of the ASRAE standard). for the duration of the mitigation process plus an additional 5 minutes.

G. Kitchen Exhaust Fan:

Points List - KITCHEN FAN

Point Name	POINTS									ALARMS					
	GRAPHIC	ANALOG HARDWARE INPUT (AI)	BINARY HARDWARE INPUT (BI)	ANALOG HARDWARE OUTPUT (AO)	BINARY HARDWARE OUTPUT (BO)	SOFTWARE POINT (SFT)	HARDWARE INTERLOCK (HDW)	WIRELESS (WLS)	NETWORK (NET)	HIGH ANALOG LIMIT	LOW ANALOG LIMIT	BINARY	LATCH DIAGNOSTIC	SENSOR FAIL	COMMUNICATION FAIL
EXHAUST FAN SPEED COMMAND **EAF**				X											
EXHAUST FAN STATUS **EAF**	X		X												
EXTERNAL DEVICE COMMAND FAN SPEED **EXT DEV SPD**		X													
EXTERNAL DEVICE ENABLE FAN **EXT DEV EN**			X												
EXHAUST FAN START STOP COMMAND **EAF**	X				X										
BAS COMMUNICATION STATE **BAS COM**						X									

Sequence of Operation: KITCHEN FAN

General Exhaust Operation:

The exhaust fan shall be commanded on by the BAS as a result of a contact closure from an external device to coordinate with HV - 2 as general exhaust. The exhaust fan shall be modulated by the BAS as a result of a variable signal from an external device.

Cooking Operation:

The exhaust fan shall increase speed to enable cooking mode as a result of a contact closure from an physical switch.

Fan Status:

The fan status shall be monitored by a differential pressure switch. If the fan is signaled to start, and status is not proven within 20 seconds (adj.), an alarm shall annunciate at the BAS.

H. VAV 1-17:

Points List - VAV 1-17

Point Name	POINTS									ALARMS					
	GRAPHIC	ANALOG HARDWARE INPUT (AI)	BINARY HARDWARE INPUT (BI)	ANALOG HARDWARE OUTPUT (AO)	BINARY HARDWARE OUTPUT (BO)	SOFTWARE POINT (SFT)	HARDWARE INTERLOCK (HDW)	WIRELESS (WLS)	NETWORK (NET)	HIGH ANALOG LIMIT	LOW ANALOG LIMIT	BINARY	LATCH DIAGNOSTIC	SENSOR FAIL	COMMUNICATION FAIL
AIR VALVE DRIVE OPEN COMMAND **AIR VLV OPN**	X				X										
AIR VALVE DRIVE CLOSE COMMAND **AIR VLV CLS**	X				X										
DISCHARGE AIR TEMPERATURE **DAT**	X	X								X	X			X	
LOCAL HEAT VALVE COMMAND CLOSE **HW VLV CLS**	X				X										
LOCAL HEAT VALVE COMMAND OPEN **HW VLV OPN**	X				X										
SPACE OCCUPANCY INPUT **SP OCC**	X		X												

SPACE TEMPERATURE LOCAL **SPT**	X	X													
SPACE TEMPERATURE SETPOINT LOCAL **SPT SP**	X	X													
SUPPLY AIRFLOW **DA FLW**	X	X								X	X				
BAS COMMUNICATION STATE **BAS COM**						X									X
DESIGN HEAT DISCHARGE AIR TEMP SETPOINT **DSNG HT DAT SP**						X									
MAXIMUM COOLING AIRFLOW SETPOINT **MAX CLG FLW SP**						X									
MINIMUM COOLING AIRFLOW SETPOINT **MIN CLG FLW SP**						X									
MAXIMUM HEATING AIRFLOW SETPOINT **MAX HTG FLW SP**						X									
MINIMUM HEATING AIRFLOW SETPOINT **MIN HTG FLW SP**						X									
OCCUPIED BYPASS TIMER **OCC TMR**	X					X									
OCCUPIED COOLING SETPOINT **OCC CLG SP**	X					X									
OCCUPIED HEATING SETPOINT **OCC HTG SP**	X					X									
UNOCCUPIED COOLING SETPOINT **UNOCC CLG SP**	X					X									
UNOCCUPIED HEATING SETPOINT **UNOCC HTG SP**	X					X									

Sequence of Operation: VAV 1-17

Occupied:

The occupancy mode shall be communicated or hardwired to the controller via a binary input. When the unit is in the occupied mode the VAV shall maintain the space temperature at the active occupied heating or cooling setpoint. Applicable ventilation and airflow setpoints shall be enforced. The occupied mode shall be the default mode of the VAV. Applicable ventilation and airflow setpoints shall be enforced. The occupied mode shall be the default mode of the VAV.

Occupied Standby:

The occupancy mode shall be communicated or hardwired to the controller via a binary input, even though the BAS has scheduled the space as occupied. In the occupied standby mode, the active cooling and heating setpoints shall be relaxed (see cooling and heating mode) and both the ventilation airflow and minimum airflow setpoints shall be lowered (see VAV schedule).

Unoccupied:

Normal operating mode for unoccupied spaces or nighttime operation. When the unit is in unoccupied mode the VAV controller shall maintain the space temperature at the stored unoccupied heating or cooling setpoint regardless of the presence of a hardwired or communicated setpoint. When the space temperature drops below its Unoccupied Heating Setpoint, the controller shall modulate the air damper and the hot water valve until the zone temperature rises back to 2.0 deg. F above the Unoccupied Heating Setpoint. When the space temperature exceeds the active unoccupied setpoint the hot water valve shall the air damper and hot water valve shall modulate fully closed.

Occupied Bypass:

Mode used to temporarily place the unit into the occupied operation. Tenants shall be able to override the unoccupied mode from the space sensor. The override shall last for a maximum of 4 hours (adj.). The tenants shall be able to cancel the override from the space sensor at any time. During the override the unit shall operate in occupied mode.

Heat/Cool Setpoint:

The space temperature setpoint shall be determined either by a local (e.g., thumbwheel) setpoint, the VAV default setpoint or a communicated value. The VAV shall use the locally stored default setpoints when neither a local setpoint nor communicated setpoint is present. If both a local setpoint and communicated setpoint exist, the VAV shall use the communicated value.

Cooling Mode:

When the unit is in cooling mode, the VAV controller shall maintain the space temperature at the active cooling setpoint by modulating the airflow between the active cooling minimum airflow setpoint to the maximum cooling airflow setpoint. The VAV shall use the measured space temperature and the active cooling setpoint to determine the requested cooling capacity of the unit. The outputs shall be controlled based on the unit configuration and the requested cooling capacity.

Based on the VAV controller occupancy mode, the active cooling setpoint shall be one of the following:

Setpoint	Default Value
Occupied Cooling Setpoint	76.0 deg. F
Unoccupied Cooling Setpoint	85.0 deg. F
Occupied Standby Cooling Setpoint	78.0 deg. F
Occupied Min Cooling Airflow Setpoint	See VAV Schedule
Occupied Max Cooling Airflow Setpoint	See VAV Schedule

Heating Mode:

Reheat shall only be allowed when the supply air temperature is 5.0 deg. F below the configured reheat enable setpoint of 70.0 deg. F (adj.). The reheat shall be enabled when the space temperature drops below the active heating setpoint and the minimum airflow requirements are met. During reheat the VAV shall operate at its minimum heating airflow setpoint and energize the heat as follows:

Setpoint	Default Value
Occupied Heating Setpoint	68.0 deg. F
Unoccupied Heating Setpoint	60.0 deg. F
Occupied Standby Heating Setpoint	67.0 deg. F
Occupied Min Heating Airflow Setpoint	See VAV Schedule
Occupied Max Heating Airflow Setpoint	See VAV Schedule

Local Reheat Control:

Reheat shall only be allowed when the primary air temperature is 5.0 deg. F below the configured reheat enable setpoint of 70.0 deg. F (adj.). The reheat shall be enabled when the space temperature drops below the active heating setpoint and the minimum airflow requirements are met. During reheat the VAV shall operate at its minimum heating airflow setpoint and energize the heat as follows:

Space Sensor Failure:

If there is a fault with the operation of the zone sensor an alarm shall be annunciated at the BAS. Space sensor failure shall cause the VAV to drive the damper to minimum air flow if the VAV is in the occupied mode, or drive it closed if the VAV is in the unoccupied mode.

I. CAV 1-4:

Points List - CAV 1-4

Point Name	POINTS									ALARMS					
	GRAPHIC	ANALOG HARDWARE INPUT (AI)	BINARY HARDWARE INPUT (BI)	ANALOG HARDWARE OUTPUT (AO)	BINARY HARDWARE OUTPUT (BO)	SOFTWARE POINT (SFT)	HARDWARE INTERLOCK (HDW)	WIRELESS (WLS)	NETWORK (NET)	HIGH ANALOG LIMIT	LOW ANALOG LIMIT	BINARY	LATCH DIAGNOSTIC	SENSOR FAIL	COMMUNICATION FAIL
AIR VALVE DRIVE OPEN COMMAND **AIR VLV OPN**	X				X										
AIR VALVE DRIVE CLOSE COMMAND **AIR VLV CLS**	X				X										
DISCHARGE AIR TEMPERATURE **DAT**	X	X								X	X			X	
LOCAL HEAT VALVE COMMAND CLOSE **HW VLV CLS**	X				X										
LOCAL HEAT VALVE COMMAND OPEN **HW VLV OPN**	X				X										
SPACE OCCUPANCY INPUT **SP OCC**	X		X												
SPACE TEMPERATURE LOCAL **SPT**	X	X													
SPACE TEMPERATURE SETPOINT LOCAL **SPT SP**	X	X													
SUPPLY AIRFLOW **DA FLW**	X	X								X	X				
BAS COMMUNICATION STATE **BAS COM**						X									X
DESIGN HEAT DISCHARGE AIR TEMP SETPOINT **DSNG HT DAT SP**						X									
MAXIMUM COOLING AIRFLOW SETPOINT **MAX CLG FLW SP**						X									
MINIMUM COOLING AIRFLOW SETPOINT **MIN CLG FLW SP**						X									
MAXIMUM HEATING AIRFLOW SETPOINT **MAX HTG FLW SP**						X									

MINIMUM HEATING AIRFLOW SETPOINT **MIN HTG FLW SP**						X									
OCCUPIED BYPASS TIMER **OCC TMR**	X					X									
OCCUPIED COOLING SETPOINT **OCC CLG SP**	X					X									
OCCUPIED HEATING SETPOINT **OCC HTG SP**	X					X									
UNOCCUPIED COOLING SETPOINT **UNOCC CLG SP**	X					X									
UNOCCUPIED HEATING SETPOINT **UNOCC HTG SP**	X					X									

Sequence of Operation: CAV 1-4

Occupied:

The occupancy mode shall be communicated or hardwired to the controller via a binary input. When the unit is in the occupied mode the VAV shall maintain the space temperature at the active occupied heating or cooling setpoint. Applicable ventilation and airflow setpoints shall be enforced. The occupied mode shall be the default mode of the VAV. Applicable ventilation and airflow setpoints shall be enforced. The occupied mode shall be the default mode of the VAV.

Occupied Standby:

The occupancy mode shall be communicated or hardwired to the controller via a binary input, even though the BAS has scheduled the space as occupied. In the occupied standby mode, the active cooling and heating setpoints shall be relaxed (see cooling and heating mode) and both the ventilation airflow and minimum airflow setpoints shall be lowered (see VAV schedule).

Unoccupied:

Normal operating mode for unoccupied spaces or nighttime operation. When the unit is in unoccupied mode the VAV controller shall maintain the space temperature at the stored unoccupied heating or cooling setpoint regardless of the presence of a hardwired or communicated setpoint. When the space temperature drops below its Unoccupied Heating Setpoint, the controller shall modulate the air damper and the hot water valve until the zone temperature rises back to 2.0 deg. F above the Unoccupied Heating Setpoint. When the space temperature exceeds the active unoccupied setpoint the hot water valve shall the air damper and hot water valve shall modulate fully closed.

Occupied Bypass:

Mode used to temporarily place the unit into the occupied operation. Tenants shall be able to override the unoccupied mode from the space sensor. The override shall last for a maximum of 4 hours (adj.). The tenants shall be able to cancel the override from the space sensor at any time. During the override the unit shall operate in occupied mode.

Heat/Cool Setpoint:

The space temperature setpoint shall be determined either by a local (e.g., thumbwheel) setpoint, the VAV default setpoint or a communicated value. The VAV shall use the locally stored default setpoints when neither a local setpoint nor communicated setpoint is present. If both a local setpoint and communicated setpoint exist, the VAV shall use the communicated value.

Cooling Mode:

When the unit is in cooling mode, the VAV controller shall maintain the space temperature at the active cooling setpoint by modulating the airflow between the active cooling minimum airflow setpoint to the maximum cooling airflow setpoint. The VAV shall use the measured space temperature and the active cooling setpoint to determine the requested cooling capacity of the unit. The outputs shall be controlled based on the unit configuration and the requested cooling capacity.

Based on the VAV controller occupancy mode, the active cooling setpoint shall be one of the following:

Setpoint	Default Value
Occupied Cooling Setpoint	76.0 deg. F
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Occupied Min Cooling Airflow Setpoint	See VAV Schedule
Occupied Max Cooling Airflow Setpoint	See VAV Schedule

Heating Mode:

Reheat shall only be allowed when the supply air temperature is 5.0 deg. F below the configured reheat enable setpoint of 70.0 deg. F (adj.). The reheat shall be enabled when the space temperature drops below the active heating setpoint and the minimum airflow requirements are met. During reheat the VAV shall operate at its minimum heating airflow setpoint and energize the heat as follows:

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Occupied Min Heating Airflow Setpoint	See VAV Schedule
Occupied Max Heating Airflow Setpoint	See VAV Schedule

Local Reheat Control:

Reheat shall only be allowed when the primary air temperature is 5.0 deg. F below the configured reheat enable setpoint of 70.0 deg. F (adj.). The reheat shall be enabled when the space temperature drops below the active heating setpoint and the minimum airflow requirements are met. During reheat the VAV shall operate at its minimum heating airflow setpoint and energize the heat as follows:

Space Sensor Failure:

If there is a fault with the operation of the zone sensor an alarm shall be annunciated at the BAS. Space sensor failure shall cause the VAV to drive the damper to minimum air flow if the VAV is in the occupied mode, or drive it closed if the VAV is in the unoccupied mode.

END OF SECTION 230924

SECTION 232113 - HYDRONIC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Copper tube and fittings.
2. Steel pipe and fittings.
3. Plastic pipe and fittings.
4. Joining materials.
5. Transition fittings.
6. Dielectric fittings.

1.3 SUBMITTALS

A. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions

B. Manufacturer's installation instructions shall be provided along with product data.

C. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).

D. Product Data: For each type of the following:

1. Pipe and tube.
2. Fittings.
3. Joining materials.
4. Transition fittings.
5. Bypass chemical feeder.

E. Submit an Environmental Product Declaration (EPD) from the manufacturer for steel pipe within this specification section, if available. A statement of the contractor's good faith effort to obtain the EPD shall be provided if not available.

1. Manufacturer-provided EPDs must be Product Specific Type III (Third-Party Reviewed), in adherence with ISO 14025 *Environmental labels and declarations*, ISO 14044 *Environmental management – Life cycle assessment*, and ISO 21930 *Core rules for environmental product declarations of construction products and services*.

F. Qualification Data: For Installer.

G. Welding certificates.

H. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Installer Qualifications:

1. Installers of Pressure-Sealed Joints: Installers shall be certified by pressure-seal joint manufacturer as having been trained and qualified to join piping with pressure-seal pipe couplings and fittings.
2. Fiberglass Pipe and Fitting Installers: Installers of RTRF and RTRP shall be certified by manufacturer of pipes and fittings as having been trained and qualified to join fiberglass piping with manufacturer-recommended adhesive.

B. Steel Support Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

C. Pipe Welding: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code: Section IX.

1. Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation.
2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Hydronic piping components and installation shall be capable of withstanding the following minimum working pressure and temperature unless otherwise indicated:

1. Hot-Water Heating Piping: 100 psig at 180 deg F.
2. Condenser-Water Piping: 150 psig at 73 deg F .
3. Condensate-Drain Piping: 150 deg F and 180 deg F.
4. Air-Vent Piping: 200 deg F.Safety-Valve-Inlet and -Outlet Piping: Equal to the pressure of the piping system to which it is attached.

2.2 COPPER TUBE AND FITTINGS

A. Drawn-Temper Copper Tube: ASTM B88, Type K and ASTM B88, Type L. Tube in "Annealed-Temper Copper Tube" paragraph below is generally available in NPS 1/8 to NPS 12 (DN 6 to DN 300). Annealed-temper copper tubing is commonly referred to as "soft" copper tube.

B. Annealed-Temper Copper Tube: ASTM B88, Type K and ASTM B88, Type L.

C. DWV Copper Tube: ASTM B306, Type DWV.

D. Cast-Copper, Solder-Joint Fittings: ASME B16.18, pressure fittings.

E. Wrought-Copper, Solder-Joint Fittings: ASME B16.22, pressure fittings.

F. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends.

G. Cast Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces and solder-joint or threaded ends.

H. Wrought Copper Unions: ASME B16.22.

I. Grooved, Mechanical-Joint, Copper Tube Appurtenances:

1. Grooved-End Copper Fittings: ASTM B75, copper tube or ASTM B584, bronze castings.
2. Grooved-End-Tube Couplings: To fit copper-tube dimensions; rigid pattern unless otherwise indicated; gasketed fitting EPDM-rubber gasket rated for minimum 230 deg F for use with ferrous housing, and steel bolts and nuts; 300 psig minimum CWP pressure rating.

J. Copper-Tube, Pressure-Seal-Joint Fittings:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Mueller Industries, Inc.
b. NIBCO INC.
c. Viega LLC.
d. Approved equivalent.

2. Fittings: Cast-brass, cast-bronze, or wrought-copper with EPDM O-ring seal in each end.
3. Minimum 200-psig working-pressure rating at 250 deg F.

2.3 STEEL PIPE AND FITTINGS

A. Steel Pipe: ASTM A53, black steel with plain ends; welded and seamless, Grade B, and wall thickness as indicated in "Piping Applications" Article.

B. Cast-Iron Threaded Fittings: ASME B16.4; Classes 125 and 250 as indicated in "Piping Applications" Article.

C. Malleable-Iron Threaded Fittings: ASME B16.3, Classes 150 and 300 as indicated in "Piping Applications" Article.

D. Malleable-Iron Unions: ASME B16.39; Classes 150, 250, and 300 as indicated in "Piping Applications" Article.

E. Cast-Iron Pipe Flanges and Flanged Fittings: ASME B16.1, Classes 25, 125, and 250; raised ground face, and bolt holes spot faced as indicated in "Piping Applications" Article.

F. Wrought-Steel Fittings: ASTM A234, wall thickness to match adjoining pipe.

G. Wrought Cast- and Forged-Steel Flanges and Flanged Fittings: ASME B16.5, including bolts, nuts, and gaskets of the following material group, end connections, and facings:

1. Material Group: 1.1.
2. End Connections: Butt welding.
3. Facings: Raised face.

H. Grooved Mechanical-Joint Fittings and Couplings:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Grinnell G-Fire by Johnson Controls Company.
    b. Nexus Valve, Inc.
    c. Victaulic Company.
    d. Approved equivalent.

2. Joint Fittings: ASTM A536, Grade 65-45-12 ductile iron; ASTM A47, Grade 32510 malleable iron; ASTM A53, Type F, E, or S, Grade B fabricated steel; or ASTM A106, Grade B steel fittings with grooves or shoulders constructed to accept grooved-end couplings; with nuts, bolts, locking pin, locking toggle, or lugs to secure grooved pipe and fittings.
3. Couplings: Ductile- or malleable-iron housing and [EPDM] [or] [nitrile] gasket of central cavity pressure-responsive design; with nuts, bolts, locking pin, locking toggle, or lugs to secure grooved pipe and fittings.

I. Plain-End Mechanical-Joint Couplings:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Anvil International.
    b. Shurjoint-Apollo Piping Products USA Inc.
    c. Victaulic Company.
    d. Approved equivalent.

2. Housing: ASTM A536 Grade 65-45-12 segmented ductile iron or type 304 stainless steel.
3. Housing coating: None.
4. Gasket: EPDM.
5. Sealing Mechanism: Double-lip sealing system or carbon steel case-hardened jaws.
6. Bolts, hex nuts, washers, or lock bars based on manufacturer's design.
7. Minimum Pressure Rating: Equal to that of the joined pipes.

J. Steel Pressure-Seal Fittings:

1. Manufacturers: Subject to compliance with requirements, [provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

   a. Victaulic Company.
   b. Viega LLC.
   c. Approved equivalent.

2. Housing: Steel.
3. O-Rings and Pipe Stop: EPDM.
4. Tools: Manufacturer's special tool.
5. Minimum 300-psig working-pressure rating at 230 deg F.

K. Steel Pipe Nipples: ASTM A733, made of same materials and wall thicknesses as pipe in which they are installed.

2.4 FIBERGLASS PIPE AND FITTINGS

A. RTRP: ASTM D2996, filament-wound pipe with tapered bell and spigot ends for adhesive joints.

B. RTRF: Compression or spray-up/contact molded of same material, pressure class, and joining method as pipe.

C. Flanges: ASTM D4024. Full-face gaskets suitable for the service, minimum 1/8-inch thick, 60-70 durometer. ASTM A307, Grade B, hex head bolts with washers.

2.5 JOINING MATERIALS

A. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.

1. ASME B16.21, nonmetallic, flat, asbestos free, 1/8-inch maximum thickness unless otherwise indicated.

   a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
   b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.

B. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

C. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer unless otherwise indicated.

D. Solder Filler Metals: ASTM B32, lead-free alloys. Include water-flushable flux according to ASTM B813.

E. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for joining copper with copper; or BAg-1, silver alloy for joining copper with bronze or steel.

F. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

G. Solvent Cements for CPVC Piping: ASTM F493.

H. Solvent Cements for PVC Piping: ASTM D2564. Include primer according to ASTM F656.

I. Fiberglass Pipe Adhesive: As furnished or recommended by pipe manufacturer.

2.6 TRANSITION FITTINGS

A. Plastic-to-Metal Transition Fittings:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Charlotte Pipe and Foundry Company.
    b. Uponor.
    c. Viega LLC.
    d. Approved equivalent.

2. One-piece fitting with one threaded brass or copper insert and one solvent-cement-joint end of material and wall thickness to match plastic pipe material.

B. Plastic-to-Metal Transition Unions:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Charlotte Pipe and Foundry Company.
    b. IPEX USA LLC.
    c. NIBCO INC.
    d. Approved equivalent.

2. Brass or copper end, solvent-cement-joint end of material and wall thickness to match plastic pipe material, rubber gasket, and threaded union.

2.7 DIELECTRIC FITTINGS

A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.

B. Dielectric Unions:

1. Description:

a. Standard: ASSE 1079.
b. Pressure Rating: 125 psig minimum at 180 deg F.
c. End Connections: Solder-joint copper alloy and threaded ferrous.

C. Dielectric Flanges:

1. Description:

a. Standard: ASSE 1079.
b. Factory-fabricated, bolted, companion-flange assembly.
c. Pressure Rating: 125 psig minimum at 180 deg F.
d. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

D. Dielectric-Flange Insulating Kits:

1. Description:

a. Nonconducting materials for field assembly of companion flanges.
b. Pressure Rating: 150 psig.
c. Gasket: Neoprene or phenolic.
d. Bolt Sleeves: Phenolic or polyethylene.
e. Washers: Phenolic with steel backing washers.

E. Dielectric Nipples:

1. Description:

a. Standard: IAPMO PS 66.
b. Electroplated steel nipple, complying with ASTM F1545.
c. Pressure Rating: 300 psig at 225 deg F.
d. End Connections: Male threaded or grooved.
e. Lining: Inert and noncorrosive, propylene.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

A. Hot-water heating piping, aboveground, NPS 2 and smaller, shall be any of the following:

1. Type L or Type M, drawn-temper copper tubing, wrought-copper fittings, and brazed pressure-seal joints.
2. Schedule 40, Grade B steel pipe; Class 150, malleable-iron fittings; cast-iron flanges and flange fittings; and threaded joints.

B. Hot-water heating piping, aboveground, NPS 2-1/2 and larger, shall be any of the following:

1. Type L, drawn-temper copper tubing, wrought-copper fittings, and brazed joints.
2. Schedule 40 steel pipe, wrought-steel fittings and wrought-cast or forged-steel flanges and flange fittings, and welded and flanged joints.
3. Schedule 40 steel pipe; grooved, mechanical joint coupling and fittings; and grooved, mechanical joints.
4. Schedule 40 steel pipe, plain-end mechanical-coupled joints.

C. Hot-water heating piping installed belowground and within slabs shall be[either of] the following:

1. Type K, drawn-temper copper tubing, wrought-copper fittings, and brazed joints. Use the fewest possible joints.

D. Condenser-water piping, aboveground, NPS 2 and smaller, shall be any of the following:

1. Type L or Type M, drawn-temper copper tubing, wrought-copper fittings, and brazed pressure-seal joints.
2. Schedule 40 steel pipe; Class 150, malleable-iron fittings; cast-iron flanges and flange fittings; and threaded joints.

E. Condenser-water piping, aboveground, NPS 2-1/2 and larger, shall be any of the following:

1. Type L Type M, drawn-temper copper tubing, wrought-copper fittings, and brazed joints.
2. Schedule 40 steel pipe, wrought-steel fittings and wrought-cast or forged-steel flanges and flange fittings, and welded and flanged joints.
3. Schedule 40 steel pipe; grooved, mechanical joint coupling and fittings; and grooved, mechanical joints.
4. Schedule 40 steel pipe, plain-end mechanical-coupled joints.

F. Condenser-water piping installed belowground and within slabs shall be either of the following:

1. Type K, annealed-temper copper tubing, wrought-copper fittings, and brazed joints. Use the fewest possible joints.
2. RTRP and RTRF with adhesive or flanged joints.
3. PP piping and fittings with heat fusion joints.

G. Condensate-Drain Piping, Copper: Type M, drawn-temper copper tubing, wrought-copper fittings, and soldered joints.

H. Condensate-Drain Piping, PVC: Schedule 40 PVC plastic pipe and fittings and solvent-welded joints.

I. Blowdown-Drain Piping: Same materials and joining methods as for piping specified for the service in which blowdown drain is installed.

J. Air-Vent Piping:

1. Inlet: Same as service where installed with metal-to-plastic transition fittings for plastic piping systems according to piping manufacturer's written instructions.
2. Outlet: Type K, annealed-temper copper tubing with soldered or flared joints.

K. Safety-Valve-Inlet and Outlet Piping for Hot-Water Piping: Same materials and joining methods as for piping specified for the service in which safety valve is installed with metal-to-plastic transition fittings for plastic piping systems according to piping manufacturer's written instructions.

3.2 INSTALLATION OF PIPING

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

E. Install piping to permit valve servicing.

F. Install piping at indicated slopes.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Install piping to allow application of insulation.

J. Select system components with pressure rating equal to or greater than system operating pressure.

K. Install groups of pipes parallel to each other, spaced to permit applying insulation and servicing of valves.

L. Install drains, consisting of a tee fitting, NPS 3/4 ball valve, and short NPS 3/4 threaded nipple with cap, at low points in piping system mains and elsewhere as required for system drainage.

M. Install piping at a uniform grade of 0.2 percent or 1/4 inch per 10 feet upward in direction of flow.

N. Reduce pipe sizes using eccentric reducer fitting installed with level side up.

O. Install branch connections to mains using mechanically formed tee fittings in main pipe, with the branch connected to the bottom of the main pipe. For up-feed risers, connect the branch to the top of the main pipe.

P. Install unions in piping, NPS 2 and smaller, adjacent to valves, at final connections of equipment, and elsewhere as indicated.

Q. Install flanges in piping, NPS 2-1/2 and larger, at final connections of equipment and elsewhere as indicated.

R. Install shutoff valve immediately upstream of each dielectric fitting.

S. Comply with requirements in Section 230516 "Expansion Fittings and Loops for HVAC Piping" for installation of expansion loops, expansion joints, anchors, and pipe alignment guides.

T. Comply with requirements in Section 230553 "Identification for HVAC Piping and Equipment" for identifying piping.

U. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 230517 "Sleeves and Sleeve Seals for HVAC Piping."

V. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 230517 "Sleeves and Sleeve Seals for HVAC Piping."

W. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 230518 "Escutcheons for HVAC Piping."

3.3 JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Soldered Joints: Apply ASTM B813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B32.

D. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.

E. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

F. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to "Quality Assurance" Article.

G. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

H. Plastic Piping Solvent-Cemented Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

1. Comply with ASTM F402 for safe-handling practice of cleaners, primers, and solvent cements.
2. CPVC Piping: Join according to ASTM D2846 Appendix.
3. PVC Pressure Piping: Join ASTM D1785 schedule number, PVC pipe and PVC socket fittings according to ASTM D2672. Join other-than-schedule number PVC pipe and socket fittings according to ASTM D2855.
4. PVC Nonpressure Piping: Join according to ASTM D2855.

I. Fiberglass Bonded Joints: Prepare pipe ends and fittings, apply adhesive, and join according to pipe manufacturer's written instructions.

J. Grooved Joints: Assemble joints with coupling and gasket, lubricant, and bolts. Cut or roll grooves in ends of pipe based on pipe and coupling manufacturer's written instructions for pipe wall thickness. Use grooved-end fittings and rigid, grooved-end-pipe couplings.

K. Plain-End Mechanical-Coupled Joints: Prepare, assemble, and test joints in accordance with manufacturer's written installation instructions.

L. Mechanically Formed, Copper-Tube-Outlet Joints: Use manufacturer-recommended tools and procedure, and brazed joints.

M. Pressure-Sealed Joints: Use manufacturer-recommended tools and procedure. Leave insertion marks on pipe after assembly.

3.4 INSTALLATION OF DIELECTRIC FITTINGS

A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.

B. Dielectric Fittings for NPS 2 and Smaller: Use dielectric nipples.

C. Dielectric Fittings for NPS 2-1/2 to NPS 4: Use dielectric nipples.

D. Dielectric Fittings for NPS 5 and Larger: Use dielectric flange kits.

3.5 INSTALLATION OF HANGERS AND SUPPORTS

A. Comply with requirements for seismic-restraint devices specified in Section 230548 "Vibration and Seismic Controls for HVAC."

B. Comply with requirements in Section 230529 "Hangers and Supports for HVAC Piping and Equipment" for hangers, supports, and anchor devices

C. Install hangers for copper tubing and steel piping, with maximum horizontal spacing and minimum rod diameters, shall be in accordance with Section 230529 “Hangers and Supports for HVAC Piping and Equipment, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

D. Install hangers for plastic piping, with maximum horizontal spacing and minimum rod diameters, to comply with manufacturer's written instructions, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

E. Install hangers for fiberglass piping, with maximum horizontal spacing and minimum rod diameters, to comply with manufacturer's written instructions, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

F. Support horizontal piping within 12 inches of each fitting and coupling.

G. Support vertical runs of copper tubing and steel piping to comply with MSS-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

H. Support vertical runs of fiberglass piping to comply with manufacturer's written instructions, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

3.6 TERMINAL EQUIPMENT CONNECTIONS

A. Sizes for supply and return piping connections shall be the same as or larger than equipment connections.

B. Install control valves in accessible locations close to connected equipment.

C. Install bypass piping with globe valve around control valve. If parallel control valves are installed, only one bypass is required.

D. Install ports for pressure gauges and thermometers at coil inlet and outlet connections. Comply with requirements in Section 230519 "Meters and Gages for HVAC Piping."

3.7 FIELD QUALITY CONTROL

A. Prepare hydronic piping according to ASME B31.9 and as follows:

1. Leave joints, including welds, uninsulated and exposed for examination during test.
2. Provide temporary restraints for expansion joints that cannot sustain reactions due to test pressure. If temporary restraints are impractical, isolate expansion joints from testing.
3. Flush hydronic piping systems with clean water; then remove and clean or replace strainer screens.

4. Isolate equipment from piping. If a valve is used to isolate equipment, its closure shall be capable of sealing against test pressure without damage to valve. Install blinds in flanged joints to isolate equipment.
5. Install safety valve, set at a pressure no more than one-third higher than test pressure, to protect against damage by expanding liquid or other source of overpressure during test.

B. Perform the following tests on hydronic piping:

1. Use ambient temperature water as a testing medium unless there is risk of damage due to freezing. Another liquid that is safe for workers and compatible with piping may be used.
2. While filling system, use vents installed at high points of system to release air. Use drains installed at low points for complete draining of test liquid.
3. Isolate expansion tanks and determine that hydronic system is full of water.
4. Subject piping system to hydrostatic test pressure that is not less than 1.5 times the system's working pressure. Test pressure shall not exceed maximum pressure for any vessel, pump, valve, or other component in system under test. Verify that stress due to pressure at bottom of vertical runs does not exceed 90 percent of specified minimum yield strength or 1.7 times the "SE" value in Appendix A in ASME B31.9, "Building Services Piping."
5. After hydrostatic test pressure has been applied for at least 10 minutes, examine piping, joints, and connections for leakage. Eliminate leaks by tightening, repairing, or replacing components, and repeat hydrostatic test until there are no leaks.
6. Prepare written report of testing.

C. Perform the following before operating the system:

1. Open manual valves fully.
2. Inspect pumps for proper rotation.
3. Set makeup pressure-reducing valves for required system pressure.
4. Inspect air vents at high points of system and determine if all are installed and operating freely (automatic type), or bleed air completely (manual type).
5. Set temperature controls so all coils are calling for full flow.
6. Inspect and set operating temperatures of hydronic equipment, such as boilers, chillers, cooling towers, to specified values.
7. Verify lubrication of motors and bearings.

END OF SECTION 232113

SECTION 232300 - REFRIGERANT PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Copper tube and fittings.
2. Steel pipe and fittings.
3. Valves and specialties.
4. Refrigerants.

1.3 SUBMITTALS

A. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions

B. Manufacturer’s installation instructions shall be provided along with product data.

C. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).

D. Product Data: For each type of valve, refrigerant piping, and piping specialty.

1. Include pressure drop, based on manufacturer's test data, for the following:

a. Thermostatic expansion valves.
b. Solenoid valves.
c. Hot-gas bypass valves.
d. Filter dryers.
e. Strainers.
f. Pressure-regulating valves.

E. Shop Drawings:

1. Show layout of refrigerant piping and specialties, including pipe, tube, and fitting sizes; flow capacities; valve arrangements and locations; slopes of horizontal runs; oil traps; double risers; wall and floor penetrations; and equipment connection details.
2. Show piping size and piping layout, including oil traps, double risers, specialties, and pipe and tube sizes to accommodate, as a minimum, equipment provided, elevation difference

between compressor and evaporator, and length of piping to ensure proper operation and compliance with warranties of connected equipment.
3. Show interface and spatial relationships between piping and equipment.
4. Shop Drawing Scale: 1/4 inch equals 1 foot.

F. Welding certificates.

G. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For refrigerant valves and piping specialties to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Comply with ASHRAE 15, "Safety Code for Refrigeration Systems."

B. Comply with ASME B31.5, "Refrigeration Piping and Heat Transfer Components."

1.6 PRODUCT STORAGE AND HANDLING

A. Store piping with end caps in place to ensure that piping interior and exterior are clean when installed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Line Test Pressure for Refrigerant R-32:

1. Suction Lines for Heat-Pump Applications: 650 psig.
2. Hot-Gas and Liquid Lines: 650 psig.

B. Line Test Pressure for Refrigerant R-454B:

1. Suction Lines for Air-Conditioning Applications: 650 psig.
2. Suction Lines for Heat-Pump Applications: 650 psig.
3. Hot-Gas and Liquid Lines: 650 psig.

2.2 COPPER TUBE AND FITTINGS

A. Copper Tube: ASTM B 280, Type ACR.

B. Wrought-Copper Fittings, Brazed-Joint: ASME B16.50.

C. Wrought-Copper Unions: ASME B16.22.

D. Brazing Filler Metals: AWS A5.8.

E. Flexible Connectors:

1. Body: Tin-bronze bellows with woven, flexible, tinned-bronze-wire-reinforced protective jacket.
2. End Connections: Socket ends.
3. Offset Performance: Capable of minimum 3/4-inch misalignment in minimum 7-inch- long assembly.
4. Working Pressure Rating: Factory test at minimum 800 psig.
5. Maximum Operating Temperature: 250 deg F.

F. Flared Tube Fittings:

1. Refrigerant Tube Type: SAE J513.

G. Copper-Tube, Pressure-Seal-Joint Fittings for Refrigerant Piping:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Conex Banninger - USA.
b. Parker Hannifin, Sporlan Division.
c. Approved equivalent.

2. Standard: UL 207; certified by UL for field installation. Certification as a UL-recognized component alone is unacceptable.
3. Housing: Copper.
4. O-Rings: HNBR or compatible with specific refrigerant.
5. Tools: Manufacturer's approved special tools.
6. Minimum Rated Pressure: 800 psig.

2.3 VALVES AND SPECIALTIES

A. Diaphragm Packless Valves:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Danfoss Inc.
b. Heldon Products; Henry Technologies.
c. Paul Mueller Company.
d. Approved equivalent.

2. Body and Bonnet: Forged brass or cast bronze; globe design with straight-through or angle pattern.

3. Diaphragm: Phosphor bronze and stainless steel with stainless-steel spring.
4. Operator: Rising stem and hand wheel.
5. Seat: Nylon.
6. End Connections: Socket, union, or flanged.
7. Working Pressure Rating: 800 psig.
8. Maximum Operating Temperature: 275 deg F.

B. Packed-Angle Valves:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Danfoss Inc.
    b. Heldon Products; Henry Technologies.
    c. Paul Mueller Company.
    d. Approved equivalent.

2. Body and Bonnet: Forged brass or cast bronze.
3. Packing: Molded stem, back seating, and replaceable under pressure.
4. Operator: Rising stem.
5. Seat: Nonrotating, self-aligning polytetrafluoroethylene.
6. Seal Cap: Forged-brass or valox hex cap.
7. End Connections: Socket, union, threaded, or flanged.
8. Working Pressure Rating: 80 0psig.
9. Maximum Operating Temperature: 275 deg F.

C. Check Valves:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Heldon Products; Henry Technologies.
    b. Paul Mueller Company.
    c. Approved equivalent.

2. Body: Ductile iron, forged brass, or cast bronze; globe pattern.
3. Bonnet: Bolted ductile iron, forged brass, or cast bronze; or brass hex plug.
4. Piston: Removable polytetrafluoroethylene seat.
5. Closing Spring: Stainless steel.
6. Manual Opening Stem: Seal cap, plated-steel stem, and graphite seal.
7. End Connections: Socket, union, threaded, or flanged.
8. Maximum Opening Pressure: 0.50 psig.
9. Working Pressure Rating: 800 psig.
10. Maximum Operating Temperature: 275 deg F.

D. Service Valves:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Danfoss Inc.
    b. Heldon Products; Henry Technologies.
    c. Paul Mueller Company.
    d. Approved equivalent.

2. Body: Forged brass with brass cap including key end to remove core.
3. Core: Removable ball-type check valve with stainless-steel spring.
4. Seat: Polytetrafluoroethylene.
5. End Connections: Copper spring.
6. Working Pressure Rating: 800 psig.

E. Refrigerant Locking Caps:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. C & D Valve, LLC.
    b. JB Industries.
    c. RectorSeal HVAC; a CSW Industrials Company.
    d. Approved equivalent.

2. Description: Locking-type, tamper-resistant, threaded caps to protect refrigerant charging ports from unauthorized refrigerant access and leakage.
3. Material: Brass, with protective shroud or sleeve.
4. Refrigerant Identification: Color-coded, refrigerant specific or Universal design.
5. Special Tool: For installing and unlocking.

F. Solenoid Valves: Comply with AHRI 760 and UL 429; listed and labeled by a National Recognized Testing Laboratory (NRTL).

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Danfoss Inc.
    b. Heldon Products; Henry Technologies.
    c. Paul Mueller Company.
    d. Approved equivalent.

2. Body and Bonnet: Plated steel.
3. Solenoid Tube, Plunger, Closing Spring, and Seat Orifice: Stainless steel.
4. Seat: Polytetrafluoroethylene.
5. End Connections: Threaded.

6. Electrical: Molded, watertight coil in NEMA 250 enclosure of type required by location with 1/2-inch conduit adapter, and 208-V ac coil.
7. Working Pressure Rating: 800 psig.
8. Maximum Operating Temperature: 240 deg F.

G. Safety Relief Valves: Comply with 2010 ASME Boiler and Pressure Vessel Code; listed and labeled by an NRTL.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Danfoss Inc.
    b. Heldon Products; Henry Technologies.
    c. Paul Mueller Company.
    d. Approved equivalent.

2. Body and Bonnet: Ductile iron and steel, with neoprene O-ring seal.
3. Piston, Closing Spring, and Seat Insert: Stainless steel.
4. Seat: Polytetrafluoroethylene.
5. End Connections: Threaded.
6. Working Pressure Rating: 800 psig.
7. Maximum Operating Temperature: 240 deg F.

H. Thermostatic Expansion Valves: Comply with AHRI 750.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Danfoss Inc.
    b. Emerson Climate Technologies.
    c. Paul Mueller Company.
    d. Approved equivalent.

2. Body, Bonnet, and Seal Cap: Forged brass or steel.
3. Diaphragm, Piston, Closing Spring, and Seat Insert: Stainless steel.
4. Packing and Gaskets: Non-asbestos.
5. Capillary and Bulb: Copper tubing filled with refrigerant charge.
6. Suction Temperature: 40 deg F.
7. Superheat: Adjustable.
8. Reverse-flow option (for heat-pump applications).
9. End Connections: Socket, flare, or threaded union.
10. Working Pressure Rating: 800 psig.

I. Straight-Type Strainers:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Danfoss Inc.
b. Heldon Products; Henry Technologies.
c. Parker Hannifin Corp.
d. Approved equivalent.

2. Body: Welded steel with corrosion-resistant coating.
3. Screen: 100-mesh stainless steel.
4. End Connections: Socket or flare.
5. Working Pressure Rating: 800 psig.
6. Maximum Operating Temperature: 275 deg F.

J. Angle-Type Strainers:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Danfoss Inc.
b. Heldon Products; Henry Technologies.
c. Parker Hannifin Corp.
d. Approved equivalent.

2. Body: Forged brass or cast bronze.
3. Drain Plug: Brass hex plug.
4. Screen: 100-mesh monel.
5. End Connections: Socket or flare.
6. Working Pressure Rating: 800 psig.
7. Maximum Operating Temperature: 275 deg F.

K. Moisture/Liquid Indicators:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Danfoss Inc.
b. Heldon Products; Henry Technologies.
c. Parker Hannifin Corp.
d. Approved equivalent.

2. Body: Forged brass.
3. Window: Replaceable, clear, fused glass window with indicating element protected by filter screen.
4. Indicator: Color coded to show moisture content in parts per million (ppm).
5. Minimum Moisture Indicator Sensitivity: Indicate moisture above 60 ppm.
6. End Connections: Socket or flare.
7. Working Pressure Rating: 800 psig.
8. Maximum Operating Temperature: 240 deg F.

L. Replaceable-Core Filter Dryers: Comply with AHRI 730.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Danfoss Inc.
    b. Heldon Products; Henry Technologies.
    c. Parker Hannifin Corp.
    d. Approved equivalent.

2. Body and Cover: Painted-steel shell with ductile-iron cover, stainless-steel screws, and neoprene gaskets.
3. Filter Media: 10 micron, pleated with integral end rings; stainless-steel support.
4. Desiccant Media: Activated charcoal.
5. Designed for reverse flow (for heat-pump applications).
6. End Connections: Socket.
7. Access Ports: NPS 1/4 connections at entering and leaving sides for pressure differential measurement.
8. Maximum Pressure Loss: 2 psig.
9. Rated Flow: 10 ton.
10. Working Pressure Rating: 800 psig.
11. Maximum Operating Temperature: 240 deg F.

M. Permanent Filter Dryers: Comply with AHRI 730.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Danfoss Inc.
    b. Heldon Products; Henry Technologies.
    c. Parker Hannifin Corp.
    d. Approved equivalent.

2. Body and Cover: Painted-steel shell.
3. Filter Media: 10 micron, pleated with integral end rings; stainless-steel support.
4. Desiccant Media: Activated charcoal.
5. Designed for reverse flow (for heat-pump applications).
6. End Connections: Socket.
7. Access Ports: NPS 1/4 connections at entering and leaving sides for pressure differential measurement.
8. Maximum Pressure Loss: 2 psig.
9. Rated Flow: Refer to schedules.
10. Working Pressure Rating: 800 psig.
11. Maximum Operating Temperature: 240 deg F.

N. Mufflers:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Danfoss Inc.
b. Emerson Climate Technologies.
c. Heldon Products; Henry Technologies.
d. Approved equivalent.

2. Body: Welded steel with corrosion-resistant coating.
3. End Connections: Socket or flare.
4. Working Pressure Rating: 800 psig.
5. Maximum Operating Temperature: 275 deg F.

O. Receivers: Comply with AHRI 495.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Heldon Products; Henry Technologies.
b. Approved equivalent.

2. Comply with 2010 ASME Boiler and Pressure Vessel Code; listed and labeled by an NRTL.
3. Comply with UL 207; listed and labeled by an NRTL.
4. Body: Welded steel with corrosion-resistant coating.
5. Tappings: Inlet, outlet, liquid level indicator, and safety relief valve.
6. End Connections: Socket or threaded.
7. Working Pressure Rating: 800 psig.
8. Maximum Operating Temperature: 275 deg F.

P. Liquid Accumulators: Comply with AHRI 495.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Emerson Climate Technologies.
b. Heldon Products; Henry Technologies.
c. Parker Hannifin Corp.
d. Approved equivalent.

2. Body: Welded steel with corrosion-resistant coating.
3. End Connections: Socket or threaded.
4. Working Pressure Rating: 800 psig.
5. Maximum Operating Temperature: 275 deg F.

2.4 REFRIGERANTS

A. ASHRAE 34, R-410A: Pentafluoroethane/Difluoromethane.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Arkema Inc.
    b. DuPont Fluorochemicals Div.
    c. Mexichem Fluor Inc.
    d. Approved equivalent.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS FOR REFRIGERANT R-410A

A. Suction Lines NPS 1-1/2 and Smaller for Conventional Air-Conditioning Applications: Copper, Type ACR, annealed-temper tubing and wrought-copper fittings with brazed joints.

B. Suction Lines NPS 3-1/2 and Smaller for Conventional Air-Conditioning Applications: Copper, Type ACR, drawn-temper tubing and wrought-copper fittings with brazed joints.

C. Suction Lines NPS 4 and Smaller for Conventional Air-Conditioning Applications: Copper, Type ACR , drawn-temper tubing and wrought-copper fittings with brazed joints.

D. Hot-Gas and Liquid Lines , and Suction Lines for Heat-Pump Applications:

1. Copper, Type ACR, annealed- or drawn-temper tubing and wrought-copper fittings with brazed joints.
2. Copper, Type ACR, annealed- or drawn-temper tubing and wrought-copper fittings with brazed joints.
3. Copper, Type ACR, drawn-temper tubing and wrought-copper fittings with 95-5 tin-antimony brazed joints.
4. Copper, Type ACR, drawn-temper tubing and wrought-copper fittings with Alloy HB brazed joints.

E. Hot-Gas and Liquid Lines, and Suction Lines for Heat-Pump Applications, Multiple Tube Types and Joining Methods:

1. NPS 5/8 and Smaller: Copper, Type ACR, annealed- or drawn-temper tubing and wrought-copper fittings with brazed joints.
2. NPS 3/4 to NPS 1 and Smaller: Copper, Type ACR, annealed- or drawn-temper tubing and wrought-copper fittings with brazed joints.
3. NPS 1-1/4 and Smaller: Copper, Type ACR, drawn-temper tubing and wrought-copper fittings with 95-5 tin-antimony brazed joints.
4. NPS 1-1/2 to NPS 2: Copper, Type ACR, drawn-temper tubing and wrought-copper fittings with Alloy HB brazed joints.
5. NPS 2 to NPS 4: Schedule 40, black-steel and wrought-steel fittings with welded joints.

F. Safety-Relief-Valve Discharge Piping:

1. Copper, Type ACR, annealed- or drawn-temper tubing and wrought-copper fittings with brazed joints.
2. Copper, Type ACR, annealed- or drawn-temper tubing and wrought-copper fittings with brazed joints.
3. Copper, Type ACR, drawn-temper tubing and wrought-copper fittings with 95-5 tin-antimony brazed joints.
4. Copper, Type ACR, drawn-temper tubing and wrought-copper fittings with Alloy HB brazed joints.

G. Safety-Relief-Valve Discharge Piping, Multiple Tube Sizes and Joining Materials:

1. NPS 5/8 and Smaller: Copper, Type ACR, annealed- or drawn-temper tubing and wrought-copper fittings with brazed joints.
2. NPS 3/4 to NPS 1 and Smaller: Copper, Type ACR, annealed- or drawn-temper tubing and wrought-copper fittings with brazed joints.
3. NPS 1-1/4 and Smaller: Copper, Type ACR, drawn-temper tubing and wrought-copper fittings with 95-5 tin-antimony brazed joints.
4. NPS 1-1/2 to NPS 2: Copper, Type ACR, drawn-temper tubing and wrought-copper fittings with Alloy HB brazed joints.
5. NPS 2 to NPS 4: Schedule 40, black-steel and wrought-steel fittings with welded joints.

3.2 VALVE AND SPECIALTY APPLICATIONS

A. Install packed-angle valves in suction and discharge lines of compressor.

B. Install service valves for gauge taps at inlet and outlet of hot-gas bypass valves and strainers if they are not an integral part of valves and strainers.

C. Install a check valve at the compressor discharge and a liquid accumulator at the compressor suction connection.

D. Except as otherwise indicated, install packed-angle valves on inlet and outlet side of filter dryers.

E. Install a full-size, three-valve bypass around filter dryers.

F. Install solenoid valves upstream from each expansion valve and hot-gas bypass valve. Install solenoid valves in horizontal lines with coil at top.

G. Install thermostatic expansion valves as close as possible to distributors on evaporators.

1. Install valve so diaphragm case is warmer than bulb.
2. Secure bulb to clean, straight, horizontal section of suction line using two bulb straps. Do not mount bulb in a trap or at bottom of the line.
3. If external equalizer lines are required, make connection where it will reflect suction-line pressure at bulb location.

H. Install safety relief valves where required by 2010 ASME Boiler and Pressure Vessel Code. Pipe safety-relief-valve discharge line to outside according to ASHRAE 15.

I. Install moisture/liquid indicators in liquid line at the inlet of the thermostatic expansion valve or at the inlet of the evaporator coil capillary tube.

J. Install strainers upstream from and adjacent to the following unless they are furnished as an integral assembly for the device being protected:

1. Solenoid valves.
2. Thermostatic expansion valves.
3. Hot-gas bypass valves.
4. Compressor.

K. Install filter dryers in liquid line between compressor and thermostatic expansion valve, and in the suction line at the compressor.

L. Install receivers sized to accommodate pump-down charge.

M. Install flexible connectors at compressors.

N. Provide refrigerant locking caps on refrigerant charging ports that are located outdoors unless otherwise protected from unauthorized access by a means acceptable to the authority having jurisdiction.

3.3 INSTALLATION OF PIPING, GENERAL

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems; indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Shop Drawings.

B. Install refrigerant piping according to ASHRAE 15.

C. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping adjacent to machines to allow service and maintenance.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Select system components with pressure rating equal to or greater than system operating pressure.

J. Refer to Section 230923 "Direct Digital Control (DDC) System for HVAC" and Section 230993.11 "Sequence of Operations for HVAC DDC" for solenoid valve controllers, control wiring, and sequence of operation.

K. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.

L. Arrange piping to allow inspection and service of refrigeration equipment. Install valves and specialties in accessible locations to allow for service and inspection. Install access doors or panels as specified in Section 083113 "Access Doors and Frames" if valves or equipment requiring maintenance is concealed behind finished surfaces.

M. Install refrigerant piping in protective conduit where installed belowground.

N. Install refrigerant piping in rigid or flexible conduit in locations where exposed to mechanical injury.

O. Slope refrigerant piping as follows:

1. Install horizontal hot-gas discharge piping with a uniform slope downward away from compressor.
2. Install horizontal suction lines with a uniform slope downward to compressor.
3. Install traps and double risers to entrain oil in vertical runs.
4. Liquid lines may be installed level.

P. When brazing or soldering, remove solenoid-valve coils and sight glasses; also remove valve stems, seats, and packing, and accessible internal parts of refrigerant specialties. Do not apply heat near expansion-valve bulb.

Q. Before installation of steel refrigerant piping, clean pipe and fittings using the following procedures:

1. Shot blast the interior of piping.
2. Remove coarse particles of dirt and dust by drawing a clean, lintless cloth through tubing by means of a wire or electrician's tape.
3. Draw a clean, lintless cloth saturated with trichloroethylene through the tube or pipe. Continue this procedure until cloth is not discolored by dirt.
4. Draw a clean, lintless cloth, saturated with compressor oil, squeezed dry, through the tube or pipe to remove remaining lint. Inspect tube or pipe visually for remaining dirt and lint.
5. Finally, draw a clean, dry, lintless cloth through the tube or pipe.
6. Safety-relief-valve discharge piping is not required to be cleaned but is required to be open to allow unrestricted flow.

R. Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation installation.

S. Identify refrigerant piping and valves according to Section 230553 "Identification for HVAC Piping and Equipment."

T. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 230517 "Sleeves and Sleeve Seals for HVAC Piping."

U. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 230517 "Sleeves and Sleeve Seals for HVAC Piping."

V. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 230518 "Escutcheons for HVAC Piping."

3.4 PIPE JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Fill pipe and fittings with an inert gas (nitrogen or carbon dioxide), during brazing or welding, to prevent scale formation.

D. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."

1. Use Type BCuP (copper-phosphorus) alloy for joining copper socket fittings with copper pipe.
2. Use Type BAg (cadmium-free silver) alloy for joining copper with bronze.

E. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

3.5 INSTALLATION OF HANGERS AND SUPPORTS

A. Comply with requirements for seismic restraints in Section 230548 "Vibration and Seismic Controls for HVAC."

B. Comply with Section 230529 "Hangers and Supports for HVAC Piping and Equipment" for hangers, supports, and anchor devices.

C. Install the following pipe attachments:

1. Adjustable steel clevis hangers for individual horizontal runs less than 20 feet long.
2. Roller hangers and spring hangers for individual horizontal runs 20 feet or longer.
3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet or longer, supported on a trapeze.
4. Spring hangers to support vertical runs.
5. Copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.

D. Install hangers for copper tubing, with maximum horizontal spacing and minimum rod diameters, to comply with MSS-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

E. Support horizontal piping within 12 inches of each fitting.

F. Support vertical runs of copper tubing to comply with MSS-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

3.6 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Comply with ASME B31.5, Chapter VI.
2. Test refrigerant piping, specialties, and receivers. Isolate compressor, condenser, evaporator, and safety devices from test pressure if they are not rated above the test pressure.
3. Test high- and low-pressure side piping of each system separately at not less than the pressures indicated in "Performance Requirements" Article.

    a. Fill system with nitrogen to the required test pressure.
    b. System shall maintain test pressure at the manifold gage throughout duration of test.
    c. Test joints and fittings with electronic leak detector or by brushing a small amount of soap and glycerin solution over joints.
    d. Remake leaking joints using new materials, and retest until satisfactory results are achieved.

B. Prepare test and inspection reports.

3.7 SYSTEM CHARGING

A. Charge system using the following procedures:

1. Install core in filter dryers after leak test but before evacuation.
2. Evacuate entire refrigerant system with a vacuum pump to 500 micrometers. If vacuum holds for 12 hours, system is ready for charging.
3. Break vacuum with refrigerant gas, allowing pressure to build up to 2 psig.
4. Charge system with a new filter-dryer core in charging line.

3.8 ADJUSTING

A. Adjust thermostatic expansion valve to obtain proper evaporator superheat.

B. Adjust high- and low-pressure switch settings to avoid short cycling in response to fluctuating suction pressure.

C. Adjust set-point temperature of air-conditioning or chilled-water controllers to the system design temperature.

D. Perform the following adjustments before operating the refrigeration system, according to manufacturer's written instructions:

1. Open shutoff valves in condenser water circuit.
2. Verify that compressor oil level is correct.

3. Open compressor suction and discharge valves.
4. Open refrigerant valves except bypass valves that are used for other purposes.
5. Check open compressor-motor alignment and verify lubrication for motors and bearings.

E. Replace core of replaceable filter dryer after system has been adjusted and after design flow rates and pressures are established.

END OF SECTION 232300

SECTION 233113 - METAL DUCTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Double-wall rectangular ducts and fittings.
2. Single-wall round ducts and fittings.
3. Double-wall round and flat-oval ducts and fittings.
4. Sheet metal materials.
5. Duct liner.
6. Sealants and gaskets.
7. Hangers and supports.

1.3 SUBMITTALS

A. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.

B. Manufacturer's installation instructions shall be provided along with product data.

C. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).

D. Product Data: For each type of the following products:

1. Liners and adhesives.
2. Sealants and gaskets.

E. Submit an Environmental Product Declaration (EPD) from the manufacturer for steel sheets within this specification section, if available. A statement of the contractor's good faith effort to obtain the EPD shall be provided if not available.

1. Manufacturer-provided EPDs must be Product Specific Type III (Third-Party Reviewed), in adherence with ISO 14025 *Environmental labels and declarations*, ISO 14044 *Environmental management – Life cycle assessment*, and ISO 21930 *Core rules for environmental product declarations of construction products and services.*

2. Product Data: For adhesives, indicating VOC content.

3. Product Data: For sealants, indicating VOC content.
4. Laboratory Test Reports: For antimicrobial coatings, indicating compliance with requirements for low-emitting materials.

F. Shop Drawings:

1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
2. Factory- and shop-fabricated ducts and fittings.
3. Duct layout indicating sizes, configuration, liner material, and static-pressure classes.
4. Elevation of top and bottom of ducts.
5. Dimensions of all duct runs from building grid lines.
6. Fittings.
7. Reinforcement and spacing.
8. Seam and joint construction.
9. Penetrations through fire-rated and other partitions.
10. Equipment installation based on equipment being used on Project.
11. Locations for duct accessories, including dampers, turning vanes, and access doors and panels.
12. Hangers and supports, including methods for duct and building attachment and vibration isolation.

G. Delegated-Design Submittal:

1. Sheet metal thicknesses.
2. Joint and seam construction and sealing.
3. Reinforcement details and spacing.
4. Materials, fabrication, assembly, and spacing of hangers and supports.

H. Welding certificates.

I. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel in accordance with the following:

1. AWS D1.1, "Structural Welding Code - Steel," for hangers and supports.
2. AWS D1.2, "Structural Welding Code - Aluminum," for aluminum supports.
3. AWS D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Duct Design: Duct construction, including sheet metal thicknesses, seam and joint construction, reinforcements, and hangers and supports, shall comply with SMACNA's "HVAC

Duct Construction Standards - Metal and Flexible" and with performance requirements and design criteria indicated in "Duct Schedule" Article.

B. Structural Performance: Duct hangers and supports shall withstand the effects of gravity loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and ASCE/SEI 7.

C. Airstream Surfaces: Surfaces in contact with airstream shall comply with requirements in ASHRAE 62.1.

D. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment," and Section 7 - "Construction and System Startup."

E. ASHRAE/IES Compliance: Applicable requirements in ASHRAE/IES 90.1, Section 6.4.4 - "HVAC System Construction and Insulation."

F. Duct Dimensions: Unless otherwise indicated, all duct dimensions indicated on Drawings are inside clear dimensions and do not include insulation or duct wall thickness.

2.2 DOUBLE-WALL RECTANGULAR DUCTS AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. McGill AirFlow LLC.
2. MKT Metal Manufacturing.
3. Sheet Metal Connectors, Inc.
4. Approved equivalent.

B. Rectangular Ducts: Fabricate ducts with indicated dimensions for clear internal dimensions of the inner duct.

C. Outer Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.

1. Construct ducts of galvanized sheet steel unless otherwise indicated.
2. For ducts exposed to weather, construct outer duct of Type 304 stainless steel indicated by manufacturer to be suitable for outdoor installation.

D. Transverse Joints: Select joint types and fabricate in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-1, "Rectangular Duct/Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

1. For ducts with longest side less than 36 inches, select joint types in accordance with Figure 2-1.
2. For ducts with longest side 36 inches or greater, use flange joint connector Type T-22, T-24, T-24A, T-25a, or T-25b. Factory-fabricated flanged duct connection system may be used if submitted and approved by Director’s Representative.

3. Where specified for specific applications, all joints shall be welded.

E. Longitudinal Seams: Select seam types and fabricate in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible." All longitudinal seams shall be Pittsburgh lock seams unless otherwise specified for specific application.

1. Where specified for specific applications, all joints shall be welded.

F. Interstitial Insulation: Fibrous-glass liner complying with ASTM C1071, NFPA 90A, or NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard."

1. Install spacers that position the inner duct at uniform distance from outer duct without compressing insulation.
2. Coat insulation with antimicrobial coating.
3. Cover insulation with polyester film complying with UL 181, Class 1.

G. Interstitial Insulation: Flexible elastomeric duct liner complying with ASTM C534, Type II for sheet materials, and with NFPA 90A or NFPA 90B.

H. Inner Duct: Minimum 24-gauge solid galvanized sheet steel.

2.3 SINGLE-WALL ROUND DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Ch. 3, "Round, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.

1. Construct ducts of galvanized sheet steel unless otherwise indicated.
2. For ducts exposed to weather, construct of Type 316 stainless steel indicated by manufacturer to be suitable for outdoor installation.
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. Elgen Manufacturing.
    b. Linx Industries (formerly Lindab).
    c. McGill AirFlow LLC.
    d. MKT Metal Manufacturing.
    e. Nordfab Ducting.
    f. SEMCO, LLC; part of FlaktGroup.
    g. Set Duct Manufacturing.
    h. Sheet Metal Connectors, Inc.
    i. Spiral Manufacturing Co., Inc.
    j. Stamped Fittings Inc.
    k. Approved equivalent.

B. Transverse Joints: Select joint types and fabricate in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Round Duct Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

1. Transverse Joints in Ducts Larger Than 60 Inches in Diameter: Flanged.

C. Longitudinal Seams: Select seam types and fabricate in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Round Duct Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

1. Fabricate round ducts larger than 90 inches in diameter with butt-welded longitudinal seams.
2. Fabricate flat-oval ducts larger than 72 inches in width (major dimension) with butt-welded longitudinal seams.

D. Tees and Laterals: Select types and fabricate in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.4 DOUBLE-WALL ROUND AND FLAT-OVAL DUCTS AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Linx Industries (formerly Lindab).
2. McGill AirFlow LLC.
3. MKT Metal Manufacturing.
4. SEMCO, LLC; part of FlaktGroup.
5. Set Duct Manufacturing.
6. Sheet Metal Connectors, Inc.
7. Approved equivalent.

B. Flat-Oval Ducts: Indicated dimensions are the duct width (major dimension) and diameter of the round sides connecting the flat portions of the duct (minor dimension) of the inner duct.

1. Outer Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Ch. 3, "Round, Oval, and Flexible Duct," based on static-pressure class unless otherwise indicated.

    a. Construct ducts of galvanized sheet steel unless otherwise indicated.
    b. For ducts exposed to weather, construct outer duct of Type 316 stainless steel indicated by manufacturer to be suitable for outdoor installation.

2. Transverse Joints: Select joint types and fabricate in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Round Duct Transverse

Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

a. Transverse Joints in Ducts Larger Than 60 Inches in Diameter: Flanged.

3. Longitudinal Seams: Select seam types and fabricate in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Round Duct Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

a. Fabricate round ducts larger than 90 inches in diameter with butt-welded longitudinal seams.
b. Fabricate flat-oval ducts larger than 72 inches in width (major dimension) with butt-welded longitudinal seams.

4. Tees and Laterals: Select types and fabricate in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

C. Inner Duct: Minimum 24-gauge solid galvanized sheet steel.

D. Interstitial Insulation: Fibrous-glass liner complying with ASTM C1071, NFPA 90A, or NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard."

1. Install spacers that position the inner duct at uniform distance from outer duct without compressing insulation.
2. Coat insulation with antimicrobial coating.
3. Cover insulation with polyester film complying with UL 181, Class 1.

E. Interstitial Insulation: Flexible elastomeric duct liner complying with ASTM C534/C534M, Type II for sheet materials, and with NFPA 90A or NFPA 90B.

2.5 SHEET METAL MATERIALS

A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Galvanized Sheet Steel: Comply with ASTM A653.

1. Galvanized Coating Designation: G90.
2. Finishes for Surfaces Exposed to View: Mill phosphatized.

C. PVC-Coated, Galvanized Sheet Steel: Comply with ASTM A653.

1. Galvanized Coating Designation: G90.
2. Minimum Thickness for Factory-Applied PVC Coating: 4 mils thick on sheet metal surface of ducts and fittings exposed to corrosive conditions, and minimum 1 mil thick on opposite surface.
3. Coating Materials: Acceptable to authorities having jurisdiction for use on ducts listed and labeled by an NRTL for compliance with UL 181, Class 1.

D. Carbon-Steel Sheets: Comply with ASTM A1008, with oiled, matte finish for exposed ducts.

E. Stainless-Steel Sheets: Comply with ASTM A480, Type 304 or 316, as indicated in "Duct Schedule" Article; cold rolled, annealed, sheet. Exposed surface finish shall be No. 2B, No. 2D, No. 3, or No. 4 as indicated in "Duct Schedule" Article.

F. Aluminum Sheets: Comply with ASTM B209 Alloy 3003, H14 temper; with mill finish for concealed ducts, and standard, one-side bright finish for duct surfaces exposed to view.

G. Factory or Shop-Applied Antimicrobial Coating:

1. Apply to the surface of sheet metal that will form the interior surface of the duct. An untreated clear coating shall be applied to the exterior surface.
2. Antimicrobial compound shall be tested for efficacy by an NRTL and registered by the EPA for use in HVAC systems.
3. Coating containing the antimicrobial compound shall have a hardness of 2H, minimum, when tested in accordance with ASTM D3363.
4. Surface-Burning Characteristics: Maximum flame-spread index of 25 and maximum smoke-developed index of 50 when tested in accordance with UL 723; certified by an NRTL.
5. Shop-Applied Coating Color: White.
6. Antimicrobial coating on sheet metal is not required for duct containing liner treated with antimicrobial coating.

H. Reinforcement Shapes and Plates: ASTM A36, steel plates, shapes, and bars; black and galvanized.

1. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.

I. Tie Rods: Galvanized steel, 1/4-inch-minimum diameter for lengths 36 inches or less; 3/8-inch-minimum diameter for lengths longer than 36 inches

2.6 DUCT LINER

A. Fibrous-Glass Duct Liner: Comply with ASTM C1071, NFPA 90A, or NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard."

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. CertainTeed Corporation; Saint-Gobain North America.

b. Johns Manville; a Berkshire Hathaway company.
c. Knauf Insulation.
d. Owens Corning.
e. Voltek; a division of Sekisui America Corp.
f. Approved equivalent.

2. Antimicrobial Erosion-Resistant Coating: Apply to the surface of the liner that will form the interior surface of the duct to act as a moisture repellent and erosion-resistant coating. Antimicrobial compound shall be tested for efficacy by an NRTL and registered by the EPA for use in HVAC systems.
3. Water-Based Liner Adhesive: Comply with NFPA 90A or NFPA 90B and with ASTM C916.

a. Adhesive shall have a VOC content of 80 g/L or less.

B. Flexible Elastomeric Duct Liner: Preformed, cellular, closed-cell, sheet materials complying with ASTM C534, Type II, Grade 1; and with NFPA 90A or NFPA 90B.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Aeroflex USA.
b. Armacell LLC.
c. Ductmate Industries, Inc.
d. K-Flex USA.
e. Voltek; a division of Sekisui America Corp.
f. Approved equivalent.

2. Surface-Burning Characteristics: Maximum flame-spread index of 25 and maximum smoke-developed index of 50 when tested in accordance with UL 723; certified by an NRTL.
3. Liner Adhesive: As recommended by insulation manufacturer and complying with NFPA 90A or NFPA 90B.

a. Adhesive shall have a VOC content of 80 g/L or less.

C. Fiberglass-Free Duct Liner: Made from partially recycled cotton or polyester products and containing no fiberglass. Airstream surface overlaid with fire-resistant facing to prevent surface erosion by airstream, complying with NFPA 90A or NFPA 90B. Treat natural-fiber products with antimicrobial coating.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Acoustical Surfaces, Inc.
b. Ductmate Industries, Inc.
c. Approved equivalent.

2. Maximum Thermal Conductivity: 0.24 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature when tested in accordance with ASTM C518.
3. Surface-Burning Characteristics: Maximum flame-spread index of 25 and maximum smoke-developed index of 50 when tested in accordance with ASTM E84; certified by an NRTL.
4. Liner Adhesive: As recommended by insulation manufacturer and complying with NFPA 90A or NFPA 90B.

    a. Adhesive shall have a VOC content of 80 g/L or less.

D. Insulation Pins and Washers:

1. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.135-inch- diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch galvanized carbon-steel washer.
2. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- thick galvanized steel; with beveled edge sized as required to hold insulation securely in place, but not less than 1-1/2 inches in diameter.

E. Shop Application of Duct Liner: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 7-11, "Flexible Duct Liner Installation."

1. 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.
2. Apply adhesive to transverse edges of liner facing upstream that do not receive metal nosing.
3. Butt transverse joints without gaps, and coat joint with adhesive.
4. Fold and compress liner in corners of rectangular ducts or cut and fit to ensure butted-edge overlapping.
5. Do not apply liner in rectangular ducts with longitudinal joints, except at corners of ducts, unless duct size and dimensions of standard liner make longitudinal joints necessary.
6. Secure liner with mechanical fasteners 4 inches from corners and at intervals not exceeding 12 inches transversely; at 3 inches from transverse joints and at intervals not exceeding 18 inches longitudinally.
7. Secure transversely oriented liner edges facing the airstream with metal nosings that have either channel or "Z" profiles or are integrally formed from duct wall. Fabricate edge facings at the following locations:

    a. Fan discharges.
    b. Intervals of lined duct preceding unlined duct.
    c. Upstream edges of transverse joints in ducts where air velocities are higher than 2500 fpm or where indicated.

8. 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.

2.7 SEALANT AND GASKETS

A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested in accordance with UL 723; certified by an NRTL.

B. Two-Part Tape Sealing System:

1. Tape: Woven cotton fiber impregnated with mineral gypsum and modified acrylic/silicone activator to react exothermically with tape to form hard, durable, airtight seal.
2. Tape Width: 3 inches.
3. Sealant: Modified styrene acrylic.
4. Water resistant.
5. Mold and mildew resistant.
6. Maximum Static-Pressure Class: 10 inch wg, positive and negative.
7. Service: Indoor and outdoor.
8. Service Temperature: Minus 40 to plus 200 deg F.
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum.
10. Sealant shall have a VOC content of 420 g/L or less.

C. Water-Based Joint and Seam Sealant:

1. Application Method: Brush on.
2. Solids Content: Minimum 65 percent.
3. Shore A Hardness: Minimum 20.
4. Water resistant.
5. Mold and mildew resistant.
6. VOC: Maximum 75 g/L (less water).
7. Maximum Static-Pressure Class: 10 inch wg, positive and negative.
8. Service: Indoor or outdoor.
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

D. Flanged Joint Sealant: Comply with ASTM C920.

1. General: Single-component, acid-curing, silicone, elastomeric.
2. Type: S.
3. Grade: NS.
4. Class: 25.
5. Use: O.
6. Sealant shall have a VOC content of 420 g/L or less.

E. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

F. Round Duct Joint O-Ring Seals:

1. Seal shall provide maximum leakage class of 3 cfm/100 sq. ft. at 1-inch wg and shall be rated for10-inch wg static-pressure class, positive or negative.
2. EPDM O-ring to seal in concave bead in coupling or fitting spigot.

3. Double-lipped, EPDM O-ring seal, mechanically fastened to factory-fabricated couplings and fitting spigots.

2.8 HANGERS AND SUPPORTS

A. Hanger Rods for Noncorrosive Environments: Galvanized-steel rods and nuts.

B. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.

C. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct."

D. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A603.

E. Steel Cables for Stainless-Steel Ducts: Stainless steel complying with ASTM A492.

F. Steel Cable End Connections: Galvanized-steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.

G. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

H. Trapeze and Riser Supports:

1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
2. Supports for Stainless-Steel Ducts: Stainless-steel shapes and plates.
3. Supports for Aluminum Ducts: Aluminum or galvanized steel coated with zinc chromate.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and coordination drawings.

B. Install ducts in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.

C. Install ducts in maximum practical lengths with fewest possible joints.

D. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.

E. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.

F. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

G. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.

H. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.

I. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.

J. Install fire and smoke dampers where indicated on Drawings and as required by code, and by local authorities having jurisdiction. Comply with requirements in Section 233300 "Air Duct Accessories" for fire and smoke dampers and specific installation requirements of the damper UL listing.

K. Install heating coils, cooling coils, air filters, dampers, and all other duct-mounted accessories in air ducts where indicated on Drawings.

L. Protect duct interiors from moisture, construction debris and dust, and other foreign materials both before and after installation. Comply with SMACNA's "IAQ Guidelines for Occupied Buildings Under Construction," Appendix G, "Duct Cleanliness for New Construction Guidelines."

M. Elbows: Use long-radius elbows wherever they fit.

1. Fabricate 90-degree rectangular mitered elbows to include turning vanes.
2. Fabricate 90-degree round elbows with a minimum of three segments for 12 inches and smaller and a minimum of five segments for 14 inches and larger.

N. Branch Connections: Use lateral or conical branch connections.

3.2 INSTALLATION OF EXPOSED DUCTWORK

A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.

B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.

C. Grind welds to provide smooth surface free of burrs, sharp edges, and weld splatter. When welding stainless steel with a No. 3 or 4 finish, grind the welds flush, polish the exposed welds, and treat the welds to remove discoloration caused by welding.

D. Maintain consistency, symmetry, and uniformity in arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.

E. Repair or replace damaged sections and finished work that does not comply with these requirements.

3.3 ADDITIONAL INSTALLATION REQUIREMENTS FOR TYPE 1 COMMERCIAL KITCHEN GREASE HOOD EXHAUST DUCT

A. Install ducts in accordance with NFPA 96, "Ventilation Control and Fire Protection of Commercial Cooking Operation"; SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; and SMACNA's "Kitchen Ventilation Systems and Food Service Equipment Fabrication and Installation Guidelines" unless otherwise indicated.

B. Install all ducts without dips and traps that may hold grease, and sloped a minimum of 2 percent to drain grease back to the hood.

C. All ducts exposed to view shall be constructed of stainless steel as per "Duct Schedule" Article. All ducts concealed from view shall be stainless steel as per "Duct Schedule" Article.

D. All joints shall be welded and shall be telescoping, bell, or flange joint as per NFPA 96.

E. Install fire-rated access panel assemblies at each change in direction and at maximum intervals of 20 feet in horizontal ducts, and at every floor for vertical ducts, or as indicated on Drawings.

F. Do not penetrate fire-rated assemblies except as allowed by applicable building codes and authorities having jurisdiction.

3.4 DUCTWORK EXPOSED TO WEATHER

A. All external joints are to have secure watertight mechanical connections. Seal all openings to provide weatherproof construction.

B. Construct ductwork to resist external loads of wind, snow, ice, and other effects of weather. Provide necessary supporting structures.

C. Single Wall:

1. Ductwork shall be galvanized steel.

    a. If duct outer surface is uninsulated, protect outer surface with suitable paint. Paint materials and application requirements are specified in Section 099113 "Exterior Painting."

2. Where ducts have external insulation, provide weatherproof aluminum jacket. See Section 230713 "Duct Insulation."

D. Double Wall:

1. Ductwork shall comply with requirements in "Double-Wall Rectangular Ducts and Fittings" or "Double-Wall Round and Flat-Oval Ducts and Fittings" Article.

2. Ductwork outer wall shall be Type 316 stainless steel indicated by manufacturer to be suitable for outdoor installation.
3. Provide interstitial insulation.

3.5 DUCT SEALING

A. Seal ducts for duct static-pressure, seal classes, and leakage classes specified in "Duct Schedule" Article in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

B. Seal ducts at a minimum to the following seal classes in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible":

1. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
2. Outdoor, Supply-Air Ducts: Seal Class A.
3. Outdoor, Exhaust Ducts: Seal Class C.
4. Outdoor, Return-Air Ducts: Seal Class C.
5. Unconditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg and Lower: Seal Class B.
6. Unconditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg: Seal Class A.
7. Unconditioned Space, Exhaust Ducts: Seal Class C.
8. Unconditioned Space, Return-Air Ducts: Seal Class B.
9. Conditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg and Lower: Seal Class C.
10. Conditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg: Seal Class B.
11. Conditioned Space, Exhaust Ducts: Seal Class B.
12. Conditioned Space, Return-Air Ducts: Seal Class C.

3.6 HANGER AND SUPPORT INSTALLATION

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."

B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.

1. Where practical, install concrete inserts before placing concrete.
2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches thick.
4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.
5. Do not use powder-actuated concrete fasteners for seismic restraints.

C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum

Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.

D. Hangers Exposed to View: Threaded rod and angle or channel supports.

E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet.

F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.7 CONNECTIONS

A. Make connections to equipment with flexible connectors complying with Section 233300 "Air Duct Accessories."

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.8 PAINTING

A. Paint interior of metal ducts that are visible through registers and grilles and that do not have duct liner. Apply one coat of flat, black, latex paint over a compatible galvanized-steel primer. Paint materials and application requirements are specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

3.9 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Leakage Tests:

1. Comply with SMACNA's "HVAC Air Duct Leakage Test Manual." Submit a test report for each test.
2. Test the following systems:

    a. Ducts with a Pressure Class Higher Than 3-Inch wg: Test representative duct sections, selected by Director’s Representative from sections installed, totaling no less than 25 percent of total installed duct area for each designated pressure class.
    b. Supply Ducts with a Pressure Class of 3-Inch wg or Higher: Test representative duct sections, selected by Director’s Representative from sections installed, totaling no less than 100 percent of total installed duct area for each designated pressure class.
    c. Return Ducts with a Pressure Class of 3- Inch wg or Higher: Test representative duct sections, selected by Director’s Representative from sections installed, totaling no less than 100 percent of total installed duct area for each designated pressure class.
    d. Exhaust Ducts with a Pressure Class of 3-Inch wg or Higher: Test representative duct sections, selected by Director’s Representative from sections installed, totaling

no less than 100 percent of total installed duct area for each designated pressure class.

e. Outdoor-Air Ducts with a Pressure Class of 3-Inch wg or Higher: Test representative duct sections, selected by Director's Representative from sections installed, totaling no less than 100 percent of total installed duct area for each designated pressure class.

3. Disassemble, reassemble, and seal segments of systems to accommodate leakage testing and for compliance with test requirements.
4. Testing of each duct section is to be performed with access doors, coils, filters, dampers, and other duct-mounted devices in place as designed. No devices are to be removed or blanked off so as to reduce or prevent additional leakage.
5. Test for leaks before applying external insulation.
6. Conduct tests at static pressures equal to maximum design pressure of system or section being tested. If static-pressure classes are not indicated, test system at maximum system design pressure. Do not pressurize systems above maximum design operating pressure.
7. Give seven days' advance notice for testing.

C. Duct System Cleanliness Tests:

1. Visually inspect duct system to ensure that no visible contaminants are present.
2. Test sections of metal duct system, chosen randomly by Director's Representative, for cleanliness in accordance with "Description of Method 3 - NADCA Vacuum Test" in NADCA ACR, "Assessment, Cleaning and Restoration of HVAC Systems."

a. Acceptable Cleanliness Level: Net weight of debris collected on the filter media shall not exceed 0.75 mg/100 sq. cm.

D. Duct system will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

3.10 DUCT CLEANING

A. Clean new duct system(s) before testing, adjusting, and balancing.

B. For cleaning of existing ductwork, see Section 230130.52 "Existing HVAC Air Distribution System Cleaning."

C. Use duct cleaning methodology as indicated in NADCA ACR.

D. Use service openings for entry and inspection.

1. Provide openings with access panels appropriate for duct static-pressure and leakage class at dampers, coils, and any other locations where required for inspection and cleaning access. Provide insulated panels for insulated or lined duct. Patch insulation and liner as recommended by duct liner manufacturer. Comply with Section 233300 "Air Duct Accessories" for access panels and doors.
2. Disconnect and reconnect flexible ducts as needed for cleaning and inspection.
3. Remove and reinstall ceiling to gain access during the cleaning process.

E. Particulate Collection and Odor Control:

1. When venting vacuuming system inside the building, use HEPA filtration with 99.97 percent collection efficiency for 0.3-micron-size (or larger) particles.
2. When venting vacuuming system to outdoors, use filter to collect debris removed from HVAC system, and locate exhaust downwind and away from air intakes and other points of entry into building.

F. Clean the following components by removing surface contaminants and deposits:

1. Air outlets and inlets (registers, grilles, and diffusers).
2. Supply, return, and exhaust fans including fan housings, plenums (except ceiling supply and return plenums), scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.
3. Air-handling unit internal surfaces and components including mixing box, coil section, air wash systems, spray eliminators, condensate drain pans, humidifiers and dehumidifiers, filters and filter sections, and condensate collectors and drains.
4. Coils and related components.
5. Return-air ducts, dampers, actuators, and turning vanes except in ceiling plenums and mechanical equipment rooms.
6. Supply-air ducts, dampers, actuators, and turning vanes.
7. Dedicated exhaust and ventilation components and makeup air systems.

G. Mechanical Cleaning Methodology:

1. Clean metal duct systems using mechanical cleaning methods that extract contaminants from within duct systems and remove contaminants from building.
2. Use vacuum-collection devices that are operated continuously during cleaning. Connect vacuum device to downstream end of duct sections so areas being cleaned are under negative pressure.
3. Use mechanical agitation to dislodge debris adhered to interior duct surfaces without damaging integrity of metal ducts, duct liner, or duct accessories.
4. Clean fibrous-glass duct liner with HEPA vacuuming equipment; do not permit duct liner to get wet. Replace fibrous-glass duct liner that is damaged, deteriorated, or delaminated or that has friable material, mold, or fungus growth.
5. Clean coils and coil drain pans in accordance with NADCA ACR. Keep drain pan operational. Rinse coils with clean water to remove latent residues and cleaning materials; comb and straighten fins.
6. Provide drainage and cleanup for wash-down procedures.
7. Antimicrobial Agents and Coatings: Apply EPA-registered antimicrobial agents if fungus is present. Apply antimicrobial agents in accordance with manufacturer's written instructions after removal of surface deposits and debris.

3.11 STARTUP

A. Air Balance: Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC."

3.12 DUCT SCHEDULE

A. Fabricate ducts with galvanized sheet steel except as otherwise indicated and as follows:

1. Fabricate all ducts to achieve SMACNA pressure class, seal class, and leakage class as indicated below.

B. Supply Ducts:

1. Ducts Connected to Constant-Volume Air-Handling Units:

a. Pressure Class: Positive 3- inch wg.
b. Minimum SMACNA Seal Class: A.
c. SMACNA Leakage Class for Rectangular: 4.
d. SMACNA Leakage Class for Round and Flat Oval: 2.

2. Ducts Connected to Variable-Air-Volume Air-Handling Units:

a. Pressure Class: Positive 3- inch wg.
b. Minimum SMACNA Seal Class: A.
c. SMACNA Leakage Class for Rectangular: 4.
d. SMACNA Leakage Class for Round and Flat Oval: 2.

3. Ducts Connected to Equipment Not Listed Above:

a. Pressure Class: Positive 3-inch wg.
b. Minimum SMACNA Seal Class: A.
c. SMACNA Leakage Class for Rectangular: 4.
d. SMACNA Leakage Class for Round and Flat Oval: 2.

C. Return Ducts:

1. Ducts Connected to Air-Handling Units:

a. Pressure Class: Positive or negative 3- inch wg.
b. Minimum SMACNA Seal Class: A.
c. SMACNA Leakage Class for Rectangular: 4.
d. SMACNA Leakage Class for Round and Flat Oval: 2.

2. Ducts Connected to Equipment Not Listed above:

a. Pressure Class: Positive or negative 3-inch wg.
b. Minimum SMACNA Seal Class: A.
c. SMACNA Leakage Class for Rectangular: 4.
d. SMACNA Leakage Class for Round and Flat Oval: 2.

D. Exhaust Ducts:

1. Ducts Connected to Fans Exhausting (ASHRAE 62.1, Class 1 and 2) Air:

a. Pressure Class: Negative 3-inch wg.

b. Minimum SMACNA Seal Class: A negative pressure, and A if positive pressure.
c. SMACNA Leakage Class for Rectangular: 4.
d. SMACNA Leakage Class for Round and Flat Oval: 2.

2. Ducts Connected to Air-Handling Units:

a. Pressure Class: Positive or negative 3- Inch wg.
b. Minimum SMACNA Seal Class: A if negative pressure, and A if positive pressure.
c. SMACNA Leakage Class for Rectangular: 4.
d. SMACNA Leakage Class for Round and Flat Oval: 2.

3. Ducts Connected to Commercial Kitchen Hoods: Comply with NFPA 96.

a. Exposed to View: Type 304, stainless-steel sheet, No. 4 finish.
b. Concealed: Type 304, stainless-steel sheet, No. 2D finish.
c. Welded seams and joints.
d. Pressure Class: Positive or negative 3-inch wg.
e. Airtight/watertight.

E. Outdoor-Air (Not Filtered, Heated, or Cooled) Ducts:

1. Ducts Connected to Air-Handling Units:

a. Pressure Class: Positive or negative 3- inch wg.
b. Minimum SMACNA Seal Class: A.
c. SMACNA Leakage Class for Rectangular: 4.
d. SMACNA Leakage Class for Round and Flat Oval: 2.

F. Intermediate Reinforcement:

1. Galvanized-Steel Ducts: Galvanized steel or carbon steel coated with zinc-chromate primer.

2. Stainless-Steel Ducts:

a. Exposed to Airstream: Match duct material.
b. Not Exposed to Airstream: Galvanized.

3. Aluminum Ducts: Aluminum or galvanized steel coated with zinc chromate.

G. Liner:

1. Supply-Air Ducts: Fibrous glass, Type I, 1 inch thick.
2. Return-Air Ducts: Fibrous glass, Type I, 1 inch thick.
3. Exhaust-Air Ducts: Fibrous glass, Type I, 1 inch thick.
4. Supply Fan Plenums: Fibrous glass, Type II, 1 inch thick.
5. Return- and Exhaust-Fan Plenums: Fibrous glass, Type II, 2 inches thick.
6. Transfer Ducts: Fibrous glass, Type I, 1 inch thick.

H. Double-Wall Duct Interstitial Insulation:

1. Supply-Air Ducts: 1 inch thick.
2. Return-Air Ducts: 1 inch thick.
3. Exhaust-Air Ducts: 2 inch thick.

I. Elbow Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."

    a. Velocity 1000 fpm or Lower:

        1) Radius Type RE 1 with minimum 0.5 radius-to-diameter ratio.
        2) Mitered Type RE 4 without vanes.

    b. Velocity 1000 to 1500 fpm:

        1) Radius Type RE 1 with minimum 1.0 radius-to-diameter ratio.
        2) Radius Type RE 3 with minimum 0.5 radius-to-diameter ratio and two vanes.
        3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."

    c. Velocity 1500 fpm or Higher:

        1) Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
        2) Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
        3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."

2. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."

    a. Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
    b. Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
    c. Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."

3. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "Round Duct Elbows."

    a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.
        1) Velocity 1000 fpm or Lower: 0.5 radius-to-diameter ratio and three segments for 90-degree elbow.

2) Velocity 1500 fpm or Higher: 1.5 radius-to-diameter ratio and five segments for 90-degree elbow.
3) Radius-to Diameter Ratio: 1.5.

b. Round Elbows, 12 Inches and Smaller in Diameter: Stamped or pleated.
c. Round Elbows, 14 Inches and Larger in Diameter: Standing seam.

J. Branch Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-6, "Branch Connection."

a. Rectangular Main to Rectangular Branch: 45-degree entry.
b. Rectangular Main to Round Branch: Conical spin in.

2. Round and Flat Oval: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees." Saddle taps are permitted in existing duct.

a. Velocity 1000 fpm or Lower: 90-degree tap.
b. Velocity 1000 to 1500 fpm: Conical tap.
c. Velocity 1500 fpm or Higher: 45-degree lateral.

END OF SECTION 233113

SECTION 233300 - AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Backdraft and pressure relief dampers.
2. Manual volume dampers.
3. Control dampers.
4. Flange connectors.
5. Turning vanes.
6. Remote damper operators.
7. Duct-mounted access doors.
8. Duct access panel assemblies.
9. Flexible connectors.
10. Duct accessory hardware.

B. Related Requirements:

1. Section 233346 "Flexible Ducts" for insulated and non-insulated flexible ducts.
2. Section 233723 "HVAC Gravity Ventilators" for roof-mounted ventilator caps.

1.3 SUBMITTALS

A. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.

B. Manufacturer’s installation instructions shall be provided along with product data.

C. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).

D. Product Data: For each type of product.

1. For duct silencers, include pressure drop, dynamic insertion loss, and self-generated noise data. Include breakout noise calculations for high-transmission-loss casings.

E. Shop Drawings: For duct accessories. Include plans, elevations, sections, details, and attachments to other work.

1. Detail duct accessories' fabrication and installation in ducts and other construction. Include dimensions, weights, loads, and required clearances; and method of field assembly into duct systems and other construction. Include the following:

    a. Special fittings.
    b. Manual volume damper installations.
    c. Control-damper installations.
    d. Fire-damper, smoke-damper, combination fire- and smoke-damper, ceiling, and corridor-damper installations, including sleeves; and duct-mounted access doors and remote damper operators.
    e. Include diagrams for power, signal, and control wiring.

F. Coordination Drawings: Reflected ceiling plans, or BIM model, drawn to scale, on which ceiling-mounted access panels and access doors required for access to duct accessories are shown and coordinated with each other, using input from installers of the items involved.

G. Source quality-control reports.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For air duct accessories to include in operation and maintenance manuals.

1.5 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. Fusible Links: Furnish quantity equal to 10 percent of amount installed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Comply with NFPA 90A and NFPA 90B.

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

2.2 BACKDRAFT AND PRESSURE RELIEF DAMPERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Greenheck Fan Corporation.
2. Lloyd Industries, Inc.
3. NCA Manufacturing, Inc.
4. United Enertech.
5. Approved equivalent.

B. Description: Gravity balanced.

C. Performance:

1. Maximum Air Velocity: 2000 fpm.
2. Maximum System Pressure: 3 inches wg.
3. AMCA Certification: Test and rate in accordance with AMCA 511.
4. Leakage:

    a. Class IA: Leakage shall not exceed 3 cfm/sq. ft. against 1-inch wg differential static pressure.
    b. Class I: Leakage shall not exceed 4 cfm/sq. ft. against 1-inch wg differential static pressure.
    c. Class II: Leakage shall not exceed 10 cfm/sq. ft. against 1-inch wg differential static pressure.
    d. Class III: Leakage shall not exceed 40 cfm/sq. ft. against 1-inch wg differential static pressure.

D. Construction:

1. Frame:

    a. Hat shaped.
    b. 16-gauge- thick, galvanized sheet steel, with welded or mechanically attached corners and mounting flange.

2. Blades:

    a. Multiple single-piece blades.
    b. Center pivoted, maximum 6-inch width, 16-gauge- thick, galvanized sheet steel with sealed edges.

3. Blade Action: Parallel.

E. Blade Seals: Neoprene, mechanically locked.

F. Blade Axles:

1. Material: Galvanized steel
2. Diameter: 0.20 inch.

G. Tie Bars and Brackets: Galvanized steel.

H. Return Spring: Adjustable tension.

I. Bearings: Steel ball or Brass sleeve.

J. Damper Actuator - Electric:

1. Electric - 24 V ac.
2. UL 873 plenum rated.
3. Fully modulating with fail-safe spring return.

    a. Sufficient motor torque and spring torque to drive damper fully closed with adequate force to achieve required damper seal.
    b. Minimum 90-degree drive rotation.

4. Clockwise or counterclockwise drive rotation as required for application.
5. Environmental Operating Range:

    a. Temperature: Minus 40 to plus 130 deg F.
    b. Humidity: 5 to 95 percent relative humidity noncondensing.

6. Environmental Enclosure: NEMA 2.
7. Actuator to be factory mounted and provided with a single-point wiring connection.

K. Controllers, Electrical Devices, and Wiring:

1. Comply with requirements for electrical devices and connections specified in Section 230923 "Direct Digital Control (DDC) System for HVAC."
2. Electrical Connection: 24 V, 60 Hz.

L. Accessories:

1. Adjustment device to permit setting for varying differential static pressure.
2. Counterweights and spring-assist kits for vertical airflow installations.
3. Chain pulls.
4. Screen Mounting:

    a. Front mounted in sleeve.

        1) Sleeve Thickness: 20 gauge minimum.
        2) Sleeve Length: 6 inches minimum.

5. Screen Material: Galvanized steel.
6. Screen Type: Insect.
7. 90-degree stops.

2.3 MANUAL VOLUME DAMPERS

A. Standard, Steel, Manual Volume Dampers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Aire Technologies, Inc.; a DMI company.
b. Cesco Products; a division of MESTEK, Inc.
c. Greenheck Fan Corporation.
d. United Enertech.
e. Approved equivalent.

2. Performance:

a. Leakage Rating Class III: Leakage not exceeding 40 cfm/sq. ft. against 1-inch wg differential static pressure.

3. Construction:

a. Linkage out of airstream.
b. Suitable for horizontal or vertical airflow applications.

4. Frames:

a. Hat-shaped, 16-gauge- thick, galvanized sheet steel.
b. Mitered and welded corners.
c. Flanges for attaching to walls and flangeless frames for installing in ducts.

5. Blades:

a. Multiple or single blade.
b. Parallel- or opposed-blade design.
c. Stiffen damper blades for stability.
d. Galvanized steel; 16 gauge thick.

6. Blade Axles: Galvanized steel.
7. Bearings:

a. Oil-impregnated stainless steel sleeve.
b. Dampers mounted with vertical blades to have thrust bearing at each end of every blade.

8. Tie Bars and Brackets: Galvanized steel.
9. Locking device to hold damper blades in a fixed position without vibration.

B. Standard, Aluminum, Manual Volume Dampers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Cesco Products; a division of MESTEK, Inc.
b. McGill AirFlow LLC.
c. RoofGoose Vent.
d. United Enertech.
e. Approved equivalent.

2. Performance:

    a. Leakage Rating Class III: Leakage not exceeding 40 cfm/sq. ft. against 1-inch wg differential static pressure.

3. Construction:

    a. Linkage out of airstream.
    b. Suitable for horizontal or vertical airflow applications.

4. Frames:

    a. Hat-shaped, 0.10-inch- thick, aluminum sheet channels.
    b. Flanges for attaching to walls and flangeless frames for installing in ducts.

5. Blades:

    a. Multiple or single blade.
    b. Parallel- or opposed-blade design.
    c. Stiffen damper blades for stability.
    d. Roll-Formed Aluminum Blades: 0.10-inch- thick aluminum sheet.
    e. Extruded-Aluminum Blades: 0.050-inch- thick extruded aluminum.

6. Blade Axles: Galvanized steel.
7. Bearings:

    a. Oil-impregnated bronze.
    b. Dampers mounted with vertical blades to have thrust bearing at each end of every blade.

8. Tie Bars and Brackets: Aluminum.
9. Locking device to hold damper blades in a fixed position without vibration.

C. Low-Leakage, Steel, Manual Volume Dampers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Greenheck Fan Corporation.
    b. Lloyd Industries, Inc.
    c. United Enertech.
    d. Approved equivalent.

2. Performance:

    a. AMCA Certification: Test and rate in accordance with AMCA 511.
    b. Leakage:

        1) Class IA: Leakage shall not exceed 3 cfm/sq. ft. against 1-inch wg differential static pressure.

2) Class I: Leakage shall not exceed 4 cfm/sq. ft. against 1-inch wg differential static pressure.
3) Class II: Leakage shall not exceed 10 cfm/sq. ft. against 1-inch wg differential static pressure.

3. Construction:

a. Linkage: Out of airstream.
b. Suitable for horizontal or vertical airflow applications.

4. Frames:

a. Hat, U, or angle shaped.
b. Thickness: 16-gauge galvanized sheet steel.
c. Mitered and welded corners.
d. Flanges for attaching to walls and flangeless frames for installing in ducts.

5. Blades:

a. Multiple or single blade.
b. Parallel- or opposed-blade design.
c. Stiffen damper blades for stability.
d. Galvanized, roll-formed steel; 16 gauge thick.

6. Blade Edging Seals:

a. Closed-cell neoprene.
b. Inflatable seal blade edging or replaceable rubber seals.

7. Blade Jamb Seals: Flexible metal compression type.
8. Blade Axles: Galvanized steel.
9. Bearings:

a. Oil-impregnated bronze.
b. Dampers mounted with vertical blades to have thrust bearing at each end of every blade.

10. Tie Bars and Brackets: Galvanized steel.
11. Locking device to hold damper blades in a fixed position without vibration.

D. Low-Leakage, Aluminum, Manual Volume Dampers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Lloyd Industries, Inc.
b. McGill AirFlow LLC.
c. United Enertech.
d. Approved equivalent.

2. Performance:

    a. AMCA Certification: Test and rate in accordance with AMCA 511.
    b. Leakage:

        1) Class IA: Leakage shall not exceed 3 cfm/sq. ft. against 1-inch wg differential static pressure.
        2) Class I: Leakage shall not exceed 4 cfm/sq. ft. against 1-inch wg differential static pressure.
        3) Class II: Leakage shall not exceed 10 cfm/sq. ft. against 1-inch wg differential static pressure.

3. Construction:

    a. Linkage out of airstream.
    b. Suitable for horizontal or vertical airflow applications.

4. Frames:

    a. Hat, U, or angle shaped.
    b. Thickness: 0.08-inch aluminum sheet channels.
    c. Flanges for attaching to walls and flangeless frames for installing in ducts.

5. Blades:

    a. Multiple or single blade.
    b. Parallel- or opposed-blade design.
    c. Roll-Formed Aluminum Blades:0.072-inch thick aluminum sheet.
    d. Extruded-Aluminum Blades: 0.050-inch- thick extruded aluminum.

6. Blade Edging Seals:

    a. Closed-cell neoprene
    b. Inflatable seal blade edging or replaceable rubber seals.

7. Blade Jamb Seals: Flexible metal compression type.
8. Blade Axles: Galvanized steel.
9. Bearings:

    a. Oil-impregnated bronze.
    b. Dampers mounted with vertical blades to have thrust bearings at each end of every blade.

10. Tie Bars and Brackets: Galvanized steel.
11. Locking device to hold damper blades in a fixed position without vibration.

E. Jackshaft:

1. Size: 1-inch diameter.
2. Material: Galvanized-steel pipe rotating within pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.

3. Length and Number of Mountings: As required to connect linkage of each damper in multiple-damper assembly.

F. Damper Hardware:

1. Zinc-plated, die-cast core with dial and handle, made of 3/32-inch- thick zinc-plated steel, and a 3/4-inch hexagon locking nut.
2. Include center hole to suit damper operating-rod size.
3. Include elevated platform for insulated duct mounting.

2.4 CONTROL DAMPERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Greenheck Fan Corporation.
2. Lloyd Industries, Inc.
3. McGill AirFlow LLC.
4. United Enertech.
5. Approved equivalent.

B. General Requirements:

1. Unless otherwise indicated, use parallel-blade configuration for two-position control, equipment isolation service, and when mixing two airstreams. For other applications, use opposed-blade configuration.
2. Factory or field assemble multiple damper sections to provide a single damper assembly of size required by the application.

C. Performance:

1. AMCA Certification: Test and rate in accordance with AMCA 511.
2. Leakage:

a. Class IA: Leakage shall not exceed 3 cfm/sq. ft. against 1-inch wg differential static pressure.
b. Class I: Leakage shall not exceed 4 cfm/sq. ft. against 1-inch wg differential static pressure.
c. Class II: Leakage shall not exceed 10 cfm/sq. ft. against 1-inch wg differential static pressure.
d. Class III: Leakage shall not exceed 40 cfm/sq. ft. against 1-inch wg differential static pressure.

3. Pressure Drop: 0.05 inch wg at 1500 fpm across a 24-by-24-inch damper when tested in accordance with AMCA 500-D, Figure 5.3.
4. Velocity: Up to 3000 fpm.
5. Temperature: Minus 25 to plus 180 deg F.
6. Pressure Rating: Damper close-off pressure equal to fan shutoff pressure with a maximum blade deflection of 1/200 of blade length.

D. Construction:

1. Linkage out of airstream.
2. Suitable for horizontal or vertical airflow applications.
3. Frames:

    a. Hat, U, or angle shaped.
    b. 16-gauge- thick, galvanized sheet steel.
    c. Mitered and welded corners.
    d. Flanges for attaching to walls and flangeless frames for installing in ducts.

4. Blades:

    a. Multiple blade with maximum blade width of 6 inches.
    b. Opposed-blade design.
    c. Galvanized steel.
    d. 16-gauge- thick single skin.

5. Blade Edging Seals:

    a. Replaceable Closed-cell neoprene.
    b. Inflatable seal blade edging, or replaceable rubber seals.

6. Blade Jamb Seal: Flexible stainless steel, compression type.
7. Blade Axles: 1/2-inch diameter; [galvanized] [stainless] steel.
8. Blade-Linkage Hardware: Zinc-plated steel and brass; ends sealed against blade bearings. Linkage mounted out of air stream.
9. Bearings:

    a. Oil-impregnated bronze.
    b. Dampers mounted with vertical blades to have thrust bearings at each end of every blade.

E. Damper Actuator - Electric:

1. Electric - 24 V ac.
2. UL 873, plenum rated.
3. Fully modulating with fail-safe spring return.

    a. Sufficient motor torque and spring torque to drive damper fully open and fully closed with adequate force to achieve required damper seal.
    b. Minimum 90-degree drive rotation.

4. Clockwise or counterclockwise drive rotation as required for application.
5. Environmental Operating Range:

    a. Temperature: Minus 40 to plus 130 deg F.
    b. Humidity: 5 to 95 percent relative humidity noncondensing.

6. Environmental enclosure: NEMA 2.
7. Actuator to be factory mounted and provided with a single-point wiring connection.

F. Controllers, Electrical Devices, and Wiring:

1. Comply with requirements for electrical devices and connections specified in Section 230923 "Direct Digital Control (DDC) System for HVAC."
2. Electrical Connection: 24 V, 60 Hz.

2.5 FLANGE CONNECTORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. CL WARD & Family Inc.
2. Ductmate Industries, Inc; a DMI company.
3. Approved equivalent.

B. Description: Add-on or roll-formed, factory fabricated, slide-on transverse flange connectors, gaskets, and components.

C. Material: Galvanized steel.

D. Gauge and Shape: Match connecting ductwork.

2.6 TURNING VANES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Aero-Dyne Sound Control Co.
2. CL WARD & Family Inc.
3. Ductmate Industries, Inc; a DMI company.
4. Approved equivalent.

B. Manufactured Turning Vanes for Metal Ducts: Fabricate curved blades of galvanized sheet steel; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.

1. Acoustic Turning Vanes: Fabricate airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.

C. Manufactured Turning Vanes for Nonmetal Ducts: Fabricate curved blades of resin-bonded fiberglass with acrylic polymer coating; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.

D. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."

E. Vane Construction:

1. Single wall for ducts up to 48 inches wide and double wall for larger dimensions.

2.7 REMOTE DAMPER OPERATORS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. United Enertech.
2. Approved equivalent.

B. Description: Cable system designed for remote manual damper adjustment.

C. Tubing: Copper.

D. Cable: Stainless steel.

E. Wall-Box Mounting: Surface.

F. Wall-Box Cover-Plate Material: Steel.

2.8 DUCT-MOUNTED ACCESS DOORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. CL WARD & Family Inc.
2. Ductmate Industries, Inc; a DMI company.
3. United Enertech.
4. Approved equivalent.

B. Duct-Mounted Access Doors: Fabricate access panels in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figure 7-2 (7-2M), "Duct Access Doors and Panels," and Figure 7-3, "Access Doors - Round Duct."

1. Door:

a. Double wall, rectangular.
b. Galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class.
c. 24-gauge- thick galvanized steel door panel.
d. Vision panel.
e. Hinges and Latches: 1-by-1-inch butt or piano hinge and cam latches.
f. Fabricate doors airtight and suitable for duct pressure class.

2. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.

a. 24-gauge- thick galvanized steel or 0.032-inch- thick aluminum frame.

3. Number of Hinges and Locks:

a. Access Doors Less Than 12 Inches Square: No hinges and two sash locks.
b. Access Doors up to 18 Inches Square: Two hinges and two sash locks.

c. Access Doors up to 24 by 48 Inches: Three hinges and two compression latches with outside and inside handles.
d. Access Doors Larger Than 24 by 48 Inches: Four hinges and two compression latches with outside and inside handles.

C. Pressure Relief Access Door:

1. Door and Frame Material: Galvanized sheet steel.

a. 24-gauge- thick galvanized steel or 24-gauge- thick stainless steel door panel.

2. Door: [Single wall] [Double wall with insulation fill] with metal thickness applicable for duct pressure class.
3. Operation: Open outward for positive-pressure ducts and inward for negative-pressure ducts.
4. Factory set at 3.0 to 8.0 inches wg.
5. Doors close when pressures are within set-point range.
6. Hinge: Continuous piano.
7. Latches: Cam.
8. Seal: Neoprene or foam rubber.
9. Insulation Fill: 1-inch- thick, fibrous-glass or polystyrene-foam board.

2.9 DUCT ACCESS PANEL ASSEMBLIES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. CL WARD & Family Inc.
2. Ductmate Industries, Inc; a DMI company.
3. Approved equivalent.

B. Access panels used in cooking applications:

1. Labeled compliant to NFPA 96 for grease duct access doors.
2. Labeled in accordance with UL 1978 by an NRTL.

C. Panel and Frame: Minimum thickness 16-gauge stainless steel.

D. Fasteners: Stainless steel. Panel fasteners shall not penetrate duct wall.

E. Gasket: Comply with NFPA 96, grease-tight, high-temperature ceramic fiber, rated for minimum 2000 deg F.

F. Minimum Pressure Rating: 10 inches wg positive or negative.

2.10 FLEXIBLE CONNECTORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. CL WARD & Family Inc.
2. Ductmate Industries, Inc; a DMI company.
3. DynAir; a Carlisle Company.
4. Approved equivalent.

B. Fire-Performance Characteristics: Adhesives, sealants, fabric materials, and accessory materials shall have flame-spread index not exceeding 25 and smoke-developed index not exceeding 50 when tested in accordance with ASTM E84.

C. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

D. Materials: Flame-retardant or noncombustible fabrics.

E. Coatings and Adhesives: Comply with UL 181, Class 1.

F. Metal-Edged Connectors: Factory fabricated with a fabric strip 5-3/4 inches wide attached to two strips of 2-3/4-inch- wide, 0.028-inch-thick, galvanized sheet steel or 0.032-inch- thick aluminum sheets. Provide metal compatible with connected ducts.

G. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.

1. Minimum Weight: 26 oz./sq. yd.
2. Tensile Strength: 480 lbf/inch in the warp and [360 lbf/inch] <Insert value> in the filling.
3. Service Temperature: Minus 40 to plus 200 deg F.

H. Outdoor System, Flexible Connector Fabric: Glass fabric double coated with weatherproof, synthetic rubber resistant to UV rays and ozone.

1. Minimum Weight: 24 oz./sq. yd.
2. Tensile Strength: 530 lbf/inch in the warp and 440 lbf/inch in the filling.
3. Service Temperature: Minus 50 to plus 250 deg F.

2.11 DUCT ACCESSORY HARDWARE

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. CL WARD & Family Inc.
2. United Enertech.
3. Approved equivalent.

B. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct-insulation thickness.

C. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

2.12 MATERIALS

A. Galvanized Sheet Steel: Comply with ASTM A653.

1. Galvanized Coating Designation: G90.
2. Exposed-Surface Finish: Mill phosphatized.

B. Stainless Steel Sheets: Comply with ASTM A480, Type 304, and having a No. 2 finish for concealed ducts and <Insert finish designation> finish for exposed ducts.

C. Aluminum Sheets: Comply with ASTM B209, Alloy 3003, Temper H14; with mill finish for concealed ducts and standard, one-side bright finish for exposed ducts.

D. Extruded Aluminum: Comply with ASTM B221, Alloy 6063, Temper T6.

E. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless steel ducts.

F. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install duct accessories in accordance with applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116 for fibrous-glass ducts.

B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless steel accessories in stainless steel ducts, and aluminum accessories in aluminum ducts.

C. Install [backdraft] [control] dampers at inlet of exhaust fans or exhaust ducts as close as possible to exhaust fan unless otherwise indicated.

D. Where multiple damper sections are necessary to achieve required dimensions, provide reinforcement to fully support damper assembly when fully closed at full system design static pressure.

E. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.

1. Install steel volume dampers in steel ducts.
2. Install aluminum volume dampers in aluminum ducts.

F. Set dampers to fully open position before testing, adjusting, and balancing.

G. Install test holes at fan inlets and outlets and elsewhere as indicated and as needed for testing and balancing.

H. Install fire dampers in accordance with UL listing.

I. Connect ducts to duct silencers rigidly.

J. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:

1. On both sides of duct coils.
2. Upstream and downstream from duct filters.
3. At outdoor-air intakes and mixed-air plenums.
4. At drain pans and seals.
5. Downstream from manual volume dampers, control dampers, backdraft dampers, and equipment.
6. Adjacent to and close enough to fire or smoke dampers, to reset or reinstall fusible links. Access doors for access to fire or smoke dampers having fusible links shall be pressure relief access doors and shall be outward operation for access doors installed upstream from dampers and inward operation for access doors installed downstream from dampers.
7. At each change in direction and at maximum 50-ft. spacing.
8. Upstream and downstream from turning vanes.
9. Upstream or downstream from duct silencers.
10. For grease ducts, install at locations and spacing as required by NFPA 96.
11. Control devices requiring inspection.
12. Elsewhere as indicated.

K. Install access doors with swing against duct static pressure.

L. Access Door Sizes:

1. One-Hand or Inspection Access: 8 by 5 inches.
2. Two-Hand Access: 12 by 6 inches.
3. Head and Hand Access: 18 by 10 inches.
4. Head and Shoulders Access: 21 by 14 inches.
5. Body Access: 25 by 14 inches.
6. Body plus Ladder Access: 25 by 17 inches.

M. Label access doors according to Section 230553 "Identification for HVAC Piping and Equipment" to indicate the purpose of access door.

N. Install flexible connectors to connect ducts to equipment.

O. For fans developing static pressures of 5 inches wg and more, cover flexible connectors with loaded vinyl sheet held in place with metal straps.

P. Install duct test holes where required for testing and balancing purposes.

Q. Install thrust limits at centerline of thrust, symmetrical on both sides of equipment. Attach thrust limits at centerline of thrust and adjust to a maximum of 1/4-inch movement during start and stop of fans.

3.2 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Operate dampers to verify full range of movement.
2. Inspect locations of access doors, and verify that size and location of access doors are adequate to perform required operation.
3. Operate fire, smoke, and combination fire and smoke dampers to verify full range of movement and that proper heat-response device is installed.
4. Inspect turning vanes for proper and secure installation, and verify that vanes do not move or rattle.
5. Operate remote damper operators to verify full range of movement of operator and damper.

END OF SECTION 233300

SECTION 233346 - FLEXIBLE DUCTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Non-insulated flexible ducts.
2. Insulated flexible ducts.

1.3 SUBMITTALS

A. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.

B. Manufacturer’s installation instructions shall be provided along with product data.

C. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).

D. Product Data: For each type of product.

E. Shop Drawings: For flexible ducts.

1. Include plans showing locations and mounting and attachment details.

F. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which ceiling-mounted access panels and access doors required for access to duct accessories are shown and coordinated with each other, using input from installers of the items involved.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTION

A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise

indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

C. Comply with the Air Diffusion Council's "ADC Flexible Air Duct Test Code FD 72-R1."

D. Comply with ASTM E96/E96M, "Test Methods for Water Vapor Transmission of Materials."

2.2 NON-INSULATED FLEXIBLE DUCTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. McGill AirFlow LLC.
2. Thermaflex; a Flex-Tek Group company.
3. Ward Industries; a brand of Hart & Cooley, Inc.
4. Approved equivalent.

B. Non-Insulated, Flexible Duct: UL 181, Class 0, interlocking spiral of aluminum foil.

1. Pressure Rating: 8-inch wg positive or negative.
2. Maximum Air Velocity: 5000 fpm.
3. Temperature Range: Minus 100 to plus 435 deg F.

2.3 INSULATED FLEXIBLE DUCTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. McGill AirFlow LLC.
2. Thermaflex; a Flex-Tek Group company.
3. Ward Industries; a brand of Hart & Cooley, Inc.
4. Approved equivalent.

B. Interior, Insulated, Flexible Duct: UL 181, Class 0, interlocking spiral of aluminum foil; fibrous-glass insulation; aluminized vapor-barrier film.

1. Pressure Rating: 8-inch wg positive or negative.
2. Maximum Air Velocity: 5000 fpm.
3. Temperature Range: Minus 20 to plus 250 deg F.
4. Insulation R-Value: Comply with ASHRAE/IES 90.1 R6.

C. Exterior, Insulated, Flexible Duct: UL 181, Class 0, interlocking spiral of aluminum foil; fibrous-glass insulation; aluminized vapor-barrier film.

1. Pressure Rating: 8-inch wg positive or negative.
2. Maximum Air Velocity: 5000 fpm.
3. Temperature Range: Minus 20 to plus 250 deg F.
4. Insulation R-Value: Comply with ASHRAE/IES 90.1 R6.

2.4 FLEXIBLE DUCT CONNECTORS

A. Clamps: Stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action in sizes 3 through 18 inches, to suit duct size.

B. Non-Clamp Connectors: Adhesive plus sheet metal screws.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install flexible ducts according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.

B. Install in indoor applications only. Flexible ductwork should not be exposed to UV lighting.

C. Connect terminal units to supply ducts directly or with maximum 12-inch lengths of flexible duct. Do not use flexible ducts to change directions.

D. Connect diffusers or light troffer boots to ducts directly or with maximum 60-inch lengths of flexible duct clamped or strapped in place.

E. Connect flexible ducts to metal ducts with draw bands adhesive plus sheet metal screws.

F. Install duct test holes where required for testing and balancing purposes.

G. Installation:

1. Install ducts fully extended.
2. Do not bend ducts across sharp corners.
3. Bends of flexible ducting shall not exceed a minimum of one duct diameter.
4. Avoid contact with metal fixtures, water lines, pipes, or conduits.
5. Install flexible ducts in a direct line, without sags, twists, or turns.

H. Supporting Flexible Ducts:

1. Suspend flexible ducts with bands 1-1/2 inches wide or wider and spaced a maximum of 48 inches apart. Maximum centerline sag between supports shall not exceed 1/2 inch per 12 inches.
2. Install extra supports at bends placed approximately one duct diameter from center line of the bend.
3. Ducts may rest on ceiling joists or truss supports. Spacing between supports shall not exceed the maximum spacing per manufacturer's written installation instructions.
4. Vertically installed ducts shall be stabilized by support straps at a maximum of 72 inches o.c.

END OF SECTION 233346

SECTION 233416 - CENTRIFUGAL HVAC FANS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Backward-inclined centrifugal fans, including airfoil and curved blade fans.
2. Forward-curved centrifugal fans.
3. Square in-line centrifugal fans.
4. Tubular in-line centrifugal fans.
5. Plenum fans.
6. Plug fans.
7. Utility set fans.

1.3 SUBMITTALS

A. Submittals for this section are subject to the er-evaluation fee identified in Article 4 of the General Conditions.

B. Manufacturer’s installation instructions shall be provided along with product data.

C. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).

D. Product Data: For each type of product.

1. Construction details, material descriptions, dimensions of individual components and profiles, and finishes for fans.
2. Rated capacities, operating characteristics, and furnished specialties and accessories.
3. Certified fan performance curves with system operating conditions indicated.
4. Certified fan sound-power ratings.
5. Motor ratings and electrical characteristics, plus motor and electrical accessories.
6. Material thickness and finishes, including color charts.
7. Dampers, including housings, linkages, and operators.

E. Shop Drawings:

1. Include plans, elevations, sections, and attachment details.

2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include diagrams for power, signal, and control wiring.
4. Design Calculations: Calculate requirements for selecting vibration isolators and for designing vibration isolation bases.
5. Vibration Isolation Base Details: Detail fabrication, including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.

F. Coordination Drawings: Fan room layout and relationships between components and adjacent structural and mechanical elements, drawn to scale, and coordinated with each other, using input from installers of the items involved.

G. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For centrifugal fans to include in normal operation, emergency operation, and maintenance manuals with replacement parts listing.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials**,** from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Belts: One set for each belt-driven unit.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Capacities and Characteristics:

1. Fan Type: Centrifugal Square in-line centrifugal Tubular in-line centrifugal Plenum].
2. Blade Type: Forward curved Backward inclined airfoil Backward inclined curved Backward inclined flat.
3. Drive Arrangement:
4. Drive Type: Belt Direct.
5. Housing Material: Reinforced steel
6. Housing Coating: Powder-baked enamel
7. Wheel Material: Steel
8. Wheel Coating: Powder-baked enamel
9. Motor:

    a. Motor Enclosure Type: Totally enclosed, fan cooled
    b. Service Factor: 100 percent.

c. Suitable for Use with Variable-Frequency Drive: Yes.

10. Vibration Isolators:

a. Type: Restrained spring .
b. Static Deflection: 1 inch.

11. Spark-Resistance Class: Classified according to AMCA 99, Type A.

2.2 BACKWARD-INCLINED CENTRIFUGAL FANS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Acme Engineering & Manufacturing Corp.
2. Loren Cook Company.
3. New York Blower Company (The).
4. Approved equivalent.

B. Description:

1. Factory-fabricated, -assembled, -tested, and -finished, **belt**- driven centrifugal fans, consisting of housing, wheel, fan shaft, bearings, motor, drive assembly, and support structure. Deliver fans as factory-assembled units, to the extent allowable by shipping limitations.
2. Factory-installed and -wired disconnect switch.

C. Housings:

1. Housing Material: Reinforced steel
2. Housing Coating: Powder-baked enamel.
3. Housing Assembly: Sideplates continuously welded or attached by continuous Pittsburgh lock seal or similar seal.
4. Formed panels to make curved-scroll housings with shaped cutoff.
5. Panel Bracing: Steel angle- or channel-iron member supports for mounting and supporting fan scroll, wheel, motor, and accessories.
6. Horizontally split, bolted-flange housing.
7. Spun inlet cone with flange.
8. Outlet flange.
9. Discharge Arrangement: Fan scroll housing is field rotatable to any of seven discharge positions. Provide fan with discharge positioned in proper direction to minimize connected duct turns.

D. Wheels:

1. Wheel Configuration: DWDI construction with a precision-spun curved inlet flange and a backplate fastened to shaft with setscrews. Wheels shall be statically and dynamically balanced, and nonoverloading.
2. Wheel and Blade Material: Steel.

a. Spark-Resistant Construction: Classified according to AMCA 99, Type A.

3. Blade Coating Hot-dip galvanized.
4. Cast-iron or cast-steel hub riveted to backplate and fastened to shaft with set screws.
5. Backward-Inclined Curved Blades:

a. Curved design.
b. Heavy backplate.
c. Single-thickness blades continuously welded at tip flange and backplate.

E. Shafts:

1. Statically and dynamically balanced, and selected for continuous operation at maximum rated fan speed and motor horsepower, with adjustable alignment and belt tensioning.
2. Turned, ground, and polished hot-rolled steel with keyway. Ship with protective coating of lubricating oil.
3. Designed to operate at no more than 70 percent of first critical speed at top of fan's speed range.

F. Bearings:

1. Prelubricated and Sealed Shaft Bearings:

a. Self-aligning, pillow-block-type ball bearings.
b. Ball-Bearing Rating Life: ABMA 9, L(10) at 120,000.
c. Roller-Bearing Rating Life: ABMA 11, L(10) at 120,000 hours.

G. Belt Drives:

1. Factory mounted, with adjustable alignment and belt tensioning.
2. Service Factor Based on Fan Motor Size: 1.5.
3. Fan Pulleys: Cast iron or cast steel with split, tapered bushing; dynamically balanced at factory.
4. Motor Pulleys: Adjustable pitch for use with motors through 5 hp. Select pulley so pitch adjustment is at the middle of adjustment range at fan design conditions. Provide fixed pitch pulleys for use with motors larger than 5 hp.
5. Belts: Oil resistant, nonsparking, and nonstatic; matched sets for multiple belt drives.
6. Belt Guards: Comply with OSHA and fabricate according to SMACNA's "HVAC Duct Construction Standards"; 0.146 inch- thick, 3/4-inch diamond-mesh wire screen, welded to steel angle frame or equivalent, prime coated. Secure to fan or fan supports without short-circuiting vibration isolation. Include provisions for adjustment of belt tension, lubrication, and use of tachometer with guard in place.
7. Motor Mount: Adjustable for belt tensioning.

H. Motor Enclosure: Totally enclosed, fan cooled.

I. Accessories:

1. Access for Inspection, Cleaning, and Maintenance: Comply with requirements in ASHRAE 62.1.
2. Scroll Drain Connection: NPS 1 steel pipe coupling welded to low point of fan scroll.

3. Companion Flanges: Rolled flanges for duct connections of same material as housing.
4. Discharge Dampers: Assembly with parallel blades constructed of two plates formed around, and to, shaft, channel frame, and sealed ball bearings; with blades linked outside of airstream to single control lever of same material as housing.
5. Inlet Screens: Grid screen of same material as housing.
6. Shaft Cooler: Metal disk between bearings and fan wheel, designed to dissipate heat from shaft.
7. Shaft Seals: Airtight seals installed around shaft on drive side of single-width fans.
8. Weather Cover: Enameled-steel sheet with ventilation slots, bolted to housing.
9. Piezometer Ring: Piezometer ring mounted at fan inlet cone for airflow measurement.

2.3 FORWARD-CURVED CENTRIFUGAL FANS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Acme Engineering & Manufacturing Corp.
2. New York Blower Company (The).
3. Approved equivalent.

B. Description:

1. Factory-fabricated, -assembled, -tested, and -finished, direct-driven centrifugal fans, consisting of housing, wheel, fan shaft, bearings, motor, drive assembly, and support structure.
2. Deliver fans as factory-assembled units, to the extent allowable by shipping limitations.
3. Factory-installed and -wired disconnect switch.

C. Housings:

1. Housing Material: Reinforced steel.
2. Housing Coating: Powder-baked enamel.
3. Housing Assembly: Sideplates continuously welded.
4. Formed panels to make curved-scroll housings with shaped cutoff.
5. Panel Bracing: Steel angle- or channel-iron member supports for mounting and supporting fan scroll, wheel, motor, and accessories.
6. Horizontally split, bolted-flange housing.
7. Spun inlet cone with flange.
8. Outlet flange.
9. Discharge Arrangement: Fan scroll housing field rotatable to any of eight discharge positions. Provide fan with discharge positioned in proper direction to minimize connected duct turns.

D. Wheels:

1. Wheel Configuration: SWSI construction with a curved inlet flange, and a backplate fastened to shaft with setscrews.
2. Wheel and Blade Material: Steel.

    a. Spark-Resistant Construction: Classified according to AMCA 99, Type A.

3. Wheel and Blade Coating: Powder-baked enamel.
4. Cast-iron or cast-steel hub riveted to backplate and fastened to shaft with setscrews.
5. Forward-Curved Wheels:

    a. Black-enameled or galvanized-steel construction with inlet flange, backplate, and shallow blades with inlet and tip curved forward in direction of airflow.
    b. Mechanically secured to flange and backplate; cast-steel hub swaged to backplate and fastened to shaft with setscrews.

E. Shafts:

1. Statically and dynamically balanced and selected for continuous operation at maximum rated fan speed and motor horsepower, with adjustable alignment and belt tensioning.
2. Turned, ground, and polished hot-rolled steel with keyway. Ship with protective coating of lubricating oil.
3. Designed to operate at no more than 70 percent of first critical speed at top of fan's speed range.

F. Bearings:

1. Prelubricated and Sealed Shaft Bearings:

    a. Self-aligning, pillow-block-type ballbearings.
    b. Ball-Bearing Rating Life: ABMA 9, L(10) at 120,000 hours.
    c. Roller-Bearing Rating Life: ABMA 11, L(10) at 120,000 hours.

G. Belt Drives:

1. Factory mounted, with adjustable alignment and belt tensioning.
2. Service Factor Based on Fan Motor Size: 1.5.
3. Fan Pulleys: Cast iron or cast steel with split, tapered bushing; dynamically balanced at factory.
4. Motor Pulleys: Adjustable pitch for use with motors through 5 hp. Select pulley so pitch adjustment is at the middle of adjustment range at fan design conditions. Provide fixed pitch for use with motors larger than 5 hp.
5. Belts: Oil resistant, nonsparking, and nonstatic; matched sets for multiple belt drives.
6. Belt Guards: Comply with OSHA and fabricate according to SMACNA's "HVAC Duct Construction Standards"; 0.146 inch- thick, 3/4-inch diamond-mesh wire screen, welded to steel angle frame or equivalent, prime coated. Secure to fan or fan supports without short-circuiting vibration isolation. Include provisions for adjustment of belt tension, lubrication, and use of tachometer with guard in place.
7. Motor Mount: Adjustable for belt tensioning.

H. Motor Enclosure: Totally enclosed, fan cooled.

I. Accessories:

1. Access for Inspection, Cleaning, and Maintenance: Comply with requirements in ASHRAE 62.1.
2. Scroll Drain Connection: NPS 1 steel pipe coupling welded to low point of fan scroll.
3. Companion Flanges: Rolled flanges for duct connections of same material as housing.

4. Discharge Dampers: Assembly with parallel blades constructed of two plates formed around, and to, shaft, channel frame, and sealed ball bearings; with blades linked outside of airstream to single control lever of same material as housing.
5. Inlet Screens: Grid screen of same material as housing.
6. Shaft Cooler: Metal disk between bearings and fan wheel, designed to dissipate heat from shaft.
7. Shaft Seals: Airtight seals installed around shaft on drive side of single-width fans.
8. Weather Cover: Enameled-steel sheet with ventilation slots, bolted to housing.
9. Piezometer Ring: Piezometer ring mounted at fan inlet cone for airflow measurement.

2.4 SQUARE IN-LINE CENTRIFUGAL FANS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Acme Engineering & Manufacturing Corp.
2. Greenheck Fan Corporation.
3. Loren Cook Company.
4. Approved equivalent.

B. Description: Square in-line centrifugal fans.

C. Housing:

1. Housing Material: Reinforced steel.
2. Housing Coating: Powder-baked enamel
3. Housing Construction: Side panels shall be easily removable for service. Include inlet and outlet flanges, and support bracket adaptable to floor, side wall, or ceiling mounting.

D. Direct-Drive Units: Motor mounted in airstream, factory wired to disconnect switch located on outside of fan housing; with wheel, inlet cone, and motor on swing-out service door.

E. Belt-Driven Units: Motor mounted on adjustable base, with adjustable sheaves, enclosures around belts within fan housing, and lubricating tubes from fan bearings extended to outside of fan housing.

F. Fan Wheels: Aluminum airfoil blades welded to aluminum hub.

G. Motor Enclosure: Totally enclosed, fan cooled.

H. Accessories:

1. Access for Inspection, Cleaning, and Maintenance: Comply with requirements in ASHRAE 62.1.
2. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.
3. Volume-Control Damper: Manually operated with quadrant lock, located in fan outlet.
4. Companion Flanges: For inlet and outlet duct connections.
5. Fan Guards: 1/2- by 1-inch mesh of galvanized steel in removable frame. Provide guard for inlet or outlet for units not connected to ductwork.

6. Motor and Drive Cover (Belt Guard): Epoxy-coated steel.
7. Side Discharge: Flange connector and attachment hardware to provide right-angle discharge on side of unit.

2.5 TUBULAR IN-LINE CENTRIFUGAL FANS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Acme Engineering & Manufacturing Corp.
2. Greenheck Fan Corporation.
3. New York Blower Company (The).
4. Approved equivalent.

B. Description: Tubular in-line centrifugal fans.

C. Housing:

1. Housing Material: Reinforced steel
2. Housing Coating: Powder-baked enamel.
3. Housing Construction: Split, spun aluminum with aluminum straightening vanes, inlet and outlet flanges, and support bracket adaptable to floor, side wall, or ceiling mounting.

D. Direct-Drive Units: Motor mounted in airstream, factory wired to disconnect switch located on outside of fan housing; with wheel, inlet cone, and motor on swing-out service door.

E. Belt-Driven Units: Motor mounted on adjustable base, with adjustable sheaves, enclosure around belts within fan housing, and lubricating tubes from fan bearings extended to outside of fan housing.

F. Fan Wheels: Steel, airfoil blades welded to aluminum hub.

G. Accessories:

1. Access for Inspection, Cleaning, and Maintenance: Comply with requirements in ASHRAE 62.1.
2. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.
3. Volume-Control Damper: Manually operated with quadrant lock, located in fan outlet.
4. Companion Flanges: For inlet and outlet duct connections.
5. Fan Guards: 1/2- by 1-inch mesh of galvanized steel in removable frame. Provide guard for inlet or outlet for units not connected to ductwork.
6. Motor and Drive Cover (Belt Guard): Epoxy-coated steel.

2.6 PLENUM FANS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Loren Cook Company.
2. New York Blower Company (The).
3. Approved equivalent.

B. Description:

1. Factory-fabricated, -assembled, -tested, and -finished, belt-driven centrifugal fans, consisting of wheel, fan shaft, bearings, motor, drive assembly, and support structure.
2. Deliver fans as factory-assembled units, to the extent allowable by shipping limitations.
3. Factory-installed and -wired disconnect switch.

C. Wheels:

1. Wheel Configuration: SWSI construction with curved inlet flange and heavy backplate; fastened to shaft with setscrews.
2. Wheel and Blade Material: Steel.

    a. Spark-Resistant Construction: Classified according to AMCA 99, Type A.

3. Backward-Inclined Airfoil Blades: Hollow, die-formed, airfoil-shaped blades continuously welded at tip flange and backplate.

D. Shafts:

1. Statically and dynamically balanced, and selected for continuous operation at maximum-rated fan speed and motor horsepower, with adjustable alignment and belt tensioning.
2. Turned, ground, and polished hot-rolled steel with keyway. Ship with protective coating of lubricating oil.
3. Designed to operate at no more than 70 percent of first critical speed at top of fan's speed range.

E. Bearings:

1. Prelubricated and Sealed Shaft Bearings:

    a. Self-aligning, pillow-block-type ball bearings.
    b. Ball-Bearing Rating Life: ABMA 9, L(10) at 120,000 hours.
    c. Roller-Bearing Rating Life: ABMA 11, L(10) at 120,000 hours.

F. Belt Drives:

1. Factory mounted, with adjustable alignment and belt tensioning.
2. Service Factor Based on Fan Motor Size: 1.5.
3. Fan Pulleys: Cast iron or cast steel with split, tapered bushing; dynamically balanced at factory.
4. Motor Pulleys: Adjustable pitch for use with motors through 5 hp. Select pulley so pitch adjustment is at the middle of adjustment range at fan design conditions. Provide fixed pitch for use with motors larger than 5 hp.
5. Belts: Oil resistant, nonsparking, and nonstatic; matched sets for multiple belt drives.
6. Belt Guards: Comply with OSHA and fabricate to SMACNA's "HVAC Duct Construction Standards"; 0.146 inch- thick, 3/4-inch diamond-mesh wire screen welded to steel angle

frame or equivalent, prime coated. Secure to fan or fan supports without short-circuiting vibration isolation. Include provisions for adjustment of belt tension, lubrication, and use of tachometer with guard in place.

7. Motor Mount: Adjustable for belt tensioning.

G. Motor Enclosure: Totally enclosed, fan cooled.

H. Accessories:

1. Inlet Safety Screen: Comply with OSHA and fabricate according to SMACNA's "HVAC Duct Construction Standards." Diamond mesh wire screen is welded to steel angle frame or equivalent, prime coated.
2. Safety Enclosure: Comply with OSHA and fabricate according to SMACNA's "HVAC Duct Construction Standards." Diamond mesh wire screen is welded to steel angle frame or equivalent, prime coated.
3. Belt Guard: Comply with OSHA and fabricate according to SMACNA's "HVAC Duct Construction Standards." Diamond mesh wire screen is welded to steel angle frame or equivalent, prime coated.
4. Inlet Companion Flange: Rolled flanges for duct connections of same material as housing.
5. Shaft Cooler: Metal disk between bearings and fan wheel, designed to dissipate heat from shaft.
6. Shaft Seals: Airtight seals installed around shaft on drive side of single-width fans.
7. Piezometer Ring: Piezometer ring mounted at fan inlet cone for airflow measurement.

2.7 MOTORS

A. Comply with NEMA designation, temperature rating, service factor, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."

B. Where variable-frequency drives are indicated or scheduled, provide fan motor compatible with variable-frequency drive.

2.8 SOURCE QUALITY CONTROL

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.

B. AMCA Compliance: Fans shall comply with AMCA 11 and bear the AMCA-Certified Ratings Seal.

C. Fan Sound Ratings: Comply with AMCA 311 and label fans with the AMCA-Certified Ratings Seal. Sound ratings shall comply with AMCA 301. The fans shall be tested according to AMCA 300.

D. Fan Performance Ratings: Comply with AMCA 211 and label fans with AMCA-Certified Rating Seal. The fans shall be tested for air performance - flow rate, fan pressure, power, fan efficiency, air density, speed of rotation, and fan efficiency - according to AMCA 210/ASHRAE 51.

E. Operating Limits: Classify fans according to AMCA 99.

PART 3 - EXECUTION

3.1 INSTALLATION OF CENTRIFUGAL HVAC FANS

A. Install centrifugal fans level and plumb.

B. Disassemble and reassemble units, as required for moving to the final location, according to manufacturer's written instructions.

C. Lift and support units with manufacturer's designated lifting or supporting points.

D. Equipment Mounting:

1. Install floor- or roof-mounted centrifugal fans on cast-in-place concrete equipment base(s). Comply with requirements for equipment bases and foundations specified in Section 033000 "Cast-in-Place Concrete."
2. Support duct-mounted and other hanging centrifugal fans directly from the building structure, using suitable hanging systems as specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."
3. Comply with requirements for vibration isolation devices specified in Section 230548.13 "Vibration Controls for HVAC."

E. Curb Support, Prefabricated: Rail-type wood support provided by fan manufacturer.

F. Unit Support: Install centrifugal fans level on structural **curbs**. Coordinate wall penetrations and flashing with wall construction. Secure units to structural support with anchor bolts.

G. Isolation Curb Support: Install centrifugal fans on isolation curbs, and install flexible duct connectors and vibration-isolationdevices.

1. Comply with requirements in Section 233300 "Air Duct Accessories" for flexible duct connectors.
2. Comply with requirements in Section 230548.13 "Vibration Controls for HVAC" for vibration-isolationdevices.

H. Install units with clearances for service and maintenance.

I. Label fans according to requirements specified in Section 230553 "Identification for HVAC Piping and Equipment."

3.2 DUCTWORK AND PIPING CONNECTIONS

A. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors. Flexible connectors are specified in Section 233300 "Air Duct Accessories."

B. Install ducts adjacent to fans to allow service and maintenance.

3.3 ELECTRICAL CONNECTIONS

A. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

B. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

C. Install electrical devices furnished by manufacturer, but not factory mounted, according to NFPA 70 and NECA 1.

1. Nameplate shall be laminated acrylic or melamine plastic signs, as specified in Section 260553 "Identification for Electrical Systems."

3.4 CONTROL CONNECTIONS

A. Install control and electrical power wiring to field-mounted control devices.

B. Connect control wiring according to Section 260523 "Control-Voltage Electrical Power Cables."

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Manufacturer's Field Service: Engage a Company Service Advisor to test and inspect components, assemblies, and equipment installations, including connections.

C. Perform tests and inspections with the assistance of a Company Service Advisor.

D. Tests and Inspections:

1. Verify that shipping, blocking, and bracing are removed.
2. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
3. Verify that there is adequate maintenance and access space.
4. Verify that cleaning and adjusting are complete.
5. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.
6. Adjust belt tension.
7. Adjust damper linkages for proper damper operation.
8. Verify lubrication for bearings and other moving parts.
9. Verify that manual and automatic volume control and fire and smoke dampers in connected ductwork systems are in fully open position.
10. See Section 230593 "Testing, Adjusting, and Balancing For HVAC" for testing, adjusting, and balancing procedures.
11. Remove and replace malfunctioning units and retest as specified above.

E. Test and adjust controls and safeties. Controls and equipment will be considered defective if they do not pass tests and inspections.

F. Prepare test and inspection reports.

3.6 ADJUSTING

A. Adjust damper linkages for proper damper operation.

B. Adjust belt tension.

C. Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing procedures.

D. Replace fan and motor pulleys as required to achieve design airflow.

E. Lubricate bearings.

3.7 DEMONSTRATION

A. Engage a Company Service Advisor to train Director’s Representative's maintenance personnel to adjust, operate, and maintain centrifugal fans.

END OF SECTION 233416

SECTION 233600 - AIR TERMINAL UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Modulating, single-duct air terminal units.
2. Induction air terminal units.
3. Diffuser-type air terminal units.
4. Balancing terminal units.
5. Pressure control terminal units.
6. Exhaust single-duct terminal units.
7. Casing liner.

1.3 SUBMITTALS

A. Submittals for this section are subject to the er-evaluation fee identified in Article 4 of the General Conditions.

B. Manufacturer’s installation instructions shall be provided along with product data.

C. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).

D. Product Data: For each type of air terminal unit.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for air terminal units.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

E. Shop Drawings: For air terminal units.

1. Include plans, elevations, sections, and mounting details.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include diagrams for power, signal, and control wiring.

4. Hangers and supports, including methods for duct and building attachment and vibration isolation.

F. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Ceiling suspension assembly members.
2. Size and location of initial access modules for acoustic tile.
3. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.

G. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For air terminal units to include in emergency, operation, and maintenance manuals.

1. Include the following:

a. Instructions for resetting minimum and maximum air volumes.
b. Instructions for adjusting software set points.

1.5 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. Fan-Powered-Unit Filters: Furnish one spare filter(s) for each filter installed.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-up."

C. ASHRAE Compliance: Applicable requirements in ASHRAE/IES 90.1, "Section 6 - Heating, Ventilating, and Air Conditioning."

2.2 MODULATING, SINGLE-DUCT AIR TERMINAL UNITS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Carrier Global Corporation.
2. Johnson Controls, Inc.
3. Price Industries.
4. Titus; brand of Johnson Controls International plc, Global Products.
5. Trane.
6. Approved equivalent.

B. Configuration: Volume-damper assembly inside unit casing with control components inside a protective metal shroud.

C. Casing: 0.040-inch- thick galvanized steel, single wall.

1. Casing Liner: Comply with requirements in "Casing Liner" Article for fibrous-glass duct liner.
2. Air Inlet: Round stub connection or S-slip and drive connections for duct attachment.
3. Air Outlet: S-slip and drive connections, size matching inlet size.
4. Access: Removable panels for access to parts requiring service, adjustment, or maintenance; with airtight gasket.
5. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

D. Regulator Assembly: System-air-powered bellows section incorporating polypropylene bellows for volume regulation and thermostatic control. Bellows shall operate at temperatures from zero to 140 deg F, shall be impervious to moisture and fungus, shall be suitable for 10-inch wg static pressure, and shall be factory tested for leaks.

E. Volume Damper: Galvanized steel with peripheral gasket and self-lubricating bearings.

1. Maximum Damper Leakage: AHRI 880 rated, 2 percent of nominal airflow at 3-inch wg inlet static pressure.
2. Damper Position: Normally open.

F. Attenuator Section**:** 0.032-inch aluminum sheet.

1. Attenuator Section Liner: Comply with requirements in "Casing Liner" Article for fibrous-glass duct liner.
2. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

G. Hydronic Heating Coils: Copper tube, with mechanically bonded aluminum fins spaced no closer than 0.1 inch, and rated for a minimum working pressure of 200 psig and a maximum entering-water temperature of 220 deg F. Include manual air vent and drain valve. Provide hydronic heating coils for air terminal units scheduled on Drawings.

1. Stage(s): 1.
2. SCR controlled.

3. Access door interlocked disconnect switch.
4. Downstream air temperature sensor with local connection to override discharge-air temperature to not exceed a maximum temperature set point (adjustable).
5. Nickel chrome 80/20 heating elements.
6. Airflow switch for proof of airflow.
7. Fan interlock contacts.
8. Fuses in terminal box for overcurrent protection (for coils more than 48 A).
9. Mercury contactors.
10. Pneumatic-electric switches and relays.
11. Magnetic contactor for each step of control (for three-phase coils).

H. Control devices shall be compatible with temperature controls system specified in Section 230923 "Direct Digital Control (DDC) System for HVAC."

1. Electric Damper Actuator: 24 V, powered open, capacitous return.
2. Electronic Damper Actuator: 24 V, powered open, capacitous return.
3. Electric Thermostat: Wall-mounted electronic type with clock display, temperature display in Fahrenheit and Celsius, and space temperature set point.
4. Electronic Thermostat: Wall-mounted electronic type with temperature set-point display in Fahrenheit and Celsius.
5. Electronic Velocity Controller: Factory calibrated and field adjustable to minimum and maximum air volumes; shall maintain constant airflow dictated by thermostat within 5 percent of set point while compensating for inlet static-pressure variations up to 4-inch wg; and shall have a multipoint velocity sensor at air inlet.
6. Terminal Unit Controller: Pressure-independent, variable-air-volume (VAV) controller with electronic airflow transducer with multipoint velocity sensor at air inlet, factory calibrated to minimum and maximum air volumes, and having the following features:

    a. Occupied and unoccupied operating mode.
    b. Remote reset of airflow or temperature set points.
    c. Adjusting and monitoring with portable terminal.
    d. Communication with temperature-control system specified in Section 230923 "Direct Digital Control (DDC) System for HVAC."

7. Room Sensor: Wall mounted with temperature set-point adjustment and access for connection of portable operator terminal.

I. Controls:

1. Suitable for operation with duct pressures between 0.25- and 3.0-inch wg inlet static pressure.
2. System-powered, wall-mounted thermostat.

J. Control Sequences:

1. Occupied:

    a. On a call for cooling, airflow will increase as the damper opens towards maximum setting to satisfy set point.

b. On a call for less cooling, airflow will decrease as the damper closes towards minimum setting to satisfy set point.
c. On a call for heating, after terminal unit has reached minimum airflow set point, hydronic heating coil valve will modulate toward open to satisfy set point.

2. Unoccupied:

a. Damper closes to minimum setting.

2.3 CASING LINER

A. Casing Liner: Fibrous-glass duct liner, complying with ASTM C1071, NFPA 90A, or NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard."

1. Minimum Thickness: 1 inch.

a. Maximum Thermal Conductivity:

1) Type I, Flexible: 0.27 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature.
2) Type II, Rigid: 0.23 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature.

2. Antimicrobial Erosion-Resistant Coating: Apply to the surface of the liner that will form the interior surface of the duct to act as a moisture repellent and erosion-resistant coating. Antimicrobial compound shall be tested for efficacy by an NRTL and registered by the EPA for use in HVAC systems.
3. Water-Based Liner Adhesive: Comply with NFPA 90A or NFPA 90B and with ASTM C916.

B. Casing Liner: Flexible elastomeric duct liner fabricated of preformed, cellular, closed-cell, sheet materials complying with ASTM C534, Type II, Grade 1; and with NFPA 90A or NFPA 90B.

1. Minimum Thickness: 3/4 inch.
2. Surface-Burning Characteristics: Maximum flame-spread index of 25 and maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.
3. Liner Adhesive: As recommended by insulation manufacturer and complying with NFPA 90A or NFPA 90B.

2.4 SOURCE QUALITY CONTROL

A. Factory Tests: Test assembled air terminal units according to AHRI 880.

1. Label each air terminal unit with plan number, nominal airflow, maximum and minimum factory-set airflows, coil type, and AHRI certification seal.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT INSTALLATION

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Ch. 5, "Hangers and Supports" and with Section 230529 "Hangers and Supports for HVAC Piping and Equipment."

B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.

1. Where practical, install concrete inserts before placing concrete.
2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes and for slabs more than 4 inches thick.
4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes and for slabs less than 4 inches thick.
5. Do not use powder-actuated concrete fasteners for seismic restraints.

C. Hangers Exposed to View: Threaded rod and angle or channel supports.

D. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.2 TERMINAL UNIT INSTALLATION

A. Install air terminal units according to NFPA 90A, "Standard for the Installation of Air Conditioning and Ventilating Systems."

B. Install air terminal units level and plumb. Maintain sufficient clearance for normal service and maintenance.

C. Install wall-mounted thermostats.

3.3 PIPING CONNECTIONS

A. Where installing piping adjacent to air terminal unit, allow space for service and maintenance.

B. Hot-Water Piping: Comply with requirements in Section 232113 "Hydronic Piping" and Section 232116 Hydronic Piping Specialties," and connect heating coils to supply with shutoff valve, strainer, control valve, and union or flange; and to return with balancing valve and union or flange.

3.4 DUCTWORK CONNECTIONS

A. Comply with requirements in Section 233113 "Metal Ducts" for connecting ducts to air terminal units.

B. Make connections to air terminal units with flexible connectors complying with requirements in Section 233300 "Air Duct Accessories."

3.5 ELECTRICAL CONNECTIONS

A. Install field power to each air terminal unit electrical power connection. Coordinate with air terminal unit manufacturer and installers.

B. Connect wiring in accordance with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

C. Ground equipment in accordance with Section 260526 "Grounding and Bonding for Electrical Systems."

D. Install electrical devices furnished by manufacturer, but not factory mounted, in accordance with NFPA 70 and NECA 1.

E. Install nameplate for each electrical connection, indicating electrical equipment designation and circuit number feeding connection.

1. Nameplate shall be laminated acrylic or melamine plastic signs, as specified in Section 260553 "Identification for Electrical Systems."
2. Nameplate shall be laminated acrylic or melamine plastic signs with a black background and engraved white letters at least 1/2 inch high.

3.6 CONTROL CONNECTIONS

A. Install control and electrical power wiring to field-mounted control devices.

B. Connect control wiring in accordance with Section 260523 "Control-Voltage Electrical Power Cables."

3.7 IDENTIFICATION

A. Label each air terminal unit with plan number, nominal airflow, and maximum and minimum factory-set airflows. Comply with requirements in Section 230553 "Identification for HVAC Piping and Equipment" for equipment labels and warning signs and labels.

3.8 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a company field advisor to test and inspect components, assemblies, and equipment installations, including connections.

B. Perform the following tests and inspections with the assistance of a company field advisor:

1. After installing air terminal units and after electrical circuitry has been energized, test for compliance with requirements.

2. Leak Test: After installation, fill water coils and test for leaks. Repair leaks and retest until no leaks exist.
3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Air terminal unit will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.9 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.
2. Verify that inlet duct connections are as recommended by air terminal unit manufacturer to achieve proper performance.
3. Verify that controls and control enclosure are accessible.
4. Verify that control connections are complete.
5. Verify that nameplate and identification tag are visible.
6. Verify that controls respond to inputs as specified.

3.10 DEMONSTRATION

A. Engage a factory-authorized service Company Service Advisor to train Director’s Representative's maintenance personnel to adjust, operate, and maintain air terminal units.

END OF SECTION 233600

SECTION 233713.13 - AIR DIFFUSERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Rectangular and square ceiling diffusers.

B. Related Requirements:

1. Section 233300 "Air Duct Accessories" for fire and smoke dampers and volume-control dampers not integral to diffusers.
2. Section 233713.23 "Air Registers and Grilles" for adjustable-bar register and grilles, fixed-face registers and grilles, and linear bar grilles.

1.3 SUBMITTALS

A. Submittals for this section are subject to the er-evaluation fee identified in Article 4 of the General Conditions.

B. Manufacturer’s installation instructions shall be provided along with product data.

C. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).

D. Product Data: For each type of product.

1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.
2. Diffuser Schedule: Indicate drawing designation, room location, quantity, model number, size, and accessories furnished.

E. Samples: For each exposed product and for each color and texture specified. Actual size of smallest diffuser indicated.

F. Samples for Initial Selection: For diffusers with factory-applied color finishes. Actual size of smallest diffuser indicated.

G. Samples for Verification: For diffusers, in manufacturer's standard sizes to verify color selected. Actual size of smallest diffuser indicated.

H. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Ceiling suspension assembly members.
2. Method of attaching hangers to building structure.
3. Size and location of initial access modules for acoustical tile.
4. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
5. Duct access panels.

I. Source quality-control reports.

PART 2 - PRODUCTS

2.1 RECTANGULAR AND SQUARE CEILING DIFFUSERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Titus; brand of Johnson Controls International PLC, Global Products.
2. Anemostat Products; a Mestek company.
3. Price Industries.
4. Approved equivalent.

B. Devices shall be specifically designed for variable-air-volume flows.

C. Material: Steel.

D. Finish: Baked enamel, color selected by director’s representative.

E. Face Size: 24 by 24 inches (600 by 600 mm).

F. Face Style: Plaque.

G. Mounting: Surface.

H. Pattern: Fixed.

I. Dampers: Combination damper and grid.

J. Accessories:

1. Equalizing grid.
2. Plaster ring.
3. Safety chain.
4. Wire guard.
5. Sectorizing baffles.
6. Operating rod extension.

2.2 SOURCE QUALITY CONTROL

A. Verification of Performance: Rate diffusers according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas where diffusers are installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install diffusers level and plumb.

B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practical. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.

C. Install diffusers with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.3 ADJUSTING

A. After installation, adjust diffusers to air patterns indicated, or as directed, before starting air balancing.

B. After installation, adjust diffusers to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION 233713.13

SECTION 233713.23 - REGISTERS AND GRILLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Adjustable blade face registers and grilles.
2. Fixed face registers and grilles.

B. Related Requirements:

1. Section 233300 "Air Duct Accessories" for fire and smoke dampers and volume-control dampers not integral to registers and grilles.
2. Section 233713.13 "Air Diffusers" for various types of air diffusers.

1.3 SUBMITTALS

A. Submittals for this section are subject to the er-evaluation fee identified in Article 4 of the General Conditions.

B. Manufacturer’s installation instructions shall be provided along with product data.

C. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).

D. Product Data: For each type of product.

1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.
2. Register and Grille Schedule: Indicate drawing designation, room location, quantity, model number, size, and accessories furnished.

E. Samples: For each exposed product and for each color and texture specified. Smallest size register and grille indicated.

F. Samples for Initial Selection: For registers and grilles with factory-applied color finishes. Smallest size register and grille indicated.

G. Samples for Verification: For registers and grilles, in manufacturer's standard sizes to verify color selected. Smallest size register and grille indicated.

H. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Ceiling suspension assembly members.
2. Method of attaching hangers to building structure.
3. Size and location of initial access modules for acoustical tile.
4. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
5. Duct access panels.

I. Source quality-control reports.

1.4 MAINTENANCE

A. Special Tools:

1. One bar deflection key for every five supply grilles and/or every five return grilles.
2. One operator key for every five supply registers and/or every 5 return or exhaust registers.
3. Two keys or socket wrenches for each type of damper adjustment screw or device on manual damper regulators.
4. One tool for each type and size Torx center pin fastener.

PART 2 - PRODUCTS

2.1 REGISTERS

A. Adjustable Blade Face Register:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Anemostat Products; a Mestek company.
b. Price Industries.
c. Titus; brand of Johnson Controls International PLC, Global Products.
d. Approved equivalent.

2. Material: Aluminum.
3. Finish: Baked enamel, color selected by Architect.
4. Face Blade Arrangement: Horizontal spaced 3/4 inch apart.
5. Core Construction: Removable.
6. Rear-Blade Arrangement: Vertical spaced 3/4 inch apart.
7. Frame: 1-1/4 inches wide.
8. Mounting Frame: Filter.
9. Mounting: Countersunk screw.
10. Damper Type: Adjustable opposed blade.

11. Accessories:

    a. Front-blade gang operator.
    b. Filter.

B. Fixed Face Register:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Anemostat Products; a Mestek company.
    b. Price Industries.
    c. Titus; brand of Johnson Controls International PLC, Global Products.
    d. Approved equivalent.

2. Material: Aluminum.
3. Finish: Baked enamel, color selected by Architect.
4. Face Blade Arrangement: Horizontal spaced 3/4 inch apart.
5. Face Arrangement: Perforated core.
6. Core Construction: Removable.
7. Frame: 1-1/4 inches wide.
8. Mounting Frame: Filter.
9. Mounting: Countersunk screw.
10. Damper Type: Adjustable opposed blade.
11. Accessory: Filter.

2.2 GRILLES

A. Adjustable Blade Face Grille:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Anemostat Products; a Mestek company.
    b. Nailor Industries Inc.
    c. Price Industries.
    d. Approved equivalent.

2. Material: Aluminum.
3. Finish: Baked enamel, color selected by Architect.
4. Face Blade Arrangement: Horizontal spaced 3/4 inch apart.
5. Core Construction: Removable.
6. Rear-Blade Arrangement: Vertical spaced 3/4 inch apart.
7. Frame: 1-1/4 inches wide.
8. Mounting Frame: Filter.
9. Mounting: Countersunk screw.
10. Accessories:

    a. Front-blade gang operator.
    b. Filter.

B. Fixed Face Grille:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Anemostat Products; a Mestek company.
    b. Price Industries.
    c. Titus; brand of Johnson Controls International PLC, Global Products.
    d. Approved equivalent.

2. Material: Aluminum.
3. Finish: Baked enamel, color selected by Architect.
4. Face Blade Arrangement: Horizontal; spaced 3/4 inch apart.
5. Face Arrangement: Perforated core.
6. Core Construction: Removable.
7. Frame: 1-1/4 inches wide.
8. Mounting Frame: Filter.
9. Mounting: Countersunk screw.
10. Accessory: Filter.

C. Linear Bar Grilles:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Anemostat Products; a Mestek company.
    b. Price Industries.
    c. Titus; brand of Johnson Controls International PLC, Global Products.
    d. Approved equivalent.

2. Material: Aluminum.
3. Finish: Baked enamel, color selected by Architect.
4. Face Blade Arrangement: Horizontal; spaced 1/2 inch apart.
5. Face Arrangement: Perforated core.
6. Core Construction: Removable.
7. Distribution plenum.

    a. Internal insulation.
    b. Inlet damper.

8. Frame: 1-1/4 inches wide.
9. Mounting Frame: Filter.
10. Mounting: Countersunk screw.
11. Damper Type: Adjustable opposed blade.

2.3 SOURCE QUALITY CONTROL

A. Verification of Performance: Rate registers and grilles according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas where registers and grilles are installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install registers and grilles level and plumb.

B. Outlets and Inlets Locations: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practical. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.

C. Install registers and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.3 ADJUSTING

A. After installation, adjust registers and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION 233713.23

SECTION 237416.11 - PACKAGED, SMALL-CAPACITY, ROOFTOP AIR-CONDITIONING UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Related Sections:

1. Section 230548.18 - Vibration Controls for HVAC: Vibration isolators.
2. Section 230923 - Direct-Digital Control System for HVAC: Controls remote from unit.
3. Section 230993 - Sequence of Operations for HVAC Controls: Sequences of operation applying to units in this section.
4. Section 233300 - Air Duct Accessories: Flexible connections.

1.2 SUMMARY

A. Section includes packaged, small-capacity, rooftop air-conditioning units (RTUs) with the following components:

1. Casings.
2. Fans, drives, and motors.
3. Rotary heat exchangers.
4. Coils.
5. Refrigerant circuit components.
6. Air filtration.
7. Gas furnaces.
8. Dampers.
9. Electrical power connections.
10. Controls.
11. Accessories.

1.3 DEFINITIONS

A. RTU: Rooftop unit. As used in this Section, this abbreviation means packaged, small-capacity, rooftop air-conditioning units. This abbreviation is used regardless of whether the unit is mounted on the roof or on a concrete base on ground.

1.4 SUBMITTALS

A. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.

B. Manufacturer’s installation instructions shall be provided along with product data.

C. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).

D. Product Data: For each RTU.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
2. Include rated capacities, dimensions, required clearances, characteristics, and furnished specialties and accessories.
3. Include unit dimensions and weight.
4. Include cabinet material, metal thickness, finishes, insulation, and accessories.
5. Fans:

    a. Include certified fan-performance curves with system operating conditions indicated.
    b. Include certified fan-sound power ratings.
    c. Include fan construction and accessories.
    d. Include motor ratings, electrical characteristics, and motor accessories.

6. Include certified coil-performance ratings with system operating conditions indicated.
7. Include filters with performance characteristics.
8. Include gas furnaces with performance characteristics.
9. Include dampers, including housings, linkages, and operators.

E. Shop Drawings: For each packaged, small-capacity, rooftop air-conditioning unit.

1. Include plans, elevations, sections, and mounting details.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include diagrams for power, signal, and control wiring.

F. Coordination Drawings: Floor plans and other details, or BIM model, drawn to scale, showing the items described in this Section, and coordinated with all building trades.

G. Sample Warranty: For manufacturer's warranty.

H. Product Certificates: Submit certification that specified equipment will withstand wind forces identified in "Performance Requirements" Article and in Section 230548 "Vibration and Seismic Controls for HVAC."

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculations.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of wind force and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

I. Source quality-control reports.

J. System startup reports.

K. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For RTUs to include in emergency, operation, and maintenance manuals.

1.6 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. Filters: One set(s) of filters for each unit.
2. Gaskets: One set(s) for each access door.
3. Fan Belts: One set(s) for each belt-driven fan.
4. Filters: One set(s) of filters for each unit.

1.7 WARRANTY

A. Warranty: Manufacturer agrees to repair or replace components of outdoor, semi-custom, air-handling unit that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Manufacturer Standard.
2. Warranty Period for Heat Exchangers: Manufacturer's standard, but not less than 10 years from date of Substantial Completion

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.

B. NFPA Compliance: Comply with NFPA 90A for design, fabrication, and installation of RTUs and components.

C. ASHRAE 62.1 Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."

D. ASHRAE 15 Compliance: For refrigeration system safety.

E. ASHRAE/IES 90.1 Compliance: Applicable requirements in ASHRAE/IES 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."

F. UL Compliance: Comply with UL 1995.

2.2 CAPACITIES AND CHARACTERISTICS

A. Supply-Air Fan:

1. Fan: Forward curved centrifugal type, statically and dynamically balanced, resiliently mounted.
2. Fan Drive: V-Belt type, Cast iron or steel sheaves, dynamically balanced, bored to fit shafts and keyed. Furnish solid shaft construction. Select Variable and adjustable pitch motor sheave to obtain required rpm with sheaves set at mid-position as recommended by manufacturer.

    a. Drive Rating: Minimum 1.5 times nameplate rating of motor.
    b. Fan Sheave: Adjustable.
    c. Motor Sheave: Adjustable.

3. Fan motor: Three phase, NEMA MG1 “Motors and Generators”, Design B, continuously rated at 40 degrees C, NEMA T frame, with permanently lubricated bearings and integral overload protection.
4. Fan Assembly Mounting: Furnish spring-type vibration isolators.

B. Return-Air Fan:

1. Fan: Forward curved centrifugal type, statically and dynamically balanced, resiliently mounted.
2. Fan Drive: V-Belt type, Cast iron or steel sheaves, dynamically balanced, bored to fit shafts and keyed. Furnish solid shaft construction. Select Variable and adjustable pitch motor sheave to obtain required rpm with sheaves set at mid-position as recommended by manufacturer.

    a. Fan Sheave: Adjustable.
    b. Motor Sheave: Adjustable.

3. Fan motor: Three phase, NEMA MG1 “Motors and Generators”, Design B, continuously rated at 40 degrees C, NEMA T frame, with permanently lubricated bearings and integral overload protection.
4. Fan Assembly Mounting: Furnish spring-type vibration isolators.
5. Motor Characteristics:

    a. Refer to Drawings.

C. Heat Exchanger:

1. See Drawings.

D. Supply-Air Refrigerant Coil:

1. Refer to Drawings.

E. Outdoor-Air Refrigerant Coil:

1. Refer to Drawings.

F. Hot-Gas Reheat Coil:

1. Refer to Drawings.

G. Electric-Resistance Heating Coil:

1. Refer to Drawings.

H. Compressors:

1. Refer to Drawings.

I. Gas Furnace:

1. Refer to Drawings.

J. Dampers:

1. Outdoor-Air Damper: Linked damper blades, for zero to 30 percent outdoor air, with motorized damper filter.
2. Outdoor- and Return-Air Mixing Dampers: Parallel-blade galvanized-steel dampers mechanically fastened to cadmium plated for galvanized-steel operating rod in reinforced cabinet. Connect operating rods with common linkage and interconnect so dampers operate simultaneously.
3. Relief-Air Damper: Gravity actuated or motorized, as required by ASHRAE/IES 90.1.
4. Barometric relief dampers.

K. Air Filters: Provide 6” configurable filter bank with MERV-8 pre-filters and MERV-13 final filters.

L. Vibration Isolation Devices: See Section 230548.13 "Vibration Controls for HVAC."

M. Electrical Characteristics for Single-Point Connection:

1. Refer to Drawings.

2.3 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Trane.
2. AAON.
3. Addison.
4. Allied Commercial.
5. Daikin Applied.

6. Lennox Industries, Inc.; Lennox International.
7. Valent.
8. YORK; brand of Johnson Controls International plc, Building Solutions North America.
9. Approved equivalent.

2.4 UNIT CASINGS

A. General Fabrication Requirements for Casings: Formed and reinforced double-wall insulated panels, fabricated to allow removal for access to internal parts and components, with joints between sections sealed.

B. Double-Wall Construction:

1. Outside Casing Wall: Galvanized steel, minimum 18 gauge thick with manufacturer's standard finish, with pitched roof panels and knockouts with grommet seals for electrical and piping connections and lifting lugs.
2. Inside Casing Wall: G90-coated galvanized steel.
3. Floor Plate: G90 galvanized steel, minimum 18 gauge thick.
4. Casing Insulation:

    a. Materials: Injected polyurethane foam insulation.
    b. Casing Panel R-Value: Minimum 6.7.
    c. Insulation Thickness: 2 inches.
    d. Thermal Break: Provide continuity of insulation with no through-casing metal in casing walls, floors, or roof of unit.

C. Airstream Surfaces: Surfaces in contact with airstream shall comply with requirements in ASHRAE 62.1.

D. Static-Pressure Classifications:

1. Refer to drawings.

E. Panels and Doors:

1. Panels:

    a. Fabrication: Formed and reinforced with same materials and insulation thickness as casing.
    b. Fasteners: Two or more camlock type for panel lift-out operation. Arrangement shall allow panels to be opened against air-pressure differential.
    c. Gasket: Neoprene, applied around entire perimeters of panel frames.
    d. Size: Large enough to allow inspection and maintenance of air-handling unit's internal components.

2. Access Doors:

    a. Hinges: A minimum of two ball-bearing hinges or stainless steel piano hinge and two wedge-lever-type latches, operable from inside and outside. Arrange doors to be opened against air-pressure differential.

b. Gasket: Neoprene, applied around entire perimeters of panel frames.
c. Size: Large enough to allow inspection and maintenance of air-handling unit's internal components.

3. Locations and Applications:

a. Fan Section: Doors and inspection and access panels.
b. Access Section: Doors.
c. Coil Section: Inspection and access panels.
d. Damper Section: Doors.
e. Filter Section: Doors large enough to allow periodic removal and installation of filters.
f. Mixing Section: Doors.

F. Condensate Drain Pans:

1. Location: Each type of cooling coil.
2. Construction:

a. Single-wall, stainless steel sheet.

3. Drain Connection:

a. Located at lowest point of pan and sized to prevent overflow. Terminate with threaded nipple on one end of pan.
b. Minimum Connection Size: NPS 1.

4. Slope: Minimum 0.125-in./ft. slope, to comply with ASHRAE 62.1, in at least two planes to collect condensate from cooling coils (including coil piping connections, coil headers, and return bends) and from humidifiers and to direct water toward drain connection.
5. Width: Entire width of water producing device.
6. Pan-Top Surface Coating for Galvanized-Steel Drain Pans: Asphaltic waterproofing compound.
7. Units with stacked coils shall have an intermediate drain pan to collect condensate from top coil.

2.5 FANS, DRIVES, AND MOTORS

A. Fan and Drive Assemblies: Statically and dynamically balanced and designed for continuous operation at maximum-rated fan speed and motor horsepower.

B. Supply-Air Fans: Centrifugal, rated according to AMCA 210; galvanized or painted steel; mounted on solid-steel shaft.

1. Shafts: With field-adjustable alignment.

a. Turned, ground, and polished hot-rolled steel with keyway.

2. Housings: Formed- and reinforced-steel panels to form curved scroll housings with shaped cutoff and spun-metal inlet bell.

a. Bracing: Steel angle or channel supports for mounting and supporting fan scroll, wheel, motor, and accessories.

3. Centrifugal Fan Wheels: Inlet flange, backplate, and shallow blades with inlet and tip curved forward in direction of airflow and mechanically fastened to flange and backplate; steel or aluminum hub swaged to backplate and fastened to shaft with setscrews.
4. Mounting: For internal vibration isolation. Factory-mount fans with manufacturer's standard vibration isolation mounting devices having a minimum static deflection of 1 inch.
5. Shaft Lubrication Lines: Extended to a location outside the casing.
6. Flexible Connector: Factory fabricated with a fabric strip minimum 3-1/2 inches wide, attached to two strips of minimum 2-3/4-inch-wide by 0.028-inch- thick, galvanized-steel sheet.

a. Flexible Connector Fabric: Glass fabric, double coated with neoprene. Fabrics, coatings, and adhesives shall comply with UL 181, Class 1.

C. Drives, Direct: Factory-mounted, direct drive.

D. Fan Drive: V-Belt type, Cast iron or steel sheaves, dynamically balanced, bored to fit shafts and keyed. Furnish solid shaft construction. Select Variable and adjustable pitch motor sheave to obtain required rpm with sheaves set at mid-position as recommended by manufacturer.

E. Motors:

1. Comply with NEMA designation, temperature rating, service factor, and efficiency requirements for motors.
2. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
3. Enclosure Type: Totally enclosed, fan cooled.
4. Efficiency: Premium efficient as defined in NEMA MG 1.
5. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in electrical Sections.

2.6 COILS

A. General Requirements for Coils:

1. Comply with AHRI 410.
2. Fabricate coils section to allow for removal and replacement of coil for maintenance and to allow in-place access for service and maintenance of coil(s).
3. Coils shall not act as structural component of unit.

B. Supply-Air Refrigerant Coil:

1. Tubes: Copper.
2. Fins:

a. Material: Aluminum.

3. Fin and Tube Joints: Mechanical bond.

4. Headers: seamless-copper headers with brazed connections.
5. Frames: Stainless steel.
6. Coatings: Corrosion-resistant coating.
7. Ratings: Designed, tested, and rated according to ASHRAE 33 and AHRI 410.

    a. Working Pressure: Minimum 300 psig.

C. Outdoor-Air Refrigerant Coil:

1. Tubes: Copper.
2. Fins:

    a. Material: Aluminum.

3. Fin and Tube Joints: Mechanical bond.
4. Headers: Seamless-copper headers with brazed connections.
5. Frames: Stainless steel
6. Coatings: Corrosion-resistant coating.
7. Ratings: Designed, tested, and rated according to ASHRAE 33 and AHRI 410.

    a. Working Pressure: Minimum 300 psig.

D. Hot-Gas Reheat Refrigerant Coil:

1. Tubes: Copper.
2. Fins:

    a. Material: Aluminum.

3. Fin and Tube Joints: Mechanical bond.
4. Headers: Seamless-copper headers with brazed connections.
5. Frames: Stainless steel.
6. Coatings: Corrosion-resistant coating.
7. Ratings: Designed, tested, and rated according to ASHRAE 33 and AHRI 410.

    a. Working Pressure: Minimum 300 psig.

8. Suction-discharge bypass valve.

E. Electric-Resistance Heating Coils: Comply with UL 1995.

1. Casing Assembly: Flanged type with galvanized-steel frame.
2. Open Heating Elements: Resistance wire of 80 percent nickel and 20 percent chromium supported and insulated by floating ceramic bushings recessed into casing openings, fastened to supporting brackets, and mounted in galvanized-steel frame.
3. Overtemperature Protection: Disk-type, automatically resetting, thermal-cutout, safety device; serviceable through terminal box without removing heater from coil section.
4. Secondary Protection: Load-carrying, manually resetting or manually replaceable, thermal cutouts; factory wired in series with each heater stage.
5. Control Panel: Unit mounted with disconnecting means and overcurrent protection.

a. Solid-state, stepless pulse controller.
b. Toggle switches, one per step.
c. Step controller.
d. Time-delay relay.
e. Pilot lights, one per step.
f. Airflow proving switch.

2.7 AIR FILTRATION

A. Particulate air filtration is specified in Section 234100 "Particulate Air Filtration."

B. Adhesive, Sustainability Projects: As recommended by air-filter manufacturer and with a VOC content of 80 g/L or less.

2.8 GAS FURNACES

A. Description: Factory assembled, piped, and wired; complying with ANSI Z21.47/CSA 2.3 and NFPA 54.

B. CSA Approval: Designed and certified by and bearing label of CSA.

C. Burners: Stainless steel.

1. Rated Minimum Turndown Ratio: 5 to 1.
2. Fuel: Natural gas.
3. Ignition: Electronically controlled electric spark or hot-surface igniter with flame sensor.
4. Gas Control Valve: Modulating.
5. Gas Train: Single-body, regulated, redundant, 24-V ac gas valve assembly containing pilot solenoid valve, pilot filter, pressure regulator, pilot shutoff, and manual shutoff.

D. Heat-Exchanger and Drain Pan: Stainless steel.

E. Safety Controls:

1. Gas Manifold: Safety switches and controls complying with ANSI standards.

2.9 DAMPERS

A. Dampers: Comply with requirements in Section 230923.12 "Control Dampers."

B. Outdoor- and Return-Air Dampers: Low-leakage, double-skin, airfoil-blade, galvanized-steel dampers with compressible jamb seals and extruded-vinyl blade edge seals in parallel-blade arrangement with zinc-plated steel operating rods rotating in sintered bronze bearings mounted in a single galvanized-steel frame, and with operating rods connected with a common linkage. Leakage rate shall not exceed 4 cfm/sq. ft. at 1-inch wg and 8 cfm/sq. ft. at 4-inch wg rated in accordance with AMCA 500D.

C. Damper Operators: Comply with requirements in Section 230923.12 "Control Dampers."

D. Electronic Damper Operators:

1. Direct-coupled type designed for minimum 60,000 full-stroke cycles at rated torque.
2. Electronic damper position indicator shall have visual scale indicating percent of travel and
3. Operator Motors:

    a. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."
    b. Size to operate with sufficient reserve power to provide smooth modulating action or two-position action.
    c. Permanent Split-Capacitor or Shaded-Pole Type: Gear trains completely oil immersed and sealed. Equip spring-return motors with integral spiral-spring mechanism in housings designed for easy removal for service or adjustment of limit switches, auxiliary switches, or feedback potentiometer.

4. Nonspring-Return Motors for Dampers Larger Than 25 Sq. Ft.: Size for running torque of 150 in. x lbf and breakaway torque of 300 in. x lbf.
5. Spring-Return Motors for Dampers Larger Than 25 Sq. Ft.: Size for running and breakaway torque of 150 in. x lbf.
6. Size dampers for running torque calculated as follows:

    a. Parallel-Blade Damper with Edge Seals: 7 inch-lb/sq. ft. of damper.
    b. Opposed-Blade Damper with Edge Seals: 5 inch-lb/sq. ft. of damper.
    c. Parallel-Blade Damper without Edge Seals: 4 inch-lb/sq. ft of damper.
    d. Opposed-Blade Damper without Edge Seals: 3 inch-lb/sq. ft. of damper.
    e. Dampers with 2- to 3-Inch wg of Pressure Drop or Face Velocities of 1000 to 2500 fpm: Increase running torque by 1.5.
    f. Dampers with 3- to 4-Inch wg of Pressure Drop or Face Velocities of 2500 to 3000 fpm: Increase running torque by 2.0.

7. Coupling: V-bolt and V-shaped, toothed cradle.
8. Overload Protection: Electronic overload or digital rotation-sensing circuitry.
9. Fail-Safe Operation: Mechanical, spring-return mechanism with external, manual gear release on nonspring-return actuators.
10. Power Requirements (Modulating): Maximum 10 VA at 24 V ac or 8 W at 24 V dc.
11. Proportional Signal: 2 to 10 V dc or 4 to 20 mA, and 2- to 10-V dc position feedback signal.
12. Temperature Rating: Minus 22 to plus 122 deg F.

2.10 ELECTRICAL POWER CONNECTIONS

A. RTU shall have a single connection of power to unit with unit-mounted disconnect switch accessible from outside unit and control-circuit transformer with built-in overcurrent protection.

2.11 CONTROLS

A. Control equipment and sequence of operation are specified in Section 230923 "Direct Digital Control (DDC) System for HVAC."

B. Controls: Refer to Section 230924 for sequence of operation.

C. Controls: Furnish interface to Direct Digital Control System specified in Section 230924.

D. Controls: Microprocessor based controls, factory mounted with the following features:

1. Constant Volume Controls: To operate rooftop from space temperature sensor, including economizer control.

    a. Furnish space temperature sensor with setpoint adjustment for control of unit equipped with override button for timed override.
    b. Furnish space temperature sensor with setpoint adjustment for control of unit equipped with override button for timed override. Furnish with space temperature offset of plus or minus 5 degrees F.

2. Variable Air Volume Controls: To operate VAV rooftop from supply air temperature including supply air sensor, and variable frequency drive. Microprocessor coordinates economizer control and stages of cooling with supply air temperature reset capability based upon outdoor air temperature.
3. Control Functions: Furnish the following:

    a. Unit scheduling.
    b. Occupied-unoccupied mode.
    c. Start-up and coast-down modes.
    d. Nighttime free-cool purge mode.
    e. Demand limiting.
    f. Night setback.
    g. Timed override.
    h. Alarm shutdown.
    i. Discharge air set point adjustment.
    j. Static pressure setpoint adjustment.
    k. Smoke control.
    l. Smoke evacuation.
    m. Smoke pressurization.

4. Furnish the following setpoints and diagnostic functions accessible in unit control panel:

    a. Unit operating mode.
    b. Unit failure status.
    c. Supply fan start-stop.
    d. Supply fan status.
    e. Supply fan inlet guide vane position.
    f. Supply fan variable frequency drive percent.
    g. Return fan start-stop.
    h. Return fan status.
    i. Return fan inlet guide vane position.

j. Return fan variable frequency drive percent.
k. Exhaust fan start-stop.
l. Exhaust fan status.
m. Exhaust fan variable frequency drive percent.
n. Supply air temperature.
o. Supply air temperature high-low limit with alarm.
p. Return air temperature.
q. Return air temperature high-low limit with alarm.
r. Mixed air temperature.
s. Mixed air temperature high-low limit with alarm.
t. Duct static pressure.
u. Duct static pressure high-low limit with alarm.
v. Cooling control.
w. Cooling status - all stages.
x. Heating control.
y. Heating status.
z. Number of stages activated.
aa. Damper control.
bb. Economizer status.
cc. Requested minimum position.
dd. Damper positions.
ee. Space temperature.
ff. Space temperature high-low limit with alarm.
gg. Filter status.
hh. Smoke detector status.
ii. Outside air temperature.
jj. Outside relative humidity.

5. Ventilation Override: Factory installed. Binary input from independent fire or life safety panel causes unit to override standard operation and assumes one of two factory preset ventilation sequences - purge or pressurization.
6. Indoor Air Quality Control: Furnish demand ventilation control through economizer with carbon dioxide sensor. Sensor adjustable duct mounted.

2.12 ROOF CURBS

A. Roof Curb:

1. Assemble roof curb.
2. Install roof curb level.
3. Coordinate curb installation and flashing.
4. Install units on roof curb providing watertight enclosure to protect ductwork and utility services.
5. Install gasket material between unit base and roof curb.

B. Install units on vibration isolators. Refer to Section 230548.13.

2.13 ACCESSORIES

A. Refer to Drawings.

2.14 MATERIALS

A. Steel:

1. ASTM A36 for carbon structural steel.
2. ASTM A568 for steel sheet.

B. Stainless Steel:

1. Manufacturer's standard grade for casing.
2. Manufacturer's standard type, ASTM A240 for bare steel exposed to airstream or moisture.

C. Galvanized Steel: ASTM A653.

D. Aluminum: ASTM B209.

E. Comply with Section 230546 "Coatings for HVAC" for corrosion-resistant coating.

F. Corrosion-Resistant Coating: Coat with a corrosion-resistant coating capable of withstanding a 3000 hour salt-spray test according to ASTM B117.

1. Standards:

a. ASTM B117 for salt spray.
b. ASTM D2794 for minimum impact resistance of 100 in-lb.
c. ASTM B3359 for cross-hatch adhesion of 5B.

2. Application: Immersion or Spray.
3. Thickness: 1 mil.
4. Gloss: Minimum gloss of 60 on a 60-degree meter.

2.15 SOURCE QUALITY CONTROL

A. AHRI Compliance:

1. Comply with AHRI 210/240 for testing and rating energy efficiencies for RTUs.
2. Comply with AHRI 340/360 for testing and rating energy efficiencies for RTUs.
3. Comply with AHRI 270 for testing and rating sound performance for RTUs.
4. Comply with AHRI 1060 for testing and rating performance for air-to-air exchanger.

B. AMCA Compliance:

1. Comply with AMCA 11 and bear the AMCA-Certified Ratings Seal for air and sound performance according to AMCA 211 and AMCA 311.
2. Damper leakage tested according to AMCA 500-D.

3. Operating Limits: Classify according to AMCA 99.

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 RTUs.

B. Examine roughing-in for RTUs to verify actual locations of piping and duct connections before equipment installation.

C. Examine roofs for suitable conditions where RTUs will be installed.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

1. Install normal-weight, 3000-psi, compressive strength (28-day) concrete mix inside roof curb, 4 inches thick. Concrete, formwork, and reinforcement are specified with concrete.

B. Unit Support: Install unit level on structural curbs. Coordinate wall penetrations and flashing with wall construction. Secure RTUs to structural support with anchor bolts.

C. Equipment Mounting:

1. Comply with requirements for vibration isolation devices specified in Section 230548.13 "Vibration Controls for HVAC."

3.3 PIPING CONNECTIONS

A. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Where installing piping adjacent to RTU, allow space for service and maintenance.

C. Connect piping to unit mounted on vibration isolators with flexible connectors.

D. Connect condensate drain pans using NPS 1-1/4, ASTM B88, Type M copper tubing. Extend to nearest equipment or roof drain. Construct deep trap at connection to drain pan and install cleanouts at changes in direction.

E. Gas Piping: Comply with applicable requirements in Section 231123 "Facility Natural-Gas Piping." Connect gas piping to burner, full size of gas train inlet, and connect with union and shutoff valve with sufficient clearance for burner removal and service.

F. Refrigerant Piping: Comply with applicable requirements in Section 232300 "Refrigerant Piping." Install shutoff valve and union or flange at each supply and return connection.

3.4 DUCT CONNECTIONS

A. Comply with duct installation requirements specified in other HVAC Sections. Drawings indicate general arrangement of ducts. The following are specific connection requirements:

1. Install ducts to termination at top of roof curb.
2. Remove roof decking only as required for passage of ducts. Do not cut out decking under entire roof curb.
3. Connect supply ducts to RTUs with flexible duct connectors specified in Section 233300 "Air Duct Accessories."
4. Install return-air duct continuously through roof structure.

3.5 ELECTRICAL CONNECTIONS

A. Connect electrical wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

B. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

C. Install electrical devices furnished by manufacturer, but not factory mounted, according to NFPA 70 and NECA 1.

D. Install nameplate for each electrical connection, indicating electrical equipment designation and circuit number feeding connection.

1. Nameplate shall be laminated acrylic or melamine plastic signs as specified in Section 260553 "Identification for Electrical Systems."
2. Locate nameplate where easily visible.

3.6 CONTROL CONNECTIONS

A. Install control and electrical power wiring to field-mounted control devices.

B. Connect control wiring according to Section 260523 "Control-Voltage Electrical Power Cables."

3.7 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a Company Field Advisor per OGS Spec Section 014216 to test and inspect components, assemblies, and equipment installations, including connections.

B. Perform tests and inspections with the assistance of a Company Field Advisor per OGS Spec Section 014216.

C. Tests and Inspections:

1. After installing RTUs and after electrical circuitry has been energized, test units for compliance with requirements.
2. Inspect for and remove shipping bolts, blocks, and tie-down straps.
3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. RTU will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

3.8 STARTUP SERVICE

A. Engage a Company Field Advisor per OGS Spec Section 014216 to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.
2. Inspect for visible damage to unit casing.
3. Inspect for visible damage to furnace combustion chamber.
4. Inspect for visible damage to compressor, coils, and fans.
5. Inspect internal insulation.
6. Verify that labels are clearly visible.
7. Verify that clearances have been provided for servicing.
8. Verify that controls are connected and operable.
9. Verify that filters are installed.
10. Clean condenser coil and inspect for construction debris.
11. Clean furnace flue and inspect for construction debris.
12. Connect and purge gas line.
13. Remove packing from vibration isolators.
14. Verify lubrication on fan and motor bearings.
15. Inspect fan-wheel rotation for movement in correct direction without vibration and binding.
16. Adjust fan belts to proper alignment and tension.
17. Start unit according to manufacturer's written instructions.

    a. Start refrigeration system.
    b. Do not operate below recommended low-ambient temperature.
    c. Complete startup sheets and attach copy with Contractor's startup report.

18. Inspect and record performance of interlocks and protective devices; verify sequences.
19. Operate unit for an initial period as recommended or required by manufacturer.
20. Perform the following operations for both minimum and maximum firing. Adjust burner for peak efficiency:

    a. Measure gas pressure on manifold.
    b. Inspect operation of power vents.
    c. Measure combustion-air temperature at inlet to combustion chamber.
    d. Measure flue-gas temperature at furnace discharge.

e. Perform flue-gas analysis. Measure and record flue-gas carbon dioxide and oxygen concentration.
f. Measure supply-air temperature and volume when burner is at maximum firing rate and when burner is off. Calculate useful heat to supply air.

21. Calibrate thermostats.
22. Adjust and inspect high-temperature limits.
23. Inspect outdoor-air dampers for proper stroke and interlock with return-air dampers.
24. Start refrigeration system and measure and record the following when ambient is a minimum of 15 deg F above return-air temperature:

    a. Coil leaving-air, dry- and wet-bulb temperatures.
    b. Coil entering-air, dry- and wet-bulb temperatures.
    c. Outdoor-air, dry-bulb temperature.
    d. Outdoor-air-coil, discharge-air, dry-bulb temperature.

25. Inspect controls for correct sequencing of heating, mixing dampers, refrigeration, and normal and emergency shutdown.
26. Measure and record the following minimum and maximum airflows. Plot fan volumes on fan curve.

    a. Supply-air volume.
    b. Return-air volume.
    c. Relief-air volume.
    d. Outdoor-air intake volume.

27. Simulate maximum cooling demand and inspect the following:

    a. Compressor refrigerant suction and hot-gas pressures.
    b. Short circuiting of air through condenser coil or from condenser fans to outdoor-air intake.

28. Verify operation of remote panel including pilot-light operation and failure modes. Inspect the following:

    a. High-temperature limit on gas-fired heat exchanger.
    b. Low-temperature safety operation.
    c. Filter high-pressure differential alarm.
    d. Economizer to minimum outdoor-air changeover.
    e. Relief-air fan operation.
    f. Smoke and firestat alarms.

29. After startup and performance testing and prior to Substantial Completion, replace existing filters with new filters.

3.9 ADJUSTING

A. Adjust damper linkages for proper damper operation.

B. Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC" for air-handling system testing, adjusting, and balancing.

C. Occupancy Adjustments: When requested within 12 months from date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

3.10 CLEANING

A. After completing system installation and testing, adjusting, and balancing RTUs and air-distribution systems, clean RTUs internally to remove foreign material and construction dirt and dust. Clean fan wheels, cabinets, dampers, coils, and filter housings, and install new, clean filters.

3.11 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Manufacturer's Field Service: Engage a Company Field Advisor per OGS Spec Section 014216 to test and inspect components, assemblies, and equipment installations, including connections.

C. Perform tests and inspections with the assistance of a Company Field Advisor per OGS Spec Section 014216

D. Tests and Inspections:

1. After installing RTUs and after electrical circuitry has been energized, test units for compliance with requirements.
2. Inspect for and remove shipping bolts, blocks, and tie-down straps.
3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

E. RTU will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports.

3.12 DEMONSTRATION

A. Engage a Company Field Advisor per OGS Spec Section 014216 to train Facility’s maintenance personnel to adjust, operate, and maintain RTUs.

END OF SECTION 237416.11

SECTION 237416.12 - PACKAGED, INTERMEDIATE-CAPACITY, ROOFTOP AIR CONDITIONING UNITS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Packaged rooftop air conditioning unit.
2. Roof curb.

B. Related Sections:

1. Section 230548.18 - Vibration Controls for HVAC: Vibration isolators.
2. Section 230923 - Direct-Digital Control System for HVAC: Controls remote from unit.
3. Section 233300 - Air Duct Accessories: Flexible connections.

1.2 REFERENCES

A. Air-Conditioning and Refrigeration Institute:

1. ARI 270 - Sound Rating of Outdoor Unitary Equipment.
2. ARI 340/360 - Commercial and Industrial Unitary Air-Conditioning and Heat Pump Equipment.

B. Air Movement and Control Association International, Inc.:

1. AMCA 500 - Test Methods for Louvers, Dampers, and Shutters.

C. American Society of Heating, Refrigerating and Air-Conditioning Engineers:

1. ASHRAE 52.1 - Gravimetric and Dust-Spot Procedures for Testing Air-Cleaning Devices Used in General Ventilation for Removing Particulate Matter.
2. ASHRAE 90.1 - Energy Standard for Buildings Except Low-Rise Residential Buildings.

D. ASTM International:

1. ASTM B117 - Standard Practice for Operating Salt Spray (Fog) Apparatus.

E. National Electrical Manufacturers Association:

1. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
2. NEMA MG 1 - Motors and Generators.

F. National Fire Protection Association:

1. NFPA 54 - National Fuel Gas Code.
2. NFPA 58 - Liquefied Petroleum Gas Code.
3. NFPA 90A - Standard for the Installation of Air Conditioning and Ventilating Systems.

1.3 DEFINITIONS

A. Energy Efficiency Ratio (EER) - Ratio of net cooling capacity in Btuh to total rate of electric input in watts under designated operating conditions.

B. Integrated Part-Load Value (IPLV): Single-number figure of merit based on part-load EER, COP, or kW/ton expressing part-load efficiency for air-conditioning and heat pump equipment on basis of weighted operation at various load capacities for the equipment.

1.4 SUBMITTALS

A. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.

B. Manufacturer’s installation instructions shall be provided along with product data.

C. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).

D. Product Data: Submit data indicating:

1. Cooling and heating capacities.
2. Dimensions.
3. Weights.
4. Rough-in connections and connection requirements.
5. Duct connections.
6. Electrical requirements with electrical characteristics and connection requirements.
7. Controls.
8. Accessories.

E. Test Reports: Submit results of factory test at time of unit shipment

F. Manufacturer's Installation Instructions: Submit assembly, support details, connection requirements, and include start-up instructions.

G. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

H. Manufacturer's Field Reports: Submit start-up report for each unit.

1.5 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations of controls installed remotely from units.

B. Operation and Maintenance Data: Submit manufacturer's descriptive literature, operating instructions, installation instructions, and maintenance and repair data.

1.6 QUALITY ASSURANCE

A. Cooling Capacity: Rate in accordance with AHRI 340/360.

B. Sound Rating: Measure in accordance with AHRI 270 “Sound Performance Rating of Outdoor Unitary Equipment”.

C. Insulation and adhesives: Meet requirements of NFPA 90A “Standard for the Installation of Air Conditioning and Ventilating Systems”.

D. Performance Requirements: Conform to minimum EER prescribed by ASHRAE 90.1 “Energy Standard for Buildings Except Low-Rise Residential Buildings” when tested in accordance with ARI 340/360 “Commercial and Industrial Unitary Air-Conditioning and Heat Pump Equipment”.

E. Outside Air Damper Leakage: Test in accordance with AMCA 500 “Test Methods for Louvers, Dampers, and Shutters”.

F. Maintain at least one copy of each document on site.

1.7 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years' documented experience.

B. Installer: Company specializing in performing Work of this section with minimum three years' documented experience certified by manufacturer.

1.8 PRE-INSTALLATION MEETINGS

A. Convene minimum one week prior to commencing work of this section.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Accept units on site. Inspect for damage.

B. Protect units from damage by storing off roof until roof mounting curbs are in place.

1.10 COORDINATION

A. Coordinate installation of roof curbs with roof structure, roof deck and roof membrane installation.

1.11 WARRANTY

A. Furnish five year manufacturer's warranty for compressors.

B. Furnish five year manufacturer's warranty for heat exchangers.

1.12 MAINTENANCE SERVICE

A. Furnish service and maintenance of equipment for one year from Date of Substantial Completion. Include maintenance items as shown in manufacturer's operating and maintenance data, including filter replacements, fan belt replacement, and controls checkout and adjustments.

B. Furnish 24-hour emergency service on breakdowns and malfunctions for this maintenance period.

1.13 EXTRA MATERIALS

A. Furnish one set of fan belts for each unit.

B. Furnish one set of disposable filters for each unit.

PART 2 - PRODUCTS

2.1 ROOFTOP AIR CONDITIONING UNITS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Trane.
2. AAON.
3. Addison.
4. Allied Commercial.
5. Daikin Applied.
6. Lennox Industries, Inc.; Lennox International.
7. Valent.
8. YORK; brand of Johnson Controls International plc, Building Solutions North America.
9. Approved equivalent.

B. Product Description: Self-contained, packaged, factory assembled and wired, consisting of roof curb, cabinet, supply fan, variable frequency drive, evaporator coil, compressor, refrigeration circuit, condenser, heat pump heating, gas-fired backup heating, air filters, outdoor air section, exhaust-return section, exhaust fan, energy wheel, and controls.

C. Configuration: As indicated on Drawings.

D. Roof Mounting Curb: 18 inch high, galvanized steel, channel frame with gaskets, nailer strips.

E. Cabinet:

1. Designed for outdoor installation with weatherproof construction.
2. Panels: G-90 galvanized steel with baked enamel finish meeting 500 hour salt spray test in accordance with ASTM B117 "Standard Practice for Operating Salt Spray (Fog) Apparatus". Furnish hinged access doors with handles and rubber gaskets at edges.
3. Insulation: Factory applied to exposed vertical panels, horizontal panels, and access doors. 2 inch thick, R-13 insulation.
4. Interior Surfaces: Sheet metal lined creating double wall construction.

F. Supply Fan:

1. Fan: Forward curved centrifugal type, statically and dynamically balanced, resiliently mounted.
2. Fan Drive: V-Belt type, Cast iron or steel sheaves, dynamically balanced, bored to fit shafts and keyed. Furnish solid shaft construction. Select Variable and adjustable pitch motor sheave to obtain required rpm with sheaves set at mid-position as recommended by manufacturer.

    a. Drive Rating: Minimum 1.5 times nameplate rating of motor.
    b. Fan Sheave: Adjustable.
    c. Motor Sheave: Adjustable.

3. Fan motor: Three phase, NEMA MG1 "Motors and Generators", Design B, continuously rated at 40 degrees C, NEMA T frame, with permanently lubricated bearings and integral overload protection.
4. Fan Assembly Mounting: Furnish spring-type vibration isolators.

G. Supply Fan Modulation:

1. Inlet Guide Vanes: Furnish with factory installed electric actuator, linkage and controller. Entire assembly factory adjusted.
2. Variable Frequency Drive:

    a. Furnished for supply fan and return fan.
    b. Factory installed, wired, and tested.
    c. With bypass.
    d. Full digital control.
    e. Insulated Gate Bi-Polar Transistors used to produce output pulse width modulation waveform allowing quiet operation.
    f. NEMA 250 "Enclosures for Electrical Equipment (1000 Volts Maximum)" Type 1 enclosure.
    g. Self diagnostics.
    h. Proportional-integral-derivative setpoint control.
    i. Communication port.
    j. Electronic thermal overload protection.

3. Controlled from duct static pressure by unit mounted controller. Static pressure sensed by duct mounted sensor.
4. Furnish field adjustable duct high limit safety control to protect duct work from excessive duct pressure.

H. Evaporator Coil:

1. Constructed of seamless copper tubes mechanically expanded into aluminum fins. Factory leak tested under water.
2. Galvanized drain pan and piping connection.
3. Furnish for multiple circuited units alternate row circuiting.

I. Compressors:

1. Semi-hermetic, resiliently mounted with positive lubrication, and internal motor overload protection.
2. Furnish each compressor with independent refrigeration circuit.
3. Furnish external vibration isolators.
4. Furnish short cycle protection.

J. Refrigeration circuit:

1. Dehydrate and factory charge each circuit with oil and refrigerant.
2. Furnish the following for each circuit:

    a. Thermostatic expansion device.
    b. Filter-drier.
    c. Suction, discharge, and liquid line service valves with gauge ports.
    d. Sight glass.
    e. High and low pressure safety controls.

K. Condenser:

1. Constructed of copper tubing mechanically bonded to aluminum. Factory leak tested under water.
2. Direct drive propeller fans statically and dynamically balanced. Wired to operate with compressor. Motor permanently lubricated with built-in thermal overload protection. Furnish high efficiency fan motors.

L. Gas-Fired Back Up Heating Section:

1. Fuel: Natural gas.
2. Heat Exchanger: Stainless steel, of welded construction.

M. Air Filters: Provide 6” configurable filter bank with MERV-8 pre-filters and MERV-13 final filters.

N. Outdoor Air Section:
1. Economizer: Provide economizer components and controls in accordance with ICC IECC. Furnish fully integrated factory installed fully modulating from 0 to 100 percent outside

air economizer. Economizer operation through microprocessor based primary temperature controls automatically modulate dampers to maintain space temperature conditions.

a. Furnish economizer with differential enthalpy control.
b. Furnish adjustable minimum position control located remotely in space.
c. Furnish spring return motor for outside air damper closure during unit shutdown or power interruption.

O. Exhaust and Return Section:
1. Barometric relief gravity type dampers to operate in conjunction with economizer.
2. Modulating exhaust fans: Forward curved centrifugal type, direct drive, statically and dynamically balanced, high efficiency motor. Motor permanently lubricated with built-in thermal overload protection. Furnish barometric dampers at fan outlet to prevent backdraft. Fans operated with volume control device based on field adjustable interior space pressure setpoint.

P. Return Fan:

1. Fan: Forward curved centrifugal type, statically and dynamically belt balanced, resiliently mounted.
2. Fan Drive: V-Belt type, Cast iron or steel sheaves, dynamically balanced, bored to fit shafts and keyed. Furnish solid shaft construction. Select Variable and adjustable pitch motor sheave to obtain required rpm with sheaves set at mid-position as recommended by manufacturer.

a. Fan Sheave: Adjustable.
b. Motor Sheave: Adjustable.

3. Fan motor: Three phase, NEMA MG1 “Motors and Generators”, Design B, continuously rated at 40 degrees C, NEMA T frame, with permanently lubricated bearings and integral overload protection.
4. Fan Assembly Mounting: Furnish spring-type vibration isolators.

Q. Return Fan Modulation:

1. Inlet guide vanes: Furnish with factory installed electric actuator, linkage and controller. Entire assembly factory adjusted.
2. Controlled in conjunction with supply fan.
3. Variable frequency drive: Individual drive for return fan.

R. Controls: Refer to Section 230924 for sequence of operation.

S. Controls: Furnish interface to Direct Digital Control System specified in Section 230924.

T. Controls: Microprocessor based controls, factory mounted with the following features:

1. Constant Volume Controls: To operate rooftop from space temperature sensor, including economizer control.

a. Furnish space temperature sensor with setpoint adjustment for control of unit equipped with override button for timed override.

b. Furnish space temperature sensor with setpoint adjustment for control of unit equipped with override button for timed override. Furnish with space temperature offset of plus or minus 5 degrees F.

2. Variable Air Volume Controls: To operate VAV rooftop from supply air temperature including supply air sensor, and variable frequency drive. Microprocessor coordinates economizer control and stages of cooling with supply air temperature reset capability based upon outdoor air temperature.
3. Control Functions: Furnish the following:

a. Unit scheduling.
b. Occupied-unoccupied mode.
c. Start-up and coast-down modes.
d. Nighttime free-cool purge mode.
e. Demand limiting.
f. Night setback.
g. Timed override.
h. Alarm shutdown.
i. Discharge air set point adjustment.
j. Static pressure setpoint adjustment.
k. Smoke control.
l. Smoke evacuation.
m. Smoke pressurization.

4. Furnish the following setpoints and diagnostic functions accessible in unit control panel:

a. Unit operating mode.
b. Unit failure status.
c. Supply fan start-stop.
d. Supply fan status.
e. Supply fan inlet guide vane position.
f. Supply fan variable frequency drive percent.
g. Return fan start-stop.
h. Return fan status.
i. Return fan inlet guide vane position.
j. Return fan variable frequency drive percent.
k. Exhaust fan start-stop.
l. Exhaust fan status.
m. Exhaust fan variable frequency drive percent.
n. Supply air temperature.
o. Supply air temperature high-low limit with alarm.
p. Return air temperature.
q. Return air temperature high-low limit with alarm.
r. Mixed air temperature.
s. Mixed air temperature high-low limit with alarm.
t. Duct static pressure.
u. Duct static pressure high-low limit with alarm.
v. Cooling control.
w. Cooling status - all stages.
x. Heating control.

y. Heating status.
z. Number of stages activated.
aa. Damper control.
bb. Economizer status.
cc. Requested minimum position.
dd. Damper positions.
ee. Space temperature.
ff. Space temperature high-low limit with alarm.
gg. Filter status.
hh. Smoke detector status.
ii. Outside air temperature.
jj. Outside relative humidity.

5. Ventilation Override: Factory installed. Binary input from independent fire or life safety panel causes unit to override standard operation and assumes one of two factory preset ventilation sequences - purge or pressurization.
6. Indoor Air Quality Control: Furnish demand ventilation control through economizer with carbon dioxide sensor. Sensor adjustable duct mounted.

U. Accessories:

1. Convenience Outlet: Factory installed, 115 volt, 15 amp, GFI type, internally mounted.
2. Roof Curb Adaptor Package: Furnish duct support hardware to adapt unit to existing roof curb.
3. Factory installed ultraviolet C light located downstream of cooling coil.

V. Capacity:

1. Refer to drawings for capacity

2.2 SOURCE QUALITY CONTROL

A. Perform factory test of each unit. Test includes:

1. Dynamic trim balance of completed fan assembly.
2. Complete run check of electrical components and safety controls, including proper control sequencing.
3. Pressure test, at manufacturer's rated pressure, of refrigerant coils and condenser coils prior to unit assembly.
4. Leak check of completed refrigerant circuits.
5. Compressor run check.

B. Make completed unit available for inspection at manufacturer's factory prior to packaging for shipment. Notify Director’s Representative at least seven days before inspection is allowed.

C. Allow witnessing of factory inspections and test at manufacturer's test facility. Notify Director’s Representative at least seven days before inspections and tests are scheduled.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify roof curbs are installed and dimensions are as shown on shop drawings and instructed by manufacturer.

3.2 INSTALLATION

A. Roof Curb:

1. Assemble roof curb.
2. Install roof curb level.
3. Coordinate curb installation and flashing.
4. Install units on roof curb providing watertight enclosure to protect ductwork and utility services.
5. Install gasket material between unit base and roof curb.

B. Install units on vibration isolators. Refer to Section 230548.13.

C. Connect units to supply and return ductwork with flexible connections. Refer to Section 233300.

D. Install condensate piping with trap and route from drain pan to nearest roof drain.

E. Install components furnished loose for field mounting.

F. Install electrical devices furnished loose for field mounting.

G. Install control wiring between unit and field installed accessories.

3.3 INSTALLATION - NATURAL GAS HEATING SECTION

A. Connect natural gas piping in accordance with NFPA 54 “National Fuel Gas Code”.

B. Connect natural gas piping to unit, full size of unit gas train inlet. Arrange piping with clearances for burner service.

C. Install the following piping accessories on natural gas piping connections. Refer to Section 231123.

1. Strainer.
2. Pressure gage.
3. Shutoff valve.
4. Pressure reducing valve.

D. Install natural gas piping accessories above roof.

3.4 MANUFACTURER'S FIELD SERVICES

A. Furnish services of Company Field Advisor per OGS Spec Section 014216 for minimum of one days to leak test, refrigerant pressure test, evacuate, dehydrate, charge, start-up, calibrate controls, and instruct Director’s Representative on operation and maintenance.

3.5 CLEANING

A. Vacuum clean coils and inside of cabinets.

B. Install new throwaway filters in units at Substantial Completion.

C. Install temporary filters during construction period. Replace with permanent filters at Substantial Completion.

3.6 DEMONSTRATION

A. Demonstrate unit operation and maintenance.

B. Furnish services of manufacturer's technical representative to instruct Director’s Representative's personnel in operation and maintenance of units. Schedule training with Director’s Representative, provide at least 7 days notice to Director’s Representative of training date.

3.7 SCHEDULES

A. See drawings.

END OF SECTION 237416.12

SECTION 238126 - SPLIT-SYSTEM AIR-CONDITIONERS

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes split-system air-conditioning and heat-pump units consisting of separate evaporator-fan and compressor-condenser components.

1.3 SUBMITTALS

A. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.

B. Manufacturer's installation instructions shall be provided along with product data.

C. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).

D. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. Include performance data in terms of capacities, outlet velocities, static pressures, sound power characteristics, motor requirements, and electrical characteristics.

E. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Wiring Diagrams: For power, signal, and control wiring.

F. Samples for Initial Selection: For units with factory-applied color finishes.

G. Field quality-control reports.

H. Warranty: Sample of special warranty.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For split-system air-conditioning units to include in emergency, operation, and maintenance manuals.

1.5 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. Filters: One set(s) for each air-handling unit.
2. Gaskets: One set(s) for each access door.
3. Fan Belts: One set(s) for each air-handling unit fan.

1.6 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. ASHRAE Compliance:

1. Fabricate and label refrigeration system to comply with ASHRAE 15, "Safety Standard for Refrigeration Systems."

C. ASHRAE/IES Compliance: Applicable requirements in ASHRAE/IES 90.1.

1.7 COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork are specified in Section 033000 "Cast-in-Place Concrete."

B. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of split-system air-conditioning units that fail in materials or workmanship within specified warranty period.

1. Warranty Period:

a. For Compressor: Five year(s) from date of Substantial Completion.
b. For Parts: Five year(s) from date of Substantial Completion.
c. For Labor: Five year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Mitsubishi Electric & Electronics USA, Inc.
2. Trane.
3. Coleman Company Inc. (The).
4. Friedrich Air Conditioning Company.
5. Lennox Industries, Inc.; Lennox International.
6. Samsung HVAC.
7. SANYO North America Corporation.
8. YORK; brand of Johnson Controls International plc, Building Solutions North America.
9. Approved equivalent.

2.2 INDOOR UNITS (5 TONS OR LESS)

A. Wall-Mounted, Evaporator-Fan Components:

1. Cabinet: Enameled steel with removable panels on front and ends in color selected by Architect, and discharge drain pans with drain connection.
2. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins and thermal-expansion valve. Comply with ARI 206/110.
3. Electric Coil: Helical, nickel-chrome, resistance-wire heating elements; with refractory ceramic support bushings, automatic-reset thermal cutout, built-in magnetic contactors, manual-reset thermal cutout, airflow proving device, and one-time fuses in terminal box for overcurrent protection.
4. Fan: Direct drive, centrifugal.
5. Fan Motors:

    a. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements specified in Section 230513 "Common Motor Requirements for HVAC Equipment."
    b. Multitapped, multispeed with internal thermal protection and permanent lubrication.
    c. Enclosure Type: Totally enclosed, fan cooled.
    d. NEMA Premium (TM) efficient motors as defined in NEMA MG 1.
    e. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in electrical Sections.
    f. Mount unit-mounted disconnect switches on exterior of unit.

6. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.
7. Condensate:

    a. Provide unit with condensate pump with minimum lift to lift water above the top plan of the indoor unit.

b. Drain Connection: Located at lowest point of pan and sized to prevent overflow. Terminate with threaded nipple on both ends of pan.

1) Minimum Connection Size: NPS 1.

8. Air Filtration Section:

a. General Requirements for Air Filtration Section:

1) Comply with NFPA 90A.
2) Minimum MERV according to ASHRAE 52.2.
3) Filter-Holding Frames: Arranged for flat or angular orientation, with access doors on both sides of unit. Filters shall be removable from one side or lifted out from access plenum.

b. Disposable Panel Filters:

1) Factory-fabricated, viscous-coated, flat-panel type.
2) Thickness: 2 inches.
3) MERV according to ASHRAE 52.2: 13.
4) Media: Interlaced glass fibers sprayed with nonflammable adhesive and antimicrobial agent.
5) Frame: Galvanized steel, with metal grid on outlet side, steel rod grid on inlet side, and hinged; with pull and retaining handles.

c. Extended-Surface, Disposable Panel Filters:

1) Factory-fabricated, dry, extended-surface type.
2) Thickness: 2 inches.
3) MERV according to ASHRAE 52.2: 13.
4) Media: Fibrous material formed into deep-V-shaped pleats with antimicrobial agent and held by self-supporting wire grid.
5) Media-Grid Frame: Galvanized steel.
6) Mounting Frames: Welded, galvanized steel, with gaskets and fasteners; suitable for bolting together into built-up filter banks.

2.3 OUTDOOR UNITS (5 TONS OR LESS)

A. Air-Cooled, Compressor-Condenser Components:

1. Casing: Steel, finished with baked enamel in color selected by Architect, with removable panels for access to controls, weep holes for water drainage, and mounting holes in base. Provide brass service valves, fittings, and gage ports on exterior of casing.
2. Compressor: Hermetically sealed with crankcase heater and mounted on vibration isolation device. Compressor motor shall have thermal- and current-sensitive overload devices, start capacitor, relay, and contactor.

a. Compressor Type: Scroll.
b. Two-speed compressor motor with manual-reset high-pressure switch and automatic-reset low-pressure switch.

c. Refrigerant: R454B, R-32.
d. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins and liquid subcooler. Comply with ARI 206/110.

3. Heat-Pump Components: Reversing valve and low-temperature-air cutoff thermostat.
4. Fan: Aluminum-propeller type, directly connected to motor.
5. Motor: Permanently lubricated, with integral thermal-overload protection.
6. Low Ambient Kit: Permits operation down to 45 deg F.
7. Mounting Base: Polyethylene.

2.4 ACCESSORIES

A. Control equipment and sequence of operation are specified in Section 230923 "Direct Digital Control (DDC) System for HVAC" and Section 230993.11 "Sequence of Operations for HVAC DDC."

B. Thermostat: Low voltage with subbase to control compressor and evaporator fan.

C. Thermostat: Wireless infrared functioning to remotely control compressor and evaporator fan, with the following features:

1. Compressor time delay.
2. 24-hour time control of system stop and start.
3. Liquid-crystal display indicating temperature, set-point temperature, time setting, operating mode, and fan speed.
4. Fan-speed selection including auto setting.

D. Automatic-reset timer to prevent rapid cycling of compressor.

E. Refrigerant Line Kits: Soft-annealed copper suction and liquid lines factory cleaned, dried, pressurized, and sealed; factory-insulated suction line with flared fittings at both ends.

F. Drain Hose: For condensate.

G. Monitoring:

1. Monitor constant and variable motor loads.
2. Monitor variable-frequency-drive operation.
3. Monitor economizer cycle.
4. Monitor cooling load.
5. Monitor air distribution static pressure and ventilation air volumes.

2.5 CAPACITIES AND CHARACTERISTICS

A. Cooling Capacity:

1. Total: Refer to schedule.
2. Sensible: Refer to schedule.
3. SEER: Refer to schedule

4. EER: Refer to schedule

B. Heating Capacity:

1. Type: Electric.
2. Total Capacity: Refer to schedule.
3. Air-Temperature Rise: Refer to schedule.
4. Coefficient of Performance: Refer to schedule.
5. Heating Season Performance Factor: Refer to schedule.
6. Electric Heating Coil:

a. Total Capacity: Refer to schedule.
b. Volts: Refer to schedule.
c. Phase: Refer to schedule.
d. Frequency: 60 Hz.

C. Indoor Unit:

1. Fan Motor Electrical Characteristics:

a. Volts: Refer to schedules.
b. Phase: Refer to schedules.
c. Hertz: 60.

2. Airflow: Refer to schedules.

D. Outdoor Unit:

1. Type: Air cooled.
2. Electrical Characteristics:

a. Volts: Refer to schedules.
b. Phase: Refer to schedules.
c. Hertz: 60.
d. Minimum Circuit Ampacity: Refer to schedules.
e. Maximum Overcurrent Protection: Refer to schedules.
f. Fan Motor Full-Load Amperes: Refer to schedules.
g. Compressor Full-Load Amperes: Refer to schedules.

3. Sound-Pressure Level: Refer to schedule.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install units level and plumb.

B. Install evaporator-fan components using manufacturer's standard mounting devices securely fastened to building structure.

C. Install roof-mounted, compressor-condenser components on equipment supports specified in Section 077200 "Roof Accessories." Anchor units to supports with removable, cadmium-plated fasteners.

D. Equipment Mounting:

1. Install ground-mounted, compressor-condenser components on cast-in-place concrete equipment base(s). Comply with requirements for equipment bases and foundations specified in Section 033000 "Cast-in-Place Concrete."
2. Install ground-mounted, compressor-condenser components on polyethylene mounting base.
3. Comply with requirements for vibration isolation and seismic control devices specified in Section 230548 "Vibration and Seismic Controls for HVAC."
4. Comply with requirements for vibration isolation devices specified in Section 230548.13 "Vibration Controls for HVAC."

E. Install and connect precharged refrigerant tubing to component's quick-connect fittings. Install tubing to allow access to unit.

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Where piping is installed adjacent to unit, allow space for service and maintenance of unit.

C. Duct Connections: Duct installation requirements are specified in Section 233113 "Metal Ducts." Drawings indicate the general arrangement of ducts. Connect supply and return ducts to split-system air-conditioning units with flexible duct connectors. Flexible duct connectors are specified in Section 233300 "Air Duct Accessories."

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a Company Service Advisor to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

B. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a Company Service Advisor to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

C. Tests and Inspections:

1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Remove and replace malfunctioning units and retest as specified above.

E. Prepare test and inspection reports.

3.4 STARTUP SERVICE

A. Engage a Company Field Advisor per OGS Spec Section 014216 to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.

3.5 DEMONSTRATION

A. Engage a Company Field Advisor per OGS Spec Section 014216 to train Director’s Representative's Facility’s maintenance personnel to adjust, operate, and maintain units.

END OF SECTION 238126

SECTION 238129 - VARIABLE-REFRIGERANT-FLOW HVAC SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes complete VRF HVAC system(s) including, but not limited to the following components to make a complete operating system(s) according to requirements indicated:

1. Indoor, concealed, ceiling-mounted units for ducting.
2. Indoor, exposed, wall-mounted units.
3. Indoor, recessed, ceiling-mounted units.
4. Outdoor, air-source, heat-pump units.
5. System controls.
6. System refrigerant and oil.
7. System condensate drain piping.
8. System refrigerant piping.
9. Metal hangers and supports.
10. Metal framing systems.
11. Fastener systems.
12. Pipe stands.
13. Equipment stands.
14. Miscellaneous support materials.
15. Piping and tubing insulation.
16. System control cable and raceways.

1.3 DEFINITIONS

A. Air-Conditioning System Operation: System capable of operation with all zones in cooling only.

B. Heat-Pump System Operation: System capable of operation with all zones in either heating or cooling, but not with simultaneous heating and cooling zones that transfer heat between zones.

C. Heat Recovery System Operation: System capable of operation with simultaneous heating and cooling zones that transfer heat between zones.

D. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control, signaling power-limited circuits.

E. Plenum: A space forming part of the air distribution system to which one or more air ducts are connected. An air duct is a passageway, other than a plenum, for transporting air to or from heating, ventilating, or air-conditioning equipment.

F. Three-Pipe System Design: One high pressure refrigerant vapor line, one low pressure refrigerant vapor line, and one refrigerant liquid line connect a single outdoor unit or multiple manifold outdoor units in a single system to associated system HRCUs. One liquid line and refrigerant vapor line connect HRCUs to associated indoor units.

G. Two-Pipe System Design: One refrigerant vapor line and one refrigerant liquid line connect a single outdoor unit or multiple manifold outdoor units in a single system to associated system HRCUs. One refrigerant liquid line and refrigerant vapor line connect HRCUs to associated indoor units. HRCUs used in two pipe systems act as an intermediate heat exchanger and include diverting valves and gas/liquid separators to move high and low pressure refrigerant between indoor units.

H. VRF: Variable refrigerant flow.

1.4 SUBMITTALS

A. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.

B. Manufacturer's installation instructions shall be provided along with product data.

C. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).

D. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for indoor and outdoor units.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
3. Include operating performance at design conditions and at extreme maximum and minimum outdoor ambient conditions.
4. Include description of system controllers, dimensions, features, control interfaces and connections, power requirements, and connections.
5. Include system operating sequence of operation in narrative form for each unique indoor- and outdoor-unit control.
6. Include description of control software features.
7. Include total refrigerant required and a comprehensive breakdown of refrigerant required by each system installed.
8. Include refrigerant type and data sheets showing compliance with requirements indicated.
9. For system design software.
10. Indicate location and type of service access.

E. Shop Drawings: For VRF HVAC systems.

1. Include plans, elevations, sections, and mounting and attachment details.

2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.
4. Include diagrams and details of refrigerant piping and tubing showing installation requirements for manufacturer-furnished divided flow fittings.
5. Include diagrams for power, signal, and control wiring.

F. Samples for Initial Selection: For fully and partially exposed indoor units with factory finishes viewable by occupants.

1. Include a Sample for each unique finish with unit identification, detailed description of application, and cross-referenced floor plans showing locations.

G. Coordination Drawings: Plans, elevations, sections, and details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Suspended ceiling components.
2. Structural floors, roofs and associated members to which equipment, piping, ductwork, cables, and conduit will be attached.
3. Size and location of initial access modules for acoustical tile.
4. Wall-mounted controllers located in finished space showing relationship to light switches, fire-alarm devices, and other installed devices.
5. Size and location of access doors and panels installed behind walls and inaccessible ceilings for products installed behind walls and requiring access.
6. Items penetrating finished ceiling including the following:

    a. Luminaires.
    b. Air outlets and inlets.
    c. Speakers.
    d. Sprinklers.
    e. Service access panels.

H. Qualification Data:

1. For Installer: Certificate from VRF HVAC system manufacturer certifying that Installer has successfully completed prerequisite training administered by manufacturer for proper installation of systems, including but not limited to, equipment, piping, controls, and accessories indicated and furnished for installation.

    a. Retain copies of Installer certificates on-site and make available on request.

2. For VRF HVAC system manufacturer.
3. For VRF HVAC system provider.

I. Product Certificates: For each type of product.

1. Indoor, concealed, ceiling-mounted units for ducting.

2. Indoor, exposed, wall-mounted units.
3. Indoor, recessed, ceiling-mounted units.
4. Outdoor, air-source, heat-pump units.

J. Product Test Reports: Where tests are required, for each product, for tests performed by manufacturer and witnessed by a qualified testing agency.

K. Source quality-control reports.

L. Field quality-control reports.

M. Sample Warranties: For manufacturer's warranties.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For VRF HVAC systems to include in emergency, operation, and maintenance manuals.

B. Software and Firmware Operational Documentation:

1. Software operating and upgrade manuals.
2. Program Software Backup: On CD or DVD, USB media, or approved cloud storage platform, complete with data files.
3. Device address list.
4. Printout of software application and graphic screens.

1.6 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. Filters:

a. One set(s) for each unit with replaceable filters.
b. One set(s) for each unit type and unique size of washable filters.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications:

1. Nationally recognized manufacturer of VRF HVAC systems and products.
2. Shipped VRF HVAC systems with similar requirements to those indicated for a continuous period of 10 years within time of bid.
3. VRF HVAC systems and products that have been successfully tested and in use on at least three completed projects.
4. Having complete published catalog literature, installation, and operation and maintenance manuals for all products intended for use.

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. Director’s Representative training.

B. Company Service Advisor Qualifications:

1. Authorized representative of, and trained by, VRF HVAC system manufacturer.
2. Demonstrated past experience with products being installed for period within five consecutive years before time of bid.
3. Demonstrated past experience on five projects of similar complexity, scope, and value.

    a. Each person assigned to Project shall have demonstrated past experience.

4. Staffing resources of competent and experienced full-time employees that are assigned to execute work according to schedule.
5. Service and maintenance staff assigned to support Project during warranty period.
6. Product parts inventory to support ongoing system operation for a period of not less than five years after Substantial Completion.
7. VRF HVAC system manufacturer's backing to take over execution of Work if necessary to comply with requirements indicated. Include Project-specific written letter, signed by manufacturer's corporate officer, if requested.

C. 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 by manufacturer for proper installation of systems, including, but not limited to, equipment, piping, controls, and accessories indicated and furnished for installation.
2. Installer certification 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 consecutive years before time of bid.
    b. Demonstrated past experience on 0 five projects of similar complexity, scope, and value.

D. ISO Compliance: System equipment and components furnished by VRF HVAC system manufacturer shall be manufactured in an ISO 9001 and ISO 14001 facility.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store products in a clean and dry place.

B. Comply with manufacturer's written rigging and installation instructions for unloading and moving to final installed location.

C. Handle products carefully to prevent damage, breaking, denting, and scoring. Do not install damaged products.

D. 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.
2. 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.

E. Replace installed products damaged during construction.

1.9 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: 10 year(s) from date of Substantial Completion.
b. For Parts, Including Controls: 10 year(s) from date of Substantial Completion.
c. For Labor: 10 year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Trane Company (The).
2. Daikin AC (Americas), Inc.
3. Johnson Controls, Inc.
4. Mitsubishi Electric & Electronics USA, Inc.
5. Panasonic Corporation of North America.
6. RectorSeal HVAC; a CSW Industrials Company.
7. Samsung HVAC.

8. Approved equivalent.

B. Source Limitations: Obtain products from single source from single manufacturer including, but not limited to, the following:

1. Indoor and outdoor units, including accessories.
2. Controls and software.
3. Refrigerant isolation valves.
4. Specialty refrigerant pipe fittings.

2.2 SYSTEM DESCRIPTION

A. Direct-expansion (DX) VRF HVAC system(s) with variable capacity in response to varying cooling and heating loads. System shall consist of multiple indoor units, outdoor unit(s), piping, controls, and electrical power to make complete operating system(s) complying with requirements indicated.

1. Two-pipe system design.
2. System(s) operation, air-conditioning **or** heat pump as indicated on Drawings.
3. Each system with one refrigerant circuit shared by 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. ASHRAE Compliance:

1. ASHRAE 15: For safety code for mechanical refrigeration.
2. ASHRAE 62.1: For indoor air quality.
3. ASHRAE 135: For control network protocol with remote communication.
4. ASHRAE/IES 90.1 Compliance: For system and component energy efficiency.

E. UL Compliance: Comply with UL 60335-2-40.

2.3 INDOOR, EXPOSED, WALL-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 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, complying with ASHRAE 62.1, to provide thermal resistance and prevent condensation.
3. Mounting: Manufacturer-designed provisions for field installation.
4. 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. Unit Internal Tubing: Copper tubing with brazed joints.
6. Unit Internal Tubing Insulation: Manufacturer's standard insulation, of thickness to prevent condensation.
7. Field Piping Connections: Manufacturer's standard.
8. Factory Charge: Dehydrated air or nitrogen.
9. 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: Provide unit with field-installed condensate pump accessory.
3. Field Piping Connection: Non-ferrous material with threaded NPT.

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: Two (low, high), three (low, medium, high), or more than three speed settings or variable speed with a speed range of least 50 percent.
5. Vibration Control: Integral isolation to dampen vibration transmission.

F. Filter Assembly:

1. Access: Front, to accommodate filter replacement without the need for tools.
2. Washable Media: Manufacturer's standard filter with antimicrobial treatment.

G. Grille Assembly: Manufacturer's standard discharge grille with field-adjustable air pattern mounted in top or front face of unit cabinet.

H. Unit Accessories:

1. Remote Room Temperature Sensor Kit: Wall-mounted, hardwired room temperature sensor kit for use in rooms that do not have room temperature measurement.
2. Condensate Pump: Integral reservoir and control with electrical power connection through unit power.

I. Unit Controls:

1. Enclosure: Manufacturer's standard, and suitable for indoor locations.
2. Factory-Installed Controller: Configurable digital control.
3. Communication: Network communication with other indoor units and outdoor unit(s).
4. Cable and Wiring: Manufacturer's standard with each connection labeled and corresponding to a unit-mounted wiring diagram.
5. Field Connection: Manufacturer's standard with each connection labeled and corresponding to a unit-mounted wiring diagram.

J. Unit Electrical:

1. Enclosure: Manufacturer's standard, and suitable for indoor locations.
2. Field Connection: Single point connection to power entire unit and integral controls.
3. Disconnecting Means: Factory-mounted circuit breaker or switch, complying with NFPA 70.
4. Control Transformer: Manufacturer's standard. Coordinate requirements with field power supply.
5. Wiring: Manufacturer's standard with each connection labeled and corresponding to a unit-mounted wiring diagram.
6. Raceways: Enclose line voltage wiring in metal raceways to comply with NFPA 70.

2.4 INDOOR, RECESSED, CEILING-MOUNTED UNITS

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, complying with ASHRAE 62.1, to provide thermal resistance and prevent condensation.
3. Mounting: Manufacturer-designed provisions for field installation.
4. 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. Field Piping Connections: Manufacturer's standard.
8. Factory Charge: Dehydrated air or nitrogen.

9. 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 pump or other integral lifting mechanism, capable of lifting drain water to an elevation above top of cabinet.
3. Field Piping Connection: Non-ferrous material with threaded NPT.

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: Two (low, high), three (low, medium, high), or more than three speed settings or variable speed with a speed range of least 50 percent.
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. Efficiency: ASHRAE 52.2, MERV 7.
3. Media:

    a. Replaceable: Extended surface, panel, or cartridge with antimicrobial treatment fiber media.

G. Discharge-Air Grille Assembly: Mounted in bottom of unit cabinet.

1. Discharge Pattern: One-, two-, three-, or four-way throw as indicated on Drawings.
2. Motorized Vanes: Modulating up and down flow pattern for uniform room air distribution.

H. Return-Air Grille Assembly: Manufacturer's standard grille mounted in bottom of unit cabinet.

I. Unit Accessories:

1. Remote Room Temperature Sensor Kit: Wall-mounted, hardwired room temperature sensor kit for use in rooms that do not have room temperature measurement.

J. Unit Controls:

1. Enclosure: Manufacturer's standard, and suitable for indoor locations.

2. Factory-Installed Controller: Configurable digital control.
3. Communication: Network communication with other indoor units and outdoor unit(s).
4. Cable and Wiring: Manufacturer's standard with each connection labeled and corresponding to a unit-mounted wiring diagram.
5. Field Connection: Manufacturer's standard with each connection labeled and corresponding to a unit-mounted wiring diagram.

K. Unit Electrical:

1. Enclosure: Manufacturer's standard, and suitable for indoor locations.
2. Field Connection: Single point connection to power entire unit and integral controls.
3. Disconnecting Means: Factory-mounted circuit breaker or switch, complying with NFPA 70.
4. Control Transformer: Manufacturer's standard. Coordinate requirements with field power supply.
5. Wiring: Manufacturer's standard with each connection labeled and corresponding to a unit-mounted wiring diagram.
6. Raceways: Enclose line voltage wiring in metal raceways to comply 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 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, complying with ASHRAE 62.1, to provide thermal resistance and prevent condensation.
3. Mounting: Manufacturer-designed provisions for field installation.
4. 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. Field Piping Connections: Manufacturer's standard.
8. Factory Charge: Dehydrated air or nitrogen.
9. 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 with threaded NPT.

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: Two (low, high), three (low, medium, high), or more than three speed settings or variable speed with a speed range of least 50 percent.
5. Vibration Control: Integral isolation to dampen vibration transmission.

F. Filter Assembly:

1. Access: Front, to accommodate filter replacement without the need for tools.
2. Efficiency: MERV 8 pre filter and MERV 13 final filter.
3. Washable Media: Manufacturer's standard 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. Unit Accessories:

1. Remote Room Temperature Sensor Kit: Wall-mounted, hardwired room temperature sensor kit for use in rooms that do not have room temperature measurement.
2. Condensate Pump: Integral reservoir and control with electrical power connection through unit power.

K. Unit Controls:

1. Enclosure: Manufacturer's standard, and suitable for indoor locations.
2. Factory-Installed Controller: Configurable digital control.
3. Factory-Installed Sensors: Unit inlet air temperature.
4. Field-Customizable I/O Capability:

    a. Analog Inputs: Three for use in customizable control strategies.
    b. Digital Inputs: Three for use in customizable control strategies.
    c. Digital Outputs: Three for use in customizable control strategies.

5. Features and Functions: Self-diagnostics, time delay, auto-restart, external static pressure control, auto operation mode manual operation modefilter service notification, drain assembly high water level safety shutdown and notification
6. Communication: Network communication with other indoor units and outdoor unit(s).
7. Cable and Wiring: Manufacturer's standard with each connection labeled and corresponding to a unit-mounted wiring diagram.
8. Field Connection: Manufacturer's standard with each connection labeled and corresponding to a unit-mounted wiring diagram.

L. Unit Electrical:

1. Enclosure: Manufacturer's standard, and suitable for indoor locations.
2. Field Connection: Single point connection to power entire unit and integral controls.
3. Disconnecting Means: Factory-mounted circuit breaker or switch, complying with NFPA 70.
4. Control Transformer: Manufacturer's standard. Coordinate requirements with field power supply.
5. Wiring: Manufacturer's standard with each connection labeled and corresponding to a unit-mounted wiring diagram.
6. Raceways: Enclose line voltage wiring in metal raceways to comply with NFPA 70.

2.6 OUTDOOR, AIR-SOURCE HEAT-PUMP 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.

1. Specially designed for use in systems with either all heating or all cooling demands, but not for use in systems with simultaneous heating and cooling.
2. 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 that connects multiple indoor units.
3. All units installed shall be from the same product development generation.

B. Cabinet:

1. Galvanized steel and coated with a corrosion-resistant finish.

    a. Coating with documented salt spray test performance of 1000 hours according to ASTM B117 surface scratch test (SST) procedure.

2. Mounting: Manufacturer-designed provisions for field installation.
3. 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 and turndown to 15 percent of rated capacity.
2. Protection: Integral protection against the following:

    a. High refrigerant pressure.
    b. Low oil level.
    c. High oil temperature.
    d. Thermal and overload.
    e. Voltage fluctuations.
    f. Phase failure and phase reversal.
    g. Short cycling.

3. Speed Control: Variable to automatically maintain refrigerant suction and condensing pressures while varying refrigerant flow to satisfy system cooling and heating loads.
4. Vibration Control: Integral isolation to dampen vibration transmission.
5. Oil management system to ensure safe and proper lubrication over entire operating range.
6. Crankcase heaters with integral control to maintain safe operating temperature.
7. Fusible plug.

D. Condenser Coil Assembly:

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. Aluminum Microchannel Coils:

    a. Series of flat tubes containing a series of multiple, parallel-flow microchannels layered between refrigerant header manifolds.
    b. Single- or multiple-pass arrangement.
    c. Construct fins, tubes, and header manifolds of aluminum alloy.

3. Coating: Corrosion resistant.
4. Hail Protection: Provide condenser coils with louvers, baffles, or hoods to protect against hail damage.

E. Condenser Fan and Motor Assembly:

1. Fan(s): Propeller type.

    a. Direct-drive arrangement.

b. Fabricated from non-ferrous components or ferrous components with corrosion protection finish to match performance indicated for condenser coil.
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 condenser 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.
5. Speed Settings and Control: Variable speed with a speed range of least 75 percent.
6. Vibration Control: Integral isolation to dampen vibration transmission.

F. Drain Pan: If required by manufacturer's design, provide unit with non-ferrous drain pan with bottom sloped to a low point drain connection.

G. 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, fuse protection, auto operation mode, manual operation mode, night setback control, power consumption display, run test switchequalize run time between multiple same components.
5. Communication: Network communication with indoor units and other outdoor unit(s).
6. Cable and Wiring: Manufacturer's standard with each connection labeled and corresponding to a unit-mounted wiring diagram.
7. Field Connection: Manufacturer's standard with each connection labeled and corresponding to a unit-mounted wiring diagram.

H. Unit Electrical:

1. Enclosure: Metal, similar to enclosure, and suitable for unprotected outdoor locations.
2. Field Connection: Single point connection to power entire unit and integral controls.
3. Disconnecting Means: Factory-mounted circuit breaker or switch, complying with NFPA 70.
4. Control Transformer: Manufacturer's standard. Coordinate requirements with field power supply.
5. Wiring: Manufacturer's standard with each connection labeled and corresponding to a unit-mounted wiring diagram.
6. Raceways: Enclose line voltage wiring in metal raceways to comply with NFPA 70.

I. Unit Hardware: Zinc-plated steel, or stainless steel. Coat exposed surfaces with additional corrosion-resistant coating if required to prevention corrosion when exposed to salt spray test for 1000 hours according to ASTM B117.

J. Unit Piping:

1. Unit Tubing: Copper tubing with brazed joints.
2. Unit Tubing Insulation: Manufacturer's standard insulation, of thickness to prevent condensation.
3. Field Piping Connections: Manufacturer's standard.
4. Factory Charge: Dehydrated air or nitrogen.
5. Testing: Factory pressure tested and verified to be without leaks.

2.7 SYSTEM CONTROLS

A. General Requirements:

1. Network: Indoor units and outdoor units shall include integral controls and connect through a TIA-485A or Manufacturer Selected control network.
2. Network Communication Protocol: Manufacturer proprietary or open 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 devices shall be connected to local uninterruptible power supply unit(s) to provide at least 5 minutes of battery backup operation after a power loss.
    c. Integration shall include control monitoring and scheduling.

4. Operator Interface:

    a. Operators shall interface with system and unit controls through the following:

        1) Operator interfaces integral to controllers.
        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) Temperature set-point adjustment.

B. Central Controllers:

1. Centralized control for all indoor and outdoor units from a single central controller location.

    a. Include multiple interconnected controllers as required.

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. Service diagnostics tool.
8. Able to disable and enable operation of individual controllers for indoor units.
9. Information displayed on individual controllers shall also be available for display through central controller.
10. Information displayed for outdoor units, including refrigerant high and low pressures percent capacity.
11. Multiple RJ-45 ports for direct connection to a local PC and an Ethernet network switch.
12. Operator interface through a backlit, high-resolution color display touch panel.

C. Wired Controllers for Indoor Units:

1. Single controller capable of controlling multiple indoor units as group.
2. Auto Timeout Touch Screen LCD: Timeout duration shall be adjustable.
3. Multiple Language: English and Spanish .
4. Temperature Units: Fahrenheit and Celsius.
5. On/Off: Turns indoor unit on or off.
6. Hold: Hold operation settings until hold is released.
7. Operation Mode: Cool, Heat, Auto, Dehumidification, Fan Only, and Setback.
8. Temperature Display: 1-degree increments.
9. Temperature Set-Point: Separate set points for Cooling, Heating, and Setback. Adjustable in 1-degree increments between.
10. Relative Humidity Display: 1 percent increments.
11. Fan Speed Setting: Select between available options furnished with the unit.
12. Airflow Direction Setting: If applicable to unit, select between available options furnished with the unit.
13. Seven-day programmable operating schedule with up to eight events per day. Operations shall include On/Off, Operation Mode, and Temperature Set-Point.
14. Auto Off Timer: Operates unit for an adjustable time duration and then turns unit off.
15. Occupancy detection.
16. Service Notification Display: "Filter".
17. Service Run Tests: Limit use by service personnel to troubleshoot operation.
18. Error Code Notification Display: Used by service personnel to troubleshoot abnormal operation and equipment failure.
19. User and Service Passwords: Capable of preventing adjustments by unauthorized users.

20. Setting stored in nonvolatile memory to ensure that settings are not lost if power is lost. Battery backup for date and time only.
21. Low-voltage power required for controller shall be powered through non-polar connections to indoor unit.

2.8 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 or R454B.

B. Oil:

1. As required by VRF HVAC system manufacturer and to comply with performance requirements indicated.

2.9 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 B88, Type M or Type DWV according to ASTM B306.
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, 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.

2.10 SYSTEM REFRIGERANT PIPING

A. Comply with requirements in Section 232300 "Refrigerant Piping" for system piping requirements.

B. Refrigerant Tubing Kits:

1. Furnished by VRF HVAC system manufacturer.

2. Factory-rolled and -bundled, soft-copper tubing with tubing termination fittings at each end.
3. Standard one-piece length for connecting to indoor units.
4. Pre-insulated with flexible elastomeric insulation of thickness to comply with governing energy code and sufficient to eliminate condensation.

C. 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.

D. Refrigerant Isolation Ball Valves:

1. Description: Uni-body full port design, rated for maximum system temperature and pressure, and factory tested under pressure to ensure tight shutoff. Designed for valve operation without removing seal cap.
2. Seals: Compatible with system refrigerant and oil. Seal service life of at least 20 years.
3. Valve Connections: Flare or sweat depending on size.

2.11 METAL HANGERS AND SUPPORTS

A. Copper Tube Hangers:

1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
2. Hanger Rods: Continuous-thread rod, nuts, and washer made of galvanized or copper-coated steel.

B. Plastic Pipe Hangers:

1. Description: MSS SP-58, Types 1 through 58, galvanized-steel, factory-fabricated components.
2. Hanger Rods: Continuous-thread rod, nuts, and washer made of galvanized steel.

2.12 METAL FRAMING SYSTEMS

A. MFMA Manufacturer Metal Framing Systems:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. ABB, Electrification Business.
b. Cooper B-line; brand of Eaton, Electrical Sector.
c. Flex-Strut Inc.
d. G-Strut.
e. Haydon Corporation.
f. MIRO Industries.
g. Unistrut; Atkore International.
h. Wesanco, Inc.

i. Approved equivalent.

2. Description: Shop- or field-fabricated, pipe-support assembly made of steel channels, accessories, fittings, and other components for supporting multiple parallel pipes.
3. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
4. Channels: Continuous slotted stainless steel, Type 304 channel with inturned lips.
5. Channel Width: Selected for applicable load criteria.
6. Channel Nuts: Formed or stamped steel nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
7. Hanger Rods: Continuous-thread rod, nuts, and washer made of galvanized steel material for use indoors and of stainless steel for use outdoors.
8. Metallic Coating for Use Indoors: Hot-dip galvanized
9. Plastic Coating for Use Outdoors: PVC.

2.13 FASTENER SYSTEMS

A. Powder-Actuated Fasteners: Threaded, zinc-coated steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

B. Mechanical-Expansion Anchors: Insert-wedge-type anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

1. Indoor Applications: Zinc-coated or stainless steel.
2. Outdoor Applications: Stainless steel.

2.14 PIPE STANDS

A. General Requirements for Pipe Stands: Shop- or field-fabricated assemblies made of manufactured corrosion-resistant components to support roof-mounted piping.

B. Compact Pipe Stand:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Eberl Iron Works, Inc.
b. MIRO Industries.
c. PHP Systems/Design.
d. Approved equivalent.

2. Description: Single base unit with integral-rod roller, pipe clamps, or V-shaped cradle to support pipe, for roof installation without membrane penetration.
3. Base: Single, vulcanized rubber, molded polypropylene, or polycarbonate.
4. Hardware: Galvanized steel or polycarbonate.
5. Accessories: Protection pads.

C. Low-Profile, Single-Base, Single-Pipe Stand:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

   a. Eberl Iron Works, Inc.
   b. MIRO Industries.
   c. PHP Systems/Design.
   d. Approved equivalent.

2. Description: Single base with vertical and horizontal members, and pipe support, for roof installation without membrane protection.
3. Base: Single, vulcanized rubber, molded polypropylene, or polycarbonate.
4. Vertical Members: Two, stainless-steel, continuous-thread 1/2-inch rods.
5. Horizontal Member: Adjustable horizontal, stainless steel pipe support channels.
6. Pipe Supports: Roller or strut clamps.
7. Hardware: Stainless steel.
8. Accessories: Protection pads.
9. Height: 12 inches above roof.

D. Curb-Mounted-Type Pipe Stands: Shop- or field-fabricated pipe supports made from structural-steel shapes, continuous-thread rods, and rollers, for mounting on permanent stationary roof curb.

2.15 OUTDOOR EQUIPMENT STANDS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Eberl Iron Works, Inc.
2. MIRO Industries.
3. RectorSeal HVAC; a CSW Industrials Company.
4. Approved equivalent.

B. Description: Individual foot supports with elevated adjustable channel cross bars and clamps/fasteners/bolts for ground or roof-supported outdoor equipment components, without roof membrane penetration, in a prefabricated system that can be modularly assembled on-site.

C. Foot Material: Rubber or polypropylene.

D. Rails Material: Hot-dip galvanized carbon steel.

E. Wind/Sliding Load Resistance: Up to 100 mph minimum.

2.16 MISCELLANEOUS SUPPORT MATERIALS

A. Grout: ASTM C1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Nonstaining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi, 28-day compressive strength.

B. Structural Steel: ASTM A36, carbon-steel plates, shapes, and bars; galvanized.

C. Threaded Rods: Continuously threaded. Zinc-plated steel or galvanized steel for indoor applications and stainless steel for outdoor applications. Mating nuts and washers of similar material as rods.

2.17 PIPING AND TUBING INSULATION

A. Comply with requirements in Section 230719 "HVAC Piping Insulation" for system piping insulation requirements.

2.18 SYSTEM CONTROL CABLE

A. Cable Rating: Listed and labeled for application according to NFPA 70.

1. Flame Travel and Smoke Density in Plenums: As determined by testing identical products according to NFPA 262, by a qualified testing agency. Identify products for installation in plenums with appropriate markings of applicable testing agency.

    a. Flame Travel Distance: 60 inches or less.
    b. Peak Optical Smoke Density: 0.5 or less.
    c. Average Optical Smoke Density: 0.15 or less.

2. Flame Travel and Smoke Density for Riser Cables in Non-Plenum Building Spaces: As determined by testing identical products according to UL 1666.
3. Flame Travel and Smoke Density for Cables in Non-Riser Applications and Non-Plenum Building Spaces: As determined by testing identical products according to UL 1685.

B. Low-Voltage Control Cabling:

1. Paired Cable: NFPA 70, Type CMG.

    a. One pair, twisted, No. 16 AWG, stranded (19x29) or No. 18 AWG, stranded (19x30) tinned-copper conductors as required by VRF HVAC system manufacturer.
    b. PVC insulation.
    c. Braided or foil shielded.
    d. PVC jacket.
    e. Flame Resistance: Comply with UL 1685.

2. Plenum-Rated, Paired Cable: NFPA 70, Type CMP.

    a. One pair, twisted, No. 16 AWG, stranded (19x29) or No. 18 AWG, stranded (19x30) tinned-copper conductors as required by VRF HVAC system manufacturer.
    b. PVC insulation.
    c. Braided or foil shielded.

d. PVC jacket.
e. NFPA 262 includes the standard flame-resistance test criteria in common use for cables and conductors.
f. Flame Resistance: Comply with NFPA 262.

C. TIA-485A Network Cabling:

1. Standard Cable: NFPA 70, Type CMG.

a. Paired, two pairs, twisted, No. 22 AWG, stranded (7x30) tinned-copper conductors.
b. PVC insulation.
c. Unshielded.
d. PVC jacket.
e. Flame Resistance: Comply with UL 1685.

2. Plenum-Rated Cable: NFPA 70, Type CMP.

a. Paired, two pairs, No. 22 AWG, stranded (7x30) tinned-copper conductors.
b. Fluorinated ethylene propylene insulation.
c. Unshielded.
d. Fluorinated ethylene propylene jacket.
e. NFPA 262 includes the standard flame-resistance test criteria in common use for cables and conductors.
f. Flame Resistance: NFPA 262.

D. Ethernet Network Cabling: TIA-568-C.2 Category 6 cable with RJ-45 connectors.

1. Description: Four-pair, balanced-twisted pair cable, certified to meet transmission characteristics of category cable indicated.
2. Conductors: 100-ohm, 23 AWG solid copper.
3. Shielding: Unshielded twisted pairs (UTP).
4. Cable Rating: By application.
5. Jacket: Blue thermoplastic.

E. Comply with requirements in Section 260533 "Raceways and Boxes for Electrical Systems" for control wiring and cable raceways.

2.19 MATERIALS

A. Steel:

1. ASTM A36/A36M for carbon structural steel.
2. ASTM A568/A568M for steel sheet.

B. Stainless Steel:

1. Manufacturer's standard grade for casing.
2. Manufacturer's standard type, ASTM A240 for bare steel exposed to airstream or moisture.

C. Galvanized Steel: ASTM A653.

D. Aluminum: ASTM B209.

2.20 SOURCE QUALITY CONTROL

A. Factory Tests: Test and inspect factory-assembled equipment.

B. Equipment will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports for historical record. Submit reports only if requested.

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. Loose Components: Install components, devices, and accessories furnished by manufacturer, with equipment, that are not factory mounted.

1. Loose components shall be installed by manufacturer's service representative or system Installer under supervision of manufacturer's service representative.

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.

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.

H. For floor- and wall-mounted units that are exposed, conceal piping and tubing, controls, and electrical power serving units within walls.

I. Install floor-mounted units on support structure indicated on Drawings.

J. Install floor-mounted units on cast-in-place concrete equipment bases. Comply with requirements for equipment bases and foundations specified in Section 033000 "Cast-in-Place Concrete."

K. Attachment: Install hardware for proper attachment to supported equipment.

L. Grouting: Place grout under equipment supports and make bearing surface smooth.

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. 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 230517 "Sleeves and Sleeve Seals for HVAC Piping."

L. Install escutcheons for piping and tubing penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 230518 "Escutcheons for HVAC Piping."

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 using hangers and supports indicated at intervals not to exceed 5 feet. Minimum rod size, 1/4 inch.
3. Prepare tubing ends and make mating connections to provide a pressure tight and leak-free installation.

B. Install refrigerant piping according to ASHRAE 15 and governing codes.

C. Select system components with pressure rating equal to or greater than system operating pressure.

D. Install piping as short and direct as possible, with a minimum number of joints and fittings.

E. 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.

F. Install refrigerant piping and tubing in protective conduit where installed belowground.

G. Install refrigerant piping and tubing in rigid or flexible conduit in locations where exposed to mechanical damage.

H. 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. Install traps to entrain oil in vertical runs.
4. Liquid lines may be installed level.

I. When brazing, remove or protect components that could be damaged by heat.

J. Before installation, clean piping, tubing, and fittings to cleanliness level required by VRF HVAC system manufacturer.

K. Joint Construction:

1. Ream ends of tubes and remove burrs.
2. Remove scale, slag, dirt, and debris from inside and outside of tube and fittings before assembly.
3. Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter.

    a. Use Type BCuP (copper-phosphorus) alloy for joining copper fittings with copper tubing.
    b. Use Type BAg (cadmium-free silver) alloy for joining copper with bronze.

3.8 INSTALLATION OF METAL HANGERS AND SUPPORTS

A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.

B. Metal Framing System Installation: Arrange for grouping of parallel runs of piping, and support together on field-assembled metal framing systems.

C. Comply with MFMA-103 for metal framing system selections and applications that are not specified.

D. Fastener System Installation:

1. Install powder-actuated fasteners, for use in lightweight concrete or concrete slabs less than 4 inches thick, in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.
3. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

E. Pipe Stand Installation:

1. Pipe Stand Types except Curb-Mounted Type: Assemble components and mount on smooth roof surface. Do not penetrate roof membrane.
2. Curb-Mounted-Type Pipe Stands: Assemble components or fabricate pipe stand and mount on permanent, stationary roof curb. See Section 077200 "Roof Accessories" for curbs.

F. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

G. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

H. Install lateral bracing with pipe hangers and supports to prevent swaying.

I. Install building attachments within concrete slabs or attach to structural steel.

1. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

J. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

K. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

L. Piping and Tubing Insulation:

1. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
2. Shield Dimensions for Pipe: Not less than the following:

a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.

M. Horizontal-Piping Hangers and Supports: Install the following types:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30.
2. Pipe Hangers (MSS Type 5): For suspension of pipes NPS 1/2 to NPS 4, to allow off-center closure for hanger installation before pipe erection.
3. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.
4. Multiple horizontal pipes located indoors may use metal framing systems with split clamp attachment for each pipe in lieu if individual clevis hangers.
5. Pipe stands for horizontal pipes located outdoors.
6. Provide copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.
7. On plastic pipe, install pads or cushions on bearing surfaces to prevent hanger from scratching pipe.

N. Horizontal Piping Hanger Spacing and Rod Size: Install hangers for drawn-temper copper piping with the following maximum horizontal spacing and minimum rod sizes:

1. Sizes through NPS 3/4: Maximum span, 5 feet; minimum rod size, 1/4 inch.
2. NPS 1: Maximum span, 6 feet; minimum rod size, 1/4 inch.
3. NPS 1-1/4: Maximum span, 7 feet; minimum rod size, 3/8 inch.
4. NPS 1-1/2: Maximum span, 8 feet; minimum rod size, 3/8 inch.

5. NPS 2: Maximum span, 8 feet; minimum rod size, 3/8 inch.
6. NPS 2-1/2: Maximum span, 9 feet; minimum rod size, 3/8 inch.
7. NPS 3 and Larger: Maximum span, 10 feet; minimum rod size, 3/8 inch.

O. Plastic Pipe Hanger and Support Spacing:

1. Space hangers and supports according to pipe manufacturer's written instructions for service conditions.
2. Maximum spacing, 5 feet; minimum rod size, 1/4 inch.

P. Vertical-Piping Clamps: Install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8).
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): If longer ends are required for riser clamps.

Q. Support vertical runs at roof, at each floor, and at midpoint intervals between floors, not to exceed 5 feet.

R. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified.

S. Use hangers, supports, and attachments with galvanized coatings unless otherwise indicated.

T. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

U. Trim excess length of continuous-thread hanger and support rods to 1 inch.

V. Hanger-Rod Attachments: Install the following types:

1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
3. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
4. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.

W. Building Attachments: Install the following types:

1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.
3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
6. C-Clamps (MSS Type 23): For structural shapes.
7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.

9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
11. Malleable-Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
12. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:

    a. Light (MSS Type 31): 750 lb.
    b. Medium (MSS Type 32): 1500 lb.

13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.

3.9 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 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 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 o.c. and at end joints.

3.10 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 air duct accessories specified in Section 233300 "Air Duct Accessories."

D. Comply with requirements for flexible ducts specified in Section 233346 "Flexible Ducts."

E. Comply with requirements for air diffusers specified in Section 233713.13 "Air Diffusers."

F. Comply with requirements for registers and grilles specified in Section 233713.23 "Registers and Grilles."

3.11 ELECTRICAL INSTALLATION

A. Comply with requirements indicated on Drawings and in applicable Division 26 Sections.

B. To extent electrical power is required for system equipment, components, and controls, and is not indicated on Drawings and addressed in the Specifications, the design for such electrical power shall be delegated to VRF HVAC system provider.

1. Delegated design of electrical power to equipment, components and controls, and associated installation shall be included at no additional cost to Director’s Representative.

C. Connect field electrical power source to each separate electrical device requiring field electrical power. Coordinate termination point and connection type with Installer.

D. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" for wiring connections.

E. Comply with requirements in Section 260526 "Grounding and Bonding for Electrical Systems" for grounding connections.

F. Install nameplate or acrylic label with self-adhesive back for each electrical connection indicating electrical equipment designation and circuit number feeding connection.

1. Nameplate shall be laminated phenolic layers of black with engraved white letters. Letters at least 1/2 inch high.
2. Locate nameplate or label where easily visible.

G. Comply with requirements in Section 260533 "Raceways and Boxes for Electrical Systems" for raceway selection and installation requirements for boxes, conduits, and wireways as supplemented or revised in this Section.

1. Outlet boxes for cables shall be no smaller than 4 inches square by 2-1/8 inches deep with extension ring sized to bring edge of ring to within 1/8 inch of the finished wall surface.
2. Flexible metal conduit shall not be used.

H. Comply with TIA-569-D for pull-box sizing and length of conduit and number of bends between pull points.

I. Install manufactured conduit sweeps and long-radius elbows if possible.

J. Install metal conduits with grounding bushings and connect with grounding conductor to grounding system.

3.12 SOFTWARE

A. Cybersecurity:

1. Software:

a. Coordinate security requirements with IT department.
b. Ensure that latest stable software release is installed and properly operating.
c. Disable or change default passwords to password using a combination of uppercase and lower letters, numbers, and symbols at least eight characters in length. Record passwords and turn over to party responsible for system operation and administration.

2. Hardware:

a. Coordinate location and access requirements with IT department.
b. Enable highest level of wireless encryption that is compatible with Director’s Representative 's ICT network.
c. Disable dual network connections.

3.13 INSTALLATION OF SYSTEM CONTROL CABLE

A. Comply with NECA 1.

B. Installation Method:

1. Install cables in raceways except as follows:

a. Within equipment and associated control enclosures.

2. Conceal raceway and cables except in unfinished spaces.

C. General Requirements for Cabling:

1. Comply with TIA-568-C Series of standards.
2. Comply with BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems."
3. Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, and cross-connect and patch panels.
4. Cables may not be spliced and shall be continuous from terminal to terminal. Do not splice cable.

5. Cables serving a common system may be grouped in a common raceway. Install control cable in separate raceway from power wiring. Do not group conductors from different systems or different voltages.
6. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
7. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems." Install lacing bars and distribution spools.
8. Do not install bruised, kinked, scored, deformed, or abraded cable. Remove and discard cable if damaged during installation and replace it with new cable.
9. Cold-Weather Installation: Bring cable to room temperature before dereeling. Do not use heat lamps for heating.
10. Pulling Cable: Comply with BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems." Monitor cable pull tensions.
11. Support: Do not allow cables to lie on removable ceiling tiles or access panels.
12. Secure: Fasten securely in place with hardware specifically designed and installed so as to not damage cables.
13. Provide strain relief.
14. Keep runs short. Allow extra length for connecting to terminals.
15. Do not bend cables in a radius less than 10 times the cable OD.
16. Use sleeves or grommets to protect cables from vibration at points where they pass around sharp corners and through penetrations.
17. Ground wire shall be copper, and grounding methods shall comply with IEEE C2. Demonstrate ground resistance.

D. Balanced Twisted-Pair Cable Installation:

1. Comply with TIA-568-C.2.
2. Do not untwist balanced twisted-pair cables more than 1/2 inch at the point of termination to maintain cable geometry.

E. Open-Cable Installation:

1. Suspend copper cable not in a wireway or pathway a minimum of 8 inches above ceilings by cable supports not more than 30 inches apart.
2. Cable shall not be run through or on structural members or in contact with pipes, ducts, or other potentially damaging items. Do not run cables between structural members and corrugated panels.

F. Separation from EMI Sources: Comply with BICSI TDMM and TIA-569-D recommendations for separating unshielded cable from potential EMI sources including electrical power wiring and equipment.

3.14 FIRESTOPPING

A. Comply with requirements in Section 078413 "Penetration Firestopping."

B. Comply with TIA-569-D, Annex A, "Firestopping."

C. Comply with BICSI TDMM, "Firestopping" Chapter.

3.15 GROUNDING INSTALLATION

A. For low-voltage control cabling, comply with requirements in Section 260526 "Grounding and Bonding for Electrical Systems."

3.16 IDENTIFICATION

A. Identify system equipment, piping, tubing, and valves. Comply with requirements for identification specified in Section 230553 "Identification for HVAC Piping and Equipment."

B. Identify system electrical and controls components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

1. Identify each control cable on each end and at each terminal with a number-coded identification tag. Each cable shall have a unique tag.

3.17 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 an employee or a factory-trained and -authorized company service advisor of VRF HVAC system manufacturer whose primary job responsibilities are to provide direct technical support of its products.

    a. Additional company service advisors may assist with completion of certain activities only if supervised by manufacturer's employee. A company service advisor shall not provide assistance without manufacturer's employee supervision.

2. Manufacturer shall provide on-site visits during the course of 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 50 percent completion of system(s).
    c. Third Visit: At approximately 90 percent completion of system(s).
    d. Fourth 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.
e. Issue a report for each visit, documenting the visit.

1) Report to include name and contact information of individual making the visit.
2) Date(s) and time frames while on-site.
3) Names and contact information of people meeting with while on-site.
4) Clearly identify and list each separate issue that requires resolution. For each issue, provide a unique identification number, relevant importance, specific location or equipment identification, description of issue, recommended corrective action, and follow-up requirements needed. Include a digital photo for clarification if deemed to be beneficial.

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. Manufacturer 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) Humidity settings and readings within an acceptable range.
16) Condensate removal acceptable.
17) Fan settings and readings within an acceptable range.
18) Unit airflow direction within an acceptable range.
19) If applicable, fan external static pressure setting.
20) Filter type and condition acceptable.
21) Noise level within an acceptable range.
22) Refrigerant piping properly connected and insulated.
23) Condensate drain piping properly connected and insulated.
24) If applicable, ductwork properly connected.
25) If applicable, external interlocks properly connected.
26) 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.
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) Remarks.

f. Inspection reports for indoor, dedicated outdoor air ventilation 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) Humidity settings and readings within an acceptable range.
16) Condensate removal acceptable.
17) Fan settings and readings within an acceptable range.
18) Fan external static pressure setting.
19) Filter type and condition acceptable.
20) Noise level within an acceptable range.
21) Refrigerant piping properly connected and insulated.
22) Condensate drain piping properly connected and insulated.
23) Automatic dampers properly installed and operating.
24) Ductwork properly connected.
25) If applicable, external interlocks properly connected.
26) Remarks.

g. Installer shall provide manufacturer with the requested documentation and technical support during inspection.
h. Installer shall correct observed deficiencies found by the inspection.
i. 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.
j. 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.
k. 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: 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 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 of not less than 1.5 times VRF HVAC system operating pressure, but not less than 800 psig using dry nitrogen.
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.

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(s) 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.
6. Upon successful completion of evacuation testing, system shall be charged with refrigerant.

E. System Refrigerant Charge:

1. Using information collected from the refrigerant tubing evacuation testing, system Installer shall consult variable refrigerant system manufacturer to determine the correct system refrigerant charge.
2. Installer shall charge system following VRF HVAC system manufacturer's written instructions.
3. System refrigerant charging shall be witnessed by system manufacturer's representative.
4. Total refrigerant charge shall be recorded and permanently displayed at the system's outdoor unit.

F. Products will be considered defective if they do not pass tests and inspections.

G. Prepare test and inspection reports.

3.18 STARTUP SERVICE

A. Engage a VRF HVAC system manufacturer's service representative to perform system(s) startup service.

1. Service representative shall be an employee or a Company Field Advisor per OGS Spec Section 014216 of VRF HVAC system manufacturer.
2. Complete startup service of each separate system.
3. 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 indoor unit's response to demand for cooling and heating.
3. Check each indoor unit's response to changes in airflow settings.
4. Check each indoor unit and outdoor unit for proper condensate removal.
5. Check sound levels of each indoor and outdoor unit.

C. Installer shall accompany manufacturer's 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 two hours 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 Director’s Representative and Commissioning Agent to witness startup service procedures.
2. Provide written notice not less than 20 business days before start of startup service.

3.19 ADJUSTING

A. Adjust equipment and components to function smoothly, and lubricate as recommended by manufacturer.

B. Adjust initial temperature and humidity set points. Adjust initial airflow settings and discharge airflow patterns.

C. Set field-adjustable switches and circuit-breaker trip ranges according to VRF HVAC system manufacturer's written instructions, and as indicated.

D. Occupancy Adjustments: When requested within 12 months from date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

3.20 PROTECTION

A. Protect products from moisture and water damage. Remove and replace products that are wet, moisture damaged, or mold damaged.

B. Protect equipment from physical damage. Replace equipment with physical damage that cannot be repaired to new condition. Observable surface imperfections shall be grounds for removal and replacement.

C. Protect equipment from electrical damage. Replace equipment suffering electrical damage.

D. Cover and seal openings of equipment to keep inside of equipment clean. Do not remove covers until finish work is complete.

3.21 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.

3.22 SOFTWARE SERVICE AGREEMENT

A. Technical Support: Beginning at Substantial Completion, service agreement shall include software support for two years.

B. Upgrade Service: At Substantial Completion, update software to latest version. Install and program software upgrades that become available within two years from date of Substantial Completion. Upgrading software shall include operating system and new or revised licenses for using software.

1. Upgrade Notice: At least 30 days to allow Director’s Representative to schedule and access the system and to upgrade computer equipment if necessary.

3.23 DEMONSTRATION

A. Engage a VRF HVAC system manufacturer's employed training instructor Company Field Advisor per OGS Spec Section 014216 to train Director’s Representative '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.
2. Instructor's credentials shall be submitted for review by Commissioning Agent Director’s Representative before scheduling training.
3. Instructor(s) primary job responsibility shall be Director’s Representative training.
4. Instructor(s) shall have not less than five years of training experience with VRF HVAC system manufacturer and past training experience on at least five projects of comparable size and complexity.

C. Schedule and Duration:

1. Schedule training with Director’s Representative at least 20 business days before first training session.
2. Training shall occur before Director’s Representative occupancy.
3. Training shall be held at mutually agreed date and time during normal business hours.
4. Each training day shall not exceed eight hours of training. Daily training schedule shall allow time for one-hour lunch period and 15 -minute break after every 4 hours of training.
5. Perform not less than 24 total hours of training.

D. Location: Director’s Representative shall provide a suitable on-site location to host classroom training.

E. Training Attendees: Assume three people.

F. 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.

G. Training Format: Individual training modules shall include classroom training followed by hands-on field demonstration and training.

H. Training Materials: Provide training materials in electronic format to each attendee.

1. Include instructional videos showing general operation and maintenance that are coordinated with operation and maintenance manuals.
2. Video record each classroom training session and submit an electronic copy to Director's Representative before requesting Director's Representative acceptance of training.

I. Acceptance: Obtain Commissioning Agent or Director's Representative written acceptance that training is complete and requirements indicated have been satisfied

END OF SECTION 238129

SECTION 238239.13 - CABINET UNIT HEATERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes cabinet unit heaters with centrifugal fans and electric-resistance heating coils.

1.3 DEFINITIONS

A. CWP: Cold working pressure.

B. DDC: Direct digital control.

C. PTFE: Polytetrafluoroethylene plastic.

D. TFE: Tetrafluoroethylene plastic.

1.4 SUBMITTALS

A. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.

B. Manufacturer’s installation instructions shall be provided along with product data.

C. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).

D. Product Data: For each type of product.

E. Include rated capacities, operating characteristics, furnished specialties, and accessories.

F. Shop Drawings:

1. Include plans, elevations, sections, and details.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include location and size of each field connection.
4. Include details of anchorages and attachments to structure and to supported equipment.

5. Include equipment schedules to indicate rated capacities, operating characteristics, furnished specialties, and accessories.
6. Wiring Diagrams: Power, signal, and control wiring.

G. Samples: For each exposed product and for each color and texture specified.

H. Samples for Initial Selection: Finish colors for units with factory-applied color finishes.

I. Samples for Verification: Finish colors for each type of cabinet unit heater indicated with factory-applied color finishes.

J. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For cabinet unit heaters to include in emergency, operation, and maintenance manuals.

PART 2 - PRODUCTS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Stelpro.
2. Airtherm; a Mestek company.
3. Carrier Corporation.
4. Engineered Air.
5. INDEECO.
6. Markel Products; TPI Corporation.
7. Marley Engineered Products.
8. Ouellet Canada Inc.
9. Rosemex Products.
10. Trane.
11. USA Coil & Air.
12. Approved equivalent.

2.2 DESCRIPTION

A. Factory-assembled and -tested unit complying with AHRI 440.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Comply with UL 2021.

2.3 PERFORMANCE REQUIREMENTS

A. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."

B. ASHRAE/IESNA 90.1 Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."

2.4 CABINETS

A. Material: Steel with epoxy-polyester powdercoat finish with manufacturer's standard paint, in color selected by Director's Representative.

1. Vertical Unit, Exposed Front Panels: Minimum 0.0528-inch- thick sheet steel, removable panels with channel-formed edges secured with tamperproof cam fasteners.
2. Recessed Flanges: Steel, finished to match cabinet.
3. Control Access Door: Key operated.

2.5 COILS

A. Electric-Resistance Heating Coil: Nickel-chromium heating wire, free from expansion noise and hum, mounted in ceramic inserts in galvanized-steel housing; with fuses in terminal box for overcurrent protection and limit controls for high-temperature protection. Terminate elements in stainless-steel machine-staked terminals secured with stainless-steel hardware.

2.6 CONTROLS

A. Fan and Motor Board: Removable.

1. Fan: Forward curved, double width, centrifugal, directly connected to motor; thermoplastic or painted-steel wheels and aluminum, painted-steel, or galvanized-steel fan scrolls.
2. Motor: Permanently lubricated; resiliently mounted on motor board. Comply with requirements in Section 230513 "Common Motor Requirements for HVAC Equipment."
3. Wiring Terminations: Connect motor to chassis wiring with plug connection.

B. Basic Unit Controls:

1. Control voltage transformer.
2. Unit integral thermostat with the following features:

    a. Heat-off switch.
    b. Fan on-auto switch.

3. Unit-mounted temperature sensor.
4. Unoccupied period override push button.
5. Data entry and access port.

    a. Input data includes room temperature and occupied and unoccupied periods.

b. Output data includes room temperature, supply-air temperature, entering-water temperature, operating mode, and status.

6. Heating-Coil Operations:

a. Occupied Periods: Energize electric-resistance coil to provide heating if room temperature falls below thermostat set point.
b. Unoccupied Periods: Start fan and energize electric-resistance coil if room temperature falls below setback temperature.

7. Controller shall have volatile-memory backup.

C. Electrical Connection: Factory-wired motors and controls for a single field connection.

2.7 CAPACITIES AND CHARACTERISTICS

A. Cabinet:

1. Vertical, Fully Recessed: Downflow.

a. Air Inlet: Front punched louver.
b. Air Outlet: punched louver.

B. Fan:

1. Airflow: 300.
2. Motor Horsepower: 1/15 hp.

C. Heating Capacity:

1. Output: 6825 BTU/Hr.

D. Electric-Resistance Heating Coil:

1. Capacity: 2 KW.

E. Electrical Characteristics for Single-Point Connection:

1. Volts: 208 V.
2. Phase: 1 Phase.
3. Hertz: 60 Hz.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to receive cabinet unit heaters for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for electrical connections to verify actual locations before unit-heater installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install wall boxes in finished wall assembly; seal and weatherproof. Joint-sealant materials and applications are specified in Section 079200 "Joint Sealants."

B. Install cabinet unit heaters to comply with NFPA 90A.

3.3 CONNECTIONS

A. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

B. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.4 FIELD QUALITY CONTROL

A. Perform the following tests and inspections with the assistance of a Company Field Advisor:

1. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
2. Operate electric heating elements through each stage to verify proper operation and electrical connections.
3. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.

B. Units will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports.

3.5 ADJUSTING

A. Adjust initial temperature set points.

B. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

3.6 DEMONSTRATION

A. Engage a Company Field Advisor to train Director’s Representative's Facility’ maintenance personnel to adjust, operate, and maintain cabinet unit heaters.

END OF SECTION 238239.13

SECTION 238239.19 - WALL AND CEILING UNIT HEATERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes wall and ceiling heaters with propeller fans and electric-resistance heating coils.

1.3 SUBMITTALS

A. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.

B. Manufacturer’s installation instructions shall be provided along with product data.

C. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).

D. Product Data: For each type of product.

1. Include rated capacities, operating characteristics, furnished specialties, and accessories.

E. Shop Drawings:

1. Include plans, elevations, sections, and details.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include details of anchorages and attachments to structure and to supported equipment.
4. Include equipment schedules to indicate rated capacities, operating characteristics, furnished specialties, and accessories.
5. Wiring Diagrams: Power, signal, and control wiring.

F. Samples: For each exposed product and for each color and texture specified.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For wall and ceiling unit heaters to include in emergency, operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Oxford.
2. INDEECO.
3. Markel Products; TPI Corporation.
4. Marley Engineered Products.
5. Ouellet Canada Inc.
6. Trane.
7. Approved equivalent.

2.2 DESCRIPTION

A. Assembly including chassis, electric heating coil, fan, motor, and controls. Comply with UL 2021.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.3 CABINET

A. Front Panel: Extruded-aluminum bar grille, with removable panels fastened with tamperproof fasteners.

B. Finish: Baked enamel over baked-on primer with manufacturer's standard color selected by Director’s Representative, applied to factory-assembled and -tested wall and ceiling heaters before shipping.

C. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

D. Surface-Mounted Cabinet Enclosure: Steel with finish to match cabinet.

2.4 COIL

A. Electric-Resistance Heating Coil: Nickel-chromium heating wire, free from expansion noise and 60-Hz hum, embedded in magnesium oxide refractory and sealed in corrosion-resistant metallic sheath. Terminate elements in stainless-steel, machine-staked terminals secured with stainless-steel hardware, and limit controls for high-temperature protection. Provide integral circuit breaker for overcurrent protection.

2.5 FAN AND MOTOR

A. Fan: Aluminum propeller directly connected to motor.

B. Motor: Permanently lubricated**.** Comply with requirements in Section 230513 "Common Motor Requirements for HVAC Equipment."

2.6 CONTROLS

A. Controls: Unit-mounted thermostat.

B. Electrical Connection: Factory wire motors and controls for a single field connection with disconnect switch.

2.7 CAPACITIES AND CHARACTERISTICS

A. Airflow: 350.

B. Heating Coil: 2 kw.

C. Electrical Characteristics for Single-Point Connection:

1. Volts: 208 V.
2. Phase: 1 Phase.
3. Hertz: 60 Hz.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to receive wall and ceiling unit heaters for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for electrical connections to verify actual locations before unit-heater installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install wall and ceiling unit heaters to comply with NFPA 90A.

B. Install wall and ceiling unit heaters level and plumb.

C. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

D. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

END OF SECTION 238239.19

Controls Proposal

(Price / Scope Valid For 30 Days)

Prepared For: Yonkers State Armory

Date*:* April 8, 2026

Job Name: Yonkers State Armory

Proposal Number: 8397846

Engineer: A&J Consulting

Payment Terms: Net 30 Days

Delivery Terms:
Freight Allowed and Prepaid - F.O.B. Factory

Presented By:
Trane U.S. Inc.
10-27 46th Avenue, Long Island City, NY 11101
245 Newtown Road – Suite 500, Plainview NY 11803

Trane U.S. Inc. is pleased to provide the following proposal for your review and approval.

This Scope of Work will be executed based on Trane's scope of work proposed herein, which is a clarification of the plans and specifications, and adheres to Trane's "Standard Contract Terms and Conditions" only; any other document and/or contract will not bind and/or supersede these conditions.

Building Automation System

This proposal has been developed from the following documentation:

- Plans and Specs prepared by: A&J Consulting. Mechanical drawings M-001, M-002, M-003, M-004, M-060, M-061, M-062, M-100, M-101, M-102, M-200, M-201, M-202, M-203, M-301, M-401, M-402, M-405, M-501, M-502, M-503, M-504, M-601, M-602 and M-603 dated 9-4-25 100% estimator set.
- Mechanical drawings M-001, M-002, M-003, M-004, M-060, M-061, M-062, M-100, M-101, M-102, M-200, M-201, M-202, M-203, M-301, M-401, M-402, M-405, M-501, M-502, M-503, M-504, M-601, M-602 and M-603 dated 11-24-25 permit set.
- Mechanical drawings M-001, M-002, M-003, M-004, M-060, M-061, M-062, M-100, M-101, M-102, M-200, M-201, M-202, M-203, M-301, M-401, M-402, M-405, M-501, M-502, M-503, M-504, M-505, M-506, M-507, M-508, M-601, M-602 and M-603 dated 3-11-26 final pricing set.
- Electrical drawings E-001, E-002, E-004, E-060, E-061, E-062, E-100, E-101, E-102, E-200, E-201, E-301, E-501, E-502, E-601, E-602, E-701, E-702
- **Specification section documents not provided to Trane at time of bid. All additional work as a result of these documents that is not listed below is not included in this bid.**

Trane's pricing accounts for the following considerations:

- **Straight Time Labor (Shift Differential, over time, double time not included)**
- Trane's Electrical field installation will be performed by: **Union Electrical Contractor**
- Electrical Installation: Refer to Electrical Clarification section below
- Trane has included our standard controls start-up and checkout labor practices for this project. In addition, Trane has included training, commissioning assistance, and balancing assistance hours stated below. Any time above and beyond must be purchased separately on a T&M basis upon request.
    - Training [hours]: **8**
    - Commissioning Assistance [hours]: **40**
    - Balancing Assistance [hours]: **8**
    - ***Assistance only: Trane excludes provision of commissioning or balancing agents.**
- **1 Year** parts and labor warranty against defects in material and workmanship on all new, Trane provided, field installed, DDC controllers and components.
- Estimated completion date for escalation purposes only is **December 31, 2026.** Escalation costs incurred after this date are not included and will be in addition to the Total Net Price(s) stated below. Added costs will depend upon the remaining scope identified at that time.

The following is Trane's scope of work:

1) Trane Building Automation System (BAS) Front-End Equipment:

a) Existing Enterprise Server (Trane Tracer Ensemble)

b) Existing System Level Controller(s) (Trane Tracer SC+)

c) Trane to setup operator interface for proper interaction with the BAS. User workstation interface will be:
   i) Laptop, mouse, carry bag, printer and surge protector per M-507

d) **Match Existing Graphics -** Operator interface graphics will be generated for each mechanical system identified below in our scope of work. Operator interface graphics shall match existing BAS graphics. BAS floor plan graphic development is dependent upon Trane receiving completed floor plan drawings in either AutoCAD or PDF formats.

2) Associated mechanical equipment:

a) (1) Existing Field installed DDC controller to monitor and control the existing Boiler System. Field installation to include:
   i. (1) New Heating water differential pressure sensor located 2/3 downstream (installation of metal or plastic tubing by others)
   ii. (1) New Heating water bypass valve, 2-Way (installation of valve by others)

b) (2) Roof Top Units (RTU-1 & RTU-2) with factory mounted DDC controls. BAS will provide monitoring, control, and alarming of available points and field installation of the following devices:
   i. Space Temperature sensor [wired]
   ii. Accordion door contact interlock [RTU-2 only]
   iii. Duct static pressure sensor [VAV units only]
   iv. Building pressure sensor – Statitrac [VAV units only]
   v. Communication bus [wired – BACnet]

c) (1) Existing Air Handling Unit (HVAC-1) with factory mounted DDC controls. BAS will provide monitoring, control, and alarming of available points and field installation of the following devices:
   i. Program adjustments for new VAVs
   ii. Damper Actuator per M-100
   iii. Outside air flow measuring station
   iv. Exhaust air flow measuring station

d) (1) Air Handling Unit (HV-2) with factory mounted DDC controls. BAS will provide monitoring, control, and alarming of available points and field installation of the following devices:
   i. Space Temperature sensor [wired]
   ii. Communication bus [wired – BACnet]

e) VRF System**.** BAS will provide monitoring, control, and alarming of available points.
   1. Includes field installation of the following devices:
      i. CAT-6 Wiring to Centralized Controller. Trane will provide integration to the VRF Centralized Controller via BACnet/IP.
      ii. Interlock to **(2)** Outdoor Air-Cooled Condensing Unit(s)

   2. Low Voltage M-NET Daisy Chain Communication Wiring (16Ga TSP) to the following components:
      i. **(5)** Indoor Unit(s)

   3. Wiring to the following components associated with <u>each</u> indoor Unit:
      i. Space Thermostat [Furnished by manuf.]

f) (21) Terminal Reheat VAV Boxes units with factory mounted DDC controllers. BAS will provide monitoring, control, and alarming of available points, and field installation of the following devices:
   i. Space Temperature sensor [wired]
   ii. Room humidity sensor [wired]
   iii. CO2 Sensor [wired]
   iv. Discharge air temperature sensor
   v. Hot water control valve (installation of valve by others)
   vi. Communication bus [wired – BACnet controller]
   vii. Electrical 120 vac power provided by Division 26 Electrical Contractor

g) (6) Exhaust fans with field mounted controls. BAS will provide monitoring, control, and alarming and field installation of the following devices:
   i. Installation of Trane Programmable DDC controller in Enclosure
   ii. BACnet MSTP Communication wiring to DDC controller
      1. EF-1 thru EF-5:
         a. Start/stop control through BMS
         b. Fan Status monitored by BMS
         c. Damper Actuator interlock with start/stop control
      2. EF-6:
         a. Controlled by a toggle switch
         b. Fan Status monitored by BMS
         c. Air flow measuring station
         d. Speed command

h) (10) Cabinet Unit Heaters with factory-mounted controls. BAS will provide monitoring, control, and alarming of available points, and field installation of the following devices:
   i. BACnet Thermostat
   ii. Enable/Disable
   iii. Status

Project Specific Not Included:

1. 120V power to any equipment or DDC controllers listed above – to be handled by the Division 26 Project Electrician per E-001 per Electrical Note 10.
2. Any work associated with field mounted DDC controllers and end devices associated other than what's specified above.
3. Any demolition work.
4. Any work associated with the existing systems not mentioned above.
5. Providing any end devices or commissioning for any existing systems or equipment not mentioned above.

3) Project Management, Design Engineering, Field Engineering, and Operator Training Labor:

a) Trane has included factory-trained BAS Project Management, Project Engineering, and Field Technician labor required to deliver a functional control system as qualified in this proposal. Mechanical startup in not included unless otherwise specified above.
b) Trane to provide Trane factory standard engineered control submittals including product data sheets, and associated mechanical system sequence of operations. Any additional modifications or formatting that is not in the plans and specification are not included in this proposal.
c) Project Management and field installation labor will be provided based upon project schedule and mechanical equipment field readiness.
d) Trane has included an allowance, as stated above, for a field technician to assist the Balancing Contractor (BC) to connect their laptop for hydronic and air systems testing. This assistance includes helping the BC review the site, connect to the network and discover all devices. This assistance **DOES NOT** include a technician to work with the BC as they perform their work. The BC MUST possess their own laptop with a licensed copy of Trane balancing tool software. Contractor MUST provide Trane two weeks' notice for prior to scheduling. Trane will provide Time & Material billing based on published labor rates beyond the allotted allowance hours.
e) Trane to provide O&M manuals and as-built control submittal drawings upon completion of the project
f) BAS Operator training allowance included as stated above. Additional training support hours are available on a T&M basis upon request. Training to be completed within (3) month of system acceptance.

4) Electrical installation work clarifications:

a) Trane has included 120 vac power wiring for **(0)** field mounted panels and electronic digital controllers in our scope of work. All other 120 vac end devices and panels are to be installed and wired by Division 26 Electrical Contractor, and **are not** included in this proposal.

b) Trane is excluding power wiring of any kind (not listed above). Including but not limited to equipment, VAV boxes, DDC control panels and 120 vac control valve actuators
c) BAS control wiring will be installed in EMT conduit in exposed mechanical spaces. For all other locations (i.e. ceilings and walls), wiring shall be installed with properly supported plenum rated cable outside of conduit.
d) Outdoor control wiring shall be installed in galvanized rigid conduit or outdoor rated EMT that meets the National Electric Code requirements for the location of the project.
e) Trane has not included any labor associated with trenching required for underground conduits
f) Trane electrical installation labor includes cleanup labor to ensure the work areas are clean of debris at the end of each working day. It has been assumed by Trane, the GC/CM for the project will be providing central collection areas for all project related debris.

5) Warranty/Service Agreement

a) Includes a one-year parts & labor warranty against defects in material & workmanship on all new, Trane provided, field-installed, DDC controllers and components. Warranty repair and replacement labor will occur during normal working hours.
b) Warranty will end 18 months from shipment date or 12 months beginning with the date of beneficial use, whichever comes first.
c) In the event of construction phasing of this project, each DDC system in a completed Phase will be warranted for 12 months, beginning with the date of beneficial use.
d) BAS parts & labor warranty applies to field-installed controls only. Please refer to the equipment proposal for warranty coverage of the DDC controls factory supplied with the HVAC equipment.
e) Extended warranties are available upon specific requests

6) Clarifications:

a) Trane is unable to release control submittals, order any materials or provide field labor until the tax determination for the project has been confirmed. If the project is exempt of taxes, Trane must be given appropriate state exempt forms at the onset of the project
b) Trane will begin control submittals after the receipt of all approved Trane, non-Trane equipment submittals, and a detailed project schedule.
c) Trane's BAS proposal and pricing is based upon Trane providing the HVAC equipment, with factory installed & tested controls, as described in this proposal. If non-Trane HVAC equipment is provided, Trane reserves the right to modify this proposal and subsequent pricing based upon the mechanical equipment being provided.
d) Non-Trane systems being integrated to the BMS will come with the necessary material, labor and technical support to facilitate the integration to the BMS at no cost to Trane.
e) Trane has included our standard start-up and checkout labor practices for this project. Upon requiring coordination, documentation, and/or demonstration of systems performance to a designated Commissioning Agent Trane reserves the right to modify our pricing. A meeting is to be established to outline the method and documentation required for the commissioning work required.

7) NOT Included:

a) Providing, wiring, controlling or monitoring of any equipment/devices not included in the above scope
b) Furnishing of PC or laptop computer for interface with BAS (refer to scope of work above).
c) Electrical installation labor and material not included in the above scope.
d) Interfacing to another BAS, to include any third party devices, software/hardware and any associated wiring and labor associated with integration
e) Startup, testing, troubleshooting or commissioning of equipment and devices not furnished by Trane. This includes miscellaneous control wiring provided by Trane for third party items
f) Furnishing Variable Frequency Drives, starters, HOA switches, disconnects and/or associated electrical power wiring or integration.
g) Installation of valves, dampers, pipe pressure taps, temperature sensor wells, pressure sensor/switch/transducer line sensor tubing and air flow measuring station
h) Furnishing of control dampers
i) Automatic, Fire, Smoke and/or Fire/Smoke dampers and associated end switches, including but not limited to furnishing, installing, powering, monitoring, purging, position status and HVAC system interlocks.
j) Furnishing or installation of manufacturer supplied Boiler equipment, safeties, integral controls, gas train controls emergency shutoff switches, remote components and boiler circulating pumps control and associated wiring
k) Installation and furnishing of Boiler Safety Glass Shutdown and associated wiring
l) Boiler combustion dampers, control and associated wiring
m) Humidifier, Steam Generator, associated instruments, safety wiring and associated devices, utility piping, electrical power wiring, remote panel installation, or start-up labor
n) Stairwell pressurization control and any associated wiring
o) Air compressor and associated field devices with existing pneumatic system

p) Sales Taxes
q) Alternate(s)/Add Alternate(s) are not included in the base scope
r) Exhaust Fans Dampers and associated wiring
s) Duct smoke detectors; interface wiring with fire alarm system; smoke purge initiation and fan/equipment shutdown.
t) Trenching required for underground conduit installation
u) Any cost associated with liquidated damages
v) Bid, Performance, or Payment Bonds
w) Access doors
x) Calibration certificates for any control devices
y) Demolition; excavation, roof penetrations; ceiling tile removal or replacement, cutting, patching and painting
z) Checkout, repair, replacement or warranty of existing equipment
aa) Video recording of training or installation of Trane personnel
bb) Lifts, scaffolding, fencing or access platforms
cc) Accelerated shipping costs
dd) Temporary, Standby or Overtime Labor; *All work figured to be done during normal working hours (7am to 3:30pm).*

Cost Summary

Trane Labor

Labor Type	Description	Not to Exceed NYS Net Price	Hours	Price Charged to Customer
Project/Program Manager	Individual employed by the Contractor or Subcontractor who oversees all onsite Work.	$ 204.97	154.00	$ 31,565.38
Enginnering (Designer)	Indi vi dual employed by the Contractor or Subcontractor who performs design Servi ces rel ated to the Install ati on and Integration of an Intelligent Facility and Security System and Sol ution as permi tted by Thi s Award, excluding Professional Desi gn Services.	$ 232.69	55.00	$ 12,797.95
Microprocessor-Control HVAC Equipment System Technician Onsite Region 3	Indi vi dual employed by the Contractor or Subcontractor who Starts-Up, Commissions, Programs, Integrates, and Maintai ns (both Preventative and Remedial Maintenance) Building Automation Systems, Energy Management Systems, and, Lighting Control/Occupancy Detecting Systems. ***This Job Titl e can only be used for work/Services on Systems/Product Li nes/Equipment which are incl uded on the Contractor's Contract***.	$ 215.71	206.00	$ 44,436.26
CAD Specialist	Individual employed by the Contractor or Subcontractor who generates diagrams, drawings, plans, etc. ***This Job Title can only be used for work/Services on Systems/Product Lines/Equipment which are included on the Contractor's Contract***.	$ 166.17	24.00	$ 3,988.08
			Total Trane Labor Charged to Customer:	**$ 92,787.67**

Trane Material

Contract Line Item #	Product/Model	Product Description	Quantity	NYS Net Price
135	BMCF000AAA0DB00	SC+ 15 Dev Core License	5	$ 3,847.50
98	X1365152401	BACnet Term (2 pack)	1	$ 49.00
137	BMCF000AAA0EB00	SC+ 3 Year SMP	1	$ 750.00
74	X1379088601	Sens Zn Dsp Stpt TOV	4	$ 394.00
94	BMUC600AAA0100011	Tracer UC600 Controller	1	$ 738.00
54	4190113300.00%	6" Therm Duct/Imm Temp Sens	8	$ 276.00
				$ -
			Total Trane Material Charged to Customer:	**$ 6,054.50**

NonTrane Material

Contract Line Item #	Product/Model	Product Description	Quantity	NYS Net Price
33332	10044000.00%	POLY TUBING 1/4 INCH OD X 3/16 INCH ID PER FT	1	$ 7.92
33501	A-302-K	STATIC PRESSURE TIP- 1/4IN BARB	2	$ 6.82
33506	A-345-K	MOUNTING FLANGE FOR A-301-K & A-302-K	2	$ 5.27
13413	BA/BG	LARGE BAPI GUARD TSTAT PROTECTOR	40	$ 563.95
13424	BA/BS3C20C10M	2% BAPISAT 3 WALL TEMP F 4/20 MA RH 4/20MA	25	$ 8,270.03
374	AFB24-SR	Damper Actuator, 180 in-lb [20 Nm], Spring return, AC/DC 24 V	1	$ 383.88
23700	RIBU1C	SPDT PILOT RELAY UNIVERSAL	6	$ 33.85
56919	H600	CURR SWITCH- 0.15-200A- 0.15A FIXED- SPLIT CORE	6	$ 71.42
8283	LF120-S	ACT/SR/35INLB(4NM)/120VAC/ON/OFF	6	$ 1,733.52
17870	A-389	STAND-OFF BRKT FOR 1800 SWITCH	1	$ 10.54
2407	B230+LF24-SR US	Characterized Control Valve (CCV), 1 1/4", 2-way, Cv 19 |Valve	1	$ 402.78
51590	2301001PB3V11A	DP TRANS WET +/- 1 PSID 3VAL 4-20MA BUNA-N	1	$ 1,009.37
56622	CWLP2T2	WALL LCD 2% RH BACNET/MODBUS TEMP NIST 2PT	10	$ 8,502.99
23378	PSH100A	XFORMER SWITCH/BREAKER 96VA	1	$ 36.50
		Small Ancillary items	1	$ 8,250.00
	AFMS	Air Flow Measuring Station	3	$ 9,000.00
	MET-44WG-36	DOOR CONTACT	1	$ 26.00
	DELL	Dell laptop	1	$ 645.00
	UPS280	UPS	1	$ 179.00
	C3760dn	Printer	1	$ 360.00
			Total Non-Trane Material Charged to Customer:	**$ 39,498.85**

Subcontractor Labor

Subcontractor Name	Trade		Subcontractor Labor Quote
Touchtel	Low voltage electrical subcontractor		$ 142,950.00
Centralized Services	Graphics subcontractor		$ 3,500.00
		Subcontractor Percent Markup	**25.00%**
		Price Charged to Customer	**$ 183,062.50**
		Total Price Charged to Customer:	**$ 321,403.52**

Total Net Price (*Excludes Sales Taxes)*.....$ 321,403.52

Sincerely,

Pedro Baez

Trane U.S. Inc.
10-27 46th Avenue, Long Island City, NY 11101
245 Newtown Road – Suite 500, Plainview NY 11803

CUSTOMER ACCEPTANCE

Authorized Representative

Printed Name

Title

Purchase Order

Acceptance Date

TERMS AND CONDITIONS – COMMERCIAL TURNKEY INSTALLATION – Trane Equipment and Related Work
"Trane" or "Company" shall mean Trane U.S. Inc. for Work performed in the United States or Trane Canada ULC for Work performed in Canada.
1. Acceptance; Agreement. These terms and conditions are an integral part of Company's offer and form the basis of any agreement (the "Agreement") resulting from Company's proposal (the "Proposal") for the commercial goods and/or services described (the "Work"). COMPANY'S TERMS AND CONDITIONS AND EQUIPMENT PRICES ARE SUBJECT TO PERIODIC CHANGE OR AMENDMENT. The Proposal is subject to acceptance in writing by the party to whom this offer is made or an authorized agent ("Customer") delivered to Company within 30 days from the date of the Proposal. Prices in the Proposal are subject to change at any time upon notice to Customer. If Customer accepts the Proposal by placing an order, without the addition of any other terms and conditions of sale or any other modification, Customer's order shall be deemed acceptance of the Proposal subject to Company's terms and conditions, and the final Proposal price ("Proposal Price"). If Customer's order is expressly conditioned upon Company's acceptance or assent to terms and/or conditions other than those expressed herein, return of such order by Company with Company's terms and conditions attached or referenced serves as Company's notice of objection to Customer's terms and as Company's counteroffer to provide Work in accordance with the Proposal and the Company terms and conditions. If Customer does not reject or object in writing to Company within 10 days, Company's counteroffer will be deemed accepted. Notwithstanding anything to the contrary herein, Customer's acceptance of the Work by Company will in any event constitute an acceptance by Customer of Company's terms and conditions. This Agreement is subject to credit approval by Company. Upon disapproval of credit, Company may delay or suspend performance or, at its option, renegotiate prices and/or terms and conditions with Customer. If Company and Customer are unable to agree on such revisions, this Agreement shall be cancelled without any liability, other than Customer's obligation to pay for Work rendered by Company to the date of cancellation.
2. Connected Services. In addition to these terms and conditions, the Connected Services Terms of Service ("Connected Services Terms"), available at https://www.trane.com/TraneConnectedServicesTerms, as updated from time to time, are incorporated herein by reference and shall apply to the extent that Company provides Customer with Connected Services, as defined in the Connected Services Terms.
3. Title and Risk of Loss. All Equipment sales with destinations to Canada or the U.S. shall be made as follows: FOB Company's U.S. manufacturing facility or warehouse (full freight allowed). Title and risk of loss or damage to Equipment will pass to Customer upon tender of delivery of such to carrier at Company's U.S. manufacturing facility or warehouse.
4. Pricing and Taxes.
a. Unless otherwise noted, the price in the Proposal includes standard ground transportation and, if required by law, all sales, consumer, use and similar taxes legally enacted as of the date hereof for equipment and material installed by Company. Tax exemption is contingent upon Customer furnishing appropriate certificates evidencing Customer's tax-exempt status. Company shall charge Customer additional costs for bonds agreed to be provided. Equipment sold on an uninstalled basis and any taxable labor/labour do not include sales tax and taxes will be added. Within thirty (30) days following Customer acceptance of the Proposal without addition of any other terms and conditions of sale or any modification, Customer shall provide notification of release for immediate production at Company's factory. Prices for Work are subject to change at any time prior to shipment to reflect any cost increases related to the manufacture, supply, and shipping of goods. This includes, but is not limited to, cost increases in raw materials, supplier components, labor, utilities, freight, logistics, wages and benefits, regulatory compliance, or any other event beyond Company's control. If such release is not received within 6 months after date of order receipt, Company reserves the right to cancel any order. If shipment is delayed due to Customer's actions, Company may also charge Customer storage fees. Company shall be entitled to equitable adjustments in the contract price to reflect any cost increases as set forth above and will provide notice to Customer prior to the date for which the increased price is to be in effect for the applicable customer contract. In no event will prices be decreased.
b. Allocation to Trane of Tax Deduction under Section 179D of the Internal Revenue Code. For calendar tax year(s) in which (a) the provisions of Section 179D of the Internal Revenue Code are in effect and (b) the qualifying property installed as a part of the Services has been placed in service pursuant to Section 179D, Customer agrees to allocate the tax deduction available under Section 179D solely to Trane pursuant to Section 179D(d)(4) and, upon a written request from Trane, shall provide the written form of allocation to the Customer that is required by the Internal Revenue Service.
5. Exclusions from Work. Company's obligation is limited to the Work as written and defined under the scope of Work and does not include any modifications to the Work site under the Americans With Disabilities Act or any other law or building code(s). In no event shall Company be required to perform work Company reasonably believes is outside of the defined Work without a written change order signed by Customer and Company in accordance with the Change of Work process defined hereunder..
6. Performance. Company shall perform the Work in accordance with industry standards generally applicable in the area under similar circumstances as of the time Company performs the Work. Company may refuse to perform any Work where working conditions could endanger property or put at risk the safety of persons. Unless otherwise agreed to by Customer and Company, at Customer's expense and before the Work begins, Customer will provide any necessary access platforms, catwalks to safely perform the Work in compliance with OSHA or state industrial safety regulations.
7. Payment. For Work requiring a longer construction schedule and progress payments, Customer shall pay Company or cause Company to be paid for the Services as follows: (a) **Initial Payment:** For Upon execution hereof, [Initial Payment]% of the Contract Price (for engineering, drafting and other mobilization costs incurred prior to on-site installation) shall be due; and (b) **Progress and Final Payments:** Company will invoice in accordance with the Proposal for all materials and equipment delivered to the job site (or, as applicable, to an off-site storage facility) and for all installation, labor and services performed during the billing period; Customer shall pay all amounts due upon receipt of the invoice and any invoice not paid within ten (10) calendar days of its date shall be past due. All amounts outstanding ten (10) calendar days beyond the due date shall bear interest payable to Trane at the maximum allowable legal rate, retroactive to the due date. Customer shall pay all costs (including attorneys' fees) incurred by Company in attempting to collect amounts due from Customer. For all other Work, Customer shall pay Company's invoices within net 30 days of invoice date. Company may invoice Customer for all equipment or material furnished, whether delivered to the installation site or to an off-site storage facility and for all Work performed on-site or off-site. No retention shall be withheld from any payments except as expressly agreed in writing by Company, in which case retention shall be reduced per the contract documents and released no later than the date of substantial completion. Under no circumstances shall any retention be withheld for the equipment portion of the order. If payment is not received as required, Company may suspend performance and the time for completion shall be extended for a reasonable period of time not less than the period of suspension. Customer shall be liable to Company for all reasonable shutdown, standby and start-up costs as a result of the suspension. Company reserves the right to add to any account outstanding for more than 30 days a service charge equal to 1.5% of the principal amount due at the end of each month. Customer shall pay all costs (including attorneys' fees) incurred by Company in attempting to collect amounts due and otherwise enforcing these terms and conditions. If requested, Company will provide appropriate lien waivers upon receipt of payment. Customer agrees that, unless Customer makes payment in advance, Company will have a purchase money security interest in all equipment from Company to secure payment in full of all amounts due Company and its order for the equipment, together with these terms and conditions, form a security agreement. Customer shall keep the equipment free of all taxes and encumbrances, shall not remove the equipment from its original installation point and shall not assign or transfer any interest in the equipment until all payments due Company have been made.
8. Time for Completion. Except to the extent otherwise expressly agreed in writing signed by an authorized representative of Company, all dates provided by Company or its representatives for commencement, progress or completion are estimates only. While Company shall use commercially reasonable efforts to meet such estimated dates, Company shall not be responsible for any damages for its failure to do so. Delivery dates are approximate and not guaranteed. Company will use commercially

reasonable efforts to deliver the Equipment on or before the estimated delivery date, will notify Customer if the estimated delivery dates cannot be honored, and will deliver the Equipment and services as soon as practicable thereafter. In no event will Company be liable for any damages or expenses caused by delays in delivery.

9. Equipment Location & Access. Customer shall provide, without charge, a mutually satisfactory location or locations for the installation and operation of the equipment and the performance of the installation work, including sufficient areas for staging, mobilization, and storage. Customer shall provide access to the Premises for Trane and its contractors or subcontractors during regular business hours, or such other hours as may be requested by Trane and acceptable to Customer, to install, adjust, inspect, and correct the installation work. Trane's access to correct any emergency condition shall not be restricted by Customer. Customer grants to Company the right to remotely connect (via phone modem, internet or other agreed upon means) to Customer's building automation system (BAS) and/or HVAC equipment to view, extract, or otherwise collect and retain data from the BAS, HVAC equipment, or other building systems, and to diagnose and remotely make repairs at Customer's request.

10. Completion. When Company informs Customer that the Work has been completed, Customer shall inspect the Work in the presence of Company's representative, and Customer shall either (a) accept the Work in its entirety in writing, or (b) accept the Work in part and specifically identify, in writing, any exception items. Customer agrees to re-inspect any and all excepted items as soon as Company informs Customer that all such excepted items have been completed. The initial acceptance inspection shall take place within ten (10) days from the date when Company informs Customer that the Work has been completed. Any subsequent re-inspection of excepted items shall take place within five (5) days from the date when Company informs Customer that the excepted items have been completed. Customer's failure to cooperate and complete any of said inspections within the required time limits shall constitute complete acceptance of the Work as of ten (10) days from date when Company informs Customer that the Work, or the excepted items, if applicable, has/have been completed.

a. Substantial Completion. When Trane considers that the Services, or a portion thereof, are substantially complete, Trane will submit to Customer a proposed "punch list" listing items of the Services to be completed prior to final completion. Customer and Trane shall inspect the Work (or portion thereof) to determine if the same is substantially complete. (Substantial Completion is defined as the stage in the progress of the Services (or designated portion thereof) when the Work is sufficiently complete so that Customer can occupy or utilize the Services for its intended use.) Customer and Trane shall add to the punch list any item of work that has not been completed. When the Services (or designated portion thereof) are substantially complete, Customer and Trane shall execute a Certificate of Substantial Completion, setting forth the date of Substantial Completion and shall state the date by which Trane shall complete the items included on the punch list.

b. Final Completion. Upon Customer's receipt of written notice from Trane that the installation work included in the Work is ready for final inspection and acceptance, Customer and Trane shall inspect the installation services and determine whether the same has been performed in accordance with the Proposal. If Customer considers the installation work to have been performed in accordance with the Proposal, Customer shall issue a Certificate of Final Completion and Acceptance, to be executed by an authorized representative of Customer. In the event Trane presents a Certificate of Final Completion and Acceptance to Customer for execution and, within fourteen (14) calendar days from the date noted in the Certificate as the date of such presentation, Customer fails to deliver an executed original of the Certificate to Trane and does not provide to Trane written objections to issuance of the Certificate, providing specific facts as to why the Services have not been finally completed, the Date of Final Completion shall be the date noted in the Certificate as the date the Certificate was submitted to Customer.

11. Changes in Work

a. Customer, by written change order, may request that Trane perform services in addition to the Work ("Change Order"). Trane shall be obligated to perform such additional services only pursuant to a Change Order agreed to and executed by Customer and Trane. The Change Order shall reflect the parties' agreement with respect to the scope of the additional services, the amount of any adjustment in the Proposal Price, and the extent of any adjustment in the contract time.

b. If a Change Order provides for an adjustment to the Proposal Price, such adjustment shall be based on one of the following methods:

(1) A lump sum agreed to by Customer and Trane;
(2) Unit prices set forth in this Agreement or subsequently agreed to; or
(3) Cost of the work ordered plus a fee agreed to by the parties.

c. The following types of costs, which listing is not all-inclusive, shall be included in the determination of the cost of the additional work:

(1) costs of labor, including social security, old age and unemployment insurance, fringe benefits required by agreement or industry practice or custom, and workers' compensation insurance;
(2) costs of materials, supplies and equipment, including transportation thereof, whether the same is incorporated or consumed in the additional work;
(3) the costs of renting machinery and equipment, except hand tools;
(4) premium costs for all bonds and insurance, permit or other governmental approval or inspection fees, and sales, use or comparable taxes relating to the additional work; and
(5) additional costs of supervision and field office personnel directly attributable to the additional work.

12. Permits and Governmental Fees. Company shall secure (with Customer's assistance) and pay for building and other permits and governmental fees, licenses, and inspections necessary for proper performance and completion of the Work which are legally required when bids from Company's subcontractors are received, negotiations thereon concluded, or the effective date of a relevant Change Order, whichever is later. Customer is responsible for necessary approvals, easements, assessments and charges for construction, use or occupancy of permanent structures or for permanent changes to existing facilities. If the cost of such permits, fees, licenses and inspections are not included in the Proposal, Company will invoice Customer for such costs.

13. Utilities During Construction. Customer shall provide without charge to Company all water, heat, and utilities required for performance of the Work.

14. Concealed or Unknown Conditions. In the performance of the Work, if Company encounters conditions at the Work site that are (i) subsurface or otherwise concealed physical conditions that differ materially from those indicated on drawings expressly incorporated herein or (ii) unknown physical conditions of an unusual nature that differ materially from those conditions ordinarily found to exist and generally recognized as inherent in construction activities of the type and character as the Work, Company shall notify Customer of such conditions promptly, prior to significantly disturbing same. If such conditions differ materially and cause an increase in Company's cost of, or time required for, performance of any part of the Work, Company shall be entitled to, and Customer shall consent by Change Order to, an equitable adjustment in the Proposal Price, contract time, or both.

15. Pre-Existing Conditions. Company is not liable for any claims, damages, losses, or expenses, arising from or related to conditions that existed in, on, or upon the Work site before the Commencement Date of this Agreement ("Pre-Existing Conditions"), including, without limitation, damages, losses, or expenses involving Pre-Existing Conditions of building envelope issues, mechanical issues, plumbing issues, and/or indoor air quality issues involving mold/mould and/or fungi. Company also is not liable for any claims, damages, losses, or expenses, arising from or related to work done by or services provided by individuals or entities that are not employed by or hired by Company.

16. Asbestos and Hazardous Materials. Company's Work and other services in connection with this Agreement expressly excludes any identification, abatement, cleanup, control, disposal, removal or other work connected with asbestos, polychlorinated biphenyl ("PCB"), or other hazardous materials (hereinafter, collectively, "Hazardous Materials"). Customer warrants and represents that, except as set forth in a writing signed by Company, there are no Hazardous Materials on the Work site that will in any way affect Company's Work and Customer has disclosed to Company the existence and location of any Hazardous Materials in all areas within which Company will be performing the Work. Should Company become aware of or suspect the presence of Hazardous Materials, Company may immediately stop work in the affected area and shall notify Customer. Customer will be exclusively responsible for taking any and all action necessary to correct the condition in accordance with all applicable laws and regulations. Customer shall be exclusively responsible for and, to the fullest extent permitted by law, shall indemnify and hold harmless Company (including its employees, agents and subcontractors) from and against any loss, claim, liability, fees, penalties, injury (including death) or liability of any nature, and the payment thereof arising out of or relating to any Hazardous Materials on or about the Work site, not brought onto the Work site by Company. Company shall be required to resume performance of the Work in the affected area only in the absence of Hazardous Materials or when the affected area has been rendered harmless. In no event shall Company be obligated to transport or handle Hazardous Materials, provide any notices to any governmental agency, or examine the Work site for the presence of Hazardous Materials.

17. Force Majeure. Company's duty to perform under this Agreement is contingent upon the non-occurrence of an Event of Force Majeure. If Company shall be unable to carry out any material obligation under this Agreement due to an Event of Force Majeure, this Agreement shall at Company's election (i) remain in effect but Company's obligations shall be suspended until the uncontrollable event terminates or (ii) be terminated upon 10 days' notice to Customer, in which event Customer shall pay Company for all parts of the Work furnished to the date of termination. An "Event of Force Majeure" shall mean any cause or event beyond the control of Company. Without limiting the foregoing, "Event of Force Majeure" includes: acts of God; acts of terrorism, war or the public enemy; flood; earthquake; tornado; storm; fire; civil disobedience; pandemic insurrections; riots; labor/labour disputes; labor/labour or material shortages; sabotage; restraint by court order or public authority (whether valid or invalid), and action or non-action by or inability to obtain or keep in force the necessary governmental authorizations, permits, licenses, certificates or approvals if not caused by Company; and the requirements of any applicable government in any manner that diverts either the material or the finished product to the direct or indirect benefit of the government.

18. Customer's Breach. Each of the following events or conditions shall constitute a breach by Customer and shall give Company the right, without an election of remedies, to terminate this Agreement or suspend performance by delivery of written notice: (1) Any failure by Customer to pay amounts when due; or (2) any general assignment by Customer for the benefit of its creditors, or if Customer becomes bankrupt or insolvent or takes the benefit of any statute for bankrupt or insolvent debtors, or makes or proposes to make any proposal or arrangement with creditors, or if any steps are taken for the winding up or other termination of Customer or the liquidation of its assets, or if a trustee, receiver, or similar person is appointed over any of the assets or interests of Customer; (3) Any representation or warranty furnished by Customer in this Agreement is false or misleading in any material respect when made; or (4) Any failure by Customer to perform or comply with any material provision of this Agreement. Customer shall be liable to Company for all Work furnished to date and all damages sustained by Company (including lost profit and overhead)

19. Indemnity. To the fullest extent permitted by law, Company and Customer shall indemnify, defend and hold harmless each other from any and all claims, actions, costs, expenses, damages and liabilities, including reasonable attorneys' fees, resulting from death or bodily injury or damage to real or tangible personal property, to the extent caused by the negligence or misconduct of their respective employees or other authorized agents in connection with their activities within the scope of this Agreement. Neither party shall indemnify the other against claims, damages, expenses or liabilities to the extent attributable to the acts or omissions of the other party. If the parties are both at fault, the obligation to indemnify shall be proportional to their relative fault. The duty to indemnify will continue in full force and effect, notwithstanding the expiration or early termination hereof, with respect to any claims based on facts or conditions that occurred prior to expiration or termination.

20. Limitation of Liability. NOTWITHSTANDING ANYTHING TO THE CONTRARY, IN NO EVENT SHALL COMPANY BE LIABLE FOR ANY SPECIAL, LIQUIDATED INCIDENTAL, INDIRECT CONSEQUENTIAL, OR PUNITIVE OR EXEMPLARY DAMAGES (INCLUDING WITHOUT LIMITATION BUSINESS INTERRUPTION, LOST DATA, LOST REVENUE, LOST PROFITS, LOST DOLLAR SAVINGS, OR LOST ENERGY USE SAVINGS, INCLUDING CONTAMINANTS LIABILITIES, EVEN IF A PARTY HAS BEEN ADVISED OF SUCH POSSIBLE DAMAGES OR IF SAME WERE REASONABLY FORESEEABLE AND REGARDLESS OF WHETHER THE CAUSE OF ACTION IS FRAMED IN CONTRACT, NEGLIGENCE, ANY OTHER TORT, WARRANTY, STRICT LIABILITY, OR PRODUCT LIABILITY). In no event will Company's liability in connection with the provision of products or services or otherwise under this Agreement exceed the entire amount paid to Company by Customer under this Agreement.

21. CONTAMINANTS LIABILITY

The transmission of COVID-19 may occur in a variety of ways and circumstances, many of the aspects of which are currently not known. HVAC systems, products, services and other offerings have not been tested for their effectiveness in reducing the spread of COVID-19, including through the air in closed environments. **IN NO EVENT WILL COMPANY BE LIABLE UNDER THIS AGREEMENT OR OTHERWISE FOR ANY INDEMNIFICATION, ACTION OR CLAIM, WHETHER BASED ON WARRANTY, CONTRACT, TORT OR OTHERWISE, FOR ANY BODILY INJURY (INCLUDING DEATH), DAMAGE TO PROPERTY, OR ANY OTHER LIABILITIES, DAMAGES OR COSTS RELATED TO CONTAMINANTS (INCLUCING THE SPREAD, TRANSMISSION, MITIGATION, ELIMINATION, OR CONTAMINATION THEREOF) (COLLECTIVELY, "CONTAMINANT LIABILITIES") AND CUSTOMER HEREBY EXPRESSLY RELEASES COMPANY FROM ANY SUCH CONTAMINANTS LIABILITIES.**

22. Patent Indemnity. Company shall protect and indemnify Customer from and against all claims, damages, judgments and loss arising from infringement or alleged infringement of any United States patent by any of the goods manufactured by Company and delivered hereunder, provided that in the event of suit or threat of suit for patent infringement, Company shall promptly be notified and given full opportunity to negotiate a settlement. Company does not warrant against infringement by reason of Customer's design of the articles or the use thereof in combination with other materials or in the operation of any process. In the event of litigation, Customer agrees to reasonably cooperate with Company. In connection with any proceeding under the provisions of this Section, all parties concerned shall be entitled to be represented by counsel at their own expense.

23. Limited Warranty. Company warrants for a period of 12 months from the date of substantial completion ("Warranty Period") commercial equipment manufactured and installed by Company against failure due to defects in material and manufacture and that the labor/labour furnished is warranted to have been properly performed (the "Limited Warranty"). Trane equipment sold on an uninstalled basis is warranted in accordance with Company's standard warranty for supplied equipment. **Product manufactured by Company that includes required startup and is sold in North America will not be warranted by Company unless Company performs the product start-up**. Substantial completion shall be the earlier of the date that the Work is sufficiently complete so that the Work can be utilized for its intended use or the date that Customer receives beneficial use of the Work. If such defect is discovered within the Warranty Period, Company will correct the defect or furnish replacement equipment (or, at its option, parts therefor) and, if said equipment was installed pursuant hereto, labor/labour associated with the replacement of parts or equipment not conforming to this Limited Warranty. Defects must be reported to Company within the Warranty Period. Exclusions from this Limited Warranty include damage or failure arising from: wear and tear; corrosion, erosion, deterioration; Customer's failure to follow the Company-provided maintenance plan; refrigerant not supplied by Company; and modifications made by others to Company's equipment. Company shall not be obligated to pay for the cost of lost refrigerant. Notwithstanding the foregoing, all warranties provided herein terminate upon termination or cancellation of this Agreement. No warranty liability whatsoever shall attach to Company until the Work has been paid for in full and then said liability shall be limited to the lesser of Company's cost to correct the defective Work and/or the purchase price of the equipment shown to be defective. Equipment, material and/or parts that are not manufactured by Company ("Third-Party Product(s)" are not warranted by Company and have such warranties as may be extended by the respective manufacturer. **CUSTOMER UNDERSTANDS THAT COMPANY IS NOT THE MANUFACTURER OF ANY THIRD-PARTY PRODUCT(S) AND ANY WARRANTIES, CLAIMS, STATEMENTS, REPRESENTATIONS, OR SPECIFICATIONS ARE THOSE OF THE THIRD-PARTY MANUFACTURER, NOT COMPANY AND CUSTOMER IS NOT RELYING ON ANY WARRANTIES, CLAIMS, STATEMENTS, REPRESENTATIONS, OR SPECIFICATIONS REGARDING THE THIRD-PARTY PRODUCT THAT MAY BE PROVIDED BY COMPANY OR ITS AFFILIATES, WHETHER ORAL OR WRITTEN. THE WARRANTY AND LIABILITY SET FORTH IN THIS AGREEMENT ARE IN LIEU OF ALL OTHER WARRANTIES AND LIABILITIES, WHETHER IN CONTRACT OR IN NEGLIGENCE, EXPRESS OR IMPLIED, IN LAW OR IN FACT, INCLUDING IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE AND/OR OTHERS ARISING FROM COURSE OF DEALING OR TRADE. COMPANY MAKES NO REPRESENTATION OR WARRANTY OF ANY KIND, INCLUDING WARRANTY OF MERCHANTABILITY OR FITNESS FOR PARTICULAR PURPOSE. ADDITIONALLY, COMPANY MAKES NO REPRESENTATION OR WARRANTY OF ANY KIND REGARDING PREVENTING, ELIMINATING, REDUCING OR INHIBITING ANY MOLD, FUNGUS, BACTERIA, VIRUS, MICROBIAL GROWTH, OR ANY OTHER CONTAMINANTS (INCLUDING COVID-19 OR ANY SIMILAR VIRUS) (COLLECTIVELY, "CONTAMINANTS"), WHETHER INVOLVING OR IN CONNECTION WITH EQUIPMENT, ANY COMPONENT THEREOF, SERVICES OR OTHERWISE. IN NO EVENT SHALL COMPANY HAVE ANY LIABILITY FOR THE PREVENTION, ELIMINATION, REDUCTION OR INHIBITION OF THE GROWTH OR SPREAD OF SUCH CONTAMINANTS INVOLVING OR IN CONNECTION WITH ANY EQUIPMENT, THIRD-PARTY PRODUCT, OR ANY COMPONENT THEREOF, SERVICES OR OTHERWISE AND CUSTOMER HEREBY SPECIFICALLY ACKNOWLEDGES AND AGREES THERETO.**

24 Insurance.

a. Company agrees to maintain the following insurance while the Work is being performed with limits not less than shown below and will, upon request from Customer, provide a Certificate of evidencing the following coverage:

Commercial General Liability	$2,000,000 per occurrence
Automobile Liability	$2,000,000 CSL
Workers Compensation	Statutory Limits

If Customer has requested to be named as an additional insured under Company's insurance policy, Company will do so but only subject to Company's manuscript additional insured endorsement under its primary Commercial General Liability policies. In no event does Company waive its right of subrogation.

b. **Customer's Liability and Property Insurance.** (a) Customer shall be responsible for purchasing and maintaining Commercial General Liability Insurance of the type and amount Customer deems necessary and appropriate. (b) Customer shall purchase and maintain until Final Payment property insurance for the installation work in progress at least in an amount equal to the Proposal Price, as the same may be adjusted from time to time, for the installation work (including the equipment) on a replacement cost basis with a deductible of no more than $5,000 from an insurer reasonably acceptable to Trane. Such property insurance shall include the interests of Customer, Trane, and its subcontractors (at whatever tier) as additional insureds as their interests may appear. The property insurance purchased by Customer shall be on an all-risk policy form. The property insurance shall cover portions of the installation work stored off site after written approval of Customer at the value established in the approval. Customer, for itself and its insurance carriers, hereby waives all rights of subrogation against Trane and any of its subcontractors, agents, employees, and officers with respect to property insurance and any other insurance coverages maintained by Customer. (c) A loss insured under Customer's property insurance shall be adjusted by Customer's Insurer as a fiduciary and made payable to Customer as a fiduciary for the insureds, as their respective interests may appear, subject to requirements of any applicable mortgagee clause. Trane shall pay its subcontractors their just shares of insurance proceeds received by Customer and remitted to Trane, and, by appropriate agreements, written where legally required for validity, shall require said subcontractors to make payments to their subcontractors in a similar manner. In its fiduciary role, Customer shall have the power to negotiate and settle a loss with insurers; provided, however, that at least ten (10) days prior to agreeing to the proposed settlement, Customer shall advise the parties in interest in writing of the terms of the same and the parties in interest shall have seven (7) days thereafter to object in writing to the proposed adjustment or settlement; if such objection is made, Customer shall not enter into or agree to the proposed adjustment. (d) Certificates of insurance acceptable to the Customer and to Trane shall be provided by each party to the other prior to commencement of performance of any Services. Such certificates shall contain a provision that coverages afforded under the policies will not be canceled or allowed to expire until at least thirty (30) days prior written notice has been given to the other party. If any of the insurance coverages are required to remain in force after final payment and are reasonably available, an additional certificate evidencing continuation of such coverage shall be submitted with the final application for payment.

25. Commencement of Statutory Limitation Period. Except as to warranty claims, as may be applicable, any applicable statutes of limitation for acts or failures to act shall commence to run, and any alleged cause of action stemming therefrom shall be deemed to have accrued, in any and all events not later than the last date that Company or its subcontractors physically performed work on the project site.

26. General. Except as provided below, to the maximum extent provided by law, this Agreement is made and shall be interpreted and enforced in accordance with the laws of the state or province in which the Work is performed, without regard to choice of law principles which might otherwise call for the application of a different state's or province's law. Any dispute arising under or relating to this Agreement that is not disposed of by agreement shall be decided by litigation in a court of competent jurisdiction located in the state or province in which the Work is performed. To the extent the Work site is owned and/or operated by any agency of the Federal Government, determination of any substantive issue of law shall be according to the Federal common law of Government contracts as enunciated and applied by Federal judicial bodies and boards of contract appeals of the Federal Government. This Agreement contains all of the agreements, representations and understandings of the parties and supersedes all previous understandings, commitments or agreements, oral or written, related to the subject matter hereof. This Agreement may not be amended, modified

or terminated except by a writing signed by the parties hereto. No documents shall be incorporated herein by reference except to the extent Company is a signatory thereon. If any term or condition of this Agreement is invalid, illegal or incapable of being enforced by any rule of law, all other terms and conditions of this Agreement will nevertheless remain in full force and effect as long as the economic or legal substance of the transaction contemplated hereby is not affected in a manner adverse to any party hereto. Customer may not assign, transfer, or convey this Agreement, or any part hereof, or its right, title or interest herein, without the written consent of the Company. Subject to the foregoing, this Agreement shall be binding upon and inure to the benefit of Customer's permitted successors and assigns. This Agreement may be executed in several counterparts, each of which when executed shall be deemed to be an original, but all together shall constitute but one and the same Agreement. A fully executed facsimile copy hereof or the several counterparts shall suffice as an original.

27. Federal Requirements. The Parties shall comply with all United States federal labor law obligations under 29 CFR part 471, appendix A to subpart A. THE FOLLOWING PROVISIONS ARE INCORPORATED HEREIN BY REFERENCE: Executive Order 11701 and 41 CFR §§ 60-250.5(a), 60-300.5; Executive Order 11758 and 41 CFR § 60-741.5(a); U.S. immigration laws, including the L-1 Visa Reform Act of 2004 and the H-1B Visa Reform Act of 2004; and Executive Order 13496. The Parties shall abide by the requirements of 41 CFR 60-300.5(a) and 60-741.5(a). These regulations prohibit discrimination against qualified individuals based on their status as protected veterans or individuals with disabilities. Moreover, these regulations require that covered prime contractors and subcontractors take affirmative action to employ and advance in employment individuals without regard to protected veteran status or disability. The Parties certify that they do not operate any programs promoting DEI that violate any applicable United States anti-discrimination laws and acknowledge and agree that their compliance with all applicable federal anti-discrimination laws is material to the federal government's payment decisions. The Parties acknowledge and agree that their employment, procurement, and contracting practices shall not consider race, color, sex, sexual preference, religion, or national origin in ways that violate United States federal civil rights laws.

28. Export Laws. The obligation of Company to supply Equipment and/or Services under this Agreement is subject to the ability of Company to supply such items consistent with applicable laws and regulations of the United States and other governments. Company reserves the right to refuse to enter into or perform any order, and to cancel any order, under this Agreement if Company in its sole discretion determines that performance of the transaction to which such order relates would violate any such applicable law or regulation. Customer will pay all handling and other similar costs from Company's factories including the costs of freight, insurance, export clearances, import duties and taxes. Customer will be "exporter of record" with respect to any export from the United States of America and will perform all compliance and logistics functions in connection therewith and will also comply with all applicable laws, rules and regulations. Customer understands that Company and/or the Equipment and/or Services are subject to laws and regulations of the United States of America which may require licensing or authorization for and/or prohibit export, re-export or diversion of Company's Equipment and/or Services to certain countries, and agrees it will not knowingly assist or participate in any such diversion or other violation of applicable United States of America laws and regulations. Customer agrees to hold harmless and indemnify Company for any damages resulting to Customer or Company from a breach of this paragraph by Customer.

29. U.S. Government Work.

The following provision applies only to direct sales by Company to the US Government. The Parties acknowledge that all items or services ordered and delivered under this Agreement are Commercial Items as defined under Part 12 of the Federal Acquisition Regulation (FAR). In particular, Company agrees to be bound only by those Federal contracting clauses that apply to "commercial" suppliers and that are contained in FAR 52.212-5(e)(1). Company complies with 52.219-8 or 52.219-9 in its service and installation contracting business.

The following provision applies only to indirect sales by Company to the US Government. As a Commercial Item Subcontractor, Company accepts only the following mandatory flow down provisions in effect as of the date of this subcontract: 52.203-19; 52.204-21; 52.204-23; 52.219-8; 52.222-21; 52.222-26; 52.222-35; 52.222-36; 52.222-50; 52.225-26; 52.247-64. If the Work is in connection with a U.S. Government contract, Customer certifies that it has provided and will provide current, accurate, and complete information, representations and certifications to all government officials, including but not limited to the contracting officer and officials of the Small Business Administration, on all matters related to the prime contract, including but not limited to all aspects of its ownership, eligibility, and performance. Anything herein notwithstanding, Company will have no obligations to Customer unless and until Customer provides Company with a true, correct and complete executed copy of the prime contract. Upon request, Customer will provide copies to Company of all requested written communications with any government official related to the prime contract prior to or concurrent with the execution thereof, including but not limited to any communications related to Customer's ownership, eligibility or performance of the prime contract. Customer will obtain written authorization and approval from Company prior to providing any government official any information about Company's performance of the work that is the subject of the Proposal or this Agreement, other than the Proposal or this Agreement.

30. Limited Waiver of Sovereign Immunity. If Customer is an Indian tribe (in the U.S.) or a First Nation or Band Council (in Canada), Customer, whether acting in its capacity as a government, governmental entity, a duly organized corporate entity or otherwise, for itself and for its agents, successors, and assigns: (1) hereby provides this limited waiver of its sovereign immunity as to any damages, claims, lawsuit, or cause of action (herein "Action") brought against Customer by Company and arising or alleged to arise out of the furnishing by Company of any product or service under this Agreement, whether such Action is based in contract, tort, strict liability, civil liability or any other legal theory; (2) agrees that jurisdiction and venue for any such Action shall be proper and valid (a) if Customer is in the U.S., in any state or United States court located in the state in which Company is performing this Agreement or (b) if Customer is in Canada, in the superior court of the province or territory in which the work was performed; (3) expressly consents to such Action, and waives any objection to jurisdiction or venue; (4) waives any requirement of exhaustion of tribal court or administrative remedies for any Action arising out of or related to this Agreement; and (5) expressly acknowledges and agrees that Company is not subject to the jurisdiction of Customer's tribal court or any similar tribal forum, that Customer will not bring any action against Company in tribal court, and that Customer will not avail itself of any ruling or direction of the tribal court permitting or directing it to suspend its payment or other obligations under this Agreement. The individual signing on behalf of Customer warrants and represents that such individual is duly authorized to provide this waiver and enter into this Agreement and that this Agreement constitutes the valid and legally binding obligation of Customer, enforceable in accordance with its terms.

31. Building Automation Systems and Network Security. Customer and Trane acknowledge that Building Automation System (BAS) and connected networks security requires Customer and Trane to maintain certain cybersecurity obligations. Customer acknowledges that upon completion of installation and configuration of the BAS, the Customer maintains ownership of the BAS and the connected network equipment. Except for any applicable warranty obligations, Customer is solely responsible for the maintenance and security of the BAS and related networks and systems. In the event there is a service agreement between Trane and Customer, Trane will provide the services as set forth in the service agreement.

In order to maintain a minimum level of security for the BAS, associated networks, network equipment and systems, Customer's cybersecurity responsibilities include without limitation:

1. Ensure that the BAS, networks, and network equipment are physically secure and not accessible to unauthorized personnel.
2. Ensure the BAS remains behind a secure firewall and properly segmented from all other customer networks and systems, especially those with sensitive information.
3. Keep all Inbound ports closed to any IP Addresses in the BAS.
4. Remove all forwarded inbound ports and IP Addresses to the BAS.
5. Maintain user login credentials and unique passwords, including the use of strong passwords and the removal of access for users who no longer require access.
6. Where remote access is desired, utilize a secure method such as Trane Connect Secure Remote Access or your own VPN.
7. For any Trane services requiring remote data transfer and/or remote user access, configure the BAS and related firewall(s) per instructions provided by Trane. This typically includes configuring Port 443 and associated firewall(s) for Outbound only.
8. Perform regular system maintenance to ensure that your BAS is properly secured, including regular software updates to your BAS and related network equipment (i.e., firewalls).

Any and all claims, actions, losses, expenses, costs, damages, or liabilities of any nature due to Customer's failure to maintain BAS security responsibilities and/or industry standards for cybersecurity are the sole responsibility of the Customer.

1-26.251-10 (07072025)
Supersedes 1-26.251-10(0325)

SECURITY ADDENDUM

This Addendum shall be applicable to the sale, installation and use of Trane equipment and the sale and provision of Trane services. "Trane" shall mean Trane U.S. Inc. for sales and services in the United States, or Trane Canada ULC for sales and services in Canada.

1. **Definitions.** All terms used in this Addendum shall have the meaning specified in the Agreement unless otherwise defined herein. For the purposes of this Addendum, the following terms are defined as follows:
"Customer Data" means Customer account information as related to the Services only and does not include HVAC Machine Data or personal data. Trane does not require, nor shall Customer provide personal data to Trane under the Agreement. Such data is not required for Trane to provide its Equipment and/or Services to the Customer.
"Equipment" shall have the meaning set forth in the Agreement.
"HVAC Machine Data" means data generated and collected from the product or furnished service without manual entry. HVAC Machine Data is data relating to the physical measurements and operating conditions of a HVAC system, such as but not limited to, temperatures, humidity, pressure, HVAC equipment status. HVAC Machine Data does not include Personal Data and, for the purposes of this agreement, the names of users of Trane's controls products or hosted applications shall not be Personal Data, if any such user chooses to use his/her name(s) in the created accounts within the controls product (e.g., firstname.lastname@address.com). HVAC Machine Data may be used by Trane: (a) to provide better support services and/or products to users of its products and services; (b) to assess compliance with Trane terms and conditions; (c) for statistical or other analysis of the collective characteristics and behaviors of product and services users; (d) to backup user and other data or information and/or provide remote support and/or restoration; (e) to provide or undertake: engineering analysis; failure analysis; warranty analysis; energy analysis; predictive analysis; service analysis; product usage analysis; and/or other desirable analysis, including, but not limited to, histories or trends of any of the foregoing; and (f) to otherwise understand and respond to the needs of users of the product or furnished service. "Personal Data" means data and/or information that is owned or controlled by Customer, and that names or identifies, or is about a natural person, such as: (i) data that is explicitly defined as a regulated category of data under any data privacy laws applicable to Customer; (ii) non-public personal information ("NPI") or personal information ("PI"), such as national identification number, passport number, social security number, social insurance number, or driver's license number; (iii) health or medical information, such as insurance information, medical prognosis, diagnosis information, or genetic information; (iv) financial information, such as a policy number, credit card number, and/or bank account number; (v) personally identifying technical information (whether transmitted or stored in cookies, devices, or otherwise), such as IP address, MAC address, device identifier, International Mobile Equipment Identifier ("IMEI"), or advertising identifier; (vi) biometric information; and/or (vii) sensitive personal data, such as, race, religion, marital status, disability, gender, sexual orientation, geolocation, or mother's maiden name.
"Security Incident" shall refer to (i) a compromise of any network, system, application or data in which Customer Data has been accessed or acquired by an unauthorized third party; (ii) any situation where Trane reasonably suspects that such compromise may have occurred; or (iii) any actual or reasonably suspected unauthorized or illegal Processing, loss, use, disclosure or acquisition of or access to any Customer Data.
"Services" shall have the meaning set forth in the Agreement.

2. HVAC Machine Data; Access to Customer Extranet and Third Party Systems. If Customer grants Trane access to HVAC Machine Data via web portals or other non-public websites or extranet services on Customer's or a third party's website or system (each, an "Extranet"), Trane will comply with the following:
    a. Accounts. Trane will ensure that Trane's personnel use only the Extranet account(s) designated by Customer and will require Trane personnel to keep their access credentials confidential.
    b. Systems. Trane will access the Extranet only through computing or processing systems or applications running operating systems managed by Trane that include: (i) system network firewalls; (ii) centralized patch management; (iii) operating system appropriate anti-malware software; and (iv) for portable devices, full disk encryption.
    c. Restrictions. Unless otherwise approved by Customer in writing, Trane will not download, mirror or permanently store any HVAC Machine Data from any Extranet on any medium, including any machines, devices or servers.
    d. Account Termination. Trane will terminate the account of each of Trane's personnel in accordance with Trane's standard practices after any specific Trane personnel who has been authorized to access any Extranet (1) no longer needs access to HVAC Machine Data or (2) no longer qualifies as Trane personnel (e.g., the individual leaves Trane's employment).
    e. Third Party Systems. Trane will provide Customer prior notice before it uses any third party system that stores or may otherwise have access to HVAC Machine Data, unless (1) the data is encrypted and (2) the third party system will not have access to the decryption key or unencrypted "plain text" versions of the HVAC Machine Data.

3. Customer Data; Confidentiality. Trane shall keep confidential, and shall not access or use any Customer Data and information that is marked confidential or by its nature is considered confidential ("Customer Confidential Information") other than for the purpose of providing the Equipment and Services, and will disclose Customer Confidential Information only: (i) to Trane's employees and agents who have a need to know to perform the Services, (ii) as expressly permitted or instructed by Customer, or (iii) to the minimum extent required to comply with applicable law, provided that Trane (1) provides Customer with prompt written notice prior to any such disclosure, and (2) reasonably cooperate with Customer to limit or prevent such disclosure.

4. Customer Data; Compliance with Laws. Trane agrees to comply with laws, regulations governmental requirements and industry standards and practices relating to the Trane's processing of Customer Confidential Information (collectively, "***Laws***").

5. Customer Data; Information Security Management. Trane agrees to establish and maintain an information security and privacy program, consistent with applicable HVAC equipment industry practices that complies with this Addendum and applicable Laws ("***Information Security Program***"). The Information Security Program shall include appropriate physical, technical and administrative safeguards, including any safeguards and controls agreed by the Parties in writing, sufficient to protect Customer systems, and Customer's Confidential Information from unauthorized access, destruction, use, modification or disclosure. The Information Security Program shall include appropriate, ongoing training and awareness programs designed to ensure that Trane's employees and agents, and others acting on Trane's, behalf are aware of and comply with the Information Security Program's policies, procedures, and protocols.

6. Monitoring. Trane shall monitor and, at regular intervals consistent with HVAC equipment industry practices, test and evaluate the effectiveness of its Information Security Program. Trane shall evaluate and promptly adjust its Information Security Program in light of the results of the testing and monitoring, any material changes to its operations or business arrangements, or any other facts or circumstances that Trane knows or reasonably should know may have a material impact on the security of Customer Confidential Information, Customer systems and Customer property.

7. Audits. Customer acknowledges and agrees that the Trane SOC2 audit report will be used to satisfy any and all audit/inspection requests/requirements by or on behalf of Customer. Trane will make its SOC2 audit report available to Customer upon request and with a signed nondisclosure agreement.

8. Information Security Contact. Trane's information security contact is Local Sales Office.

9. Security Incident Management. Trane shall notify Customer after the confirmation of a Security Incident that affects Customer Confidential Information, Customer systems and Customer property. The written notice shall summarize the nature and scope of the Security Incident and the corrective action already taken or planned.

10. Threat and Vulnerability Management. Trane regularly performs vulnerability scans and addresses detected vulnerabilities on a risk basis. Periodically, Trane engages third-parties to perform network vulnerability assessments and penetration testing. Vulnerabilities will be reported in accordance with Trane's cybersecurity vulnerability reported process. Trane periodically provides security updates and software upgrades.

11. Security Training and Awareness. New employees are required to complete security training as part of the new hire process and receive annual and targeted training (as needed and appropriate to their role) thereafter to help maintain compliance with Security Policies, as well as other corporate policies, such as the Trane Code of Conduct. This includes requiring Trane employees to annually re-acknowledge the Code of Conduct and other Trane policies as appropriate. Trane conducts periodic security awareness campaigns to educate personnel about their responsibilities and provide guidance to create and maintain a secure workplace.

12. Secure Disposal Policies. Trane will maintain policies, processes, and procedures regarding the disposal of tangible and intangible property containing Customer Confidential Information so that wherever possible, Customer Confidential Information cannot be practicably read or reconstructed.
13. Logical Access Controls. Trane employs internal monitoring and logging technology to help detect and prevent unauthorized access attempts to Trane's corporate networks and production systems. Trane's monitoring includes a review of changes affecting systems' handling authentication, authorization, and auditing, and privileged access to Trane production systems. Trane uses the principle of "least privilege" (meaning access denied unless specifically granted) for access to customer data.

14. Contingency Planning/Disaster Recovery. Trane will implement policies and procedures required to respond to an emergency or other occurrence (i.e. fire, vandalism, system failure, natural disaster) that could damage Customer Data or any system that contains Customer Data. Procedures include the following
    a. Data backups; and
    b. Formal disaster recovery plan. Such disaster recovery plan is tested at least annually.

15. Return of Customer Data. If Trane is responsible for storing or receiving Customer Data, Trane shall, at Customer's sole discretion, deliver Customer Data to Customer in its preferred format within a commercially reasonable period of time following the expiration or earlier termination of the Agreement or, such earlier time as Customer requests, securely destroy or render unreadable or undecipherable each and every original and copy in every media of all Customer's Data in Trane's possession, custody or control no later than [90 days] after receipt of Customer's written instructions directing Trane to delete the Customer Data.

16. Background Checks. Trane shall take reasonable steps to ensure the reliability of its employees or other personnel having access to the Customer Data, including the conducting of appropriate background and/or verification checks in accordance with Trane policies.

17. DISCLAIMER OF WARRANTIES. EXCEPT FOR ANY APPLICABLE WARRANTIES IN THE AGREEMENT, THE SERVICES ARE PROVIDED "AS IS", WITH ALL FAULTS, AND THE ENTIRE RISK AS TO SATISFACTORY QUALITY, PERFORMANCE, ACCURACY AND EFFORT AS TO SUCH SERVICES SHALL BE WITH CUSTOMER. TRANE DISCLAIMS ANY AND ALL OTHER EXPRESS OR IMPLIED REPRESENTATIONS AND WARRANTIES WITH RESPECT TO THE SERVICES AND THE SERVICES PROVIDED HEREUNDER, INCLUDING ANY EXPRESS OR IMPLIED WARRANTY OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR THAT THE SERVICES WILL OPERATE ERROR-FREE OR UNINTERRUPTED OR RETURN/RESPONSE TO INQUIRIES WITHIN ANY SPECIFIC PERIOD OF TIME.

SECURITY ADDENDUM
(October 2024)
Supersedes (November 2023v2)

NEW YORK STATE | Office of General Services

Design and Construction

Division of Codes & Construction Permitting, 33rd Floor, Corning Tower
The Governor Nelson A. Rockefeller Empire State Plaza
Albany, New York 12242
Phone: (518) 474-1314

STATEMENT OF SPECIAL INSPECTIONS

Project No.: 47477

Instructions: BCNYS Section 1704.2.3 requires the project Design Professional to complete the Statement of Special Inspections *as a condition for issuance of the Construction Permit.* Complete each section of this form as applicable, and submit it to the Code Compliance Manager with the Summary of Special Inspections (BDC 406).

PROJECT INFORMATION:	**DESIGNER INFORMATION:**		**CONSTRUCTION INFORMATION**:	
Project Description: *(Project Title, Facility Name and Address)* RENOVATE ARMORY STATE ARMORY 2 QUINCY PLACE YONKERS, NY	Architect/Engineer/Consultant: Bell & Spina Architects-Engineers, PC		Engineer- In-Charge:	Region:
	Name of Person Completing Form: *(if different from above)* Jack Healy - RBCD; Mike Olszewski - M&P		Name of Person Completing Form: *(if different from above)*	
	Phone: 315-488-0377	Date: 11-24-2025	Phone:	Date:
Business Unit: BU 4	Comments: Completed by Ryan Biggs Clark Davis Engineering, DPC; M&P Engineering and Land Surveying, PLLC		Comments:	
Team Leader: Kevin Renaghan				

Check if Required	INSPECTION AND TESTING Continuous and Periodic as defined by the BCNYS	Continuous	Periodic	REFERENCE STANDARD	BCNYS REFERENCE	SPEC SECTION	COMMENTS	REGIONAL INSPECTION ASSIGNMENTS
	A. Steel Construction				1705.2			
☒	1. Structural steel.	☐	☒	AISC 360 Chapter N.5	1705.2, 1705.2.1	051200.0		
☒	2. Cold-formed steel deck.		☒	SDI QA/QC 2011	1705.2, 1705.2.2	053100.0		
☐	3. Installation of open-web steel joist and joist girders.		☐	SJI specification (Section 2207.1)	1705.2, 1705.2.3, 1705.2.4			
	B. Concrete Construction				1705.3			
☒	1. Inspection of reinforcing steel, including prestressing tendons, and placement.		☒	ACI 318: Ch. 20, 25.2, 25.3, 26.6.1-26.6.3	1705.3, 1908.4	032000.0		

Check if Required	INSPECTION AND TESTING Continuous and Periodic as defined by the BCNYS	Continuous	Periodic	REFERENCE STANDARD	BCNYS REFERENCE	SPEC SECTION	COMMENTS	REGIONAL INSPECTION ASSIGNMENTS
	B. Concrete Construction				1705.3			
☒	2a. Reinforcing bar welding - Weldability of reinforcing bars other than ASTM A706.		☒	AWS D1.4; ACI 318: 26.6.4	1705.3, 1705.3.1	032000.0		
☒	2b. Reinforcing bar welding - Single-pass fillet welds, maximum 5/16 inches.		☒	AWS D1.4; ACI 318: 26.6.4	1705.3, 1705.3.1	032000.0		
☒	2c. Reinforcing bar welding - All other welds.	☒		AWS D1.4; ACI 318: 26.6.4	1705.3, 1705.3.1	032000.0		
☒	3. Cast in concrete anchorage.		☒	ACI 318: 17.8.2	1705.3	032000.0		
☒	4a. Post installed concrete members - Adhesive anchors installed horizontally or upwardly inclined to resist sustained tension loads.	☒		ACI 318: 17.8.2.4	1705.3	033000.0		
☒	4b. Post installed concrete members - Mechanical anchors and adhesive anchors not defined in 4.a.		☒	ACI 318: 17.8.2		033000.0		
☒	5. Verify use of required design mix.		☒	ACI 318: Ch. 19, 26.4.3, 26.4.4	1705.3, 1904.1, 1904.2, 1908.2, 1908.3	033000.0		
☒	6. Sampling fresh concrete: slump, air content, temperature, strength test specimens.	☒		ASTM C 172, ASTM C31; ACI 318: 26.4, 26.12	1705.3, 1908.10	033000.0		
☒	7. Inspect concrete and shotcrete placement for proper application techniques.	☒		ACI 318: 26.5	1705.3, 1908.6, 1908.7, 1908.8	033000.0		
☒	8. Inspection for maintenance of specified curing temperature and techniques.		☒	ACI 318: 26.5.3-26.5.5	1705.3, 1908.9	033000.0		
☐	9. Inspection of prestressed concrete.	☐		ACI 318: 26.10	1705.3			

Check if Required	INSPECTION AND TESTING Continuous and Periodic as defined by the BCNYS	Continuous	Periodic	REFERENCE STANDARD	BCNYS REFERENCE	SPEC SECTION	COMMENTS	REGIONAL INSPECTION ASSIGNMENTS
☐	10. Erection of precast concrete members.		☐	ACI 318: Ch. 26.8	1705.3			
☐	11. Verification of in-situ concrete strength prior to stressing of tendons in post-tensioned concrete and prior to removal of shores and forms from beams and slabs.		☐	ACI 318: 26.11.2	1705.3			
☒	12. Inspect formwork for shape, location and dimensions of the concrete member being formed.		☒	ACI 318: 26.11.1.2(b)		031000.0		
☒	13. Material Tests – In absence of sufficient data or documentation for materials.		☒	ACI 318 Ch. 19 and 20		033000.0		
	C. Masonry Construction				1705.4			
☒	1. Masonry construction.	☐	☒	ACI 530/ ASCE 5/TMS 402 and ACI 530.1/ ASCE 6/TMS 602 Ch. 3	1705.4	042000.0		
☐	2. Empirically designed masonry, glass unit masonry and masonry veneer in Risk Category IV.		☐	TMS 402/ ACI530/ ASCE 5 Level B Ch. 3	1705.4.1, 2109, 2110, or Ch. 14			
☐	3. Vertical masonry foundation elements.	☐	☐		1705.4, 1705.4.2			
	D. Wood Construction				1705.5			
☐	1. Wood construction- Fabrication of wood structural elements and assemblies.		☐		1705.5, 1704.2.5			
☐	2. High-load Diaphragms.		☐		1705.5, 1705.5.1, 2306.2,1704.2			

Check if Required	INSPECTION AND TESTING Continuous and Periodic as defined by the BCNYS	Continuous	Periodic	REFERENCE STANDARD	BCNYS REFERENCE	SPEC SECTION	COMMENTS	REGIONAL INSPECTION ASSIGNMENTS
	D. Wood Construction				1705.5			
☐	3. Metal-plate-connected wood trusses spanning 60 feet or greater (temp. and perm. installation).		☐		1705.5.2			
	E. Soils				1705.6			
☒	1. Subgrade inspection.		☒		1705.6	310000.0		
☒	2. Classification and testing of compacted fill materials.		☒		1705.6	310000.0		
☒	3. Evaluation of in-place density and lift thickness.	☒			1705.6	310000.0		
☐	**F. Driven Deep Foundations** Installation and load tests (if applicable).	☐			1705.7			
☐	**G. Cast-In-Place Deep Foundations** Installation, end bearing strata, and load tests (if applicable).	☐			1705.8			
☐	**H. Helical Pile Foundation** Installation and load tests (is applicable).	☐			1705.9			
☒	**I. Fabricated Items**		☒		1705.10, 1704.2.5	055213	Pipe and tube railings	
☐	**J. Wind Resistance** Applicable in Exposure Category B with a basic wind speed of 120 mph and Exposure Categories C or D with basic wind speed of 110 mph or greater.				1705.11			
☐	1a. Structural wood - Field gluing operation of elements of main wind force-resisting system (MWRS).	☐			1705.11.1			

Check if Required	INSPECTION AND TESTING Continuous and Periodic as defined by the BCNYS	Continuous	Periodic	REFERENCE STANDARD	BCNYS REFERENCE	SPEC SECTION	COMMENTS	REGIONAL INSPECTION ASSIGNMENTS
☐	**J. Wind Resistance** Applicable in Exposure Category B with a basic wind speed of 120 mph and Exposure Categories C or D with basic wind speed of 110 mph or greater.				1705.11			
☐	1a. Field Gluing	☐			1705.11.1			
☐	1b. Structural wood - Nailing, bolting, anchoring, and fastening elements of the MWRS.		☐		1705.11.1			
☐	2a. Cold formed steel - Welding operations of elements of MWRS.		☐		1705.11.2			
☐	2b. Cold formed steel - Screw attachments, bolting, anchoring, and fastening of elements of MWRS.		☐		1705.11.2			
☐	3. Wind-resisting components – Roof covering, roof deck, and roof framing connections. Exterior wall covering and wall connections to roof and floor diaphragms and framing.		☐		1705.11, 1705.11.3			
☐	**K. Special Inspections for Seismic Resistance** Applicable to specific structures, systems, and components.				1705.12			
☐	1. Structural steel - Seismic force-resisting systems & elements.	☐		AISC 341 Ch. J	1705.12.1.1 or 1705.12.1.2			
☐	2a. Structural wood - Field gluing operation of elements of seismic force-resisting system (SFRS).	☐			1705.12.2			
☐	2b. Structural wood - Nailing, bolting, anchoring, and fastening of elements of SFRS.		☐		1705.12.2			

Check if Required	INSPECTION AND TESTING Continuous and Periodic as defined by the BCNYS	Continuous	Periodic	REFERENCE STANDARD	BCNYS REFERENCE	SPEC SECTION	COMMENTS	REGIONAL INSPECTION ASSIGNMENTS
	K. Special Inspections for Seismic Resistance Applicable to specific structures, systems, and components.				1705.12			
☐	3. Cold-formed steel framing – welding and fasteners.		☐		1705.12.3			
☐	4. Designated seismic systems – verify that label, anchorage, and mounting conforms to the certificate of compliance.		☐	ASCE 7 Section 13.2.2	1705.12.4			
☐	5. Architectural components.		☐		1705.12.5			
☐	6. Plumbing, Mechanical and electrical components.		☐		1705.12.6			
☐	7. Storage racks and access floors.		☐		1705.12.7,			
☐	8. Seismic isolation systems.		☐		1705.12.8			
☐	9. Cold-formed steel special bolted moment frames.		☐		1705.12.9			
☐	**L. Structural Testing for Seismic Resistance** Applicable to specific structures, systems, and components.				1705.13			
☐	1. Structural steel.	☐	☐	AISC 341 Ch. J	1705.13.1			
☐	2. Nonstructural components.		☐	ASCE 7 Section 13.2.1	1705.13.2			
☐	3. Designated seismic systems.		☐	ASCE 7 Section 13.2.2	1705.13.3			

Check if Required	INSPECTION AND TESTING Continuous and Periodic as defined by the BCNYS	Continuous	Periodic	REFERENCE STANDARD	BCNYS REFERENCE	SPEC SECTION	COMMENTS	REGIONAL INSPECTION ASSIGNMENTS
	L. Structural Testing for Seismic Resistance Applicable to specific structures, systems, and components.				1705.13			
☐	4. Seismic isolation systems.		☐	ASCE 7 Section 17.8	1705.13.4			
	M. Sprayed Fire-Resistant Materials [BF]				1705.14			
☐	1. Physical and visual tests.		☐		1705.14.1			
☐	2. Structural member surface conditions.		☐		1705.14.2			
☐	3. Application.		☐		1705.14.3			
☐	4. Thickness.		☐	ASTM E 605	1705.14.4			
☐	5. Density.		☐	ASTM E 605	1705.14.5			
☐	6. Bond strength.		☐	ASTM E 736	1705.14.6			
☐	**N. Mastic and Intumescent Fire-Resistant Coatings [BF]**		☐	AWCI 12-B	1705.15			
☐	**O. Exterior Insulation and Finish Systems (EIFS)**		☐	ASTM E2570	1705.16			
☐	**P. Fire-Resistant Penetrations and Joints [BF]** High rise building or buildings assigned to risk category III or IV		☐	ASTM E2174 ASTM E2393	1705.17			
☐	**Q. Testing for Smoking Control [F]**		☐		1705.18			

NEW YORK STATE
Office of General Services
Office of Business Diversity

Design and Construction
Office of Business Diversity
29th Floor, Corning Tower
The Governor Nelson A. Rockefeller Empire State Plaza
Albany, New York 12242
Phone: (518) 486-9284 FAX: (518) 486-9285

CONTRACTOR'S MWBE UTILIZATION PLAN

☐ Revised Plan

Contract No.: _____

REMINDER: Utilize the New York State Contract System located at https://ny.newnycontracts.com/Default.asp?TN=ny&XID=8353 to report MWBE payments on a monthly basis. Making false representations or including information evidencing a lack of good faith as part of, or in conjunction with, the submission of a Utilization Plan is prohibited by law and may result in penalties including, but not limited to, termination of a contract for cause, loss of eligibility to submit future bids, and/or withholding of payments. Firms that do not perform commercially useful functions may not be counted toward MWBE utilization.

Contractor's Name, Address and Federal ID No.:	Contract Description/Location:	Date Proposal Approved:	Date Printed:	Bid Date:	MWBE GOALS	
					MBE%	WBE%
Federal ID No.:	Work/Job Order:	OGS Project Number:	Work Order Value:	Contract Amount:		

Certified MBE/WBE Name, Address and Phone No.	MBE	WBE	Tiered Sub	Description of Subcontracting/Supplies	Anticipated performance/purchase date(s)	Dollar Value of Subcontract/Supplies	FOR OGS USE ONLY	SEE BDC 328.1
Federal ID No.:	☐	☐	☐					☐
Federal ID No.:	☐	☐	☐					☐
Federal ID No.:	☐	☐	☐					☐
Federal ID No.:	☐	☐	☐					☐

Pursuant to Executive Law Article 15-A, my firm will engage in a good faith effort to achieve the MWBE goals on this contract.

Contractor's Signature:

Enter Name:

Title:

E-Mail Address: Date:

Contractor's Comments:

FOR OGS USE ONLY

☐ Accepted ☐ Accepted as Noted ☐ Notice of Deficiency Issued

MBE % _____ MBE $ _____ WBE % _____ WBE $ _____

OGS Authorized Signature:	Enter Name:	Date:

NEW YORK STATE | Office of General Services
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Design and Construction

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CONTRACTOR'S LIST OF SUBCONTRACTORS/SUPPLIERS

Contract No.

Contractor's Name, Address and Federal ID No.:	Project Description/Location:		Date Submitted:	Bid Date:	MWBE Goals		SDVOB Goal
					MBE	WBE	
Federal ID No.	☐ Construction Contracts Exceeding $100,000 ☐ Commodity or Service Contracts Exceeding $25,000		Submittal No.:	Contract Amount:			
Date Proposal Approved:	Date Printed:	OGS Project Number:	Work/Job Order:		Work Order Value:		

Subcontractor/Supplier Name, Address, Phone No., Federal ID No. (FEIN) and DOL No. *(Do not list information previously submitted.)*	Sub/Supplier *(Check One)*			MBE	WBE	SDVOB	General Description of Work	Subcontractor/ Supplier Dollar Value	**OGS Use Only**
	Sub	Tiered Sub	Supplier						
FEIN.: DOL No: - -CR	☐	☐	☐	☐	☐	☐			
FEIN.: DOL No: - -CR	☐	☐	☐	☐	☐	☐			
FEIN.: DOL No: - -CR	☐	☐	☐	☐	☐	☐			
FEIN.: DOL No: - -CR	☐	☐	☐	☐	☐	☐			

Pursuant to Executive Law Article 15-A and Article 3 of the Veterans' Services Law, my firm proposes to use the certified firms listed above.

Contractor's Signature

Title

Date

OGS Use Only

Proposed Goal Attainments:

MBE % _____ WBE % _____ SDVOB % _____

☐ Accepted ☐ Accepted as Noted ☐ Not Accepted

Reason: _____

OGS Authorized Signature _____ Date _____

OGS 47477 RENOVATE STATE ARMORY NATIONAL GUARD

GEOTECHNICAL ENGINERING SERVICES – NEW ADDITION

RGE PROJECT NUMBER: 25.0015

GEOTECHNICAL ENGINEERING SERVICES REPORT

RENAISSANCE GEOTECHNICAL ENGINEERING™



PREPARED FOR:

BELL & SPINA
215 WYOMING STREET
SYRACUSE, NY 13204

PREPARED BY:

RENAISSANCE GEOTECHNICAL ENGINEERING, PLLC
P.O. BOX 2503
GLENVILLE, NY 12302
al@renaissancegeo.com

THIS DOCUMENT CANNOT BE ALTERED WITHOUT EXPRESS WRITEN CONSCENT OF RENAISSANCE GEOTEOCHNICAL ENGINEERING, PLLC. IT IS A VIOLATION OF THE UNIVERSITY OF THE STATE OF NEW YORK, EDUCATION DEPARTMENT LAW FOR ANY PERSON TO ALTER ANY DOCUMENT THAT BEARS THE SEAL OF A PROFESSIONAL ENGINEER, UNLESS THE PERSON IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER.

RENAISSANCE GEOTECHNICAL ENGINEERING™

June 23, 2025

BELL AND SPINA
215 Wyoming Street
Syracuse, New York 13204

Attn.: Mr. James L. Paolini, AIA Email: jpaolini@bellandspina.com

RE: Geotechnical Engineering Services Report
Renovate State Armory National Guard – New Addition
2 Quincy Place, Yonkers, Rockland County, New York
OGS Project No.: 47477
RGE PROJECT Number: 25.0015

Dear Mr. Paolini:

On May 23, 2025, RENAISSANCE GEOTECHNICAL ENGINEERING, PLLC (RGE) retained the services of Core Down Drilling Company for the completion of a single subsurface exploration boring within the existing facility of the State Armory National Guard in Yonkers, New York. The purpose of this investigation was to oversee the drilling process, visually classify the recovered subgrade soils, and provide shallow footing foundation recommendations to support a lightly loaded addition.

The test boring was advanced to a depth of approximately 22 feet below current grade. A map depicting the approximate location of the boring is included with this letter as Attachment 1.

A test boring log data including the completed laboratory tests have been provided as part of Attachment 2. Expanded laboratory test results and curves are included in Attachment 3.

Site Geology

The Surficial Geologic Map of New York, Lower-Hudson, 1989 Sheet identifies the project area as part of "t – Till" described as Silty SAND with Gravel.

According to the United States Geological Survey (USGS) and the Geologic Map of New York, Lower Hudson, the project site is situated in a geologic area best described as being part of the Fordham Gneiss.

Seismic Considerations

We recommend that foundations at this site be designed assuming a Seismic Site Class "D" as recommended in Section 1613.3.2 of the New York State Building Code and Chapter 20 of ASCE 7. Seismic output parameters summarized in the table below from the ASCE/SEI 7-16 Seismic Standard Tool are also found in Attachment 4.

Seismic Site Class and Spectral Accelerations

Seismic Site Class		D
Estimated Site Coordinates	Latitude	40.938352
	Longitude	-73.89689
Adjusted Peak Ground Acceleration - PGA_M		0.264g
S_{MS} – Short Period, Site Class Modified Spectral Acceleration		0.464g
S_{M1} – 1 Second Period, Site Class Modified Spectral Acceleration		0.147g
S_{DS} – Short Period, Five Percent Damping, Spectral Acceleration		0.31g
S_{D1} – 1 Second Period, Five Percent Damping, Spectral Acceleration		0.098g

S_s – Short Period Spectral Acceleration	0.297g
S_1 – 1 Second Period Spectral Acceleration	0.061g
Assumed Risk Category (Final determination shall be by the structural engineer)	III

Groundwater Conditions

The presence of water was not observed at the time of drilling. Groundwater level fluctuations and/or perched water conditions may occur due to seasonal variations in the amount of rainfall and other factors such as drainage characteristics. To obtain more accurate groundwater level information, long-term observations in a monitoring well or piezometer that is sealed from the influence of surface water would be needed.

Shallow Foundations

To limit total and differential elastic settlements due to static loading to less than an inch, a reinforced continuous footing, with isolated column footings should be designed using a maximum allowable net bearing pressure of 2,000 pounds per square foot. This bearing pressure is the pressure that can be applied to the soils at the base of the footings in excess of the minimum surrounding overburden pressures. To provide frost heave protection and ensure adequate confinement of the bearing materials, footings should be located at least 3.5 feet below final outside grade. Interior column footings may bear at least 3 feet below the finished floor elevation and be at least 30 inches in width.

Formed continuous footings should have a minimum width of 24 inches. Prior to placing concrete, all foundation bearing grades should be dry, stable, and free of standing water, mud, or frost. Bearing grades should be compacted prior to constructing the foundations in order to densify the subgrade materials that have been loosened during the excavations. The foundation excavations should be backfilled with onsite soils, or of select granular fill meeting the gradation requirements shown below:

Sieve Size Designation	Percent Passing by Weight
4-inch	100
No. 40	0 – 70
No. 200	0 – 15

Caution should be taken to prevent wetting, drying, or disturbance of the bearing materials. This can be accomplished by placing concrete as soon as the excavation is approved by the Geotechnical Engineer's representative. Surface run-off water should drain away from the excavated areas. If the subgrade materials should become wet or dry and/or loose or disturbed, they should be removed before placing concrete. Any soft or loose areas observed should also be removed before placing concrete.

The passive resistance of the soils against the sides of the footings should be neglected within the top 2 feet. For portions of the footings that extend below the 2-foot depth and bear against undisturbed soils, an ultimate passive earth pressure of 400 psf per foot of depth can be used for stability. Lateral resistance can be calculated using an allowable coefficient of sliding friction 0.4 times the sustained dead load on the footing up to a maximum 2,000 pounds per square feet.

Slab-On-Grade Floor Slab

The floor slab should be provided with a subbase course of Select Granular Material at least 6 inches thick. This subbase course should consist of crusher-run stone that conforms to the gradation requirements shown below:

Sieve Size Designation	Percent Passing by Weight
2-inch	100
¼"	25 – 60
No. 40	5 – 40
No. 200	0 – 10

This subbase material should be compacted to 95 percent of the material maximum dry density per ASTM D-1557. We recommend placing a waterproof membrane (15-mil Polyethylene) on top of the compacted subbase below the floor slab for a vapor barrier. A slab-on-grade supported on at least 6 inches of the above specified subbase material should be designed using a modulus of subgrade reaction, k_1, of 150 pci based on a 1-foot by 1-foot plate load test.

Water curing the slab will help the curing process and should help reduce shrinkage cracks and slab curling. Alternative curing provisions of ACI 302 and ACI 308R can also be adopted as directed by the Structural Engineer. Before the floor covering is placed, we recommend slab moisture emission tests be conducted to confirm that moisture discharge levels are within the floor covering manufacture's recommendation. These tests should be run at typical temperature and humidity conditions representative of what the floor covering will be susceptible to under normal conditions.

Drainage Considerations

The ground surface should be sloped at least 2% away from the building on all sides to allow for positive drainage away from the building. Water should not be allowed to pond near the structure during or after construction. Foundation and floor drain systems are not required; however, if installed, they should be at least 4 inches thick and constructed of crushed stone or gravel with no more than 10 percent of the material passing the #4 sieve. Additional recommendations for the design of foundation and floor drains can be found in Section 1805 of the 2020 New York State Building Code.

Construction Dewatering

The presence of groundwater was not observed. However, if encountered during the excavation process for the foundations, the need for dewatering shall be the responsibility of the contractor including restoring the excavations to a dry condition and preparing the foundation subgrades that are free of mud, water, and disturbed soils.

Construction Monitoring

This report provides geotechnical recommendations based on the subsurface conditions encountered at a single test boring. It is not practical or economical to perform enough subsurface investigation borings and test pits to identify all conditions at the site. Subsurface conditions may vary with distance away from the boring completed for this report. Conditions that may affect the recommendations contained in this letter may exist and may not become known until construction. If variations appear during construction, it may be necessary to revise the recommendations contained in this letter. In general accordance with the 2020 State of New York Building Code, monitoring of subsurface conditions during construction should be performed by a geotechnical engineer registered in the State of New York or his/her representative to verify that conditions are consistent with the findings included in this letter. Foundation construction recommended in this letter must be monitored in a full-time basis by a registered geotechnical engineer.

General

The findings and recommendations contained in this letter have been made with generally accepted professional geotechnical practices in the local area. No other warranties are implied or expressed. The scope of services and recommendations contained in this letter do not include any environmental assessment or identification of contaminated or hazardous materials. Any statements in this report or in the boring log concerning suspicious odors, colors, irregular textures or abnormal conditions are for informational purposes only and have not been verified by the geotechnical engineer, drilling or testing companies.

Mr. Paolini, we appreciate the opportunity to work with you on this project, and at your request, we are prepared to assist you with the proper construction monitoring and testing services. If you have any questions regarding the information contained in this letter report or if we can be of further assistance, please call us at (518) 902-9222 or email at al@renaissancegeo.com

Respectfully,
RENAISSANCE GEOTECHNICAL ENGINEERING, PLLC



Alseny Diop, P.E.
Principal Geotechnical Engineer

Attachment 1 – Vicinity Map & Boring Location Diagram

Attachment 2 – Test Boring Log, General Notes, Key to Boring Log Symbols

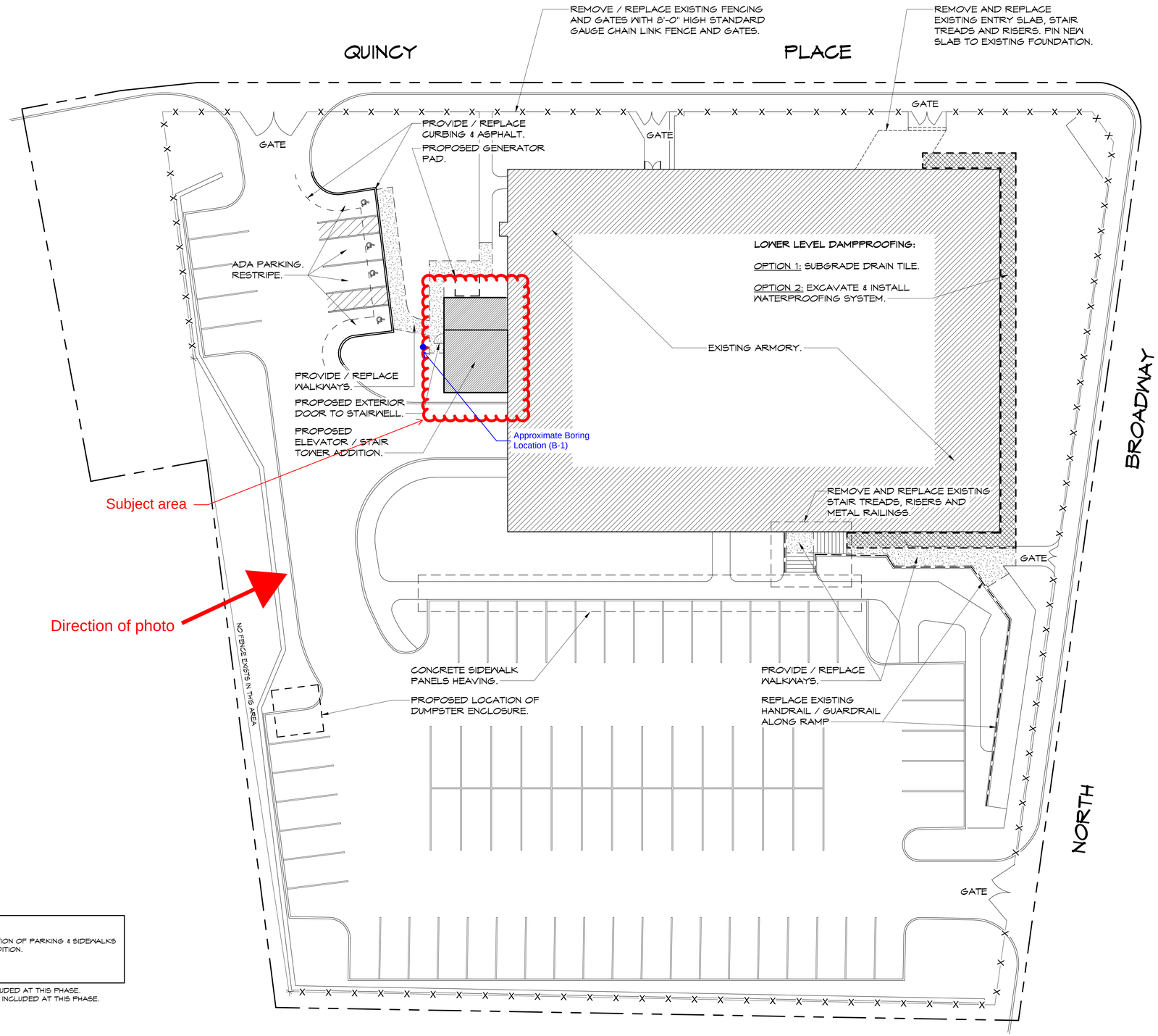
Attachment 3 – Graph of Laboratory Test Results

Attachment 4 – Seismic Output Data

Attachment 1

Vicinity Map & Boring Location Diagram


Approximate Boring
Location (B-1)



SCOPE OF SITE WORK:

1. RESTORATION AND RECONFIGURATION OF PARKING & SIDEWALKS FOR STAIR/ELEVATOR TOWER ADDITION.
2. FENCING & DUMPSTER.
3. SIDEWALKS AND RAILINGS.
4. WATERPROOFING.
5. LANDSCAPING, STORAGE NOT INCLUDED AT THIS PHASE.
6. PARKING LOT IMPROVEMENTS NOT INCLUDED AT THIS PHASE.

1 SITE PLAN
SCALE : 1/16" = 1'-0"

NEW YORK STATE OF OPPORTUNITY. Office of General Services

DESIGN & CONSTRUCTION

CONSULTANT

bell & spina ARCHITECTS

WARNING:
THE ALTERATION OF THIS MATERIAL ANY WAY, UNLESS DONE UNDER THE DIRECTION OF A COMPARABLE PROFESSIONAL, I.E. ARCHITECT FOR AN ARCHITECT, ENGINEER FOR AN ENGINEER OR LANDSCAPE ARCHITECT FOR A LANDSCAPE ARCHITECT, IS A VIOLATION OF THE NEW YORK STATE EDUCATION LAW AND/OR REGULATIONS AND IS A CLASS 'A' MISDEMEANOR

CONTRACT:
CONSTRUCTION

TITLE:
RENOVATE ARMORY

LOCATION:
STATE ARMORY
2 QUINCY PLACE
YONKERS, NY

CLIENT:
DIVISION OF MILITARY AND NAVAL AFFAIRS

MARK	DATE	DESCRIPTION
	12/04/2024	30% SUBMISSION

MARK	DATE	DESCRIPTION
PROJECT NUMBER:	47477-C	
DESIGNED BY:	JP	
DRAWN BY:	BT	
FIELD CHECK:		
APPROVED:		

SHEET TITLE:
SITE PLAN

DRAWING NUMBER:
G-102

SHEET 3 OF 109

Attachment 2

Boring Log
General Notes
Key to Boring Log Symbols

Renaissance Geotechnical Engineering, PLLC
3049 Hamburg Street
Schenectady, NY 12303
Telephone: 518-902-9222
Fax: 518-630-6757

BORING NUMBER B-1

CLIENT BELL & SPINA
PROJECT NAME NYSOGS 47477 Yonkers Armory Renovation
PROJECT NUMBER 25.0015
PROJECT LOCATION 2 Quincy Place, Yonkers, New York
DATE STARTED 5/23/25 **COMPLETED** 5/23/25
GROUND ELEVATION **HOLE SIZE** 6 inches
DRILLING CONTRACTOR RENAISSANCE GEOTECHNICAL
GROUND WATER LEVELS:
DRILLING METHOD CME-55 4-Inch ID HW40
AT TIME OF DRILLING --- None
LOGGED BY A.Diop **CHECKED BY** A.Diop
AT END OF DRILLING --- None
NOTES
AFTER DRILLING --- None

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	Test Results and Remarks	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0							0.3 **Approximately 4 inches of TOPSOIL**
	SS 1	63	1-1-3-3 (4)		SM		(SM) **(FILL) Silty SAND, trace gravel** loose, brownish-gray, moist
	SS 2	75	5-10-11-8 (21)	MC = 9% LL = NP PL = NP Fines = 36% SAND = 56%, gravel = 7%			- grades to medium dense from 2.5 feet
5	SS 3	96	5-6-5-4 (11)				
	SS 4	65	5-8-5-6 (13)				6.5 (CL-ML) **Sandy, Silty CLAY, trace gravel**
10	SS 5	58	3-6-5-15 (11)	MC = 18% LL = 22 PL = 16 Fines = 70% Sand = 29%, gravel = 1%	CL-ML		10.0
	SS 6	67	12-21-23-25 (44)	MC = 8% LL = NP PL = NP Fines = 25% SAND = 52%, Gravel = 23%	SM		(SM) **Silty SAND with Gravel** dense, light brown, dry
15	HS						
	SS 7	90	22-23-21-31 (44)	MC = 7% LL = NP PL = NP Fines = 37% SAND = 47%, Gravel = 16%			- frequent small cobbles of gneiss from 15 feet
20	HS						
	SS 8	100	22-39-50-50/6"				22.0

Bottom of borehole at 22.0 feet.

GENERAL BH / TP / WELL - GINT STD US LAB COLOR.GDT - 6/23/25 17:09 - C:\USERS\ALDIO\ONEDRIVE - RENAISSANCE GEOTECHNICAL ENGINEERING, PLLC\- PROJECTS\- 2025\- OGS PROJECTS\25.0015 - OGS 47477 RENOVATE STATE ARMORY NATIONAL GUARD

RENAISSANCE GEOTECHNICAL ENGINEERING TM

Phone: 518-902-9222
405-215-9367
info@renaissancegeo.com

BORING LOG ACRONYM LIBRARY

- SPT-N: Blow or strike count for the Standard Penetration Test or the Texas Cone Penetrometer Test. In general, the Standard Penetration Test "N" is the numbers of strikes required to advance a standard 2-inch outside diameter split-spoon a distance of 1-foot, or portion thereof, with a 140-pound hammer falling 30 inches.

  In general, the Texas Cone Penetrometer Test (TCP) "N" is the numbers of strikes with penetration depths required to advance a solid steel three-inch diameter cone of standard dimensions with a170-pound weight falling 24-inches. Two 50 strike intervals or two 6-inch penetration intervals is recorded.

- WOH: Weight of Hammer
- WOR: Weight of Drilling Rod
- USCS Symbol: The Unified Soil Classification System Identification Symbol
- ATV: All-Terrain Vehicle Mounted Drill Rig
- EL: Elevation
- Lt: Left
- Rt: Right
- LL, PL, PI: Atterberg Limits (Liquid Limit, Plastic Limit, Plasticity Index)
- -#200: Percent Passing Standard No. 200 Sieve
- NP – Non-Plastic
- MC: Moisture Content
- AS: Auger Sample
- BS: Bucket Sample
- DB: Diamond Drilling Bit (Truck Rotary Drilling using air or water to remove cuttings)
- DCD: Diamond Core Barrel Drilling
- HA: Hand Auger
- HS: Hollow Stem Auger (Truck Rotary Drilling)
- PA: Power Auger (Truck Rotary Drilling)
- NR: No Recovery
- PMT: Pressure Meter
- DMT: Dilatometer
- CPT: Cone Penetration Test
- BHS: Borehole Shear
- FV: Field Vane Shear
- TV: Torvane
- PP: Pocket Penetrometer
- RB: Rock/Roller Bit (Truck Rotary Drilling using air or water to remove cuttings)
- RC: Rock Core using
- RQD: Rock Quality Designation
- SS/SPT: Standard Penetration Test (Split-Spoon)
- ST: Thin-Wall Tube Sample (Shelby Tube): a 3" O.D. tube, unless noted otherwise
- TCP: Texas Cone Penetrometer Test
- DCP: Dynamic Cone Penetrometer
- WS: Wash Sample
- WB: Wash Bore
- AB: After Boring Complete
- DCI: Dry Cave In
- WCI: Wet Cave In
- WD: While Drilling
- WS: While Sampling
- WL: Water Level Depth from Boring Surface Elevation
- CME: Central Mine Equipment
- GP: Geoprobe
- AHS: After Hollow Stem
- BHS: Before Hollow Stem

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GENERAL INFORMATION & KEY TO THE SUBSURFACE EXPLORATION LOGS

The Subsurface Logs attached to this report present the general observations and mechanical data collected by the drillers at the site, supplemented by classification of the material removed from the borings as determined through visual identification by engineers in the field, and by technicians in the laboratory. The materials removed from the borings represent only a small fraction of the soils at the site and may not be representative of subsurface conditions between and/or away from the boring locations or the sampled intervals. The data presented on the Subsurface Logs along with the recovered samples provide a basis for estimating the engineering characteristics of the soils at the site. The evaluation must consider all the recorded details and their relative significance to the project. It is common that evaluation of standard subsurface data indicates the need for additional testing and/or sampling to evaluate the subsurface conditions more accurately. Any evaluation of the data presented on the Subsurface Logs must be performed by qualified professionals. The following information defines some of the procedures and terms used on the Subsurface Logs to describe the conditions encountered. Water levels measured in low permeability soils (clays & unfractured rock) may require long term observations and therefore, the depths shown may not be accurate.

Soil Classification and Descriptions

- Soil Classification: The soil description and classification is based on the Unified Soil Classification System (USCS) unless noted otherwise

- *Consistency/Relative Density*

Cohesionless Materials		Cohesive Materials		
N-blows/ft	Relative Density	N-blows/ft	Consistency	Est. UCS-q_u (psf)
0 – 4	very loose	0 – 2	Very Soft	< 500
5 – 10	loose	2 – 5	Soft	500 – 1,000
11 – 24	medium dense	5 – 10	Medium	1,001 – 2,000
25 – 50	dense	10 – 20	Stiff	2,001 – 4,000
51 – 80	very dense	20 – 30	Very Stiff	4,001 – 8,000
81+	extremely dense	30 – 60	Hard	8,001 – 16,000
		>60	Very Hard	> 16,000

Particle Size

Particle Size	Material Type
Boulders	>12 inches
Cobbles	3 inches to 12 inches
Gravel	coarse: ¾" to 3"
	fine: #4 to ¾"
Sand	coarse: #10 to #4
	medium: #40 to #10
	fine: #200 to #40
Silt/Clay	<#200

- Description Modifier: The following terms may be used as qualifiers for mixed soils

Term Used	Estimated Percent Total	Component	Particle Shape – Applicable to Coarse
Primary	More than 50	Noun – GRAVEL, SAND, SILT or CLAY	*Angular:* sharp edges and relatively plain sides with unpolished surfaces
and or &	35 – 50	Gravelly, sandy, silty, clayey, with	*Subangular:* similar to angular but with rounded edges
Some	20 – 35	**MOISTURE CONTENT DESCRIPTION**	*Subrounded:* nearly plane sides but with well rounded corners and edges
		Dry: absent of moisture, dusty, dry to touch	
little	10 – 20	Moist: damp but no visible water	Rounded: smoothly curved sides and no edges
trace	less than 10	Wet: visible free water	

Varved: Horizontal uniform layers or seams of soil(s)
Seam: Soil deposit less than 6" thick
Laminated - Irregular, horizontal and angled seams and partings of soil

Layer: Soil deposit more than 6"thick.
Parting: Soil deposit Jess than 1/8" thick

UNIFIED SOIL CLASSIFICATION SYSTEM (USCS)

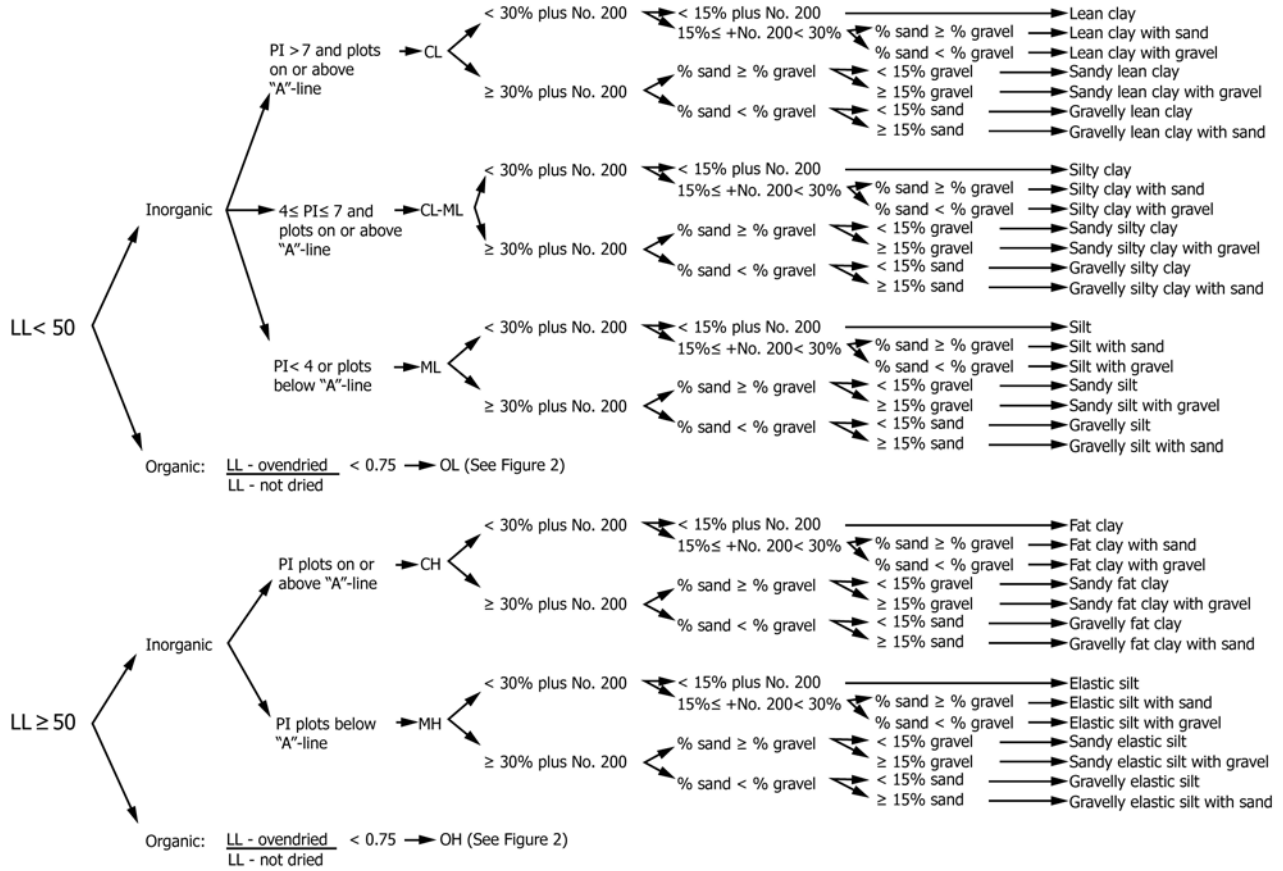


FIG. 1 Flow Chart for Classifying Fine-Grained Soil (50 % or More Passes No. 200 Sieve)

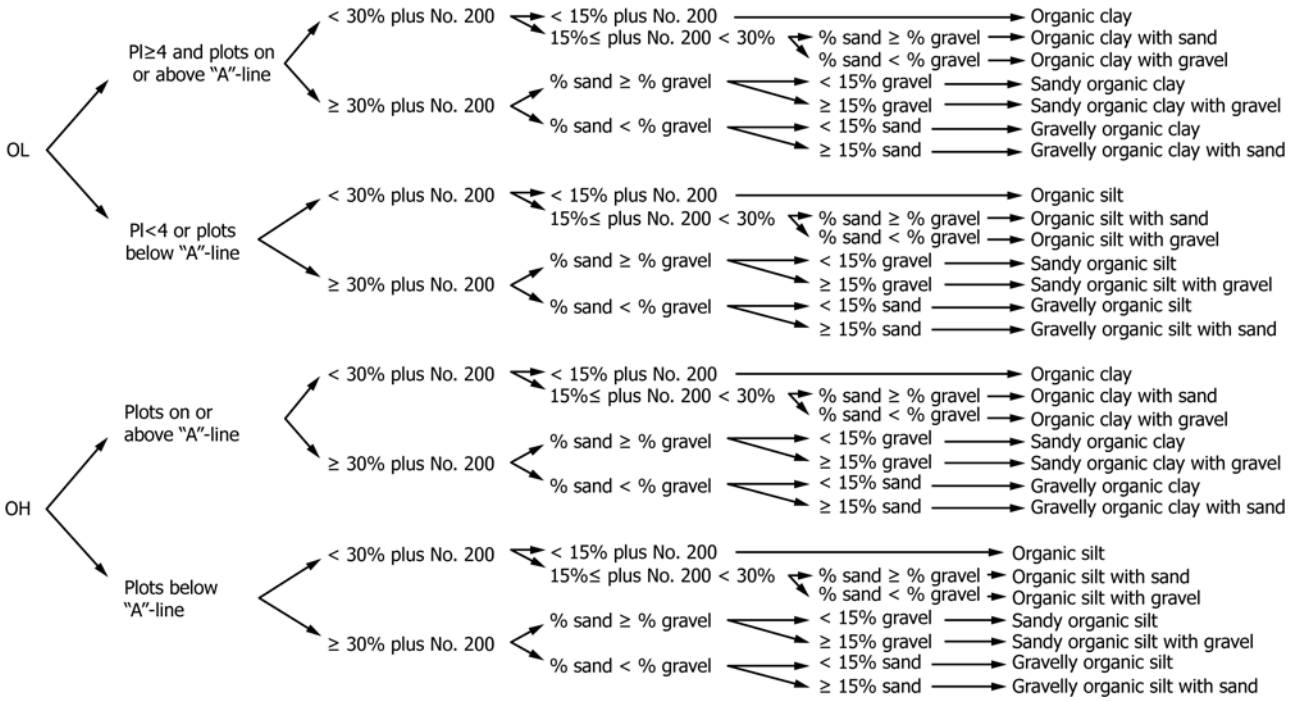


FIG. 2 Flow Chart for Classifying Organic Fine-Grained Soil (50 % or More Passes No. 200 Sieve)

Source ASTM D2487

UNIFIED SOIL CLASSIFICATION SYSTEM (USCS)

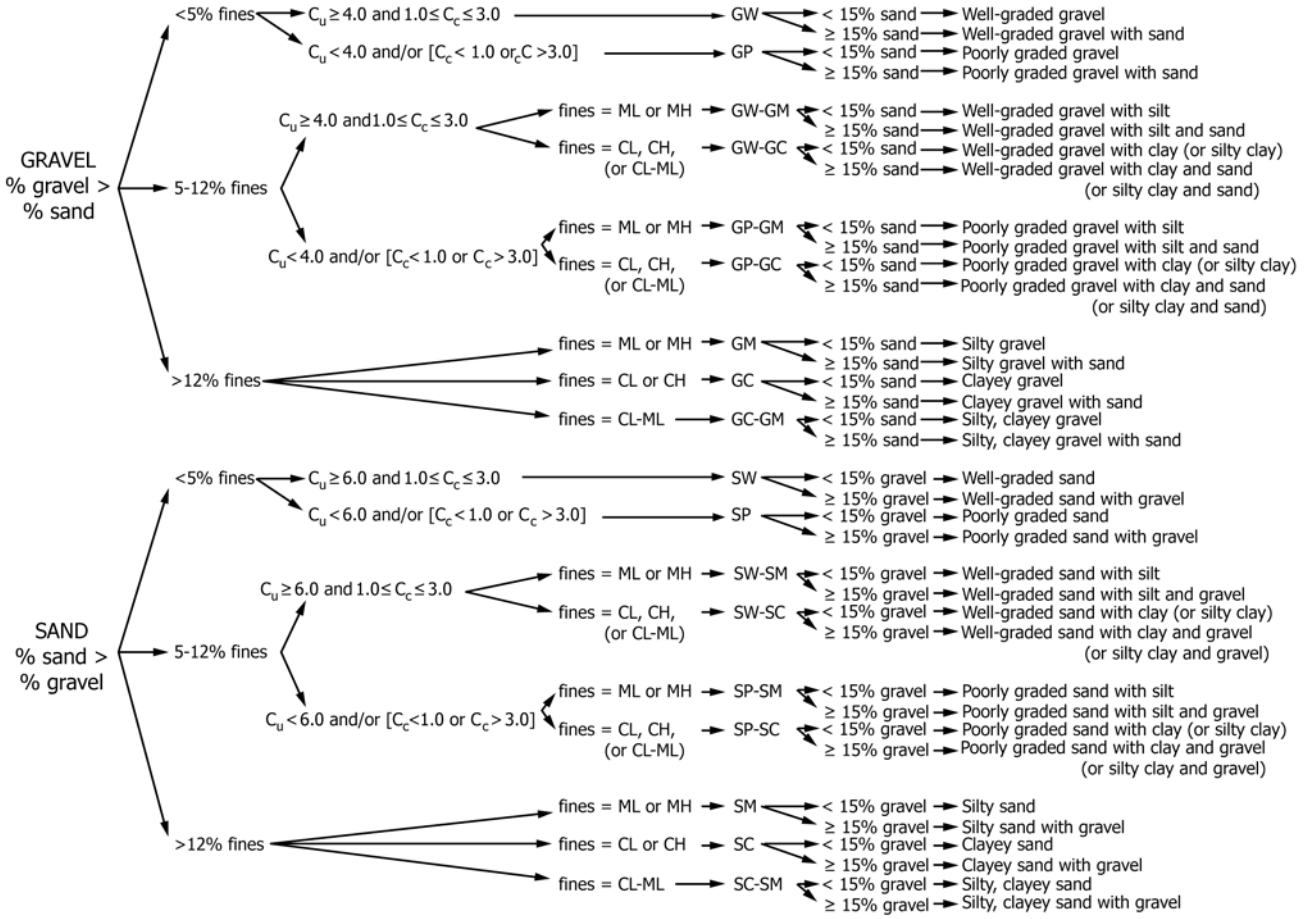


FIG. 3 Flow Chart for Classifying Coarse-Grained Soils (More Than 50 % Retained on No. 200 Sieve)

Source ASTM D2487

UNIFIED SOIL CLASSIFICATION SYSTEM (USCS)

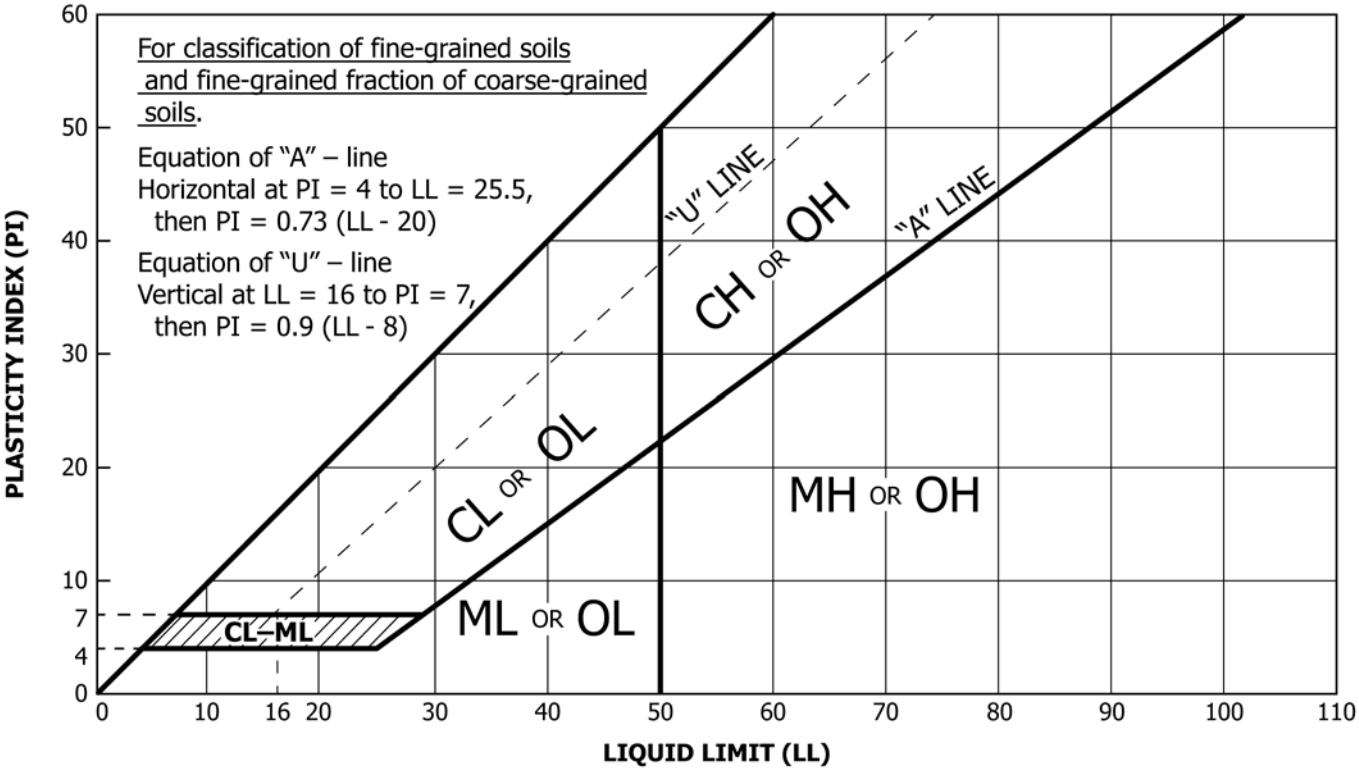


FIG. 4 Plasticity Chart

Source ASTM D2487

Renaissance Geotechnical Engineering, PLLC
3049 Hamburg Street
Schenectady, NY 12303
Telephone: 518-902-9222

KEY TO SYMBOLS

CLIENT BELL & SPINA

PROJECT NAME NYSOGS 47477 Yonkers Armory Renovation

PROJECT NUMBER 25.0015

PROJECT LOCATION 2 Quincy Place, Yonkers, New York

LITHOLOGIC SYMBOLS
(Unified Soil Classification System)


FILL: Fill (made ground)


SA CL-ML: Sandy Silty Clay


SMG: Silty SAND with Gravel


TOPSOIL: Topsoil

SAMPLER SYMBOLS


HS: Hollow Stem Auger


Split Spoon

WELL CONSTRUCTION SYMBOLS

ABBREVIATIONS

LL - LIQUID LIMIT (%)
PI - PLASTIC INDEX (%)
W - MOISTURE CONTENT (%)
DD - DRY DENSITY (PCF)
NP - NON PLASTIC
-200 - PERCENT PASSING NO. 200 SIEVE
PP - POCKET PENETROMETER (TSF)

TV - TORVANE
PID - PHOTOIONIZATION DETECTOR
UC - UNCONFINED COMPRESSION
ppm - PARTS PER MILLION


Water Level at Time Drilling, or as Shown


Water Level at End of Drilling, or as Shown


Water Level After 24 Hours, or as Shown

KEY TO SYMBOLS - GINT STD US LAB COLOR.GDT - 6/24/25 10:16 - C:\USERS\RENAISSANCE\ONEDRIVE - RENAISSANCE GEOTECHNICAL ENGINEERING, PLLC\- PROJECTS\- 2025\- OGS PROJECTS\25.0015 - OGS 47477 RENOVATE STATE ARMORY NATIONAL GUAR

Attachment 3

Expanded Laboratory Test Result Graphs

Renaissance Geotechnical Engineering, PLLC
3049 Hamburg Street
Schenectady, NY 12303
Telephone: 518-902-9222

SUMMARY OF LABORATORY RESULTS

CLIENT BELL & SPINA

PROJECT NAME NYSOGS 47477 Yonkers Armory Renovation

PROJECT NUMBER 25.0015

PROJECT LOCATION 2 Quincy Place, Yonkers, New York

Borehole	Depth	Liquid Limit	Plastic Limit	Plasticity Index	Maximum Size (mm)	%<#200 Sieve	Class-ification	Water Content (%)	Dry Density (pcf)	Satur-ation (%)	Void Ratio
B-1	2.0	NP	NP	NP	25	36	SM	8.6			
B-1	8.0	22	16	6	19	70	CL-ML	17.5			
B-1	10.0	NP	NP	NP	25	25	SM	7.8			
B-1	15.0	NP	NP	NP	50	37	SM	6.9			

LAB SUMMARY - GINT STD US LAB COLOR.GDT - 6/24/25 10:15 - C:\USERS\RENAISSANCE\ONEDRIVE - RENAISSANCE GEOTECHNICAL ENGINEERING, PLLC\- PROJECTS\- 2025\- OGS PROJECTS\25.0015 - OGS 47477 RENOVATE STATE ARMORY NATIONAL GUARD

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Fax: 518-630-6757

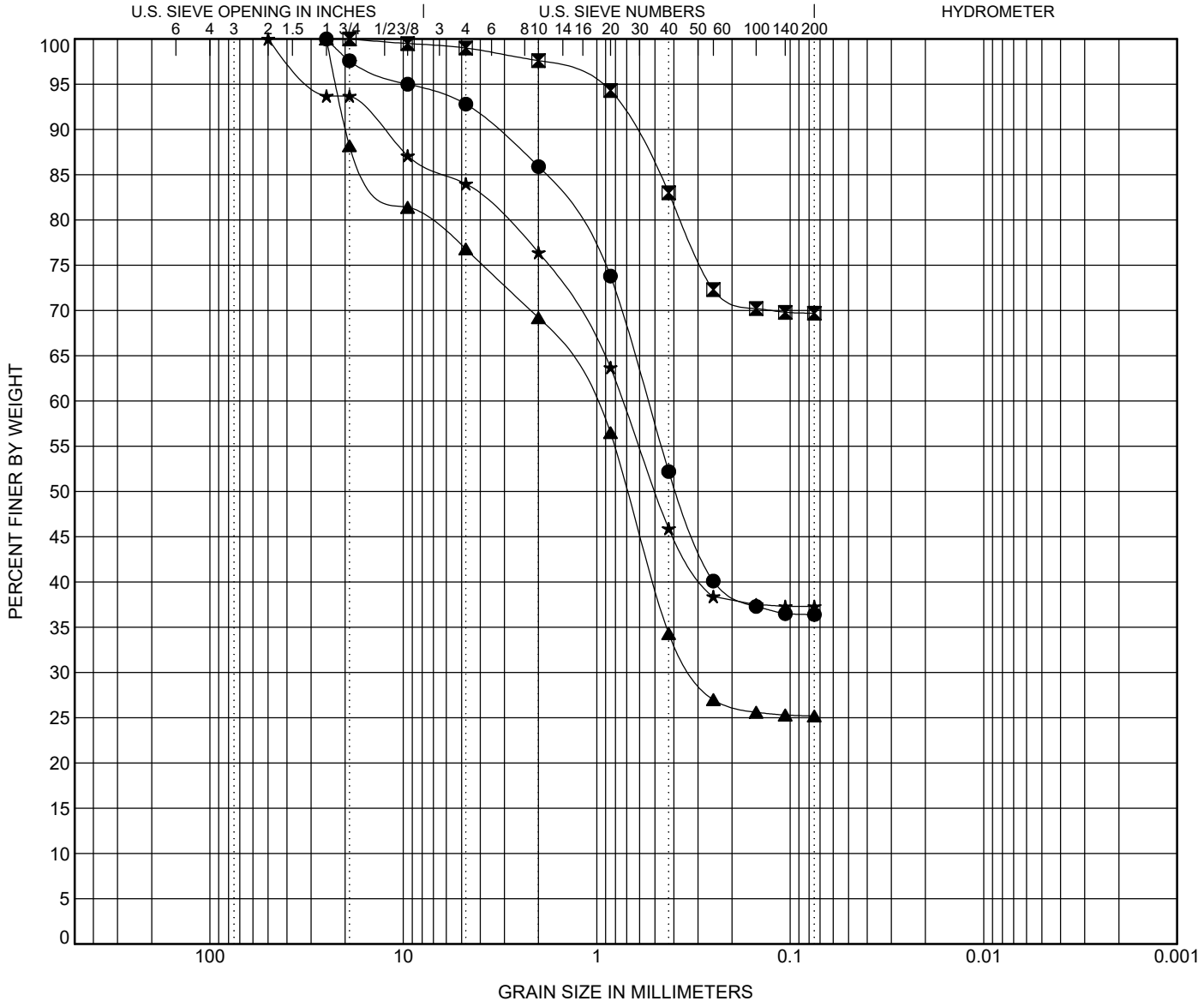
GRAIN SIZE DISTRIBUTION

CLIENT BELL & SPINA

PROJECT NAME NYSOGS 47477 Yonkers Armory Renovation

PROJECT NUMBER 25.0015

PROJECT LOCATION 2 Quincy Place, Yonkers, New York



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	B-1	2.0	SILTY SAND(SM)	NP	NP	NP		
⊠	B-1	8.0	SANDY SILTY CLAY(CL-ML)	22	16	6		
▲	B-1	10.0	SILTY SAND with GRAVEL(SM)	NP	NP	NP		
★	B-1	15.0	SILTY SAND with GRAVEL(SM)	NP	NP	NP		

	BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	B-1	2.0	25	0.546			7.2	56.4	36.4	
⊠	B-1	8.0	19				1.0	29.3	69.7	
▲	B-1	10.0	25	1.076	0.311		23.2	51.6	25.2	
★	B-1	15.0	50	0.736			16.0	46.7	37.3	

GRAIN SIZE - GINT STD US LAB COLOR.GDT - 6/23/25 17:06 - C:\USERS\ALDIO\ONEDRIVE - RENAISSANCE GEOTECHNICAL ENGINEERING, PLLC\- PROJECTS\- 2025\- OGS PROJECTS\25.0015 - OGS 47477 RENOVATE STATE ARMORY NATIONAL GUARD, YONKERS, N

Attachment 3

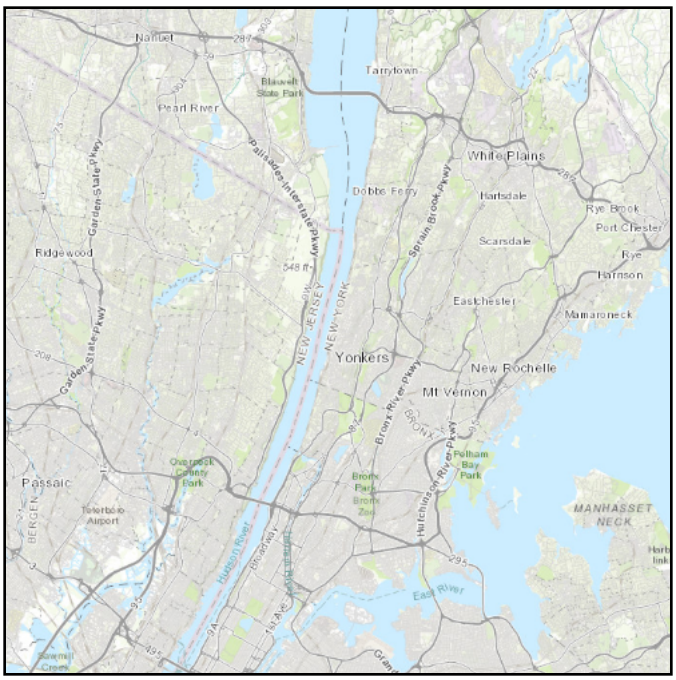
Seismic Output Data

ASCE Hazards Report

Address:
2 Quincy Pl
Yonkers, New York
10701

Standard:	ASCE/SEI 7-16	**Latitude:**	40.938352
Risk Category:	II	**Longitude:**	-73.89689
Soil Class:	D - Default (see Section 11.4.3)	**Elevation:**	99.30562790218944 ft (NAVD 88)





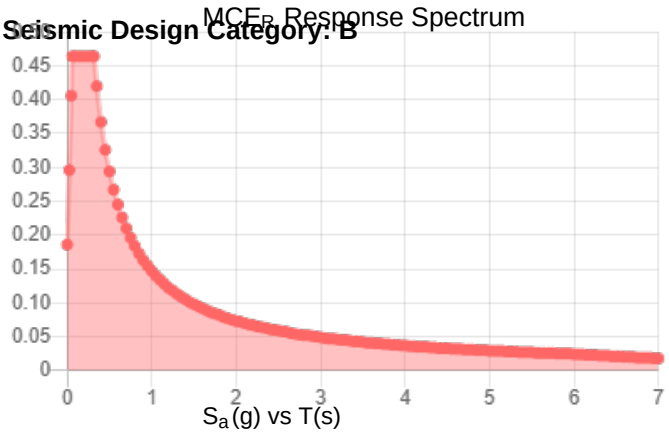
Seismic

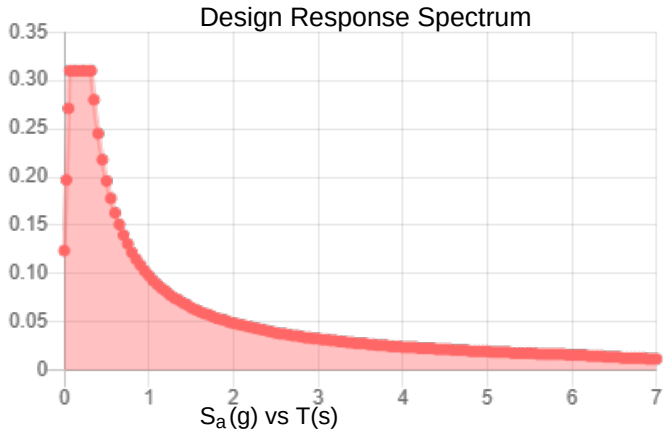
Site Soil Class: D - Default (see Section 11.4.3)

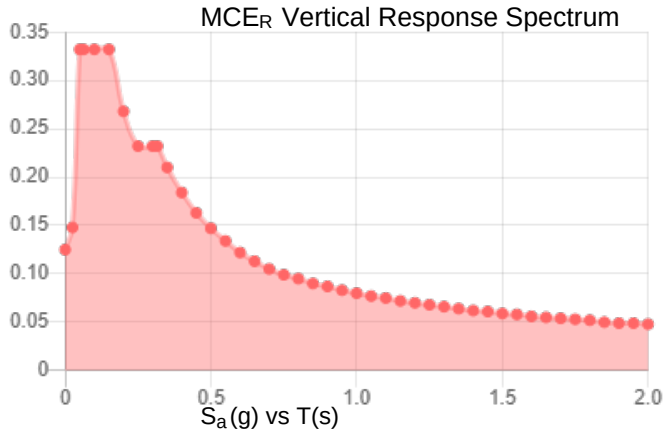
Results:

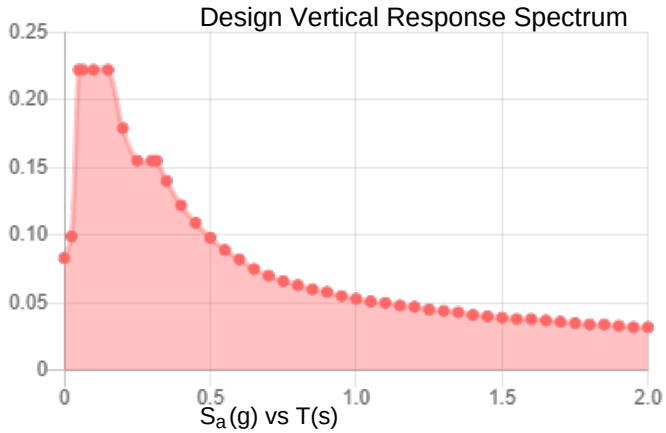
S_S :	0.297	S_{D1} :	0.098
S_1 :	0.061	T_L :	6
F_a :	1.562	PGA :	0.185
F_v :	2.4	PGA_M :	0.264
S_{MS} :	0.464	F_{PGA} :	1.431
S_{M1} :	0.147	I_e :	1
S_{DS} :	0.31	C_v :	0.894

Seismic Design Category: B









Data Accessed: **Tue Jun 24 2025**

Date Source:

USGS Seismic Design Maps based on ASCE/SEI 7-16 and ASCE/SEI 7-16 Table 1.5-2. Additional data for site-specific ground motion procedures in accordance with ASCE/SEI 7-16 Ch. 21 are available from USGS.

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Ambient Environmental, Inc.
Building Science and EHS Solutions
NYS Certified WBE,
SBA EDWOSB & DBE

April 28, 2025

Mr. James Paolini
Bell & Spina Architects
215 Wyoming Street
Syracuse, NY 13204
Ph. 315-488-0377
M. 315-436-7736
jpaolini@bellandspina.com

RE: Hazardous Materials Survey Report
Pre-Renovation
Asbestos, Lead-Based Paint, and PCB in Caulk
Yonkers Armory
127 N Broadway
Yonkers, NY 10701
Ambient Project Number: 250204AA

Dear Mr. Paolini:

Ambient Environmental, Inc. is pleased to submit the attached Hazardous Materials Survey Report for asbestos, lead-based paint, and polychlorinated biphenyls (PCB) in caulk at the above-referenced site. This report includes the procedures and methodologies followed, analytical laboratory results, and applicable conclusions and recommendations.

Ambient appreciates the opportunity to serve Bell & Spina Architects and we look forward to working with you in the future. In the meantime, if you have questions or comments regarding the information in this report or if we can be of further assistance, please do not hesitate to contact us.

Sincerely,
Ambient Environmental, Inc.

C.D. Wolford
Operations Lead

Kevin Jones
Inspector
Asbestos License # 24-6LTTH-SHAB

Enclosure

Ambient Environmental, Inc.
Building Science and EHS Solutions
NYS Certified WBE,
SBA EDWOSB & DBE

HAZARDOUS MATERIALS SURVEY
Pre-Renovation
Asbestos, Lead-Based Paint, and PCB in Caulk

Yonkers Armory
127 N Broadway
Yonkers, NY 10701

Survey Date(s): April 7-8, 2025

Prepared for:

Mr. James Paolini
Bell & Spina Architects
215 Wyoming Street
Syracuse, NY 13204

Prepared by:

Ambient Environmental, Inc.
828 Washington Ave.
Albany, New York 12203

Ambient Project No. 250204AA

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ATTACHMENTS

Attachment A Asbestos Results and Asbestos Laboratory Analysis Report with Chain of Custody Documentation

Attachment B Lead-Based Paint Testing Results

Attachment C PCB Results and Laboratory Analysis Report with Chain of Custody Documentation

Attachment D Hazardous Material Location Drawings

Attachment E Photographic Documentation

Attachment F Company, Inspector and Laboratory Accreditations and Licenses

Attachment G Historical Documentation

1.0 PURPOSE AND SCOPE OF SERVICES

The purpose of this project was to conduct a pre-renovation hazardous materials survey for asbestos, lead-based paint (LBP), and polychlorinated biphenyls (PCB) in caulk at Yonkers Armory, 127 N Broadway, Yonkers, NY 10701 (The Site). The areas inspected were the interior and exterior of the building with the exception of the roof. Ambient was provided with historical survey reports that were utilized for this inspection and only sampled materials that had not previously been sampled. Please review the Historical Reports located in attachment G for additional information. Ambient Environmental, Inc. (Ambient) provided the following services for Bell & Spina Architects (Client) in accordance with Ambient proposal number 2025-02-0068.

Conduct a representative Hazardous Materials Survey in the identified building, which includes:

- Survey the site building.
- Identify accessible suspect asbestos-containing materials (ACMs) that were not previously tested using limited destructive means.
- Quantify ACMs, including material condition and location.
- Collect and analyze bulk samples of suspect friable and non-friable materials to eliminate suspect materials as asbestos containing.
- Conduct a limited lead-based paint inspection of the building with a Viken Detection Pb200e Lead Paint Analyzer.
- Collect and analyze bulk samples of potential PCB containing window/door caulk.

2.0 EXECUTIVE SUMMARY

The inspection was conducted by NYS licensed and AHERA trained asbestos inspectors and trained lead inspectors. The inspection involved visual examinations and sampling of suspect materials that may be impacted by planned renovation projects.

Inspection results revealed the following findings:

- **The renovation area does contain asbestos containing materials**
- **The renovation area does contain lead-based paint**
- **The renovation does not contain PCBs in caulk**

Please see attachments and specific report sections for sample locations, type of materials and analytical results.

3.0 ASBESTOS-CONTAINING MATERIALS SURVEY

Ambient performed an asbestos-containing material survey for planned renovations at the subject property. Ambient examined previous reports, if available, to determine if adequate sampling was performed in the work areas and collected additional samples that appeared to be deficient. New York State certified and AHERA trained asbestos inspectors conducted the asbestos survey of the area.

The building was visually inspected for the presence of any additional building materials in the path of renovation that are suspected to contain asbestos. Bulk samples of the newly identified suspect ACMs were collected and placed into individual containers for transport to a National Voluntary Laboratory Accreditation Program (NVLAP) and a New York State Department of Health Environmental Laboratory Approval Program (ELAP)-accredited laboratory for analysis. Materials visibly identified as non-asbestos (fibrous glass, foam rubber, wood, etc.) were not sampled. The asbestos survey consisted of three basic procedures: **1)** conducting a visual inspection of the structures; **2)** identifying homogeneous areas (HAs) of suspect surfacing, thermal system insulation, and miscellaneous materials; and **3)** sampling accessible, friable and non-friable suspect materials.

3.1 Sampling Protocol

3.1.1 Homogeneous Areas

Prior to collecting any samples, HAs were identified and listed to develop a sampling strategy. A homogeneous sampling area can be described as one or more areas of material that are similar in appearance and texture and that have the same installation date and function. The actual number of samples collected from each homogeneous sampling area may vary, based on the type of material and the professional judgment of the inspector.

3.1.2 Hazard Assessment Factors

From the list of suspect homogeneous materials, a physical assessment was performed for each material on the list. A physical assessment includes evaluating the condition, assessing the potential for disturbance, and determining the friability of each material. Friability is a term used to describe the ease in which a building material inherently lends itself to disturbance. By definition, "friable" materials are those that can be crumbled or reduced to powder by hand pressure when dry. Each material on the list was further classified into one of three categories, which have specific sampling requirements for each category.

Surfacing Materials:	Refers to spray-applied or troweled surfaces such as plaster ceilings and walls, fireproofing, textured paints, textured plasters, and spray-applied acoustical surfaces.
Thermal System Insulation:	Refers to insulation used to inhibit heat gain or loss on pipes, boilers, tanks, ducts, and various other building components.
Miscellaneous Materials:	Refers to friable and non-friable products and materials that do not fit in any of the above two categories such as resilient floor covering, baseboards, mastics, adhesives, roofing material, caulking, glazing, and siding. This category also contains wallboard and ceiling tile.

All confirmed ACMs were then assessed by their condition as good (intact), fair (damaged) or poor (significantly damaged) per Title 40 Code of Federal Regulations Part 763. Material with localized significant damage was also assessed as poor when observed.

3.1.3 Sampling Strategy

The asbestos inspection was conducted according to New York State Department of Labor Industrial Code Rule 56 guidelines using a minimum number of samples collected from each HA, which also meets the sampling requirement found in 29 CFR 1926.1101.

Sample collection depends on the category that the HA falls into and the amount of material present, as follows:

GUIDELINES FOR DETERMINING THE NUMBER OF SAMPLES TO TAKE		
HA CATEGORY	**HA SIZE**	**SAMPLES REQUIRED**
Surfacing Materials	<1,000 SF	3
	1,000-5,000 SF	5
	>5,000 SF	7 or more
Thermal System Insulation	No Stipulation	3+ (Must also sample all repair patches)
Miscellaneous Materials	No Stipulation	Per AHERA, these materials must be sampled "in a manner sufficient to determine whether or not they contain asbestos" typically 2-3 samples based upon inspector judgment.

If the analytical results indicated that all the samples collected per HA did not contain asbestos, then the HA (material) would be considered a non-ACM. However, if the analytical results of one or more of the samples collected per HA indicate that asbestos is present in quantities of greater than 1 percent asbestos by weight (as defined by EPA), all of the HA (material) would be treated as an ACM regardless of any other analytical results. Material, which can visually be determined to be non-asbestos (i.e., fibrous glass, foam rubber, etc.) by the accredited inspector are not required to be sampled.

Miscellaneous materials require adequately representative sampling, which is typically done by collecting from two to three samples per material. Inspectors typically rely on other survey observations such as the condition, friability, and quantity of material to determine what would be a sufficient number of samples to accurately evaluate the presence or absence of asbestos content.

Actual collection of a bulk asbestos sample involves physically removing a small piece of material and placing it in a marked, airtight container. Sample containers are marked with a unique identification number, which is also noted in the field notes.

3.1.4 Laboratory Analytical Results

Samples were sent to AmeriSci New York in New York, New York for analysis. AmeriSci is fully accredited for bulk sample analysis under the Environmental Laboratory Approval Program (ELAP) administered by the New York State Department of Health, (ELAP# 11480). AmeriSci is also accredited by the National Voluntary Laboratory Accreditation Program (NVLAP No. 200546-0) for both air and bulk sampling.

- *Friable Samples* – Friable suspect asbestos containing material samples were analyzed utilizing Method EPA/600/R-93/116 with New York State ELAP 198.1 revision to facilitate compliance with both AHERA and the New York State Department of Health polarized light

microscopy (PLM) analytical techniques. All fibers observed were identified to determine whether or not they contained asbestos.

- *Non-Friable Samples* – Non-friable organically bound (NOB) suspect asbestos containing material samples were analyzed utilizing Method EPA/600/R-93/116 with New York State ELAP 198.6 and 198.4 revisions to facilitate compliance with both AHERA and the New York State Department of Health polarized light microscopy (PLM) and transmission electron microscopy (TEM) analytical techniques. These non-friable organically bound samples must be weighed to record initial sample weights, then subjected to muffle furnace and acid bath sample preparation to eliminate the organic constituents. If the remaining inorganic sample residue is 1% or less of the original sample weight, the sample is considered a non-asbestos containing material. If the remaining inorganic sample residue is greater than 1% of the original sample weight then the sample must be analyzed using either PLM or TEM analytical techniques to determine that the sample is an asbestos containing material (positive) or TEM to prove that the sample is a non-asbestos containing material (negative). A non-friable organically bound sample must be proven a non-asbestos containing material utilizing the NYS ELAP 198.4 TEM test method to be in compliance with the New York state Department of Health.

3.2 Asbestos Containing Material Results

The results of the asbestos survey conducted at the subject property can be found in Attachment A.

The building survey included limited destructive sampling for "hidden" materials. Therefore, the results of this survey may not be inclusive of <u>all</u> asbestos containing material that may be present in the pathway of demolition. If, during the course of renovation, any suspect material is discovered that is not listed on the table in Attachment A it must be treated as asbestos containing material and handled appropriately or sampled by an inspector and analyzed according to NYS and EPA regulations.

One (1) copy of the results of the building/structure asbestos survey shall be immediately transmitted by the building/structure owner as follows:

- One (1) copy of the completed asbestos survey shall be sent by the owner or their agent to the local government entity charged with issuing a permit for such demolition, renovation, remodeling or repair work under applicable State or local laws.
- The completed asbestos survey for controlled demolition (as per Subpart 56-11.5) or pre-demolition asbestos projects shall also be submitted to the appropriate Asbestos Control Bureau district office.
- The completed asbestos survey shall be kept on the construction site with the asbestos notification and variance, if required, throughout the duration of the asbestos project and any associated demolition, renovation, remodeling or repair project.

4.0 LEAD-BASED PAINT SURVEY

Ambient conducted a limited lead-based paint (LBP) investigation of building components which will be affected by proposed renovation work. The purpose of this investigation was to assess if building components contain actionable quantities of lead-based paint.

The U.S Environmental Protection Agency (EPA) and U.S. Department of Housing and Urban Development (HUD) has established a definition of lead-based paint as a paint or other surface coating that contains lead equal to or greater than 1.0 mg/cm^2 or 0.5% by weight (equivalent units are: 5,000 µg/g, 5,000 mg/kg, or 5,000 ppm by weight). Surface coatings include paint, shellac, varnish, or any other coating, including wallpaper, which covers painted surfaces. A limited inspection for lead-based paint using XRF instrumentation was conducted to determine if lead coated surfaces were affected. This inspection was not in full compliance with HUD guidelines.

4.1 Sampling Protocol

4.1.1 Methodology

Testing was performed using X-Ray Fluorescence in situ analysis (XRF) of painted construction materials. Ambient utilized the Pb200e analyzer manufactured by Viken Detection for this survey.
The Pb200e Lead Paint Analyzer is a complete lead paint analysis system that quickly, accurately, and non-destructively measures the concentration of LBP on surfaces. The Pb200e relies on the measurement of the K-shell X-rays to determine the amount of lead present in the painted surface. K-shell X-rays can penetrate many layers of paint and allow a measurement of the lead content of paint to be made without being significantly affected by the thickness or number of layers of paint on the surface of the sample.

The Pb200e can analyze and compute corrections for the differences in the energy spectrums relating to different substrates. This analysis of the energy spectrum means that the lead paint reading displayed on the instrument already accounts for any substrate effects and correction is not required by the operator. The Pb200e's field of view is limited to a depth of 3/8", deep enough to handle virtually all painted surfaces, but not prone to detect lead objects located behind the surface.

There are two measurement modes of operation in the Pb200e analyzer namely the "Action Level Mode" and the "Extended Reading Mode. In the "Action Level" mode, the analyzer automatically adjusts the measurement time to be the least time that is needed to make a definitive measurement with a 95% confidence level (2-sigma). The Pb200e analyzer will finish a measurement once the 2-sigma confidence level is achieved, and the data is statistically meaningful. This time period for conclusive measurements is typically between 1 to 5 seconds but can extend to a measurement of 60 seconds depending on the action level for abatement. Ambient utilized the Pb200e in the "Action Level" mode for the testing performed.

Upon arrival at the job site and once every four hours or after the day’s paint testing work was completed, a "validation test" was performed to assure that the instrument was operating properly. The “validation test” includes taking a series of three test measurements on the NIST

Paint Film Standard (SRM No. 2579) as required by the instrument's PCS. The individual readings and an average of the three readings were recorded and compared to the standards. In all cases the instrument was functioning within the standard deviation as defined by the manufacturer and the PCS. All validation readings are recorded in the XRF in the order in which they were taken at the site. If for any reason the XRF does not pass the quality control procedures, it is Ambient's policy to replace that instrument with an XRF that passes the above criteria for calibration.

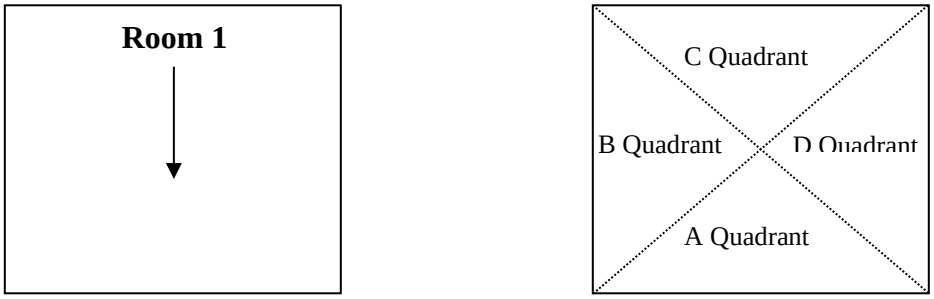
The parameters used to interpret XRF results are outlined in the HUD Guidelines and the Performance Characteristics Sheet (PCS) in Attachment B. According to the PCS, each XRF result is classified as positive for LBP if the result is greater than or equal to 1.0 mg/cm2 or negative for LBP if the result is below 1.0 mg/cm2.

When measurable amounts of lead are reported in the XRF result, the paint is classified by OSHA as a lead containing material.

4.1.2 Strategy

Location identifiers (reading numbers) were assigned to each room component. Each location sampled has a unique number. The associated sample results will be listed by room number, room location, room name, location in the space and description of material sampled. By convention a sample location is assigned a letter designator for each of the four walls. This divides the space into four equal quadrants, each quadrant consisting of a wall, portion of the floor and a portion of the ceiling. Please see Diagram 1. These letter designators are A, B, C and D. On the diagrams provided, the letter designators are marked for each of the quadrants. In this fashion the sampled space, location in the space and the description of the material sampled can be identified on the attached drawings and associated results table.

Diagram 1



4.2 Lead-Based Paint Results

The results of the lead-based paint survey conducted at the subject property can be found in Attachment B.

4.3 Recommendations

Any contractor disturbing a lead-based or lead containing paint is directed to comply with all applicable laws and regulations governing the disturbance of lead-based or lead containing materials including but not limited to *Occupational Safety and Health Administration (OSHA)* standards including *Construction Lead Standard 29 CFR 1926.62*. Air monitoring for employee exposures should be performed in accordance with the National Institute for Occupational Safety and Health (NIOSH) 7300 Method or equivalent. As an alternative to air monitoring, the contractor may provide objective data per 29 CFR 1926.62 Section (d)(3)(iv). The contractor shall employ work practices and controls to prevent the occurrence of lead contamination at the Site.

5.0 POLYCHLORINATED BIPHENYL (PCB) SURVEY

Ambient sampled suspect PCB containing caulk that could be impacted by the upcoming renovation and analyzed it for Polychlorinated Biphenyl (PCB) content.

The PCB survey involved a visual examination and sampling of caulk materials that may be impacted by the planned renovation projects. PCB, or Polychlorinated Biphenyl, was used in various products including caulking material from 1930 to approximately 1979 when PCB were banned by Congress. PCB are listed to be Probable Human Carcinogens by the ATSDR (Agency for Toxic Substances and Disease Registry), the National Cancer Institute and the World Health Organization.

PCB-containing materials are regulated under the Toxic Substances Control Act (TSCA) and 40 CFR 761 and are considered a regulated hazardous material at concentrations equal to or greater than 50 ppm (50,000 ppb). PCB must be segregated from construction debris and then be taken to a hazardous waste landfill in accordance with U.S. EPA regulations under the Toxic Substances Control Act (40 CFR761.62) and NYSDEC hazardous waste regulations (6NYCRR370-373). PCB can also be incinerated at an approved facility. There are also alternative methods for PCB destruction.

Bulk samples were collected and submitted to Schneider Labs, 2512 W. Cary Street, Richmond, Virginia. The samples were analyzed using EPA SW-846 Method 8082 PCB by Gas Chromatography.

5.1 Polychlorinated Biphenyls (PCB) Results

The results of the PCB survey conducted can be found in Attachment C.

6.0 ASSUMPTIONS, LIMITATIONS, AND OTHER CONCERNS

The results, findings, conclusions, and recommendations expressed in this report are based only on conditions that were noted during the inspection of the subject property.

- Ambient's selection of sample locations and frequency of sampling was based on observations and the assumption that like materials in the same area are homogeneous in content.

- Refer to Section 1.0 Purpose and Scope of Services of this report to see clarification of survey locations that were in our scope of work.
- Limited wiring and electrical components were inspected as the building power was live at the time of the survey. No cloth covered wiring or transite type electrical components were observed. Other components that were not observed may contain asbestos.
- Ambient inspected mirrors located throughout the building and determined that the ones with metal frames typically located above the sinks appear to have a hanger bracket. There are some pieces of mirror glass that do appear to be glued to the wall. These mirrors may have glue dabs that contain asbestos.
- Ambient observed to the best of their ability the inside of ductwork and other building mechanical systems but destruction or disassembly is required to gain complete access. These items may contain asbestos.
- Ambient performed limited inspection of exterior areas below grade in the location of the proposed elevator. Buried piping, and other items may exist below grade which may contain asbestos.
- Floor levelers, seam sealers, adhesives, concrete sealers, and other materials below flooring layers may exist. The limited destructive nature of sampling may not have discovered these materials as only small areas of large expanses of flooring are accessed. The removal of flooring and mastics is to include the removal of these items as well and all other materials down to the concrete substrate.
- The components of the windows/doors that were accessible without demolition were inspected. Limited intrusive demolition was performed during this inspection. There may be additional materials concealed beneath or behind window/door frames. Only full removal of the window/door unit would reveal these materials.
- The lead-based paint inspection was limited to representative accessible painted surfaces that are expected to be impacted by the planned renovation or demolition as of the date of the inspection. Representative locations were selected based on available information including construction and renovation history, conditions observed during the paint inspection and inspector safety when accessing the surfaces. OSHA requires the use of lead safe work practices to protect employees who are disturbing any lead containing material including, but not limited to, components coated with lead-based paint or varnish.
- Ambient relied on historical sampling data provided by the client if the analysis methods met current regulatory requirements.
- Ambient drilled several holes in walls but raw vermiculite insulation was not found during this inspection; however, vermiculite insulation may exist in concealed spaces in the building. Currently, there is no approved analytical methodology to confirm vermiculite as non-asbestos; therefore, it automatically must be contaminated with asbestos in New York State. If encountered during renovation it must be handled as an asbestos containing material. Please refer to this link for more information http://www2.epa.gov/asbestos/protect-your-family-asbestos-contaminated-vermiculite-insulation

- Although there was no asbestos containing Thermal System Insulation (TSI) or pipe insulation found there may be TSI or pipe insulation found in unseen cavities or wet walls. A reasonable attempt was made to identify all TSI without performing full demolition.
- Ambient performed limited coring/destructive sampling of floors, walls, and ceilings during the inspection. However, only full demolition would reveal "hidden" asbestos containing materials. Care should be taken during demolition/renovation of the building.
- This report reflects the conditions found at the date and time of the inspections. Conditions of the area may change due to external events or forces. Re-inspection of the area may be required prior to the start of any work if an extended period has passed or if disturbances have occurred.
- All locations on drawings are approximate and all quantities are estimated. Any contractor or other user of this report is required to physically visit the site to verify all measurements and confirm the quantities of materials to be removed, to be bid for removal, or for any other purpose.

All construction personnel, as well as individuals who have access to locations where ACM exists, should be informed of its presence and the proper work practices in these areas. Conspicuous labeling of all ACM is suggested to ensure personnel is adequately informed. Personnel should be informed not to rest, lean or store material or equipment on or near these surfaces and not to cut, saw, drill, sand or disturb ACM. All removal, disturbance and repair of ACM should be performed in compliance with Title 12 NYCRR Part 56 by persons properly trained to handle ACM. Facility custodial and maintenance personnel should receive training commensurate with their work activities; as defined in 29 CFR 1910.1001.

The report is designed to aid the building owner, architect, construction manager, general contractors, and potential asbestos or lead abatement contractors in locating ACM. Under no circumstances is the report to be utilized as a bidding document or as a project specification document since it does not have all the components required to serve as an Asbestos Project Design document or an Abatement Workplan.

Our professional services have been performed, our findings obtained, and our conclusions and recommendations prepared in accordance with customary principles and practices in the fields of environmental science and engineering. This statement is in lieu of other statements either expressed or implied. This report does not warrant against future operations or conditions, nor does it warrant against operations or conditions present of a type or at a location not investigated.

Ambient inspected and sampled materials, which were observable and accessible to the survey team. It is possible, however, that additional suspect materials may exist within interstitial spaces (i.e. underground chases, plenums, wall cavities, beneath pavement/asphalts pathways, etc.), which were not accessible or not made accessible and as a result, not noted in this report.

If questions arise regarding asbestos in materials/locations that were not tested by Ambient, then additional survey services should be procured to test these locations. Ambient makes no representation or warranty concerning the standards and specifications provided in applicable regulations. Any materials that have not been tested and/or found during future investigation must be assumed positive for asbestos, lead-based paint and/or PCB (if applicable).

ATTACHMENT A

ASBESTOS RESULTS AND ASBESTOS LABORATORY ANALYSIS REPORT WITH CHAIN OF CUSTODY DOCUMENTATION

BELL & SPINA ARCHITECTS
YONKERS ARMORY
127 N BROADWAY, YONKERS, NY 10701
SUMMARY OF ASBESTOS SAMPLES AND ANALYSIS RESULTS

Homogeneous Area Number	Bulk Sample ID Number	Sampled Material (T, S, M)	Sample Location	Friability (N/F)	Condition (G, D, SD)	Quantity	Homogeneous Area	Asbestos Content (Type & %)
001	01	Foil Faced Duct Insulation (T)	Upper Level – Conference Room 111	N	G	N/A	N/A	NAD
001	02	Foil Faced Duct Insulation (T)	Upper Level – Conference Room 111	N	G	N/A	N/A	NAD
001	03	Foil Faced Duct Insulation (T)	Upper Level – Conference Room 111	N	G	N/A	N/A	NAD
002	01	Gray Duct Sealer (M)	Upper Level – Room 118	N	G	N/A	N/A	NAD
002	02	Gray Duct Sealer (M)	Upper Level – Room 118	N	G	N/A	N/A	NAD
003	01	Foil Backed Heating Pipe Insulation (T)	Upper Level – Room 116	N	G	N/A	N/A	NAD
003	02	Foil Backed Heating Pipe Insulation (T)	Upper Level – Room 116	N	G	N/A	N/A	NAD
003	03	Foil Backed Heating Pipe Insulation (T)	Upper Level – Room 116	N	G	N/A	N/A	NAD
004	01	White Pipe Insulation Mastic (M)	Upper Level – Conference Room 111	N	G	N/A	N/A	NAD
004	02	White Pipe Insulation Mastic (M)	Upper Level – Conference Room 111	N	G	N/A	N/A	NAD
005	01	CMU Wall (M)	Upper Level – Corridor	F	G	N/A	N/A	NAD
005	02	CMU Wall (M)	Upper Level – Corridor	F	G	N/A	N/A	NAD
006	01	Red Epoxy Floor (S)	Upper Level – Women's Latrine Room 134	F	G	N/A	N/A	NAD
006	02	Red Epoxy Floor (S)	Upper Level – Women's Latrine Room 134	F	G	N/A	N/A	NAD
006	03	Red Epoxy Floor (S)	Upper Level – Women's Latrine Room 134	F	G	N/A	N/A	NAD
007	01	White Expansion Joint Caulk (M)	Upper Level – Room 127	N	G	N/A	N/A	NAD
007	02	White Expansion Joint Caulk (M)	Upper Level – Room 127	N	G	N/A	N/A	NAD
008	01	White Caulk on Window Frame to CMU Wall (M)	Upper Level – Room 127	N	G	N/A	N/A	NAD
008	02	White Caulk on Window Frame to CMU Wall (M)	Upper Level – Room 127	N	G	N/A	N/A	NAD

BELL & SPINA ARCHITECTS
YONKERS ARMORY
127 N BROADWAY, YONKERS, NY 10701
SUMMARY OF ASBESTOS SAMPLES AND ANALYSIS RESULTS

Homogeneous Area Number	Bulk Sample ID Number	Sampled Material (T, S, M)	Sample Location	Friability (N/F)	Condition (G, D, SD)	Quantity	Homogeneous Area	Asbestos Content (Type & %)
009	01	Black Window Glazing (M)	Upper Level – Room 127	N	G	850 LF or 36 SF (25 Windows)	Upper Level	9.7% Chrysotile
009	02	Black Window Glazing (M)	Upper Level – Room 127	N	G			NA/PS
010	01	Beige Wall Paint (S)	Upper Level – Room 127	N	G	N/A	N/A	NAD
010	02	Beige Wall Paint (S)	Upper Level – Room 116	N	G	N/A	N/A	NAD
010	03	Beige Wall Paint (S)	Upper Level – Room 116	N	G	N/A	N/A	NAD
010	04	Beige Wall Paint (S)	Upper Level – Room 111	N	G	N/A	N/A	NAD
010	05	Beige Wall Paint (S)	Upper Level – Room 111	N	G	N/A	N/A	NAD
011	01	Gray Floor Paint (S)	Upper Level – Room 133	N	G	N/A	N/A	NAD
011	02	Gray Floor Paint (S)	Upper Level – Room 133	N	G	N/A	N/A	NAD
011	03	Gray Floor Paint (S)	Upper Level – Room 133	N	G	N/A	N/A	NAD
012	01	Off-White Wall Paint (S)	Lower Level – Assembly Hall 5	N	G	N/A	N/A	NAD
012	02	Off-White Wall Paint (S)	Lower Level – Assembly Hall 5	N	G	N/A	N/A	NAD
012	03	Off-White Wall Paint (S)	Lower Level – Assembly Hall 5	N	G	N/A	N/A	NAD
012	04	Off-White Wall Paint (S)	Lower Level – Assembly Hall 5	N	G	N/A	N/A	NAD
012	05	Off-White Wall Paint (S)	Lower Level – Assembly Hall 5	N	G	N/A	N/A	NAD
012	06	Off-White Wall Paint (S)	Lower Level – Assembly Hall 5	N	G	N/A	N/A	NAD
012	07	Off-White Wall Paint (S)	Lower Level – Assembly Hall 5	N	G	N/A	N/A	NAD
013	01	Yellow Wall Paint (S)	Lower Level – Assembly Hall 5	N	G	N/A	N/A	NAD
013	02	Yellow Wall Paint (S)	Lower Level – Assembly Hall 5	N	G	N/A	N/A	NAD
013	03	Yellow Wall Paint (S)	Lower Level – Assembly Hall 5	N	G	N/A	N/A	NAD

BELL & SPINA ARCHITECTS
YONKERS ARMORY
127 N BROADWAY, YONKERS, NY 10701
SUMMARY OF ASBESTOS SAMPLES AND ANALYSIS RESULTS

Homogeneous Area Number	Bulk Sample ID Number	Sampled Material (T, S, M)	Sample Location	Friability (N/F)	Condition (G, D, SD)	Quantity	Homogeneous Area	Asbestos Content (Type & %)
013	04	Yellow Wall Paint (S)	Lower Level – Assembly Hall 5	N	G	N/A	N/A	NAD
013	05	Yellow Wall Paint (S)	Lower Level – Assembly Hall 5	N	G	N/A	N/A	NAD
014	01	Black Electrical Wire Insulation (M)	Lower Level – Mechanical Room 1	N	G	N/A	N/A	NAD
014	02	Black Electrical Wire Insulation (M)	Lower Level – Mechanical Room 1	N	G	N/A	N/A	NAD
015	01	White Electrical Wire Insulation (M)	Lower Level – Mechanical Room 1	N	G	N/A	N/A	NAD
015	02	White Electrical Wire Insulation (M)	Lower Level – Mechanical Room 1	N	G	N/A	N/A	NAD
016	01	Brick Wall (M)	Exterior	F	G	N/A	N/A	NAD
016	02	Brick Wall (M)	Exterior	F	G	N/A	N/A	NAD
017	01	Tan Adhesive on Stair Tread (M)	Exterior	N	G	N/A	N/A	NAD
017	02	Tan Adhesive on Stair Tread (M)	Exterior	N	G	N/A	N/A	NAD
018	01	Tan Concrete Step (M)	Exterior	F	G	N/A	N/A	NAD
018	02	Tan Concrete Step (M)	Exterior	F	G	N/A	N/A	NAD
019	01	Concrete Sidewalk (M)	Exterior	F	G	N/A	N/A	NAD
019	02	Concrete Sidewalk (M)	Exterior	F	G	N/A	N/A	NAD
020	01	Sidewalk Caulk (M)	Exterior	N	G	N/A	N/A	NAD
020	02	Sidewalk Caulk (M)	Exterior	N	G	N/A	N/A	NAD
021	01	Foundation Sealer (M)	Exterior	N	G	N/A	N/A	NAD
021	02	Foundation Sealer (M)	Exterior	N	G	N/A	N/A	NAD

(T=TSI; S=Surfacing; M=Misc)

NAD = No asbestos detected

BELL & SPINA ARCHITECTS
YONKERS ARMORY
127 N BROADWAY, YONKERS, NY 10701
SUMMARY OF ASBESTOS SAMPLES AND ANALYSIS RESULTS

NA/PS = Not analyzed/positive stop

SF = Square Foot
LF = Linear Foot

* Quantities are estimates only and should be field verified.
* Quantities and homogenous locations only reflect renovation areas and do not represent other areas throughout the building.

Note: Refer to Assumptions & Limitations Section of the Report.

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

April 17, 2025

Ambient Environmental, Inc.
Attn: Joella Viscusi
828 Washington Avenue
Albany, NY 12203

RE: Ambient Environmental, Inc.
Job Number 225041730
P.O. #250204AA
250204AA; Bell & Spina Architects; Inspection Yonkers Armory, 127 N. Broadway, Yonkers, NY 10701, Yonkers Armory - Interior & Exterior

Dear Joella Viscusi:

Enclosed are the results of Asbestos Analysis - Bulk Protocol of the following Ambient Environmental, Inc. samples, received at AmeriSci on Wednesday, April 9, 2025, for a 5 day turnaround:

001-01, 001-02, 001-03, 002-01, 002-02, 003-01, 003-02, 003-03, 004-01, 004-02, 005-01, 005-02, 006-01, 006-02, 006-03, 007-01, 007-02, 008-01, 008-02, 009-01, 009-02, 010-01, 010-02, 010-03, 010-04, 010-05, 011-01, 011-02, 011-03, 012-01, 012-02, 012-03, 012-04, 012-05, 012-06, 012-07, 013-01, 013-02, 013-03, 013-04, 013-05, 014-01, 014-02, 015-01, 015-02, 016-01, 016-02, 017-01, 017-02, 018-01, 018-02, 019-01, 019-02, 020-01, 020-02, 021-01, 021-02

The 57 samples, placed in zip lock bag, were shipped to AmeriSci via Fed Ex. Ambient Environmental, Inc. requested ELAP PLM/TEM analysis of these samples.

The results of the analyses which were performed following ELAP Protocols 198.1 PLM Friable and/or 198.6 for PLM NOB. ELAP Protocol 198.4 TEM NOB guidelines are presented within the Summary Table of this report. The presence of matrix reduction data in the Summary Table normally indicates an NOB sample. For NOB samples the individual matrix reduction, combined PLM and TEM analysis results are listed in the Summary Bulk Asbestos Analysis Results in Table I. Complete PLM results for individual samples are presented in the PLM Bulk Asbestos Report. Samples near 1% asbestos may be analyzed by EPA 400 pt ct method (EPA 600-M4-82-020). This combined report relates ONLY to sample analysis expressed as percent composition by weight and percent asbestos. This report must not be used to claim product endorsement or approval by these laboratories, NVLAP, ELAP or any other associated agency. This report must not be reproduced, except in full without the written approval of the laboratory. This report may contain specific data not covered by NVLAP or ELAP accreditations respectively, if so identified in relevant footnotes.

AmeriSci appreciates this opportunity to serve your organization. Please contact us for any further assistance or with any questions.

Sincerely,

Marvin E. Brothers

President | Authorized Signatory

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

PLM Bulk Asbestos Report

Ambient Environmental, Inc.
Attn: Joella Viscusi
828 Washington Avenue

Albany, NY 12203

Date Received 4/9/2025 **AmeriSci Job #** 225041730
Date Examined 04/15/25 **P.O. #**
ELAP # 11480 **Page** 1 **of** 9

RE: 250204AA; Bell & Spina Architects; Inspection Yonkers Armory, 127 N. Broadway, Yonkers, NY 10701, Yonkers Armory - Interior & Exterior

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos	Notes
001-01 001	225041730-01	***No***	NAD (by NYS ELAP 198.1) by John P. Koubiadis on 04/15/25	
Location: Upper Level - Conference Room 111 - Foil Faced Duct Insulation (T) **Analyst Description:** Silver/Brown, Heterogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose 50%, Fibrous glass 10%, Non-fibrous 40%				
001-02 001	225041730-02	***No***	NAD (by NYS ELAP 198.1) by John P. Koubiadis on 04/15/25	
Location: Upper Level - Conference Room 111 - Foil Faced Duct Insulation (T) **Analyst Description:** Silver/Brown, Heterogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose 50%, Fibrous glass 10%, Non-fibrous 40%				
001-03 001	225041730-03	***No***	NAD (by NYS ELAP 198.1) by John P. Koubiadis on 04/15/25	
Location: Upper Level - Conference Room 111 - Foil Faced Duct Insulation (T) **Analyst Description:** Silver/Brown, Heterogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose 50%, Fibrous glass 10%, Non-fibrous 40%				
002-01 002	225041730-04	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by John P. Koubiadis on 04/15/25	*1*
Location: Upper Level - Room 118 - Gray Duct Sealer (M) **Analyst Description:** Gray, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 3.2%				
002-02 002	225041730-05	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by John P. Koubiadis on 04/15/25	*1*
Location: Upper Level - Room 118 - Gray Duct Sealer (M) **Analyst Description:** Gray, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 3.3%				
003-01 003	225041730-06	***No***	NAD (by NYS ELAP 198.1) by John P. Koubiadis on 04/15/25	
Location: Upper Level - Room 116 - Foil Backed Heating Pipe Insulation (T) **Analyst Description:** White/Silver, Heterogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose 50%, Fibrous glass 10%, Non-fibrous 40%				

See Reporting notes on last page

PLM Bulk Asbestos Report

250204AA; Bell & Spina Architects; Inspection Yonkers Armory, 127 N. Broadway, Yonkers, NY 10701, Yonkers Armory - Interior & Exterior

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos	Notes
003-02 003	225041730-07	***No***	NAD (by NYS ELAP 198.1) by John P. Koubiadis on 04/15/25	
Location: Upper Level - Room 116 - Foil Backed Heating Pipe Insulation (T) **Analyst Description:** White/Silver, Heterogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose 50%, Fibrous glass 10%, Non-fibrous 40%				
003-03 003	225041730-08	***No***	NAD (by NYS ELAP 198.1) by John P. Koubiadis on 04/15/25	
Location: Upper Level - Room 116 - Foil Backed Heating Pipe Insulation (T) **Analyst Description:** White/Silver, Heterogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose 50%, Fibrous glass 10%, Non-fibrous 40%				
004-01 004	225041730-09	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by John P. Koubiadis on 04/15/25	*1*
Location: Upper Level - Conference Room 111 - White Pipe Insulation Mastic (M) **Analyst Description:** White, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 22%				
004-02 004	225041730-10	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by John P. Koubiadis on 04/15/25	*1*
Location: Upper Level - Conference Room 111 - White Pipe Insulation Mastic (M) **Analyst Description:** White, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 20%				
005-01 005	225041730-11	***No***	NAD (by NYS ELAP 198.1) by John P. Koubiadis on 04/15/25	
Location: Upper Level - Corridor - CMU Wall (M) **Analyst Description:** Gray, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%				
005-02 005	225041730-12	***No***	NAD (by NYS ELAP 198.1) by John P. Koubiadis on 04/15/25	
Location: Upper Level - Corridor - CMU Wall (M) **Analyst Description:** Gray, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%				
006-01 006	225041730-13	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by John P. Koubiadis on 04/15/25	*1*
Location: Upper Level - Women's Latrine Room 134 - Red Epoxy Floor (S) **Analyst Description:** Red, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 60%				

See Reporting notes on last page

PLM Bulk Asbestos Report

250204AA; Bell & Spina Architects; Inspection Yonkers Armory, 127 N. Broadway, Yonkers, NY 10701, Yonkers Armory - Interior & Exterior

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos	Notes
006-02 006	225041730-14	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by John P. Koubiadis on 04/15/25	*1*
Location: Upper Level - Women's Latrine Room 134 - Red Epoxy Floor (S) **Analyst Description:** Red, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 60%				
006-03 006	225041730-15	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by John P. Koubiadis on 04/15/25	*1*
Location: Upper Level - Women's Latrine Room 134 - Red Epoxy Floor (S) **Analyst Description:** Red, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 65%				
007-01 007	225041730-16	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by John P. Koubiadis on 04/15/25	*1*
Location: Upper Level - Room 127 - White Expansion Joint Caulk (M) **Analyst Description:** White, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 3.5%				
007-02 007	225041730-17	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by John P. Koubiadis on 04/15/25	*1*
Location: Upper Level - Room 127 - White Expansion Joint Caulk (M) **Analyst Description:** White, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 2.2%				
008-01 008	225041730-18	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by John P. Koubiadis on 04/15/25	*1*
Location: Upper Level - Room 127 - White Caulk On Window Frame To CMU Wall (M) **Analyst Description:** White, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 0.1%				
008-02 008	225041730-19	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by John P. Koubiadis on 04/15/25	*1*
Location: Upper Level - Room 127 - White Caulk On Window Frame To CMU Wall (M) **Analyst Description:** White, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 5.7%				
009-01 009	225041730-20	***Yes***	9.7% (NOB by NYS ELAP 198.6) by John P. Koubiadis on 04/15/25	
Location: Upper Level - Room 127 - Black Window Glazing (M) **Analyst Description:** Black, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** Chrysotile 9.7% **Other Material:** Non-fibrous 14%				

See Reporting notes on last page

PLM Bulk Asbestos Report

250204AA; Bell & Spina Architects; Inspection Yonkers Armory, 127 N. Broadway, Yonkers, NY 10701, Yonkers Armory - Interior & Exterior

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos	Notes
009-02 009 **Location:** Upper Level - Room 127 - Black Window Glazing (M) **Analyst Description:** Bulk Material **Asbestos Types:** **Other Material:**	225041730-21		NA/PS	
010-01 010 **Location:** Upper Level - Room 127 - Beige Wall Paint (S) **Analyst Description:** Tan, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 19%	225041730-22	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by John P. Koubiadis on 04/15/25	*1*
010-02 010 **Location:** Upper Level - Room 116 - Beige Wall Paint (S) **Analyst Description:** Tan, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 18%	225041730-23	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by John P. Koubiadis on 04/15/25	*1*
010-03 010 **Location:** Upper Level - Room 116 - Beige Wall Paint (S) **Analyst Description:** Tan, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 20%	225041730-24	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by John P. Koubiadis on 04/15/25	*1*
010-04 010 **Location:** Upper Level - Room 111 - Beige Wall Paint (S) **Analyst Description:** Tan, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 19%	225041730-25	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by John P. Koubiadis on 04/15/25	*1*
010-05 010 **Location:** Upper Level - Room 111 - Beige Wall Paint (S) **Analyst Description:** Tan, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 22%	225041730-26	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by John P. Koubiadis on 04/15/25	*1*
011-01 011 **Location:** Upper Level - Room 133 - Gray Floor Paint (S) **Analyst Description:** Gray, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 11%	225041730-27	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by John P. Koubiadis on 04/15/25	*1*

See Reporting notes on last page

PLM Bulk Asbestos Report

250204AA; Bell & Spina Architects; Inspection Yonkers Armory, 127 N. Broadway, Yonkers, NY 10701, Yonkers Armory - Interior & Exterior

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos	Notes
011-02 011 **Location:** Upper Level - Room 133 - Gray Floor Paint (S) **Analyst Description:** Gray, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 6.3%	225041730-28	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by John P. Koubiadis on 04/15/25	*1*
011-03 011 **Location:** Upper Level - Room 133 - Gray Floor Paint (S) **Analyst Description:** Gray, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 16%	225041730-29	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by John P. Koubiadis on 04/15/25	*1*
012-01 012 **Location:** Lower Level - Assembly Hall 5 - Off-White Wall Paint (S) **Analyst Description:** Off-White, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 23%	225041730-30	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by John P. Koubiadis on 04/15/25	*1*
012-02 012 **Location:** Lower Level - Assembly Hall 5 - Off-White Wall Paint (S) **Analyst Description:** Off-White, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 25%	225041730-31	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by John P. Koubiadis on 04/15/25	*1*
012-03 012 **Location:** Lower Level - Assembly Hall 5 - Off-White Wall Paint (S) **Analyst Description:** Off-White, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 24%	225041730-32	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by John P. Koubiadis on 04/15/25	*1*
012-04 012 **Location:** Lower Level - Assembly Hall 5 - Off-White Wall Paint (S) **Analyst Description:** Off-White, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 27%	225041730-33	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by John P. Koubiadis on 04/15/25	*1*
012-05 012 **Location:** Lower Level - Assembly Hall 5 - Off-White Wall Paint (S) **Analyst Description:** Off-White, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 27%	225041730-34	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by John P. Koubiadis on 04/15/25	*1*

See Reporting notes on last page

PLM Bulk Asbestos Report

250204AA; Bell & Spina Architects; Inspection Yonkers Armory, 127 N. Broadway, Yonkers, NY 10701, Yonkers Armory - Interior & Exterior

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos	Notes
012-06 012 **Location:** Lower Level - Assembly Hall 5 - Off-White Wall Paint (S) **Analyst Description:** Off-White, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 25%	225041730-35	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by John P. Koubiadis on 04/15/25	*1*
012-07 012 **Location:** Lower Level - Assembly Hall 5 - Off-White Wall Paint (S) **Analyst Description:** Off-White, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 26%	225041730-36	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by John P. Koubiadis on 04/15/25	*1*
013-01 013 **Location:** Lower Level - Assembly Hall 5 - Yellow Wall Paint (S) **Analyst Description:** Yellow, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 28%	225041730-37	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by John P. Koubiadis on 04/15/25	*1*
013-02 013 **Location:** Lower Level - Assembly Hall 5 - Yellow Wall Paint (S) **Analyst Description:** Yellow, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 30%	225041730-38	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by John P. Koubiadis on 04/15/25	*1*
013-03 013 **Location:** Lower Level - Assembly Hall 5 - Yellow Wall Paint (S) **Analyst Description:** Yellow, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 30%	225041730-39	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by John P. Koubiadis on 04/15/25	*1*
013-04 013 **Location:** Lower Level - Assembly Hall 5 - Yellow Wall Paint (S) **Analyst Description:** Yellow, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 28%	225041730-40	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by John P. Koubiadis on 04/15/25	*1*
013-05 013 **Location:** Lower Level - Assembly Hall 5 - Yellow Wall Paint (S) **Analyst Description:** Yellow, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 29%	225041730-41	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by John P. Koubiadis on 04/15/25	*1*

See Reporting notes on last page

PLM Bulk Asbestos Report

250204AA; Bell & Spina Architects; Inspection Yonkers Armory, 127 N. Broadway, Yonkers, NY 10701, Yonkers Armory - Interior & Exterior

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos	Notes
014-01 014	225041730-42	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by John P. Koubiadis on 04/15/25	*1*
Location: Lower Level - Mechanical Room 1 - Black Electrical Wire Insulation (M) **Analyst Description:** Black, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 5.1%				
014-02 014	225041730-43	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by John P. Koubiadis on 04/15/25	*1*
Location: Lower Level - Mechanical Room 1 - Black Electrical Wire Insulation (M) **Analyst Description:** Black, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 7.4%				
015-01 015	225041730-44	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by John P. Koubiadis on 04/15/25	*1*
Location: Lower Level - Mechanical Room 1 - White Electrical Wire Insulation (M) **Analyst Description:** White, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 17%				
015-02 015	225041730-45	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by John P. Koubiadis on 04/15/25	*1*
Location: Lower Level - Mechanical Room 1 - White Electrical Wire Insulation (M) **Analyst Description:** White, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 15%				
016-01 016	225041730-46	***No***	NAD (by NYS ELAP 198.1) by John P. Koubiadis on 04/15/25	
Location: Exterior - Brick Wall (M) **Analyst Description:** Brown, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%				
016-02 016	225041730-47	***No***	NAD (by NYS ELAP 198.1) by John P. Koubiadis on 04/15/25	
Location: Exterior - Brick Wall (M) **Analyst Description:** Brown, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%				
017-01 017	225041730-48	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by John P. Koubiadis on 04/15/25	*1*
Location: Exterior - Tan Adhesive On Stair Tread (M) **Analyst Description:** Tan, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 21%				

See Reporting notes on last page

PLM Bulk Asbestos Report

250204AA; Bell & Spina Architects; Inspection Yonkers Armory, 127 N. Broadway, Yonkers, NY 10701, Yonkers Armory - Interior & Exterior

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos	Notes
017-02 017 **Location:** Exterior - Tan Adhesive On Stair Tread (M) **Analyst Description:** Tan, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 23%	225041730-49	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by John P. Koubiadis on 04/15/25	*1*
018-01 018 **Location:** Exterior - Tan Concrete Step (M) **Analyst Description:** Gray, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%	225041730-50	***No***	NAD (by NYS ELAP 198.1) by John P. Koubiadis on 04/15/25	
018-02 018 **Location:** Exterior - Tan Concrete Step (M) **Analyst Description:** Gray, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%	225041730-51	***No***	NAD (by NYS ELAP 198.1) by John P. Koubiadis on 04/15/25	
019-01 019 **Location:** Exterior - Concrete Sidewalk (M) **Analyst Description:** Gray, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%	225041730-52	***No***	NAD (by NYS ELAP 198.1) by John P. Koubiadis on 04/15/25	
019-02 019 **Location:** Exterior - Concrete Sidewalk (M) **Analyst Description:** Gray, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%	225041730-53	***No***	NAD (by NYS ELAP 198.1) by John P. Koubiadis on 04/15/25	
020-01 020 **Location:** Exterior - Sidewalk Caulk (M) **Analyst Description:** Gray, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 0.6%	225041730-54	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by John P. Koubiadis on 04/15/25	*1*
020-02 020 **Location:** Exterior - Sidewalk Caulk (M) **Analyst Description:** Gray, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 0.6%	225041730-55	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by John P. Koubiadis on 04/15/25	*1*

See Reporting notes on last page

PLM Bulk Asbestos Report

250204AA; Bell & Spina Architects; Inspection Yonkers Armory, 127 N. Broadway, Yonkers, NY 10701, Yonkers Armory - Interior & Exterior

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos	Notes
021-01 021 **Location:** Exterior - Foundation Sealer (M) **Analyst Description:** Gray, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 54%	225041730-56	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by John P. Koubiadis on 04/15/25	*1*
021-02 021 **Location:** Exterior - Foundation Sealer (M) **Analyst Description:** Gray, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 58%	225041730-57	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by John P. Koubiadis on 04/15/25	*1*

Reporting Notes:

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

Analyzed by: John P. Koubiadis
Date: 4/15/2025

Reviewed by: Marwan A. Alahiri

*NAD/NSD =no asbestos detected; NA =not analyzed; NA/PS=not analyzed/positive stop, (SOF-V) = Sprayed On Fireproofing containing Vermiculite; (SM-V) = Surfacing Material containing Vermiculite; PLM Bulk Asbestos Analysis using Olympus, Model BH-2 Pol Scope, Microscope, Serial #: 223705, by Appd E to Subpt E, 40 CFR 763 quantified by either CVES or 400 pt ct as noted for each analysis (NVLAP 200546-0), ELAP PLM Method 198.1 for NY friable samples, which includes the identification and quantitation of vermiculite, or ELAP 198.6 for NOB samples, or EPA 400 pt ct by EPA 600-M4-82-020 (NY ELAP Lab 11480); Note:PLM is not consistently reliable in detecting asbestos in floor coverings and similar non-friable organically bound materials. NAD or Trace results by PLM are inconclusive, TEM is currently the only method that can be used to determine if this material can be considered or treated as non asbestos-containing in NY State (also see EPA Advisory for floor tile, FR 59,146,38970,8/1/94) National Institute of Standards and Technology Accreditation requirements mandate that this report must not be reproduced except in full without the approval of the lab.This PLM report relates ONLY to the items tested. RI Cert AAL-094, CT Cert PH-0186, Mass Cert AA000054, NJ Lab ID #NY031.

END OF REPORT

Client Name: Ambient Environmental, Inc.

Table I

Summary of Bulk Asbestos Analysis Results by NYS ELAP 198.4

250204AA; Bell & Spina Architects; Inspection Yonkers Armory, 127 N. Broadway, Yonkers, NY 10701, Yonkers Armory - Interior & Exterior

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	001-01	001	----	----	----	----	NAD	NA
Location: Upper Level - Conference Room 111 - Foil Faced Duct Insulation (T)								
02	001-02	001	----	----	----	----	NAD	NA
Location: Upper Level - Conference Room 111 - Foil Faced Duct Insulation (T)								
03	001-03	001	----	----	----	----	NAD	NA
Location: Upper Level - Conference Room 111 - Foil Faced Duct Insulation (T)								
04	002-01	002	0.194	25.8	71.0	3.2	NAD	NAD
Location: Upper Level - Room 118 - Gray Duct Sealer (M)								
05	002-02	002	0.261	26.1	70.7	3.3	NAD	NAD
Location: Upper Level - Room 118 - Gray Duct Sealer (M)								
06	003-01	003	----	----	----	----	NAD	NA
Location: Upper Level - Room 116 - Foil Backed Heating Pipe Insulation (T)								
07	003-02	003	----	----	----	----	NAD	NA
Location: Upper Level - Room 116 - Foil Backed Heating Pipe Insulation (T)								
08	003-03	003	----	----	----	----	NAD	NA
Location: Upper Level - Room 116 - Foil Backed Heating Pipe Insulation (T)								
09	004-01	004	0.133	37.4	40.5	22.2	NAD	NAD
Location: Upper Level - Conference Room 111 - White Pipe Insulation Mastic (M)								
10	004-02	004	0.189	38.4	41.6	20.0	NAD	NAD
Location: Upper Level - Conference Room 111 - White Pipe Insulation Mastic (M)								
11	005-01	005	----	----	----	----	NAD	NA
Location: Upper Level - Corridor - CMU Wall (M)								
12	005-02	005	----	----	----	----	NAD	NA
Location: Upper Level - Corridor - CMU Wall (M)								
13	006-01	006	0.248	22.9	16.7	60.4	NAD	NAD
Location: Upper Level - Women's Latrine Room 134 - Red Epoxy Floor (S)								
14	006-02	006	0.252	22.1	17.3	60.6	NAD	NAD
Location: Upper Level - Women's Latrine Room 134 - Red Epoxy Floor (S)								
15	006-03	006	0.303	20.5	13.9	65.7	NAD	NAD
Location: Upper Level - Women's Latrine Room 134 - Red Epoxy Floor (S)								
16	007-01	007	0.268	29.8	66.7	3.5	NAD	NAD
Location: Upper Level - Room 127 - White Expansion Joint Caulk (M)								

See Reporting notes on last page

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

250204AA; Bell & Spina Architects; Inspection Yonkers Armory, 127 N. Broadway, Yonkers, NY 10701, Yonkers Armory - Interior & Exterior

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	007-02	007	0.236	29.3	68.5	2.2	NAD	NAD
Location: Upper Level - Room 127 - White Expansion Joint Caulk (M)								
18	008-01	008	0.208	28.7	71.1	0.1	NAD	NAD
Location: Upper Level - Room 127 - White Caulk On Window Frame To CMU Wall (M)								
19	008-02	008	0.180	28.5	65.8	5.7	NAD	NAD
Location: Upper Level - Room 127 - White Caulk On Window Frame To CMU Wall (M)								
20	009-01	009	0.182	41.2	34.6	14.5	Chrysotile 9.7	NA
Location: Upper Level - Room 127 - Black Window Glazing (M)								
21	009-02	009	0.189	41.7	35.3	22.9	NA/PS	NA
Location: Upper Level - Room 127 - Black Window Glazing (M)								
22	010-01	010	0.054	27.4	53.6	19.0	NAD	NAD
Location: Upper Level - Room 127 - Beige Wall Paint (S)								
23	010-02	010	0.090	28.7	52.5	18.7	NAD	NAD
Location: Upper Level - Room 116 - Beige Wall Paint (S)								
24	010-03	010	0.082	26.9	52.8	20.3	NAD	NAD
Location: Upper Level - Room 116 - Beige Wall Paint (S)								
25	010-04	010	0.071	31.0	49.7	19.3	NAD	NAD
Location: Upper Level - Room 111 - Beige Wall Paint (S)								
26	010-05	010	0.065	23.9	53.2	22.8	NAD	NAD
Location: Upper Level - Room 111 - Beige Wall Paint (S)								
27	011-01	011	0.051	66.7	22.2	11.2	NAD	NAD
Location: Upper Level - Room 133 - Gray Floor Paint (S)								
28	011-02	011	0.087	82.4	11.3	6.3	NAD	NAD
Location: Upper Level - Room 133 - Gray Floor Paint (S)								
29	011-03	011	0.062	57.7	25.3	16.9	NAD	NAD
Location: Upper Level - Room 133 - Gray Floor Paint (S)								
30	012-01	012	0.141	30.0	46.8	23.3	NAD	NAD
Location: Lower Level - Assembly Hall 5 - Off-White Wall Paint (S)								
31	012-02	012	0.206	28.5	46.1	25.4	NAD	NAD
Location: Lower Level - Assembly Hall 5 - Off-White Wall Paint (S)								
32	012-03	012	0.132	27.8	47.2	24.9	NAD	NAD
Location: Lower Level - Assembly Hall 5 - Off-White Wall Paint (S)								

See Reporting notes on last page

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

250204AA; Bell & Spina Architects; Inspection Yonkers Armory, 127 N. Broadway, Yonkers, NY 10701, Yonkers Armory - Interior & Exterior

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
33	012-04	012	0.123	26.3	46.0	27.7	NAD	NAD
Location: Lower Level - Assembly Hall 5 - Off-White Wall Paint (S)								
34	012-05	012	0.218	29.2	43.2	27.6	NAD	NAD
Location: Lower Level - Assembly Hall 5 - Off-White Wall Paint (S)								
35	012-06	012	0.238	29.0	45.3	25.8	NAD	NAD
Location: Lower Level - Assembly Hall 5 - Off-White Wall Paint (S)								
36	012-07	012	0.220	29.7	44.0	26.3	NAD	NAD
Location: Lower Level - Assembly Hall 5 - Off-White Wall Paint (S)								
37	013-01	013	0.282	35.2	36.2	28.6	NAD	NAD
Location: Lower Level - Assembly Hall 5 - Yellow Wall Paint (S)								
38	013-02	013	0.338	33.9	35.2	30.9	NAD	NAD
Location: Lower Level - Assembly Hall 5 - Yellow Wall Paint (S)								
39	013-03	013	0.302	34.5	35.0	30.5	NAD	NAD
Location: Lower Level - Assembly Hall 5 - Yellow Wall Paint (S)								
40	013-04	013	0.241	31.8	40.2	28.0	NAD	NAD
Location: Lower Level - Assembly Hall 5 - Yellow Wall Paint (S)								
41	013-05	013	0.208	8.5	61.7	29.8	NAD	NAD
Location: Lower Level - Assembly Hall 5 - Yellow Wall Paint (S)								
42	014-01	014	0.168	86.9	8.0	5.1	NAD	NAD
Location: Lower Level - Mechanical Room 1 - Black Electrical Wire Insulation (M)								
43	014-02	014	0.184	86.7	5.9	7.4	NAD	NAD
Location: Lower Level - Mechanical Room 1 - Black Electrical Wire Insulation (M)								
44	015-01	015	0.183	75.9	7.0	17.0	NAD	NAD
Location: Lower Level - Mechanical Room 1 - White Electrical Wire Insulation (M)								
45	015-02	015	0.173	76.1	8.9	15.1	NAD	NAD
Location: Lower Level - Mechanical Room 1 - White Electrical Wire Insulation (M)								
46	016-01	016	----	----	----	----	NAD	NA
Location: Exterior - Brick Wall (M)								
47	016-02	016	----	----	----	----	NAD	NA
Location: Exterior - Brick Wall (M)								
48	017-01	017	0.251	63.3	15.3	21.4	NAD	NAD
Location: Exterior - Tan Adhesive On Stair Tread (M)								

See Reporting notes on last page

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

250204AA; Bell & Spina Architects; Inspection Yonkers Armory, 127 N. Broadway, Yonkers, NY 10701, Yonkers Armory - Interior & Exterior

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
49	017-02	017	0.229	63.5	13.2	23.2	NAD	NAD
Location: Exterior - Tan Adhesive On Stair Tread (M)								
50	018-01	018	----	----	----	----	NAD	NA
Location: Exterior - Tan Concrete Step (M)								
51	018-02	018	----	----	----	----	NAD	NA
Location: Exterior - Tan Concrete Step (M)								
52	019-01	019	----	----	----	----	NAD	NA
Location: Exterior - Concrete Sidewalk (M)								
53	019-02	019	----	----	----	----	NAD	NA
Location: Exterior - Concrete Sidewalk (M)								
54	020-01	020	0.282	35.6	63.8	0.6	NAD	NAD
Location: Exterior - Sidewalk Caulk (M)								
55	020-02	020	0.198	35.1	64.4	0.6	NAD	NAD
Location: Exterior - Sidewalk Caulk (M)								
56	021-01	021	0.189	16.5	29.3	54.2	NAD	NAD
Location: Exterior - Foundation Sealer (M)								
57	021-02	021	0.169	10.8	30.7	58.5	NAD	NAD
Location: Exterior - Foundation Sealer (M)								

Analyzed by: Marwan A. Alahiri
Date: 4/15/2025



Reviewed by: Marwan A. Alahiri



**Quantitative Analysis (Semi/Full); Bulk Asbestos Analysis - PLM by Appd E to Subpt E, 40 CFR 763 or NYSDOH ELAP 198.1 for New York friable samples or NYSDOH ELAP 198.6 for New York NOB samples; TEM (Semi/Full) by EPA 600/R-93/116 (or NYSDOH ELAP 198.4; for New York samples). Analysis using Hitachi, Model H600-Noran 7 System, Microscope, Serial #: 600-27-6. NAD = no asbestos detected during a quantitative analysis; NA = not analyzed; Trace = <1%; (SOF-V) = Sprayed On Fireproofing containing Vermiculite; (SM-V) = Surfacing Material containing Vermiculite; Quantitation for beginning weights of <0.1 grams should be considered as qualitative only; Qualitative Analysis: Asbestos analysis results of "Present" or "NVA = No Visible Asbestos" represents results for Qualitative PLM or TEM Analysis only (no accreditation coverage available from any regulatory agency for qualitative analyses): NVLAP (PLM) 200546-0, NYSDOH ELAP Lab 11480, NJ Lab ID #NY031.

Warning Note: PLM limitation, only TEM will resolve fibers <0.25 micrometers in diameter. TEM bulk analysis is representative of the fine grained matrix material and may not be representative of non-uniformly dispersed debris for which PLM evaluation is recommended (i.e. soils and other heterogenous materials).

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#225041750

BULK SAMPLE DATA AND CHAIN OF CUSTODY FORM

PROJECT INFORMATION

Client:	Project Name:	Project Street Address:	Client Contact:
Bell & Spina Architects	Inspection Yonkers Armory	127 N. Broadway	James Paolini
Project Number:	**Inspector:**	**Project Address City/State:**	**Collection Date:**
250204AA	Peter Minotti & Kevin Jones	Yonkers, NY 10701	4/7/2025 – 4/8/2025
Sample TAT:	**Building Name:**	**Sampling Areas:**	**Comments: (Field)**
5 Day	Yonkers Armory	Interior & Exterior	X Analyze to First Positive By Homogeneous Material X For Negative NOB PLM's, continue to TEM

BULK SAMPLE LOCATION — TYPE OF MATERIALS

Homogeneous Area Number	Bulk Sample ID Number	Sampled Material (T, S, M)	Sample Location	Friability (N/F)	Condition (G, D, SD)	Quantity (LF, SF, EA)	Homogeneous Areas	Asbestos Content (Type & %)
001	01	Foil Faced Duct Insulation (T)	Upper Level – Conference Room 111	N	G			
001	02	Foil Faced Duct Insulation (T)	Upper Level – Conference Room 111	N	G			
001	03	Foil Faced Duct Insulation (T)	Upper Level – Conference Room 111	N	G			
002	01	Gray Duct Sealer (M)	Upper Level – Room 118	N	G			
002	02	Gray Duct Sealer (M)	Upper Level – Room 118	N	G			
003	01	Foil Backed Heating Pipe Insulation (T)	Upper Level – Room 116	N	G			
003	02	Foil Backed Heating Pipe Insulation (T)	Upper Level – Room 116	N	G			
003	03	Foil Backed Heating Pipe Insulation (T)	Upper Level – Room 116	N	G			
004	01	White Pipe Insulation Mastic (M)	Upper Level – Conference Room 111	N	G			
004	02	White Pipe Insulation Mastic (M)	Upper Level – Conference Room 111	N	G			
005	01	CMU Wall (M)	Upper Level – Corridor	F	G			
005	02	CMU Wall (M)	Upper Level – Corridor	F	G			
006	01	Red Epoxy Floor (S)	Upper Level – Women's Latrine Room 134	F	G			
006	02	Red Epoxy Floor (S)	Upper Level – Women's Latrine Room 134	F	G			

CHAIN OF CUSTODY

Relinquished By:	Date	Time	Received By:	Date	Time
I	4/8/25	15:00		4/9/25	11:11
II					

LAB INFORMATION

Lab Name	Date	Time
a. Analyzed By	4/15/25	6:17
b. QC by:		

Project Manager: C.D.	Results To: Results@ambient-env.com	Drawings: ___ Sample Locations ___ Material Locations	Comments:

(T=TSI; S=Surfacing; M=Misc)

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#250417 50

BULK SAMPLE DATA AND CHAIN OF CUSTODY FORM

PROJECT INFORMATION

Client: Bell & Spina Architects	**Project Name:** Inspection Yonkers Armory	**Project Street Address:** 127 N. Broadway	**Client Contact:** James Paolini
Project Number: 250204AA	**Inspector:** Peter Minotti & Kevin Jones	**Project Address City/State:** Yonkers, NY 10701	**Collection Date:** 4/7/2025 – 4/8/2025
Sample TAT: 5 Day	**Building Name:** Yonkers Armory	**Sampling Areas:** Interior & Exterior	**Comments: (Field)** X Analyze to First Positive By Homogeneous Material; X For Negative NOB PLM's, continue to TEM

BULK SAMPLE LOCATION — TYPE OF MATERIALS

Homogeneous Area Number	Bulk Sample ID Number	Sampled Material (T, S, M)	Sample Location	Friability (N/F)	Condition (G, D, SD)	Quantity (LF, SF, EA)	Homogeneous Areas	Asbestos Content (Type & %)
006	03	Red Epoxy Floor (S)	Upper Level – Women's Latrine Room 134	F	G			
007	01	White Expansion Joint Caulk (M)	Upper Level – Room 127	N	G			
007	02	White Expansion Joint Caulk (M)	Upper Level – Room 127	N	G			
008	01	White Caulk on Window Frame to CMU Wall (M)	Upper Level – Room 127	N	G			
008	02	White Caulk on Window Frame to CMU Wall (M)	Upper Level – Room 127	N	G			
009	01	Black Window Glazing (M)	Upper Level – Room 127	N	G			
009	02	Black Window Glazing (M)	Upper Level – Room 127	N	G			
010	01	Beige Wall Paint (S)	Upper Level – Room 127	N	G			
010	02	Beige Wall Paint (S)	Upper Level – Room 116	N	G			
010	03	Beige Wall Paint (S)	Upper Level – Room 116	N	G			
010	04	Beige Wall Paint (S)	Upper Level – Room 111	N	G			
010	05	Beige Wall Paint (S)	Upper Level – Room 111	N	G			
011	01	Gray Floor Paint (S)	Upper Level – Room 133	N	G			
011	02	Gray Floor Paint (S)	Upper Level – Room 133	N	G			

CHAIN OF CUSTODY

Relinquished By:	Date	Time	Received By:	Date	Time
I	4/8/25	15:00		4/9/25	11:11
II					

LAB INFORMATION

Lab Name	Date	Time
a. Analyzed By:	4/15/25	6:18
b. QC by:		

Project Manager: C.D.	**Results To:** Results@ambient-env.com	**Drawings:** ___ Sample Locations ___ Material Locations

Comments:

(T=TSI; S=Surfacing; M=Misc)

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#250417 50

BULK SAMPLE DATA AND CHAIN OF CUSTODY FORM

PROJECT INFORMATION

Client:	Project Name:	Project Street Address:	Client Contact:
Bell & Spina Architects	Inspection Yonkers Armory	127 N. Broadway	James Paolini
Project Number:	**Inspector:**	**Project Address City/State:**	**Collection Date:**
250204AA	Peter Minotti & Kevin Jones	Yonkers, NY 10701	4/7/2025 – 4/8/2025
Sample TAT:	**Building Name:**	**Sampling Areas:**	**Comments: (Field)**
5 Day	Yonkers Armory	Interior & Exterior	X Analyze to First Positive By Homogeneous Material X For Negative NOB PLM's, continue to TEM

BULK SAMPLE LOCATION — TYPE OF MATERIALS

Homogeneous Area Number	Bulk Sample ID Number	Sampled Material (T, S, M)	Sample Location	Friability (N/F)	Condition (G, D, SD)	Quantity (LF, SF, EA)	Homogeneous Areas	Asbestos Content (Type & %)
011	03	Gray Floor Paint (S)	Upper Level – Room 133	N	G			
012	01	Off-White Wall Paint (S)	Lower Level – Assembly Hall 5	N	G			
012	02	Off-White Wall Paint (S)	Lower Level – Assembly Hall 5	N	G			
012	03	Off-White Wall Paint (S)	Lower Level – Assembly Hall 5	N	G			
012	04	Off-White Wall Paint (S)	Lower Level – Assembly Hall 5	N	G			
012	05	Off-White Wall Paint (S)	Lower Level – Assembly Hall 5	N	G			
012	06	Off-White Wall Paint (S)	Lower Level – Assembly Hall 5	N	G			
012	07	Off-White Wall Paint (S)	Lower Level – Assembly Hall 5	N	G			
013	01	Yellow Wall Paint (S)	Lower Level – Assembly Hall 5	N	G			
013	02	Yellow Wall Paint (S)	Lower Level – Assembly Hall 5	N	G			
013	03	Yellow Wall Paint (S)	Lower Level – Assembly Hall 5	N	G			
013	04	Yellow Wall Paint (S)	Lower Level – Assembly Hall 5	N	G			
013	05	Yellow Wall Paint (S)	Lower Level – Assembly Hall 5	N	G			
014	01	Black Electrical Wire Insulation (M)	Lower Level – Mechanical Room 1	N	G			

CHAIN OF CUSTODY

Relinquished By:	Date	Time	Received By:	Date	Time
I Pat Minotti	4/8/25	15:00	[illegible]	4/9/25	11:11
II					

LAB INFORMATION

Lab Name	Date	Time
a. Analyzed By: Mamun Mahin	4/15/25	6:18
b. QC by:		

Project Manager: C.D.	Results To: Results@ambient-env.com	Drawings: ___ Sample Locations ___ Material Locations

Comments:

(T=TSI; S=Surfacing; M=Misc)

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 #250417-00

BULK SAMPLE DATA AND CHAIN OF CUSTODY FORM

PROJECT INFORMATION

Client: **Bell & Spina Architects**	Project Name: **Inspection Yonkers Armory**	Project Street Address: **127 N. Broadway**	Client Contact: **James Paolini**
Project Number: **250204AA**	Inspector: **Peter Minotti & Kevin Jones**	Project Address City/State: **Yonkers, NY 10701**	Collection Date: **4/7/2025 – 4/8/2025**
Sample TAT: **5 Day**	Building Name: **Yonkers Armory**	Sampling Areas: **Interior & Exterior**	Comments: (Field) X Analyze to First Positive By Homogeneous Material X For Negative NOB PLM's, continue to TEM

BULK SAMPLE LOCATION / TYPE OF MATERIALS

Homogeneous Area Number	Bulk Sample ID Number	Sampled Material (T, S, M)	Sample Location	Friability (N/F)	Condition (G, D, SD)	Quantity (LF, SF, EA)	Homogeneous Areas	Asbestos Content (Type & %)
014	02	Black Electrical Wire Insulation (M)	Lower Level – Mechanical Room 1	N	G			
015	01	White Electrical Wire Insulation (M)	Lower Level – Mechanical Room 1	N	G			
015	02	White Electrical Wire Insulation (M)	Lower Level – Mechanical Room 1	N	G			
016	01	Brick Wall (M)	Exterior	F	G			
016	02	Brick Wall (M)	Exterior	F	G			
017	01	Tan Adhesive on Stair Tread (M)	Exterior	N	G			
017	02	Tan Adhesive on Stair Tread (M)	Exterior	N	G			
018	01	Tan Concrete Step (M)	Exterior	F	G			
018	02	Tan Concrete Step (M)	Exterior	F	G			
019	01	Concrete Sidewalk (M)	Exterior	F	G			
019	02	Concrete Sidewalk (M)	Exterior	F	G			
020	01	Sidewalk Caulk (M)	Exterior	N	G			
020	02	Sidewalk Caulk (M)	Exterior	N	G			
021	01	Foundation Sealer (M)	Exterior	N	G			

CHAIN OF CUSTODY

Relinquished By:	Date	Time	Received By:	Date	Time
I	4/8/25	15:00		4/9/25	11:11
II					

LAB INFORMATION

Lab Name	Date	Time
a. Analyzed By:	4/15/25	6:18
b. QC by:		

Project Manager: **C.D.**	Results To: **Results@ambient-env.com**	Drawings: ___ Sample Locations ___ Material Locations	Comments:

(T=TSI; S=Surfacing; M=Misc)

Ambient Environmental, Inc.
Comprehensive Building Science Solutions
NYS Certified WBE,
SBA EDWOSB & DBE

#250417CD

BULK SAMPLE DATA AND CHAIN OF CUSTODY FORM

PROJECT INFORMATION

Client: **Bell & Spina Architects**	Project Name: **Inspection Yonkers Armory**	Project Street Address: **127 N. Broadway**	Client Contact: **James Paolini**
Project Number: **250204AA**	Inspector: **Peter Minotti & Kevin Jones**	Project Address City/State: **Yonkers, NY 10701**	Collection Date: **4/7/2025 – 4/8/2025**
Sample TAT: **5 Day**	Building Name: **Yonkers Armory**	Sampling Areas: **Interior & Exterior**	Comments: (Field) X Analyze to First Positive By Homogeneous Material X For Negative NOB PLM's, continue to TEM

BULK SAMPLE LOCATION — TYPE OF MATERIALS

Homogeneous Area Number	Bulk Sample ID Number	Sampled Material (T, S, M)	Sample Location	Friability (N/F)	Condition (G, D, SD)	Quantity (LF, SF, EA)	Homogeneous Areas	Asbestos Content (Type & %)
021	02	Foundation Sealer (M)	Exterior	N	G			

CHAIN OF CUSTODY

Relinquished By:	Date	Time	Received By:	Date	Time
I	4/8/25	15:00		4/9/25	11:41
II					

Project Manager: **C.D.**	Results To: **Results@ambient-env.com**	Drawings: ___ Sample Locations ___ Material Locations

(T=TSI; S=Surfacing; M=Misc)

LAB INFORMATION

Lab Name	Date	Time
a. Analyzed By:	4/15/25	6:18
b. QC by:		

Comments:

ATTACHMENT B
LEAD-BASED PAINT TESTING RESULTS

Ambient Environmental, Inc.
Building Science and EHS Solutions
NYS Certified WBE,
SBA EDWOSB & DBE

Lead Based Paint Inspection Detailed Report

828 Washington Avenue
Albany, New York

INSPECTION SITE:	Yonkers Armory 2 Quincy Place Yonkers, New York
INSPECTION DATE:	4/7/2025 - 4/7/2025
REPORT NUMBER:	250204AA
INSTRUMENT TYPE:	Viken Detection Pb200i XRF Lead Paint Analyzer 2327
ACTION LEVEL:	1.0 (mg/cm²)
Job ID:	250204AA

STATEMENT: Paint conditions included in this report represent conditions observed by the inspector at the time of the inspection

Lead Based Paint Inspection Detailed Report

Inspection Date:	4/7/2025 - 4/7/2025	Inspection Site:	Yonkers Armory 2 Quincy Place Yonkers, New York
Action Level:	1.0 (mg/cm²)		
Report Number:	250204AA		
Total Readings:	62		
Unit Started:	04/07/2025 17:02:47		
Unit Ended:	04/07/2025 18:50:47		

Read #	Result	-->RoomChoice	Structure	-->Member	Substrate	Wall	Location	Color	Lead (mg/cm²)	Mode
7	Negative	1	Room	Wall	Concrete	A	1	Beige	0.3 mg/cm²	Action Level
8	Negative	1	Room	Wall	Concrete	A	2	Yellow	0.4 mg/cm²	Action Level
9	Negative	1	Door		Metal	A	1	Green	0.2 mg/cm²	Action Level
10	Negative	1	Door	Frame	Metal	A	1	Black	0.7 mg/cm²	Action Level
11	Negative	1	Door	Frame	Metal	B	1	Black	0.7 mg/cm²	Action Level
12	Negative	1	Door		Metal	B	1	Green	0.2 mg/cm²	Action Level
13	Negative	1	Room	Wall	Concrete	B	1	Beige	0.1 mg/cm²	Action Level
14	Negative	1	Room	Wall	Concrete	B	2	Yellow	0.2 mg/cm²	Action Level
15	Negative	1	Room	Wall	Concrete	C	1	Beige	0.0 mg/cm²	Action Level
16	Negative	1	Room	Wall	Concrete	C	2	Yellow	0.2 mg/cm²	Action Level
17	Negative	1	Door		Metal	C	1	Gray	0.2 mg/cm²	Action Level
18	Negative	1	Door	Frame	Metal	C	1	Black	0.4 mg/cm²	Action Level
19	Negative	1	Room	Wall	Concrete	C	1	Beige	0.2 mg/cm²	Action Level
20	Negative	1	Room	Wall	Concrete	C	2	Yellow	0.1 mg/cm²	Action Level
21	Negative	1	Room	Wall	Concrete	D	1	Beige	0.1 mg/cm²	Action Level
22	Negative	1	Room	Wall	Concrete	D	2	Yellow	0.3 mg/cm²	Action Level
23	Negative	1	Door		Metal	D	1	Green	0.1 mg/cm²	Action Level
24	Negative	1	Door	Frame	Metal	D	1	Black	0.6 mg/cm²	Action Level

Lead Based Paint Inspection Detailed Report

Inspection Date: 4/7/2025 - 4/7/2025
Action Level: 1.0 (mg/cm²)
Report Number: 250204AA
Total Readings: 62
Unit Started: 04/07/2025 17:02:47
Unit Ended: 04/07/2025 18:50:47

Inspection Site: Yonkers Armory
2 Quincy Place
Yonkers, New York

Read #	Result	-->RoomChoice	Structure	-->Member	Substrate	Wall	Location	Color	Lead (mg/cm²)	Mode
25	Negative	2	Room	Wall	Concrete	A	1	Beige	0.4 mg/cm²	Action Level
26	Negative	2	Room	Wall	Concrete	A	2	Yellow	0.1 mg/cm²	Action Level
27	Negative	2	Room	Wall	Concrete	C	1	Beige	0.3 mg/cm²	Action Level
28	Negative	2	Room	Wall	Concrete	C	2	Yellow	0.2 mg/cm²	Action Level
29	Negative	2	Door		Metal	D	1	Red	0.2 mg/cm²	Action Level
30	Negative	2	Door	Frame	Metal	D	1	Black	0.6 mg/cm²	Action Level
31	Negative	3	Room	Wall	Concrete	A	1	Beige	0.5 mg/cm²	Action Level
32	Negative	3	Room	Wall	Concrete	B	1	Beige	0.1 mg/cm²	Action Level
33	Negative	3	Room	Wall	Concrete	C	1	Beige	0.1 mg/cm²	Action Level
34	Negative	3	Room	Wall	Concrete	D	1	Beige	0.0 mg/cm²	Action Level
35	Negative	4	Room	Wall	Concrete	A	1	Beige	0.2 mg/cm²	Action Level
36	Negative	4	Room	Wall	Concrete	B	1	Beige	0.1 mg/cm²	Action Level
37	Negative	4	Room	Wall	Concrete	C	1	Beige	0.2 mg/cm²	Action Level
38	Negative	4	Room	Wall	Concrete	D	1	Beige	0.2 mg/cm²	Action Level
39	Negative	4	Door		Metal	D	1	Red	0.1 mg/cm²	Action Level
40	Negative	4	Door	Frame	Metal	D	1	Black	0.6 mg/cm²	Action Level
41	Negative	4	Room	Ceiling	Drywall	D	1	White	0.1 mg/cm²	Action Level
42	Negative	4	Room	Floor	Concrete	D	1	Gray	0.4 mg/cm²	Action Level

Lead Based Paint Inspection Detailed Report

Inspection Date:	4/7/2025 - 4/7/2025	Inspection Site:	Yonkers Armory 2 Quincy Place Yonkers, New York
Action Level:	1.0 (mg/cm²)		
Report Number:	250204AA		
Total Readings:	62		
Unit Started:	04/07/2025 17:02:47		
Unit Ended:	04/07/2025 18:50:47		

Read #	Result	-->RoomChoice	Structure	-->Member	Substrate	Wall	Location	Color	Lead (mg/cm²)	Mode
43	Negative	5	Room	Floor	Concrete	A	1	Tan	0.4 mg/cm²	Action Level
44	Positive	5	Room	Wall	Ceramic	A	1	White	1.8 mg/cm²	Action Level
45	Positive	5	Room	Wall	Ceramic	B	1	White	2.0 mg/cm²	Action Level
46	Positive	5	Room	Wall	Ceramic	C	1	White	1.9 mg/cm²	Action Level
47	Positive	5	Room	Wall	Ceramic	D	1	White	1.9 mg/cm²	Action Level
48	Negative	5	Room	Ceiling	Drywall	D	1	Tan	0.1 mg/cm²	Action Level
49	Negative	6	Room	Wall	Concrete	A	1	Beige	0.3 mg/cm²	Action Level
50	Negative	6	Room	Wall	Concrete	B	1	Beige	0.3 mg/cm²	Action Level
51	Negative	6	Room	Wall	Concrete	C	1	Beige	0.3 mg/cm²	Action Level
52	Negative	6	Room	Wall	Concrete	D	1	Beige	0.2 mg/cm²	Action Level
53	Negative	6	Room	Floor	Concrete	D	1	Tan	0.5 mg/cm²	Action Level
54	Negative	6	Room	Ceiling	Drywall	D	1	Beige	0.1 mg/cm²	Action Level
55	Negative	6	Bar Joist		Metal	A	1	Red	0.1 mg/cm²	Action Level
56	Negative	7	Room	Wall	Concrete	A	1	Beige	0.3 mg/cm²	Action Level
57	Negative	7	Room	Wall	Concrete	B	1	Beige	0.4 mg/cm²	Action Level
58	Negative	7	Room	Wall	Concrete	C	1	Beige	0.2 mg/cm²	Action Level
59	Negative	7	Room	Wall	Concrete	D	1	Beige	0.2 mg/cm²	Action Level
60	Negative	8 Exterior	Door		Metal	A	1	Green	0.1 mg/cm²	Action Level

Lead Based Paint Inspection Detailed Report

Inspection Date: 4/7/2025 - 4/7/2025
Action Level: 1.0 (mg/cm²)
Report Number: 250204AA
Total Readings: 62
Unit Started: 04/07/2025 17:02:47
Unit Ended: 04/07/2025 18:50:47

Inspection Site: Yonkers Armory
2 Quincy Place
Yonkers, New York

Read #	Result	-->RoomChoice	Structure	-->Member	Substrate	Wall	Location	Color	Lead (mg/cm²)	Mode
61	Negative	8 Exterior	Door	Frame	Metal	A	1	Green	0.1 mg/cm²	Action Level
62	Negative	8 Exterior	Window	Sash	Metal	A	1	Green	0.2 mg/cm²	Action Level
63	Negative	8 Exterior	Door		Metal	B	1	Green	0.1 mg/cm²	Action Level
64	Negative	8 Exterior	Door	Frame	Metal	B	1	Green	0.2 mg/cm²	Action Level
65	Negative	8 Exterior	Door	Frame	Metal	C	1	Green	0.6 mg/cm²	Action Level
66	Negative	8 Exterior	Door	---	Metal	C	1	Gray	0.1 mg/cm²	Action Level
67	Negative	8 Exterior	Door	---	Metal	C	2	Green	0.2 mg/cm²	Action Level
68	Negative	8 Exterior	Door	Frame	Metal	C	2	Green	0.5 mg/cm²	Action Level

------ END OF READINGS ------

ATTACHMENT C

PCB RESULTS AND LABORATORY ANALYSIS REPORT WITH CHAIN OF CUSTODY DOCUMENTATION

BELL & SPINA ARCHITECTS
YONKERS ARMORY
127 N BROADWAY, YONKERS, NY 10701
SUMMARY OF PCB SAMPLES AND ANALYSIS RESULTS

Material Description	Sample Number	Total PCB (PPM)	Sample Location
White Expansion Joint Caulk -	PCB-01	<.729	Room 127
White Caulk	PCB-02	<1.390	Window Frame to CMU Wall - Room 127
Black Window Glazing	PCB-03	<10.900	Room 127
Gray Sidewalk Caulk	PCB-04	<.477	Exterior

Analysis Report

Schneider Laboratories Global, Inc

2512 W. Cary Street • Richmond, Virginia • 23220-5117
804-353-6778 • 800-785-LABS (5227) • Fax 804-359-1475

Customer: Ambient Environmentals LLC. (3639)
Address: 828 Washington Ave
Albany, NY 12203-1622

Attn:

Project: Inspection Yonkers Armory
Location: 127 N. Broadway Yonkers, NY
Number: 250204AA

Order #: 615306

Matrix Bulk
Received 04/09/25
Reported 04/14/25

PO Number:

Sample ID / Parameter	Cust. Sample ID / Method	Result	RL*	Units	Analysis Date	Analyst
615306-001	PCB-01 — White Exp Joint Caulk					
Semi-volatile Organic Compounds						
Aroclor - 1016	SW846 8082A / 3550C	**<663**	663	µg/kg	04/11/25	KM
Aroclor - 1221	SW846 8082A / 3550C	**<663**	663	µg/kg	04/11/25	KM
Aroclor - 1232	SW846 8082A / 3550C	**<663**	663	µg/kg	04/11/25	KM
Aroclor - 1242	SW846 8082A / 3550C	**<663**	663	µg/kg	04/11/25	KM
Aroclor - 1248	SW846 8082A / 3550C	**<663**	663	µg/kg	04/11/25	KM
Aroclor - 1254	SW846 8082A / 3550C	**<729**	729	µg/kg	04/11/25	KM
Aroclor - 1260	SW846 8082A / 3550C	**<663**	663	µg/kg	04/11/25	KM
Aroclor - 1262	SW846 8082A / 3550C	**<663**	663	µg/kg	04/11/25	KM
Aroclor - 1268	SW846 8082A / 3550C	**<663**	663	µg/kg	04/11/25	KM
615306-002	PCB-02 — White Caulk Window Frame					
Semi-volatile Organic Compounds						
Aroclor - 1016	SW846 8082A / 3550C	**<1260**	1260	µg/kg	04/11/25	KM
Aroclor - 1221	SW846 8082A / 3550C	**<1260**	1260	µg/kg	04/11/25	KM
Aroclor - 1232	SW846 8082A / 3550C	**<1260**	1260	µg/kg	04/11/25	KM
Aroclor - 1242	SW846 8082A / 3550C	**<1260**	1260	µg/kg	04/11/25	KM
Aroclor - 1248	SW846 8082A / 3550C	**<1260**	1260	µg/kg	04/11/25	KM
Aroclor - 1254	SW846 8082A / 3550C	**<1390**	1380	µg/kg	04/11/25	KM
Aroclor - 1260	SW846 8082A / 3550C	**<1260**	1260	µg/kg	04/11/25	KM
Aroclor - 1262	SW846 8082A / 3550C	**<1260**	1260	µg/kg	04/11/25	KM
Aroclor - 1268	SW846 8082A / 3550C	**<1260**	1260	µg/kg	04/11/25	KM
615306-003	PCB-03 — Black Window Glazing					
Semi-volatile Organic Compounds						
Aroclor - 1016	SW846 8082A / 3550C	**<9850**	9850	µg/kg	04/11/25	KM
Aroclor - 1221	SW846 8082A / 3550C	**<9850**	9850	µg/kg	04/11/25	KM
Aroclor - 1232	SW846 8082A / 3550C	**<9850**	9850	µg/kg	04/11/25	KM
Aroclor - 1242	SW846 8082A / 3550C	**<9850**	9850	µg/kg	04/11/25	KM

All internal QC parameters were met. Unusual sample conditions, if any, are described. Surrogate Spike results designated with "D" indicate that the analyte was diluted out. "MI" indicates matrix interference. Concentration and *Reporting Limit (RL) based on areas provided by client. Values are reported to three significant figures. Solid PPM = mg/kg | PPB = µg/kg and Water PPM = mg/L | PPB = µg/L. The test results apply to the sample as received.

Analysis Report

Schneider Laboratories Global, Inc

2512 W. Cary Street • Richmond, Virginia • 23220-5117
804-353-6778 • 800-785-LABS (5227) • Fax 804-359-1475

Customer: Ambient Environmentals LLC. (3639)
Address: 828 Washington Ave
Albany, NY 12203-1622

Attn:

Project: Inspection Yonkers Armory
Location: 127 N. Broadway Yonkers, NY
Number: 250204AA

Order #: 615306

Matrix Bulk
Received 04/09/25
Reported 04/14/25

PO Number:

Sample ID / Parameter	Cust. Sample ID / Method	Location / Result	RL*	Units	Analysis Date	Analyst
615306-003	PCB-03	Black Window Glazing				
Aroclor - 1248	SW846 8082A / 3550C	**<9850**	9850	µg/kg	04/11/25	KM
Aroclor - 1254	SW846 8082A / 3550C	**<10900**	10800	µg/kg	04/11/25	KM
Aroclor - 1260	SW846 8082A / 3550C	**<9850**	9850	µg/kg	04/11/25	KM
Aroclor - 1262	SW846 8082A / 3550C	**<9850**	9850	µg/kg	04/11/25	KM
Aroclor - 1268	SW846 8082A / 3550C	**<9850**	9850	µg/kg	04/11/25	KM
615306-004	PCB-04	Gray Sidewalk Caulk				
Semi-volatile Organic Compounds						
Aroclor - 1016	SW846 8082A / 3550C	**<434**	434	µg/kg	04/11/25	KM
Aroclor - 1221	SW846 8082A / 3550C	**<434**	434	µg/kg	04/11/25	KM
Aroclor - 1232	SW846 8082A / 3550C	**<434**	434	µg/kg	04/11/25	KM
Aroclor - 1242	SW846 8082A / 3550C	**<434**	434	µg/kg	04/11/25	KM
Aroclor - 1248	SW846 8082A / 3550C	**<434**	434	µg/kg	04/11/25	KM
Aroclor - 1254	SW846 8082A / 3550C	**<477**	477	µg/kg	04/11/25	KM
Aroclor - 1260	SW846 8082A / 3550C	**<434**	434	µg/kg	04/11/25	KM
Aroclor - 1262	SW846 8082A / 3550C	**<434**	434	µg/kg	04/11/25	KM
Aroclor - 1268	SW846 8082A / 3550C	**<434**	434	µg/kg	04/11/25	KM

All internal QC parameters were met. Unusual sample conditions, if any, are described. Surrogate Spike results designated with "D" indicate that the analyte was diluted out. "MI" indicates matrix interference. Concentration and *Reporting Limit (RL) based on areas provided by client. Values are reported to three significant figures. Solid PPM = mg/kg | PPB = µg/kg and Water PPM = mg/L | PPB = µg/L. The test results apply to the sample as received.

Analysis Report

Schneider Laboratories Global, Inc

2512 W. Cary Street • Richmond, Virginia • 23220-5117
804-353-6778 • 800-785-LABS (5227) • Fax 804-359-1475

Customer: Ambient Environmentals LLC. (3639)
Address: 828 Washington Ave
Albany, NY 12203-1622

Attn:

Project: Inspection Yonkers Armory
Location: 127 N. Broadway Yonkers, NY
Number: 250204AA

Order #: 615306

Matrix Bulk
Received 04/09/25
Reported 04/14/25

PO Number:

Sample ID / Parameter	Cust. Sample ID / Method	Result	RL*	Units	Analysis Date	Analyst

615306-04/14/25 03:23 PM

Kelly Muncy

Reviewed By: **Kelly Muncy**
Manager

Surrogate Recoveries

615306-001 - PCB	
DCB	84%
TCMX	153%
615306-002 - PCB	
DCB	136%
TCMX	MI
615306-003 - PCB	
DCB	MI
TCMX	MI
615306-004 - PCB	
DCB	98%
TCMX	125%

All internal QC parameters were met. Unusual sample conditions, if any, are described. Surrogate Spike results designated with "D" indicate that the analyte was diluted out. "MI" indicates matrix interference. Concentration and *Reporting Limit (RL) based on areas provided by client. Values are reported to three significant figures. Solid PPM = mg/kg | PPB = µg/kg and Water PPM = mg/L | PPB = µg/L. The test results apply to the sample as received.

Analysis Report

Schneider Laboratories Global, Inc

2512 W. Cary Street • Richmond, Virginia • 23220-5117
804-353-6778 • 800-785-LABS (5227) • Fax 804-359-1475

Customer: Ambient Environmentals LLC. (3639)
Address: 828 Washington Ave
Albany, NY 12203-1622

Attn:

Project: Inspection Yonkers Armory
Location: 127 N. Broadway Yonkers, NY
Number: 250204AA

Order #: 615306

Matrix Bulk
Received 04/09/25
Reported 04/14/25

PO Number:

Sample ID	Cust. Sample ID	Location					
Parameter		Method	Result	RL*	Units	Analysis Date	Analyst

State Certifications

Method	Parameter	New York	Virginia
SW846 8082A	Aroclor - 1016	ELAP Certified	VELAP Certified
SW846 8082A	Aroclor - 1221	ELAP Certified	VELAP Certified
SW846 8082A	Aroclor - 1232	ELAP Certified	VELAP Certified
SW846 8082A	Aroclor - 1242	ELAP Certified	VELAP Certified
SW846 8082A	Aroclor - 1248	ELAP Certified	VELAP Certified
SW846 8082A	Aroclor - 1254	ELAP Certified	VELAP Certified
SW846 8082A	Aroclor - 1260	ELAP Certified	VELAP Certified
SW846 8082A	Aroclor - 1262	ELAP Certified	VELAP Certified
SW846 8082A	Aroclor - 1268	ELAP Certified	VELAP Certified

State	Certificate Number
New York	ELAP 69247
Virginia	VELAP 12761

All internal QC parameters were met. Unusual sample conditions, if any, are described. Surrogate Spike results designated with "D" indicate that the analyte was diluted out. "MI" indicates matrix interference. Concentration and *Reporting Limit (RL) based on areas provided by client. Values are reported to three significant figures. Solid PPM = mg/kg | PPB = µg/kg and Water PPM = mg/L | PPB = µg/L. The test results apply to the sample as received.

SCHNEIDER LABORATORIES GLOBAL, INC.
2512 West Cary Street, Richmond, Virginia 23220-5117
804-353-6778 • 800-785-LABS (5227) • Fax 804-359-1475
www.slabinc.com • info@slabinc.com

615306

V:\615\615306

aelnasseh 4/9/2025 10:14:04 AM
Federal Express 818593510503

Submitting Co.	Ambient Environmental, Inc.	**State of Collection**	NY	**Cert. Required**	☐ YES ☐ NO
828 Washington Avenue		**Acct #**	3639	**Phone**	518-482-0704
Albany, New York 12203		**Email**	Results@ambient-env.com		
Project Name	Inspection Yonkers Armory	**PO #**			
Project Location	127 N. Broadway, Yonkers, NY 10701	**Special Instructions**			
Project Number	250204AA				
Collected By	Peter Minotti & Kevin Jones				

Turn Around Time **

- ☐ Same day *
- ☐ 1 business day
- ☐ 2 business days
- ☐ 3 business days
- ☒ 5 business days

* not available for all tests

** A job received past 3 PM will begin its TAT the next business day

Please schedule rush tests in advance

Matrix

- ☐ Paint
- ☒ Bulk
- ☐ Soil
- ☐ Wipe
- ☐ Ground Water
- ☐ Waste Water

Test selection for all Samples listed below (Circle desired method)

- ☐ VOC (8260/624) ☐ SVOC (8270/625)
- ☐ Pesticides (8081/608) ☐ Herbicides (8151)
- ☐ Chlordane (8081/608) ☐ Toxaphene (8081/608)
- ☒ PCB (8082) ☐ TPH-DRO (8015) ☐ TPH-GRO (8015)
- ☐ BTEX (8260/8021) ☐ MTBE (8260/8021) ☐ Naphthalene (8260/8270)

TCLP

- ☐ Volatiles
- ☐ Semi-Volatiles
- ☐ Herbicides
- ☐ Pesticides
- ☐ Full TCLP (10 Day)

Miscellaneous

- ☐ Chlorides (300/9056) ☐ Silica (7602)
- ☐ Sulfates (300/9056) ☐ PAH (8270/625)
- ☐ Oil and Grease (1664) ☐ TPH (EPA 418.1)

Individual Sample Requests

Sample #	Date Sampled	Time Sampled	# of Containers	Sample Identification	Wipe Area
PCB-01	4/7/2025			White Expansion Joint Caulk - Room 127	
PCB-02	4/7/2025			White Caulk Window Frame to CMU Wall - Room 127	
PCB-03	4/7/2025			Black Window Glazing - Room 127	
PCB-04	4/7/2025			Gray Sidewalk Caulk - Exterior	

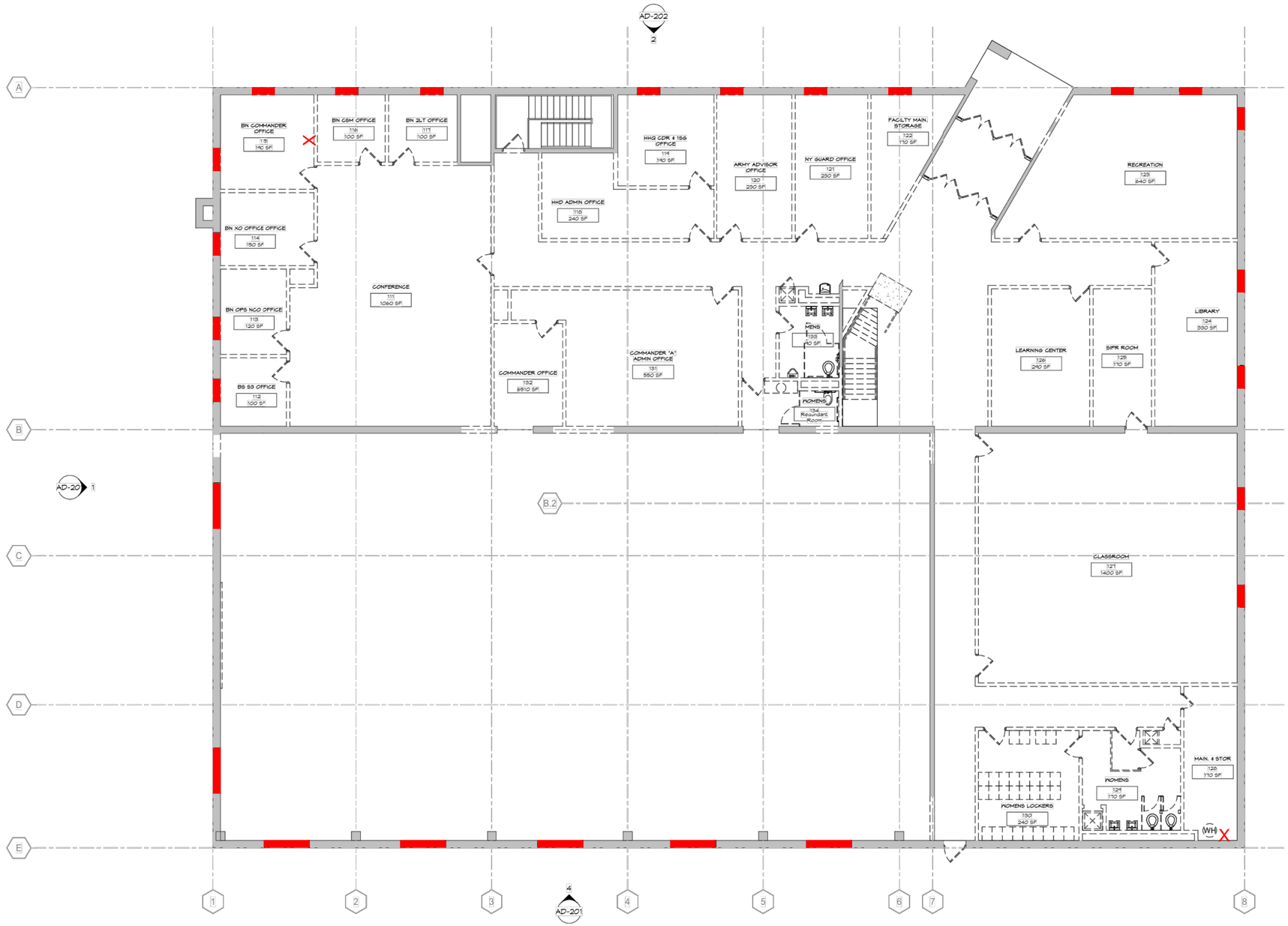
For Aqueous and Solid samples ensure enough sample is sent for duplicate and spike analyses

Relinquished By: Peter Minotti Signature: Peter Minotti Date/Time 4/8/25 15:00

! ALL SHADED FIELDS MUST BE FILLED TO AVOID DELAYS !

Chain-of-Custody documentation continued internally

ATTACHMENT D
HAZARDOUS MATERIAL LOCATION DRAWINGS



1 UPPER LEVEL REMOVALS PLAN

SCALE : 1/8" = 1'-0"

*PLEASE REFER TO THE ASSUMPTIONS AND LIMITATIONS SECTION OF REPORT

Ambient Environmental, Inc.
Building Science and EHS Solutions
828 Washington Avenue, Albany, NY 12203
PH: 518.482.0704 FAX:518.482.0750
www.ambient-env.com

LEGEND

- (009-01) BLACK WINDOW GLAZING
- X VERMICULITE PROBE LOCATION

REVISIONS

PROJECT LOCATION

NY NATIONAL GUARD ARMORY
2 QUINCY PLACE
YONKERS, NEW YORK

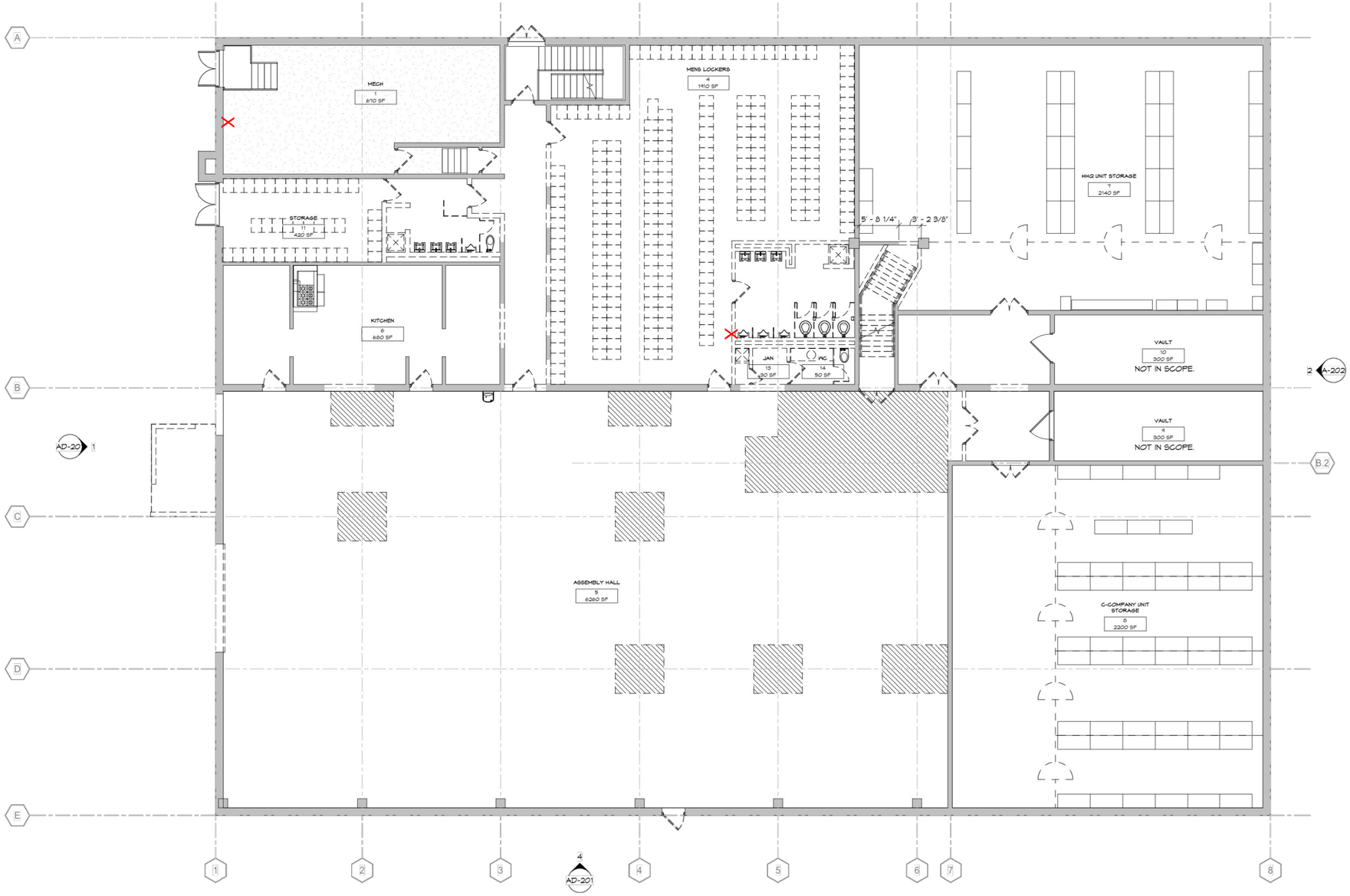
DRAWING TITLE

UPPER LEVEL MATERIALS LOCATION PLAN

DATE: 4/16/2025	SCALE: NTS
PROJECT NO.	250204AA
DRAWN BY	KAJ
CHECKED BY	CDW

DWG. NO.

ASB-200



1 LOWER LEVEL REMOVALS PLAN
SCALE : 1/8" = 1'-0"

*PLEASE REFER TO THE ASSUMPTIONS AND LIMITATIONS SECTION OF REPORT

Ambient Environmental, Inc.
Building Science and EHS Solutions
828 Washington Avenue, Albany, NY 12203
PH: 518.482.0704 FAX:518.482.0750
www.ambient-env.com

LEGEND

X VERMICULITE PROBE LOCATION

REVISIONS		

PROJECT LOCATION

NY NATIONAL GUARD
ARMORY
2 QUINCY PLACE
YONKERS, NEW YORK

DRAWING TITLE

LOWER LEVEL MATERIALS LOCATION PLAN

DATE: 4/16/2025	SCALE: NTS
PROJECT NO.	250204AA
DRAWN BY	KAJ
CHECKED BY	CDW

DWG. NO.
ASB-100

A

B

C

D



1 UPPER LEVEL REMOVALS PLAN

SCALE : 1/8" = 1'-0"

*PLEASE REFER TO THE ASSUMPTIONS AND LIMITATIONS SECTION OF REPORT

Ambient Environmental, Inc.
Building Science and EHS Solutions
828 Washington Avenue, Albany, NY 12203
PH: 518.482.0704 FAX:518.482.0750
www.ambient-env.com

LEGEND

X XRF ROOM NUMBER

X BUILDING SIDE

REVISIONS		

PROJECT LOCATION

NY NATIONAL GUARD ARMORY
2 QUINCY PLACE
YONKERS, NEW YORK

DRAWING TITLE

UPPER LEVEL LEAD BASED PAINT ROOM LOCATION PLAN

DATE: 4/16/2025	SCALE: NTS
PROJECT NO.	250204AA
DRAWN BY	KAJ
CHECKED BY	CDW

DWG. NO.

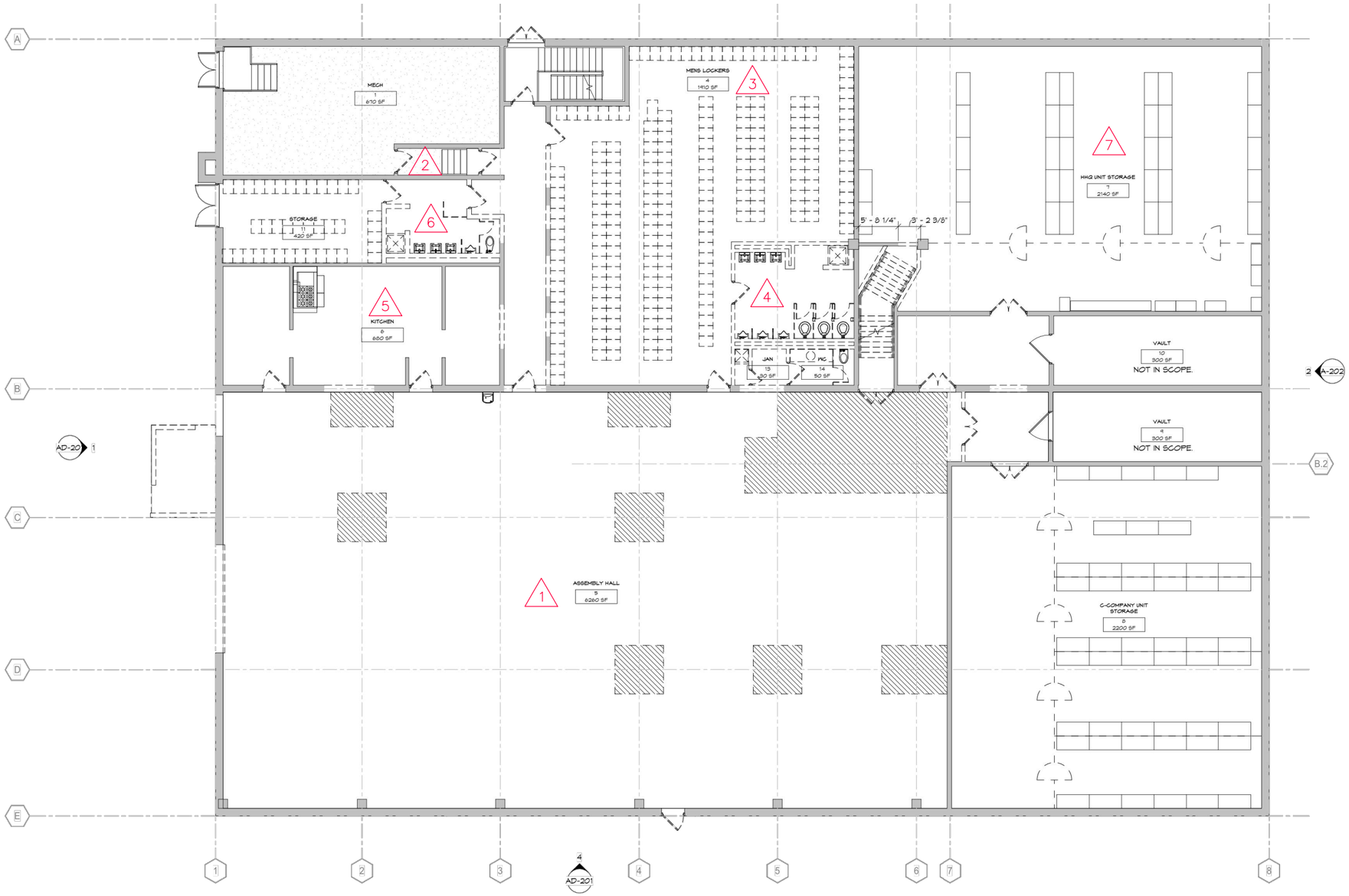
PB-200

A

B

C

D



1 LOWER LEVEL REMOVALS PLAN
SCALE : 1/8" = 1'-0"

*PLEASE REFER TO THE ASSUMPTIONS AND LIMITATIONS SECTION OF REPORT

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Building Science and EHS Solutions
828 Washington Avenue, Albany, NY 12203
PH: 518.482.0704 FAX:518.482.0750
www.ambient-env.com

LEGEND

X XRF ROOM NUMBER

X BUILDING SIDE

REVISIONS		

PROJECT LOCATION

NY NATIONAL GUARD
ARMORY
2 QUINCY PLACE
YONKERS, NEW YORK

DRAWING TITLE

LOWER LEVEL LEAD BASED PAINT ROOM LOCATION PLAN

DATE: 4/16/2025	SCALE: NTS
PROJECT NO.	250204AA
DRAWN BY	KAJ
CHECKED BY	CDW

DWG. NO.

PB-100

ATTACHMENT E
PHOTOGRAPHIC DOCUMENTATION

Ambient Environmental, Inc.
Building Science and EHS Solutions
NYS Certified WBE,
SBA EDWOSB & DBE

PHOTO LOG

Ambient Project #250204AA
Hazmat Inspection
NY National Guard Armory
2 Quincy Place, Yonkers, NY
December 27, 2019



Photograph 1 – 009-01 Black Window Glazing

ATTACHMENT F

COMPANY, INSPECTOR AND LABORATORY ACCREDITATION AND LICENSES

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

Ambient Environmental, Inc.
828 Washington Avenue, Albany, NY, 12203

License Number: 29608
License Class: RESTRICTED
Date of Issue: 06/17/2024
Expiration Date: 07/31/2025
Duly Authorized Representative: Joella Viscusi

This license has been issued in accordance with applicable provisions of Article 30 of the Labor Law of New York State and of the New York State Codes, Rules and Regulations (12 NYCRR Part 56). It is subject to suspension or revocation for a (1) serious violation of state, federal or local laws with regard to the conduct of an asbestos project, or (2) demonstrated lack of responsibility in the conduct of any job involving asbestos or asbestos material.

This license is valid only for the contractor named above and this license or a photocopy must be prominently displayed at the asbestos project worksite. This license verifies that all persons employed by the licensee on an asbestos project in New York State have been issued an Asbestos Certificate, appropriate for the type of work they perform, by the New York State Department of Labor.



Amy Phillips, Director
For the Commissioner of Labor

United States Environmental Protection Agency

This is to certify that

Ambient Environmental, Inc.

has fulfilled the requirements of the Toxic Substances Control Act (TSCA) Section 402, and has received certification to conduct lead-based paint activities pursuant to 40 CFR Part 745.226

In the Jurisdiction of:

All EPA Administered Lead-based Paint Activities Program States, Tribes and Territories

This certification is valid from the date of issuance and expires May 12, 2026

LBP-16658-3

Certification #

December 12, 2022

Issued On

Michelle Price, Chief

Lead, Heavy Metals, and Inorganics Branch

NEW YORK STATE

MINORITY- AND WOMEN-OWNED BUSINESS ENTERPRISE ("MWBE")

CERTIFICATION

Empire State Development's Division of Minority and Women's Business Development grants a

Women Business Enterprise (WBE)

pursuant to New York State Executive Law, Article 15-A to:

Ambient Environmental, Inc.

Certification Awarded on: January 30, 2020
Expiration Date: January 30, 2025
File ID#: 50943

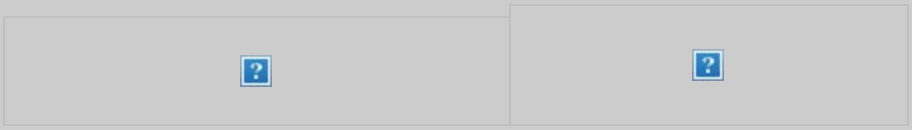
NEW YORK STATE OF OPPORTUNITY. Division of Minority and Women's Business Development

A Division of Empire State Development

From: Joella Viscusi
To: Michelle Bissonette
Cc: Christina Agans
Subject: RE: NYS: Application Review In Process
Date: Friday, January 10, 2025 9:32:33 AM
Attachments: image002.jpg
image003.jpg
image004.jpg

Thank you Michelle, please print this out and keep it in case we need to send to clients to prove we are still certified while we wait. Thank you.

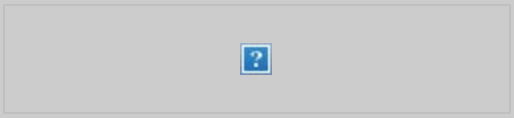
Joella Viscusi
President
828 Washington Ave.
Albany, NY 12203
Ph. 518-482-0704 | Cell 518-859-5924
joellav@ambient-env.com



From: Michelle Bissonette <michelleb@ambient-env.com>
Sent: Friday, January 10, 2025 9:10 AM
To: New York State Contract System <ny@newnycontracts.com>
Subject: RE: NYS: Application Review In Process

Good morning;
Thank you so very much for the clarification. Have a great rest of your day.

Michelle



Michelle Bissonette
Finance Director
Ambient Environmental, Inc
828 Washington Avenue
Albany, NY 12203
518.482.0704
michelleb@ambient-env.com

www.ambient-env.com

From: New York State Contract System <ny@newnycontracts.com>
Sent: Friday, January 10, 2025 9:09 AM
To: Michelle Bissonette <michelleb@ambient-env.com>
Subject: RE: NYS: Application Review In Process



RE: NYS: Application Review In Process

Good morning,

Your recertification application is under review with an analyst. Your certification will remain in effect.

Thank you for contacting us,
Olga Candelaria

> Good afternoon;
> I do have one question relating to the review
> process timing and the expiration of our WBE
> Certification.
> Is our certification still in effect during the
> review process time period, if that time is beyond
> 1/30/2025 (our certification expiration date)?
>
> Thank you
>
> Michelle
>
> [AmbientLogo2018]
>
>
> Michelle Bissonette
> Finance Director
> Ambient Environmental, Inc
> 828 Washington Avenue
> Albany, NY 12203
> 518.482.0704
> michelleb@ambient-env.com
> www.ambient-env.com
>
>
> From: New York State Contract System
>
> Sent: Monday, January 6, 2025 10:47 AM

> To: Michelle Bissonette
>
> Subject: NYS: Application Review In Process
>
> [Image removed by
> sender.]
> Certification Application Review In Process
>
> Applicant: Ambient Environmental, Inc.
> Certifying Agency: New York State
> Application Type: Recertification Application
> (NEW)
> Application Number: 4247524
> Contact: Michelle Bissonette
> Date Submitted: 1/3/2025
> Date Received: 1/6/2025
>
> Dear Michelle Bissonette,
>
> Your application received on 1/6/2025 has been
> assigned to a certification analyst and our review of your
> application will be completed in the next 90 to 120 days.
> During this time, we may contact you with questions about
> your application and/or requests for additional
> information and supporting documentation. The certification
> analyst assigned to review your application may also be in
> contact with you to schedule an on-site visit at your
> principal place of business, if required. Your prompt and
> complete responses to any questions we may ask will result
> in the most expeditious completion of your
> application. Failure to adequately respond to our questions in
> a timely manner may result in a determination that
> you have abandoned your application, which would
> require you to reapply after 90 days.
>
> To view your application, visit:
> https://ny.newnycontracts.com/?GO=677
> If you have any questions, please email us at
> ny@newnycontracts.com.
>
> New York State Contract System
> Web: https://ny.newnycontracts.com/
> Email:
> ny@newnycontracts.com
>
> NYS M/WBE Program: http://www.esd.ny.gov/MWBE.html
> This message was sent to: "Michelle Bissonette"
> Sent on: 1/6/2025 9:47:00 AM
> System ReferenceID: 255700689
>

Customer Support
https://ny.newnycontracts.com/
New York State New York State Contract System

Ticket Number: 2860366
#%#2860366%$%

This message was sent to: michelleb@ambient-env.com
Sent on: 1/10/2025 8:09:01 AM
System ReferenceID: 256246335

Certification: View

Help & Tools

Certification List | Add Date Alert

This record is from **New York State Department of Transportation**. It is not managed by New York State.

Vendor Information

BUSINESS NAME	**Ambient Environmental, Inc.**
SYSTEM VENDOR NUMBER	**20167029**
PRIMARY OWNER'S NAME	**Ms. Joella Viscusi**
ETHNIC GROUP	**Other Minority**
GENDER	**Female**

Certification Information

CERTIFYING AGENCY	**New York State Department of Transportation**
CERTIFICATION TYPE	**DBE - Disadvantaged Business Enterprise**
EFFECTIVE DATE	**3/27/2013**
RENEWAL DATE	**3/27/2026**

Contact Information

MAIN COMPANY EMAIL	**joellav@ambient-env.com**
MAIN PHONE	**518-482-0704**
MAIN FAX	**518-482-0750**
MAIN COMPANY WEBSITE	**http://www.ambient-env.com**

Addresses

PHYSICAL ADDRESS	**828 Washington Ave.** **Albany, NY 12203-1622 [map]**
MAILING ADDRESS	**828 Washington Ave.** **Albany, NY 12203-1622 [map]**

Business Capabilities

BUSINESS CERTIFIED FOR	**Environmental Services.**	
FULL DESCRIPTION OF CAPABILITIES/PRODUCTS	**Environmental Services.**	
COMMODITY CODES	**NAICS 541620**	**Environmental consulting services** (More)

Owner Ethnicity and Gender

ETHNIC GROUP	**Other Minority**
GENDER	**Female**

Location

COUNTY	**Albany (NY)**

Certification List

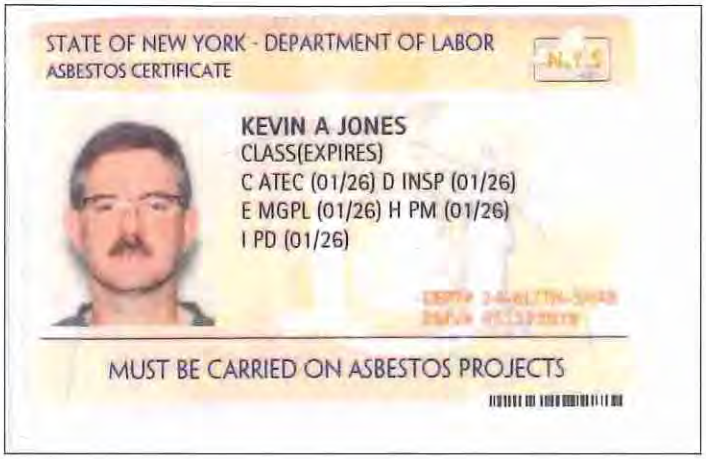
This profile was generated on 2/27/2025

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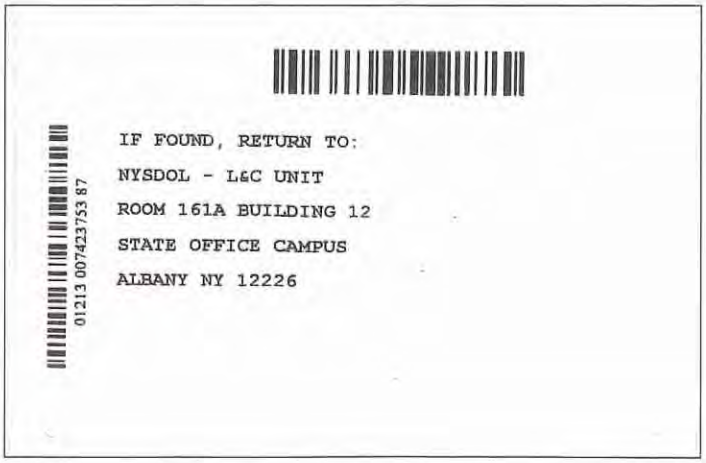
Ambient Environmental, Inc.
Building Science and EHS Solutions
NYS Certified WBE,
SBA EDWOSB & DBE

AMBIENT ENVIRONMENTAL, INC.
NEW YORK STATE DEPARTMENT OF LABOR
ASBESTOS LICENSE

Kevin Jones
Cert No. 24-6LTTH-SHAB
Front of License



Back of License



Codes:

A- Asbestos Handler
B- Restricted Handler
C- Project Air Sampling Technician
D- Inspector – R III
E- Management Planner
F- Operations and Maintenance
G- Supervisor
H- Project Monitor
I- Project Designer
J- Allied Trades

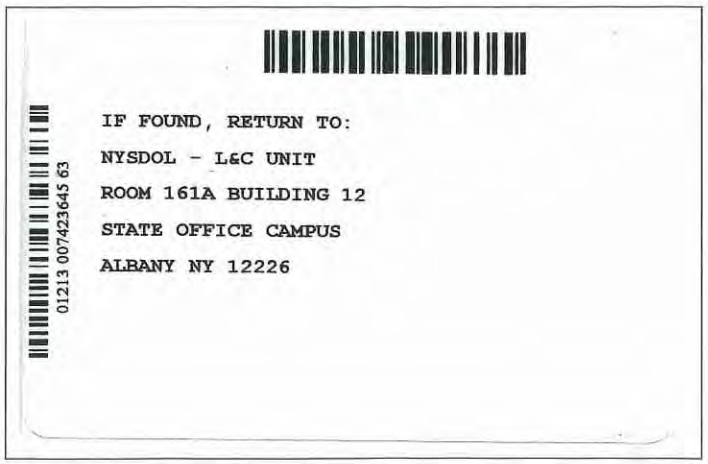
Ambient Environmental, Inc.
Building Science and EHS Solutions
NYS Certified WBE,
SBA EDWOSB & DBE

AMBIENT ENVIRONMENTAL, INC.
NEW YORK STATE DEPARTMENT OF LABOR
ASBESTOS LICENSE

Peter Minotti
Cert No. 2463H4K-SHAB
Front of License



Back of License



Codes:

A- Asbestos Handler
B- Restricted Handler
C- Project Air Sampling Technician
D- Inspector – R III
E- Management Planner
F- Operations and Maintenance
G- Supervisor
H- Project Monitor
I- Project Designer
J- Allied Trades

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

MS. KAROL H. LU
AMERICA SCIENCE TEAM NEW YORK, INC
117 EAST 30TH ST
NEW YORK, NY 10016

NY Lab Id No: 11480

is hereby APPROVED as an Environmental Laboratory for the category
ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE
All approved subcategories and/or analytes are listed below:

Miscellaneous

Asbestos in Friable Material	Item 198.1 of Manual
	EPA 600/M4/82/020
Asbestos in Non-Friable Material-PLM	Item 198.6 of Manual (NOB by PLM)
Asbestos in Non-Friable Material-TEM	Item 198.4 of Manual

Serial No.: 70488

Property of the New York State Department of Health. Certificates are valid only at the address shown and must be conspicuously posted by the laboratory. Continued accreditation depends on the laboratory's successful ongoing participation in the Program. Consumers may verify a laboratory's accreditation status online at https://apps.health.ny.gov/pubdoh/applinks/wc/elappublicweb/, by phone (518) 485-5570 or by email to elap@health.ny.gov.

NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER

Expires 12:01 AM April 01, 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

MR. FAYEZ ABOUZAKI
SCHNEIDER LABORATORIES GLOBAL, INC
2512 WEST CARY STREET
RICHMOND, VA 23220-5117

NY Lab Id No: 11413

is hereby APPROVED as an Environmental Laboratory in conformance with the National Environmental Laboratory Accreditation Conference Standards (2016) for the category ENVIRONMENTAL ANALYSES NON POTABLE WATER
All approved analytes are listed below:

Metals III

Cobalt, Total	EPA 6010D
Molybdenum, Total	EPA 6010D
Thallium, Total	EPA 6010D
Tin, Total	EPA 6010D
Titanium, Total	EPA 6010D

Nitroaromatics and Isophorone

2,4-Dinitrotoluene	EPA 8270D
Nitrobenzene	EPA 8270D

Polychlorinated Biphenyls

Aroclor 1016 (PCB-1016)	EPA 8082A
Aroclor 1221 (PCB-1221)	EPA 8082A
Aroclor 1232 (PCB-1232)	EPA 8082A
Aroclor 1242 (PCB-1242)	EPA 8082A
Aroclor 1248 (PCB-1248)	EPA 8082A
Aroclor 1254 (PCB-1254)	EPA 8082A
Aroclor 1260 (PCB-1260)	EPA 8082A
Aroclor 1262 (PCB-1262)	EPA 8082A
Aroclor 1268 (PCB-1268)	EPA 8082A

Polynuclear Aromatics

Acenaphthene	EPA 8270D
Anthracene	EPA 8270D
Benzo(a)anthracene	EPA 8270D
Benzo(a)pyrene	EPA 8270D
Benzo(b)fluoranthene	EPA 8270D
Benzo(g,h,i)perylene	EPA 8270D
Benzo(k)fluoranthene	EPA 8270D

Serial No.: 70458

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ATTACHMENT G

HISTORICAL DOCUMENTATION

Adelaide
ENVIRONMENTAL HEALTH

1511 Route 22, Suite C24
Brewster, NY 10509 845.278.7710
90 State Street, Suite 700
Albany, NY 12207 518.874.0617
1967 Wehrle Drive, Suite One
Buffalo, NY 14221 716.402.4580
E-mail: adelaidemail@adelaidellc.com
Fax: 845.278.7750

LIMITED SURVEY
FOR
ASBESTOS-CONTAINING MATERIALS, LEAD-BASED PAINT & PCBs

PERFORMED AT:

Yonkers Armory
2 Quincy Place
Yonkers, New York 10701
Adelaide Project# MACF:20060.00-IN
OGS Project# 46166

PREPARED FOR:

Mr. John Miranowski
McFarland-Johnson, Inc.
49 Court Street, P.O. Box 1980
Binghamton, New York 13901

PREPARED BY:
Philip J. Page
August 18, 2020

REVIEWED BY:



Stephanie A. Soter
President

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APPENDICES

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1.0 Introduction

1.1 Scope of Work / Project Personnel

Adelaide Environmental Health Associates, Inc. **(Adelaide)** performed an Asbestos, Lead and PCB Survey for Building/Structure Demolition, Renovation, Remodeling and/or Repair, in conformance with ALL Federal, State and Local regulations, on August 12, 2020 for McFarland-Johnson, Inc. The survey is related to New York State Office of General Services (OGS) project# 46166 to replace the boiler and HVAC equipment. The survey included a visual inspection/assessment for hazardous materials throughout accessible interior and/or exterior spaces of the building/structure or portion thereof identified to be demolished, renovated, remodeled or repaired. Certified **Adelaide** personnel (Appendix D), Philip J. Page (NYS Asbestos Inspector/Cert. #12-10888 and EPA Lead-based Paint Inspector/Cert. #LBP-I-I172697-1), performed the visual assessment throughout inspection area(s) identified.

1.2 Executive Summary

On August 12, 2020, **Adelaide** inspected the boiler room, gym, roof and various control valve locations throughout that will be affected by the proposed scope of work for suspect ACM, LBP and PCBs. **Adelaide** collected fourteen (14) suspect asbestos samples/layers, twenty three (23) XRF readings [calibrations included] and zero (0) suspect PCB samples from the above-mentioned area(s). Zero (0) samples/homogenous areas tested positive for asbestos and two (2) XRF readings tested positive for lead-based paint. No suspect PCB-containing materials were observed to be impacted by the above-mentioned scope of work.

1.2.1 Conclusions and Recommendations

The following conclusions and recommendations are prepared by **Adelaide** as per the provided scope of work for Building/Structure Demolition, Renovation, Remodeling and/or Repair. Should the scope of work change, it is recommended that the findings be revisited to determine if additional sampling will be required to satisfy ALL Federal, State and Local regulations.

1.2.2 Asbestos-containing Materials (ACM)

- This survey concluded that the materials listed in Section 2.2 tested ***negative for asbestos***.

1.2.3 Lead-based Paint (LBP)

- This survey concluded that the materials listed in Section 2.3 tested ***positive for lead-based paint.***
- These areas must be either abated or Lead safe work practices must be implemented during the demolition, renovation, remodeling, or repair activities if these areas are to be disturbed.

1.2.4 PolyChlorinated Biphenyls (PCB)

- This survey concluded that no suspect PCB-containing materials were observed to be impacted by the above-mentioned scope of work.

2.0 Summary of Hazardous Materials

2.1 Summary of Identified ACM/PACM

KEY: **ACM** = Materials containing greater than 1% of asbestos; **HA** = Homogeneous Area; **LF** = Linear Feet; **SF** = Square Feet; **PACM** = Presumed Asbestos-containing Materials; **Friable** = ACM capable of being released into air, and which can be crumbled, pulverized, powdered, crushed or exposed by hand-pressure.

Samples collected by **Adelaide** August 12, 2020

HA	Identified ACM	ACM Location(s)	Approx. Qty.	Condition	Friable? (Yes or No)
NO Asbestos-containing Materials (ACM) identified upon PLM, PLM-NOB, QTEM and/or PLM-SM-V analysis, by a laboratory approved under the NYSDOH ELAP, of samples collected/analyzed in reference to the above-mentioned scope of work.					

2.2 Summary of Identified Non-ACM

Samples collected by **Adelaide** August 12, 2020

Identified Non-ACM	Sample Location(s) & HA's
Sheetrock & Joint Compound	Boiler Room Ceiling
Mudded Fittings	Boiler Room, Breeching
Tar (top layer)	Boiler Room, Boiler Sections
Rope Gasket (bottom layer)	
Canvas Wrap (ductwork)	Throughout

2.3 Summary of Identified LBP

Based on review of the data generated by the Thermo Scientific Niton XLp 300A and/or Heuresis Corp. Pb200i Analyzer, the following surfaces tested were identified as lead-based, as defined by HUD/EPA (equal to or in excess of 1.0 milligram per square centimeter):

Readings collected by **Adelaide** August 12, 2020

Location of LBP	LBP Component	Substrate	Color	Condition	Readings (mg/cm2)
Boiler Room	Orange Piping	Metal	Orange	Fair	*1.5 – 1.6*

2.4 Summary of Identified PCB-containing Materials

Inspection performed by **Adelaide** August 12, 2020

Sample #	Location / Description	Material Matrix	Color	Substrate	Analytical Result
NO suspect PCB-containing materials were observed to be impacted by the above-mentioned scope of work.					

2.5 Observations

ASBESTOS-CONTAINING MATERIALS (ACM)
A visual inspection was performed and homogeneous material types were established based on appearance, color and texture. The findings presented in this report are based upon reasonably available information and observed site conditions at the time the assessment was performed. The findings and conclusions of this report are not meant to be indicative of future conditions at the site and does not warrant against conditions that were not evident from visual observations or historical information obtained from others.

Representative bulk sampling was performed on suspect building materials for laboratory analysis and the following is a summary of installed building materials sampled as per the scope of work provided:

- Ceiling Materials – Sheetrock, Joint Compound.
- Thermal System Insulation (TSI) – Mudded Fittings, Canvas Wrap over Fiberglass, Rope Gasket & Tar on Boiler.
- Non-suspect Materials (not sampled) – Fiberglass Insulation, Silicone, Wood, Glass, Metal.

3.0 Asbestos-containing Materials (ACM)

3.1 Field Procedures and Analysis Methodology

Guidelines used for the inspection were established by the U.S. Environmental Protection Agency (EPA) in the Guidance for Controlling Asbestos Containing Materials in Buildings, Office of Pesticides and Toxic Substances, DOC# 560/5-85-024 and 40 CFR Part 763, Asbestos Hazard Emergency Response Act (AHERA) and Title 12 NYCRR Part 56-5.1. Field information was organized as per the AHERA concept of a homogeneous area (HA); that is, suspect Asbestos-containing Materials (ACM) with similar age, appearance, and texture were grouped together, sampled and assessed for condition.

For the purposes of this inspection, suspect ACM has been placed in three material categories: thermal, surfacing, and miscellaneous. 1) Surfacing materials are those that are sprayed on, troweled on or otherwise applied to surfaces for fireproofing, acoustical, or decorative purposes (e.g., wall and ceiling plaster). 2) Thermal materials are those applied to heat pipes or other structural components to prevent heat loss or gain or prevent water condensation (e.g., pipe and fitting insulation, duct insulation, boiler flue). 3) Miscellaneous materials are interior building materials on structural components, structural members or fixtures, such as floor and ceiling tiles, etc. and do not include surfacing material or thermal system insulation.

SURFACING MATERIALS
Surfacing materials were grouped into homogeneous sampling areas. A homogeneous area contains material that is uniform in color and texture and appears identical in every other respect. Materials installed at different times belong to different sampling areas. Homogeneous areas were determined on per floor basis.

The following protocol was used for determining the number of samples to be collected:

- At least three bulk samples were collected from each homogeneous area that is 1,000 square feet or less.
- At least five bulk samples were collected from each homogeneous area that is greater than 1,000 square feet but less than or equal to 5,000 square feet.
- At least seven bulk samples were collected from each homogeneous area that is greater than 5,000 square feet.

THERMAL SYSTEM INSULATION (TSI)

The concept of homogeneous sampling areas applies equally well to thermal insulation as to surfacing material. A "typical" building may contain multiple insulated pipe runs from any combination of the following categories:

- Hot water supply and/or return
- Cold water supply
- Chilled water supply
- Steam supply and/or return
- Roof or system drain

The following protocol was used for determining the number of samples to be collected.

- Collect at least three bulk samples from each homogeneous area of thermal system insulation.
- Collect at least one bulk sample from each homogeneous area of patched thermal system insulation if the patched section is less than 6 linear or square feet.
- In a manner sufficient to determine whether the material is ACM or not ACM, collect a minimum of three bulk samples from each homogeneous insulated mechanical system tee, elbow, and valve.

Bulk samples are not collected from any homogeneous area where the certified inspector has determined that the thermal system insulation is fiberglass, foam glass, or rubber.

MISCELLANEOUS MATERIALS

Miscellaneous materials are grouped into different homogeneous areas and at least two bulk samples are collected from each homogeneous area as per the clarification letter from the EPA and the Professional Abatement Contractors of New York, Inc in November of 2007.

Samples collected were analyzed by a laboratory approved under the New York State Department of Health Environmental Laboratory Approval Program (NYSDOH ELAP). Samples were analyzed in the laboratory by Polarized Light Microscopy (PLM), Polarized Light Microscopy-NOB (PLM-NOB) and/or Quantitative Transmission Electron Microscopy (QTEM), as required. Sample collection and laboratory analysis were conducted in compliance with the requirements of Title 12 NYCRR Part 56-5.1, 29 CFR 1926.1101 and standard EPA & OSHA accepted methods. Samples consisting of multiple layers were separated and analyzed independently in the laboratory.

3.2 Regulatory Guidelines and Requirements for ACM

FEDERAL

In accordance with the Clean Air Act (CAA), the U.S. Environmental Protection Agency (EPA) established National Emission Standards for hazardous Air Pollutants (NESHAP) to protect the public from exposure to airborne pollutants. Asbestos was one of the air pollutants, which was addressed under the NESHAP 40 CFR Part 61. The purpose of asbestos NESHAP regulations is to protect the public health by minimizing the release of asbestos when facilities, which contain ACM, are being renovated or demolished. EPA is responsible for enforcing regulations related to asbestos during renovations and demolition, however, the CAA allows the EPA to delegate this authority to State and Local Agencies. Even after EPA delegate's responsibility to a state or Local agency, EPA retains the authority to oversee agency performance and to enforce NESHAP regulations as appropriate.

NEW YORK STATE

Asbestos in New York State is regulated under the Labor Law Section 906, Part 56 of Title 12 of the Official Compilation of Codes, Rules, and Regulations. Within the department and for the purpose of the Department of Labor, this part (rule) is known as Industrial Code Rule No. 56 (ICR 56) relating to hazards to the public safety and health, during the removal, encapsulation, or disturbance of friable asbestos, or any handling of ACM that may result in the release of asbestos fiber.

As specified in Title 12 NYCRR Part 56-5.1 (h) and (i), "If the building/structure asbestos survey finds that the portion of the building/structure to be demolished, renovated, remodeled, or have repair work contains ACM, PACM, suspect miscellaneous ACM assumed to be ACM, or asbestos material, which is impacted by the work, the owner or the owner's agent shall conduct, or cause to have conducted, asbestos removal performed by a licensed asbestos abatement contractor in conformance with all standards set forth in this Part. All ACM, PACM, suspect miscellaneous ACM assumed to be ACM, or asbestos material impacted by the demolition, renovation, remodeling or repair project shall be removed as per this Part, prior to access or disturbance by other uncertified trades or personnel. No demolition, renovation, remodeling or repair work shall be commenced by any owner or the owner's agent prior to the completion of the asbestos abatement in accordance with the notification requirements of this Part…All building/structure owners and asbestos abatement contractors on a demolition, renovation, remodeling, or repair project, which includes work covered by this part, shall inform all trades on the work site about PACM, ACM, asbestos material and suspect miscellaneous ACM…Bids may be advertised and contracts awarded for demolition, remodeling, renovation, or repair work, but no work on the current intermediate portion of the project shall commence on the demolition, renovation, remodeling or repair work by any owner or agent prior to completion of all necessary asbestos abatement work for the current intermediate portion of the entire project, in conformance with all standards set forth in this Part." All work conducted should be in accordance with all legal requirements, including but not limited to U.S. Environmental Protection Agency (EPA) National Emissions Standards for Hazardous Air Pollutants (NESHAP) [40 CFR Part 61], New York State Industrial Code Rule 56 Asbestos Regulations (ICR 56) and Chapter 1 of Title 15 of the Rules of the City of New York Regulations, as applicable. Advance notification of the asbestos project to the USEPA, NYSDOL, and NYCDEP may be required.

NEW YORK CITY

Asbestos Control Program (ACP), Title 15, Chapter 1 of the New York City Department of Environmental Protection (NYCDEP) regulates all asbestos abatement activities occurring within the City of New York. The ACR regulations also require asbestos surveys and abatement work to be performed by a NYCDEP certified asbestos investigator and asbestos workers, respectively.

The New York City Department of Buildings (NYCDOB) requires an ACP notification to be included with the renovation/demolition permit applications. The notification is performed using an ACP 5 or ACP 20/21 forms.

All confirmed ACM will need to be removed prior to any building renovation or demolition. The removal and disposal of ACM must be performed by a NYS-DOL licensed asbestos handling contractor in accordance with Federal, state, and local regulations. Proper notifications must be filed with the US-EPA, NYS-DOL, NYC-DEP and other regulatory agencies prior to performing such activities.

As required by the NYS-DOL and NYC-DEP regulations, the abatement project must be monitored by a NYS-DOL certified project monitor. The project monitor oversees contractor's work practices and also performs pre, during, and final clearance post abatement air sampling in accordance with the state and city regulations.

CONCEALED ACM

In addition to the ACMs identified at the site, there is a possibility that concealed suspect ACM may exist at the building/structure. As such, if any concealed suspect ACM is encountered during future construction related activities, the work should immediately stop. Prior to resuming the work, the suspect ACM should either be 1) Sampled by an appropriately-certified asbestos professional and submitted to an Approved NYSDOH ELAP laboratory for asbestos analysis or 2) Presumed to be ACM (PACM) and removed by a licensed asbestos abatement contractor for disposal in accordance with all applicable regulations.

4.0 Lead-based Paint (LBP)

4.1 Applicable Standards/Guidelines for LBP

The U.S Department of Housing and Urban Development (HUD) defines the action level for lead-based paint as a lead content equal to or greater than 1.0 milligrams of lead per square centimeter of painted surface (≥1.0 mg Pb/cm^2) when measured with an XRF analyzer or 0.5 percent by weight when chemically tested. This definition is described in the HUD "Lead-Based Paint: Interim Guidelines for Hazard Identification and Abatement in Public and Indian Housing, September 1990". The state of New York's definition of the action level for lead-based paint is consistent with the level established by HUD.

Please note that although the HUD defines lead-based paint as paint having lead concentrations equal or greater than 1.0 mg/cm2, the Occupational Safety and Health Administration (OSHA) considers any concentration of lead in paint to be lead-containing paint. Regardless of the lead concentrations in paint, the contractor shall comply with 29 CFR 1926.62, OSHA regulations, and take precautionary measures for dust control and limit employee exposure to lead dust during the renovations.

Painted surfaces that would be impacted by planned activities such as drilling, cutting, scrapping, etc. and create dust should be properly addressed by following safe work practices, good housekeeping procedures and/or following proper abatement procedures. Grinding and sanding of paint without HEPA filter exhaust, open flame gas fired torch, unconfined abrasive blasting, and chemical strippers containing methylene chloride or other human carcinogenic chemicals are not recommended.

The Federal Resource Conservation and Recovery Act (RCRA) regulation governs the handling, transportation, and disposal of hazardous materials. Every demolition/renovation debris generator has the responsibility to determine whether the debris exhibits one or more of the characteristic wastes listed in subpart C of 40 CFR Part 261. In the case of demolition debris, lead in LBP is a characteristic waste, and therefore, it is the responsibility of the renovation/demolition debris generator to characterize the waste prior to its disposal and, if found to be hazardous waste as defined by Federal Statutes, to be properly handled and disposed.

Metal objects painted with LBP are exempt from disposal regulations applicable to lead, provided they are properly recycled. All metal objects that are painted with LBP should be sent to a certified recycling facility.

This report is not Lead-based Paint abatement specification and should not be used for specifying removal methods or techniques.

4.2 XRF Information

Thermo Scientific Niton XLp 300A X-Ray Fluorescence (XRF), Heuresis Corp. Pb200i X-Ray Fluorescence (XRF) Analyzer(s) were used to survey the building/structure or portion thereof identified to be demolished, renovated, remodeled or repaired for the presence of LBP. The XRF analyzers are using a sealed source of XLp 300A X-Ray Fluorescence (XRF) Cd109 with 40mCi and the Pb200i X-Ray Fluorescence (XRF) Co 57 with 5mCi sources, meeting HUD requirements for the analysis of paint films. During the analysis, the intensity of the x-rays is converted by the instrument's internal software into an estimate of the concentration of lead in the substance being analyzed. The results are interpreted as concentrations of lead in milligrams per square centimeter. This device is a field-screening tool, used to collect multiple readings in a short period of time. The method of measurement is based on spectrometric analysis of lead x-ray fluorescence within a controlled depth of interrogation. The reading is an estimate of lead content in all layers of paint. The results are displayed in milligrams per square centimeter (mg/cm2). The device(s) used for this inspection were the Thermo Scientific Niton XLp 300A Analyzer(s), Serial number 102951, Source date 9/15/17, and/or Heuresis Corp. Pb200i X-Ray Fluorescence (XRF) Analyzer(s) Serial

Number 2104, Source date 1/25/19, Serial number 2231, Source date 4/5/19, Serial number 2595, Source date 1/31/20.

5.0 PolyChlorinated Biphenyls (PCB)

5.1 Background and Protocol for PCBs

PolyChlorinated Biphenyls (PCB) are a group of manmade chemicals. PCBs were widely used in building materials and electrical products in the past. The U.S. Environmental Protection Agency banned the manufacturing and certain uses of PCBs in 1978, but buildings constructed or renovated between 1950 and 1978 may still have building materials and electrical products that contain PCBs. Examples of products that may contain PCBs include caulk, paint, glues, plastics, fluorescent lighting ballasts, transformers and capacitors.

PCBs are currently prohibited from being used in caulk and other commodities (U.S. EPA, 40 CFR 761). However, prior to 1977, PCBs were present in some caulking materials used in the construction of schools and other buildings. Studies have shown that concentrations of PCB can exceed 1% (10,000 ppm) by weight in some caulk materials. An investigation of 24 buildings in the Greater Boston Area revealed that one-third of the buildings tested (8 of 24) contained caulking materials with polychlorinated biphenyl (PCB) content exceeding 50 ppm by weight with an average concentration of 15,600 ppm or 1.5% (Herrick et al., 2004). These buildings included schools and other public buildings.

The U.S. EPA regulates the disposal of caulk, as well as soil and other materials contaminated with PCBs from caulk, if the concentration of PCBs exceeds 50 ppm. Such materials must be disposed at an appropriate approved or permitted facility.

U.S. EPA regulation 40 CFR 761 defines "PCB remediation waste" to include contaminated soil, and specifies a clean-up level of <1ppm without further conditions for unrestricted use in "high occupancy areas" (i.e., areas where individuals may be present for 335 hours or more per year). PCB caulk is defined as a PCB bulk product waste, and its disposal is subject to U.S. EPA regulations under the Toxic Substances Control Act (40 CFR761.62).

This protocol has been developed in consultation with the New York State Department of Health, Division of Environmental Health Assessment, Bureau of Toxic Substance Assessment to address concerns about properly managing caulk containing PCBs that will be disturbed during building renovation and maintenance.

CAULK SAMPLE COLLECTION

Buildings constructed or renovated between 1950 and 1977 have a potential to contain PCBs in existing caulk. Representative samples of caulking materials from these buildings prior to renovation or demolition work should be tested to determine whether the caulk is contaminated with PCBs. Professional judgement should be used to design the sampling plan for characterizing caulk throughout the building. The consultant should pay particular attention to construction and maintenance records and to the appearance of caulking materials (likenesses and differences). Samples should be taken from window frames or expansion joints that have not been repaired or replaced since 1977. Depending on specific information provided in the workplan developed by the project manager, such as window placement, compositing of some caulk samples might be appropriate. Caulk from different time periods or that have a different appearance should not be composited together.

It is important to note that caulk used during the time period of interest may also contain asbestos or lead. Therefore, the work plan should include testing, handling and disposal requirements appropriate for such regulated materials.

SOIL SAMPLE COLLECTION

Buildings constructed or renovated between 1950 and 1977, which have undergone further renovation after 1977, may have residual PCB contamination in adjacent soils. An adequate representation of surface soils should be tested to assess the potential for residual PCB contamination.

When designing a representative soil sampling plan, the likelihood of soil contamination from deteriorated or deteriorating caulk should be considered. Caulk that has in the past dried out and fallen to the ground is the most important source of soil contamination. Thus, sampling should include soil beneath windows where caulk has obviously deteriorated or been replaced because of previous deterioration. Areas subject to the stress of sun and prevailing weather (typically the southern and western side of each structure) should be included for sampling. These samples would provide a conservative evaluation of soil conditions due to an increased potential for material failure, possibly resulting in contamination of soil. Also, if earlier renovation or demolition work may have stockpiled potentially contaminated caulk in other school areas, the school should consider having soils in those areas tested as well.

Soil sampling should focus on areas of the building where "banks" or "gangs" of windows exist/were replaced and areas of the structure where large expansion joints are located. This would provide a conservative evaluation of potential soil contamination and permit efficient sampling.

Any obvious pieces of caulk encountered during the collection of soil samples should be removed from the soil, categorized (with respect to location and depth) and treated as a separate potential sample.

Depth – At each soil sample location, soil should be collected in depth intervals of 0-2 inches, 2-6 inches and 6-12 inches. The surface soil sample (0-2 inches) should be collected from below the vegetative surface layer, if present.

Distance from Structure – Samples should be collected within 1 foot of the building and 5 feet from the building.

Samples should be collected in a manner that prevents cross-contamination. Augers or driven core samplers should be avoided, as any caulk caught on the edge of this type of tool could be driven to lower intervals. Using a designated trowel for each sample location and each interval of depth is encouraged. If the sampling tool is field cleaned between samples, do so in a manner that does not add solvent contamination to the environment.

NOTE

Sampling was performed by **Adelaide** in compliance with protocols outlined by New York State Education Department (NYSED) and USEPA 40 CFR 761, as described above. Only one sample per homogeneous area was required for analysis of suspect PCB-containing materials. Bulk sample(s) were properly packaged and forwarded, with associated Chain of Custody (COC), to York Analytical Laboratories, Inc., for analysis using method SW846-3550B/8082. The analysis will determine if the suspect material will be classified as PCB-containing at or above 50 ppm or mg/kg as per the EPA regulations. Copies of the analytical results are contained within attached appendices for review.

6.0 General Discussion

All construction personnel as well as individuals who have access to locations where asbestos-containing materials (ACM), lead-based paints (LBP) and/or polychlorinated biphenyls (PCB) exists should be informed of its presence and the proper work practices in these areas. Conspicuous labeling of all ACM is suggested to ensure personnel is adequately informed. Personnel should be informed not to rest, lean or store material or equipment on or near these surfaces and not to cut, saw, drill, sand or disturb ACM. All removal, disturbance, and repair of ACM should be performed in compliance with Title 12 NYCRR Part 56 by persons properly trained to handle ACM. Facility custodial and maintenance personnel should receive training commensurate with their work activities; as defined in 29 CFR 1910.1001.

7.0 Disclaimers

Adelaide certifies that the information contained within this report is based solely upon site observations and the results of laboratory analysis for samples collected during this survey/assessment. These observations and results are time dependent, subject to changing site conditions and revisions to Federal, State and Local regulations. **Adelaide** warrants that these findings have been promulgated after being prepared in general accordance with generally accepted practices in the abatement industries. **Adelaide** also recognizes that inspection laboratory data is not usually sufficient to make all abatement and management decisions. No other warranties are expressed or implied.

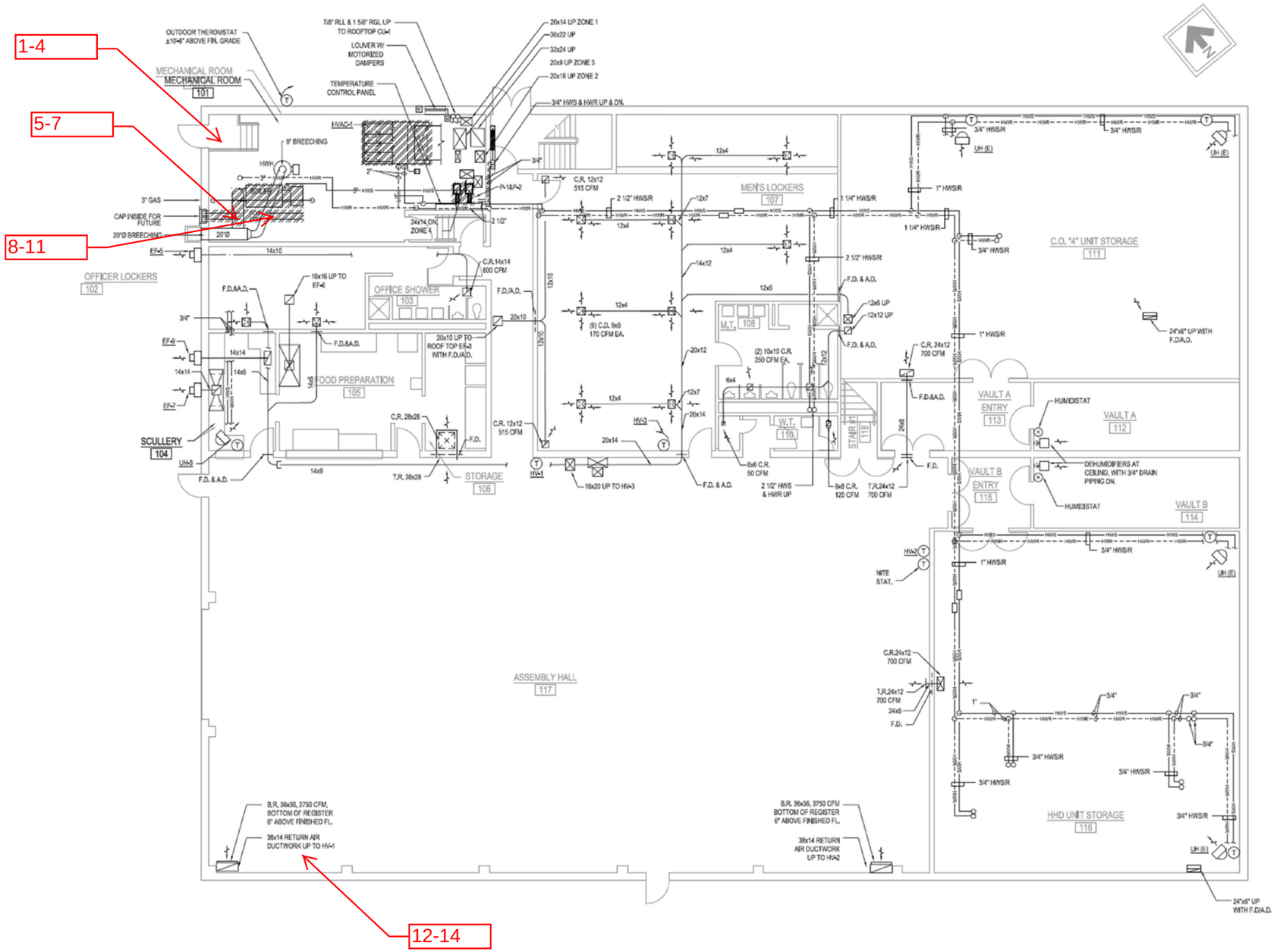
Due to the potential for concealed Asbestos-containing Materials (ACM) and/or other regulated materials, this report should not be construed to represent all ACM and/or regulated materials within the site(s). All quantities of ACM and/or other regulated materials identified, and all dimensions listed within this report are approximate and should be verified On-site.

This inspection report is not intended to be used as the sole basis for soliciting pricing for asbestos abatement. An abatement plan, specification, drawing and/or Variances should be developed to identify scope, timing, phasing and remediation means & methods for any asbestos project. The Linear and/or Square Footages (LF / SF) listed within this Report are only approximates. Abatement Contractor(s) are required to visit the building(s) in order to take actual field measurements within each listed location.

NYSDOH issued an Interim Guidance Letter, on July 9, 2013, which outlined the approved testing alternative for materials containing vermiculite. Specifically, "...Where TSI, surfacing materials, or other PACM or miscellaneous suspect ACM contain greater than 10% vermiculite, Item 198.6 may be used to evaluate the asbestos content of the material; provided, however, that any test results using this method must be reported with the following conspicuous disclaimer: *"This method does not remove vermiculite and may underestimate the level of asbestos present in a sample containing greater than 10% vermiculite."* On July 22, 2014, NYSDOH issued a Regulatory Guidance Letter outlining the new approved analytical methods for testing sprayed-on fireproofing (SOFP) that contains vermiculite. NYSDOH authorized the use of ***two*** analytical methods to evaluate the asbestos content of SOFP that contains vermiculite. As per NYSDOH Guidelines, *"After October 31, 2014, one of the new methods **must** be used to test SOF-V, regardless of the percent of vermiculite."* On May 6, 2016, NYSDOH issued a Regulatory Guidance Letter outlining the new protocol for analytical procedure for surfacing materials (ie. plaster, stucco, etc.) that contain vermiculite. As per NYSDOH Guidelines, "*The original July 2013 and July 2014 letters addressed SOF-V only. Both NYS DOH's Item 198.8 and RJ Lee Group Method 055 shall now be applied to test for vermiculite in other Surfacing Material (SM) as defined in 12 NYCRR Part 56 (NYS Industrial Code Rule 56).*"

APPENDIX A

SAMPLE LOCATION MAP(S)



Level 1 Key Plan - Sample Locations

Drawing Not to Scale

Adelaide ENVIRONMENTAL HEALTH
1511 Route 22
Brewster, NY 10509
Phone: (845) 278-7710
Fax: (845) 278-7750

CLIENT:
McFarland-Johnson
49 Court Street
Binghamton, New York 13901

OGS Project #
46166

SURVEY LOCATION:
Yonkers Armory
2 Quincy Place
Yonkers, New York 10701

DATE: 08/18/2020

DRAWING VERSION: No. 1

ISSUED FOR:
Limited HazMat Survey

ADELAIDE PROJECT NO.:
MACF:20060.00-IN

DRAWING PREPARED BY:
PJP

SL-01

APPENDIX B

ASBESTOS ANALYTICAL RESULTS

Table I
Summary of Bulk Asbestos Analysis Results
OGSx:20060.00-IN; Yonkers Armory; 2 Quincy Place, Yonkers, NY 10701

AmeriSci Sample #	Client Sample#	HG Area	Sample Weight (gram)	Heat Sensitive Organic %	Acid Soluble Inorganic %	Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
01	1	1A	----	----	----	----	NAD	NA
Location: 1st Fl. / MER / Ceiling - Sheetrock								
02	2	1A	----	----	----	----	NAD	NA
Location: 1st Fl. / MER / Ceiling - Sheetrock								
03	3	1B	----	----	----	----	NAD	NA
Location: 1st Fl. / MER / Ceiling - Joint Compound								
04	4	1B	----	----	----	----	NAD	NA
Location: 1st Fl. / MER / Ceiling - Joint Compound								
05	5	2	----	----	----	----	NAD	NA
Location: 1st Fl. / MER / Breeching - Mudded Fitting								
06	6	2	----	----	----	----	NAD	NA
Location: 1st Fl. / MER / Breeching - Mudded Fitting								
07	7	2	----	----	----	----	NAD	NA
Location: 1st Fl. / MER / Breeching - Mudded Fitting								
08	8	3A	0.202	45.4	45.4	9.2	NAD	NAD
Location: 1st Fl. / MER / Boiler Sections / Top Layer - Tar								
09	9	3A	0.257	48.4	44.8	6.8	NAD	NAD
Location: 1st Fl. / MER / Boiler Sections / Top Layer - Tar								
10	10	3B	----	----	----	----	NAD	NA
Location: 1st Fl. / MER / Boiler Sections / Bottom Layer - Rope Gasket								
11	11	3B	----	----	----	----	NAD	NA
Location: 1st Fl. / MER / Boiler Sections / Bottom Layer - Rope Gasket								
12	12	4	----	----	----	----	NAD	NA
Location: 2nd Fl. / Assembly Hall / HV-1 Ductwork / Over FG - Canvas Wrap								
13	13	4	----	----	----	----	NAD	NA
Location: 2nd Fl. / Assembly Hall / HV-1 Ductwork / Over FG - Canvas Wrap								
14	14	4	----	----	----	----	NAD	NA
Location: 2nd Fl. / Assembly Hall / HV-1 Ductwork / Over FG - Canvas Wrap								

See Reporting notes on last page

Client Name: Adelaide Environmental Health

Table I
Summary of Bulk Asbestos Analysis Results

OGSx:20060.00-IN; Yonkers Armory; 2 Quincy Place, Yonkers, NY 10701

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

Analyzed by: Khaalid W. Perine; Date Analyzed 8/13/2020 Hitachi #747/Nova

**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); 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, AIHA-LAP, LLC (PLM) Lab ID 102843.

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 deposits for which PLM evaluation is recommended (i.e. soils and other heterogenous materials).

Reviewed By: for PM

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

PLM Bulk Asbestos Report

Adelaide Environmental Health
Attn: John Soter
1511 Rte. 22, Suite C24

Brewster, NY 10509

Date Received 08/13/20 **AmeriSci Job #** 220082255
Date Examined 08/13/20 **P.O. #**
ELAP # 11480 **Page** 1 **of** 3
RE: OGSx:20060.00-IN; Yonkers Armory; 2 Quincy Place, Yonkers, NY 10701

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
1 1A	220082255-01 **Location:** 1st Fl. / MER / Ceiling - Sheetrock	*No*	NAD [1] (by NYS ELAP 198.1) by Valeriu Voicu on 08/13/20
Analyst Description: Brown/White, Heterogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose 7 %, Fibrous glass Trace, Non-fibrous 93 %			
2 1A	220082255-02 **Location:** 1st Fl. / MER / Ceiling - Sheetrock	*No*	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 08/13/20
Analyst Description: Grey, Homogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose 2 %, Fibrous glass 1 %, Non-fibrous 97 %			
3 1B	220082255-03 **Location:** 1st Fl. / MER / Ceiling - Joint Compound	*No*	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 08/13/20
Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose Trace, Non-fibrous 100 %			
4 1B	220082255-04 **Location:** 1st Fl. / MER / Ceiling - Joint Compound	*No*	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 08/13/20
Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose Trace, Non-fibrous 100 %			
5 2	220082255-05 **Location:** 1st Fl. / MER / Breeching - Mudded Fitting	*No*	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 08/13/20
Analyst Description: Grey, Homogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose Trace, Fibrous glass 15 %, Non-fibrous 85 %			

See Reporting notes on last page

PLM Bulk Asbestos Report

OGSx:20060.00-IN; Yonkers Armory; 2 Quincy Place,
Yonkers, NY 10701

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
6 2	220082255-06 **Location:** 1st Fl. / MER / Breeching - Mudded Fitting	***No***	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 08/13/20
Analyst Description: Grey/Brown, Heterogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose Trace, Fibrous glass 7 %, Non-fibrous 93 %			
7 2	220082255-07 **Location:** 1st Fl. / MER / Breeching - Mudded Fitting	***No***	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 08/13/20
Analyst Description: Grey, Homogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose Trace, Fibrous glass 10 %, Non-fibrous 90 %			
8 3A	220082255-08 **Location:** 1st Fl. / MER / Boiler Sections / Top Layer - Tar	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/13/20
Analyst Description: Black, Homogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Fibrous glass 3 %, Non-fibrous 6.2 %			
9 3A	220082255-09 **Location:** 1st Fl. / MER / Boiler Sections / Top Layer - Tar	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/13/20
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Fibrous glass Trace, Non-fibrous 6.8 %			
10 3B	220082255-10 **Location:** 1st Fl. / MER / Boiler Sections / Bottom Layer - Rope Gasket	***No***	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 08/13/20
Analyst Description: Grey, Homogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose Trace, Fibrous glass 97 %, Non-fibrous 3 %			
11 3B	220082255-11 **Location:** 1st Fl. / MER / Boiler Sections / Bottom Layer - Rope Gasket	***No***	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 08/13/20
Analyst Description: Grey, Homogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose Trace, Fibrous glass 98 %, Non-fibrous 2 %			

See Reporting notes on last page

PLM Bulk Asbestos Report

OGSx:20060.00-IN; Yonkers Armory; 2 Quincy Place,
Yonkers, NY 10701

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
12 4	220082255-12 **Location:** 2nd Fl. / Assembly Hall / HV-1 Ductwork / Over FG - Canvas Wrap	***No***	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 08/13/20
Analyst Description: White, Homogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose 75 %, Fibrous glass Trace, Non-fibrous 25 %			
13 4	220082255-13 **Location:** 2nd Fl. / Assembly Hall / HV-1 Ductwork / Over FG - Canvas Wrap	***No***	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 08/13/20
Analyst Description: OffWhite/Yellow, Heterogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose 40 %, Fibrous glass 5 %, Non-fibrous 55 %			
14 4	220082255-14 **Location:** 2nd Fl. / Assembly Hall / HV-1 Ductwork / Over FG - Canvas Wrap	***No***	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 08/13/20
Analyst Description: OffWhite, Homogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose 80 %, Fibrous glass 1 %, Non-fibrous 19 %			

Reporting Notes:

(1) This PLM job was analyzed using Olympus BH-2 Pol Scope S/N 229915

Analyzed by: Valeriu Voicu _____

*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 by Appd E to Subpt E, 40 CFR 763 (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. AIHA-LAP, LLC Lab ID 102843, RI Cert AAL-094, CT Cert PH-0186, Mass Cert AA000054.

Reviewed By:_____ _____END OF REPORT_____

Adelaide Environmental Health Associates, Inc
1511 Route 22, Suite C24
Brewster, NY 10509
845-278-7710
845-278-7750 - fax

Site Address: **Yonkers Armory**	Date: **08/12/20**	Inspector(s) **Philip J. Page**
2 Quincy Place		
Yonkers, NY 10701	Project #: **OGSx:20060.00-IN**	

Sample ID #	Homogeneous Area	Floor Level	Sample Location/Description	Quantity (In Feet)	Friable NonFriable	Condition g, d, sd
1	1_A	1	MER, CEILING - SHEETROCK			
2	↓	↓	↓			
3	1_B	↓	- JOINT COMPOUND #220082255			
4	↓	↓	↓			
5	2	↓	, BREECHING - MUDDED FITTINGS			
6	↓	↓	↓			
7	↓	↓	↓			
8	3_A	↓	, BOILER SECTIONS, TOP LAYER - TAR			
9	↓	↓	↓			
10	3_B	↓	, BOTTOM - ROPE GASKET			
11	↓	↓	↓			
12	4	2	ASSEMBLY HALL, HV-1 DUCTWORK, OVER FG - CANVAS WRAP			
13	↓	↓	↓			

Special Instructions/ Turnaround Time:

Stop at 1st Positive per Homogenous Area **24HR TAT**

E-Mail Results to AdelaideLabResults@adelaideilc.com & ppage@adelaideilc.com

Relinquished by:
Received by: 8/13/20 1115
Relinquished by:
Received by:

Adelaide Environmental Health Associates, Inc
1511 Route 22, Suite C24
Brewster, NY 10509
845-278-7710
845-278-7750 - fax

Site Address:	Date:	Inspector(s)
Yonkers Armory	**08/12/20**	**Philip J. Page**
2 Quincy Place		
Yonkers, NY 10701	Project #: **OGSx:20060.00-IN**	

Sample ID #	Homogeneous Area	Floor Level	Sample Location/Description	Quantity (In Feet)	Friable NonFriable	Condition g, d, sd
14	4	2	Assembly Hall, HV-1 Ductwork, over FG - Canvas Wrap			
			#22008225 5			

Special Instructions/ Turnaround Time:

Stop at 1st Positive per Homogenous Area ***24HR TAT***

E-Mail Results to AdelaideLabResults@adelaidellc.com & ppage@adelaidellc.com

Relinquished by:
Received by: 8/13/20 1115
Relinquished by:
Received by:

APPENDIX C

XRF READINGS

Adelaide Environmental Heath Associates Inc.
1511 Route 22, Suite C-24
Brewster, New York 10509
Adelaide Project# MACF:20060.00-IN
OGS Project# 46166
Project Name: Yonkers Armory- Boiler Replacement Project
Inspector: Philip J. Page

Reading #	Date	Time	Space Type	Floor	Room	Component	Substrate	Color	Condition	Lead Concentration (mg/cm2)	Result
1	**8/12/2020**	**7:43:48**	**Yonkers Armory**		**Calibration**					**1.1**	**Positive**
2	**8/12/2020**	**7:44:01**	**Yonkers Armory**		**Calibration**					**1**	**Positive**
3	**8/12/2020**	**7:44:14**	**Yonkers Armory**		**Calibration**					**1.1**	**Positive**
4	8/12/2020	7:47:40	Yonkers Armory	2nd Floor	Gym	HV-1	Metal	Grey	Fair	0.1	Negative
5	8/12/2020	7:47:48	Yonkers Armory	2nd Floor	Gym	HV-1	Metal	Grey	Fair	0	Negative
6	8/12/2020	7:48:16	Yonkers Armory	2nd Floor	Gym	Ductwork	Metal	Light Grey	Fair	0.1	Negative
7	8/12/2020	7:48:23	Yonkers Armory	2nd Floor	Gym	Ductwork	Metal	Light Grey	Fair	0	Negative
8	8/12/2020	7:50:48	Yonkers Armory	2nd Floor	Gym	Bar Joist	Metal	Red	Fair	0.2	Negative
9	8/12/2020	8:49:36	Yonkers Armory	1st Floor	MER	Ceiling	Drywall	White	Fair	0	Negative
10	**8/12/2020**	**8:50:14**	**Yonkers Armory**	**1st Floor**	**MER**	**Pipe**	**Metal**	**Orange**	**Fair**	**1.6**	**Positive**
11	**8/12/2020**	**8:50:39**	**Yonkers Armory**	**1st Floor**	**MER**	**Pipe**	**Metal**	**Orange**	**Fair**	**1.5**	**Positive**
12	8/12/2020	8:50:56	Yonkers Armory	1st Floor	MER	Pipe	Metal	Yellow	Fair	0.1	Negative
13	8/12/2020	8:51:15	Yonkers Armory	1st Floor	MER	Pipe	Metal	Yellow	Fair	0.2	Negative
14	8/12/2020	8:52:23	Yonkers Armory	1st Floor	MER	Boiler	Metal	Grey	Fair	0	Negative
15	8/12/2020	8:52:55	Yonkers Armory	1st Floor	MER	Burner	Metal	Blue	Fair	0.3	Negative
16	8/12/2020	8:53:45	Yonkers Armory	1st Floor	MER	HV-1	Metal	Grey	Fair	0.1	Negative
17	8/12/2020	8:54:16	Yonkers Armory	1st Floor	MER	Pump	Metal	Red	Fair	0.4	Negative
18	8/12/2020	8:54:26	Yonkers Armory	1st Floor	MER	Pump	Metal	Red	Fair	0.2	Negative
19	8/12/2020	9:06:10	Yonkers Armory	Exterior	Roof	Trane Unit	Metal	Light Green	Poor	0.1	Negative
20	8/12/2020	9:06:45	Yonkers Armory	Exterior	Roof	Curb	Metal	Black	Fair	0.3	Negative
21	**8/12/2020**	**9:11:57**	**Yonkers Armory**		**Calibration**					**1**	**Positive**
22	**8/12/2020**	**9:12:10**	**Yonkers Armory**		**Calibration**					**1**	**Positive**
23	**8/12/2020**	**9:12:23**	**Yonkers Armory**		**Calibration**					**1.1**	**Positive**

APPENDIX D

PERSONNEL AND LABORATORY CERTIFICATIONS

New York State – Department of Labor
Division of Safety and Health
License and Certificate Unit
State Campus, Building 12
Albany, NY 12240

ASBESTOS HANDLING LICENSE

Adelaide Environmental Health Associates, Inc.
Suite C24
1511 Route 22

Brewster, NY 10509

FILE NUMBER: 99-0656
LICENSE NUMBER: 29305
LICENSE CLASS: RESTRICTED
DATE OF ISSUE: 06/29/2020
EXPIRATION DATE: 07/31/2021

Duly Authorized Representative – John Soter:

This license has been issued in accordance with applicable provisions of Article 30 of the Labor Law of New York State and of the New York State Codes, Rules and Regulations (12 NYCRR Part 56). It is subject to suspension or revocation for a (1) serious violation of state, federal or local laws with regard to the conduct of an asbestos project, or (2) demonstrated lack of responsibility in the conduct of any job involving asbestos or asbestos material.

This license is valid only for the contractor named above and this license or a photocopy must be prominently displayed at the asbestos project worksite. This license verifies that all persons employed by the licensee on an asbestos project in New York State have been issued an Asbestos Certificate, appropriate for the type of work they perform, by the New York State Department of Labor.

Eileen M. Franko, Director
For the Commissioner of Labor

SH 432 (8/12)

United States Environmental Protection Agency

This is to certify that

Adelaide Environmental Health Associates, Inc

has fulfilled the requirements of the Toxic Substances Control Act (TSCA) Section 402, and has received certification to conduct lead-based paint renovation, repair, and painting activities pursuant to 40 CFR Part 745.89

In the Jurisdiction of:

All EPA Administered States, Tribes, and Territories

This certification is valid from the date of issuance and expires December 05, 2022

NAT-15081-2

Certification #

June 21, 2017

Issued On

Michelle Price, Chief

Lead, Heavy Metals, and Inorganics Branch

STATE OF NEW YORK - DEPARTMENT OF LABOR
ASBESTOS CERTIFICATE

N.Y.S



PHILIP J PAGE
CLASS(EXPIRES)
C ATEC(05/21) D INSP(05/21)
H PM (05/21) I PD (05/21)

CERT# 12-10888
DMV# 216687928

MUST BE CARRIED ON ASBESTOS PROJECTS

01213 00536798828

EYES BRO
HAIR BLN
HGT 6' 00"

IF FOUND RETURN TO:
NYSDOL - L&C UNIT
ROOM 161A BUILDING 12
STATE OFFICE CAMPUS
ALBANY NY 12240

United States Environmental Protection Agency

This is to certify that



Philip J Page

has fulfilled the requirements of the Toxic Substances Control Act (TSCA) Section 402, and has received certification to conduct lead-based paint activities pursuant to 40 CFR Part 745.226 as:

Inspector

In the Jurisdiction of:

All EPA Administered Lead-based Paint Activities Program States, Tribes and Territories

This certification is valid from the date of issuance and expires March 23, 2023

LBP-I-I172697-2

Certification #

December 23, 2019

Issued On

Susan Schulz, Acting Chief

Chemicals and Multimedia Programs Branch

NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER

Expires 12:01 AM April 01, 2021
Issued April 01, 2020

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

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

DR. THOMAS R. MCKEE
AMERISCI RICHMOND
13635 GENITO RD
MIDLOTHIAN, VA 23112

NY Lab Id No: 10984

is hereby APPROVED as an Environmental Laboratory for the category
ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE
All approved subcategories and/or analytes are listed below:

Miscellaneous

Asbestos in Friable Material	Item 198.1 of Manual
	EPA 600/M4/82/020
Asbestos in Non-Friable Material-PLM	Item 198.6 of Manual (NOB by PLM)
Asbestos in Non-Friable Material-TEM	Item 198.4 of Manual
Asbestos-Vermiculite-Containing Material	Item 198.8 of Manual

NEW YORK STATE | Department of Health

Serial No.: 61267

Property of the New York State Department of Health. Certificates are valid only at the address shown, must be conspicuously posted, and are printed on secure paper. Continued accreditation depends on successful ongoing participation in the Program. Consumers are urged to call (518) 485-5570 to verify the laboratory's accreditation status.

Adelaide
ENVIRONMENTAL HEALTH

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RENOVATION SURVEY
FOR
ASBESTOS-CONTAINING MATERIALS, LEAD-BASED PAINT & PCBs

PERFORMED AT:

Yonkers Armory
2 Quincy Place
Yonkers, New York 10701
Adelaide Project# BA:23168.00-IN
OGS Project# 47477

PREPARED FOR:

Greg Springer
Bergmann: Architects, Engineers, Planners
18 Corporate Woods Blvd., Suite 400
Albany, New York 12211

PREPARED BY:
Jason Fullum
June 15, 2023

REVIEWED BY:



Stephanie A. Soter
President

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1.0 Introduction

1.1 Scope of Work / Project Personnel

Adelaide Environmental Health Associates, Inc. **(Adelaide)** performed an Asbestos, Lead and PCB Survey for Building/Structure Demolition, Renovation, Remodeling and/or Repair, in conformance with ALL Federal, State and Local regulations for Bergmann:

SURVEY LOCATION(S):	Yonkers Armory, 2 Quincy Place, Yonkers, New York 10701
SURVEY DATE(S):	June 6, 2023
SCOPE OF WORK:	Entire building renovation excluding the roof.
SCOPE OF WORK BUILDING/ STRUCTURE PLANS UTILIZED:	As built drawings from 1985 were utilized for the inspection.
CERTIFIED ADELAIDE PERSONNEL:	Jason Fullum (NYS Asbestos Inspector/Cert. #97-20574 and EPA Lead-based Paint Risk Assessor/Cert. #LBP-R-12098-2)
SITE CONTACT(S):	Trentin Reese - Bergmann

1.2 Executive Summary

On June 6, 2023, **Adelaide** inspected the first floor, second floor and exterior areas that will be affected by the proposed scope of work for suspect ACM, LBP and PCBs.

SUSPECT HAZARDOUS MATERIAL	SAMPLE(S)/LAYER(S)/ READING(S) COLLECTED	SAMPLE(S) / HOMOGENEOUS AREA(S) IDENTIFIED POSITIVE
Asbestos-containing Materials (ACM):	56	0
Lead-based Paint (LBP):	31 (plus calibrations)	0
PolyChlorinated Biphenyls (PCB):	6	0

The following indicates assumed materials due to live electric at the time of the inspection.

- PACM electrical wiring insulation and panels, mirror mastic

There are **asbestos materials that will be impacted** by this scope of work as described in section 1.1. These materials are listed in section 2.1.

1.3 Conclusions and Recommendations

The following conclusions and recommendations are prepared by **Adelaide** as per the provided scope of work for Building/Structure Demolition, Renovation, Remodeling and/or Repair. Should the scope of work change, it is recommended that the findings be revisited to determine if additional sampling will be required to satisfy ALL Federal, State and Local regulations.

The materials sampled, as part of this survey, were limited to building materials potential affected by the provided scope of work only. All building materials outside the scope of work that have the potential to be disturbed, impacted, or if the scope of work is to change, are to be presumed asbestos-containing materials (PACM). Identified PACM **must** either be sampled by a licensed NYS Asbestos Inspector and/or abated/removed and disposed of by a licensed NYS Asbestos Abatement Contractor.

1.4 Asbestos-containing Materials (ACM)

- This survey concluded that the materials listed in Section 2.1 are assumed ***positive for asbestos***.

- There are asbestos materials that will be impacted by this scope of work. These materials are listed in section 2.1. Refer to Appendix A for the approximate location of the above materials in the affected scope of work.

- Subpart 56-5(h) of 12 NYCRR Part 56 requires that no demolition, renovation, remodeling, or repair work be commenced by any owner or the owner's agent prior to the completion of asbestos abatement. Asbestos abatement must be performed by an asbestos abatement contractor that maintains a current asbestos handling license and employs NYSDOL/NYCDEP certified asbestos handlers and supervisors. It is recommended that a 12 NYCRR 56 certified Project Monitor oversee abatement activities.

- Subpart 56-5(g) of 12 NYCRR Part 56 specifies requirements for transmittal of asbestos survey information by the owner or owner's agent. (1) One copy of the asbestos survey report shall be sent to the local government entity charged with issuing a permit for such demolition, renovation, remodeling, or repair work under applicable State or local laws. (2) If controlled demolition or pre-demolition activities will be performed, one copy of the asbestos survey report shall be submitted to the appropriate Asbestos Control Bureau district office. (3) One copy of the asbestos survey report must be kept on the construction site throughout the duration of the asbestos project and any associated demolition, renovation, remodeling, or repair project.

1.5 Lead-based Paint (LBP)

- This survey concluded that the readings summarized in Section 2.3 and Appendix E tested ***negative for lead-based paint.***

1.6 PolyChlorinated Biphenyls (PCB)

- This survey concluded that the materials listed in Section 2.4 and Appendix F tested ***negative for PCBs.***

2.0 Summary of Hazardous Materials

2.1 Summary of Identified ACM/PACM

KEY: **ACM** = Materials containing greater than 1% of asbestos; **HA** = Homogeneous Area; **LF** = Linear Feet; **SF** = Square Feet; **PACM** = Presumed Asbestos-containing Materials; **Friable** = ACM capable of being released into air, and which can be crumbled, pulverized, powdered, crushed or exposed by hand-pressure; [A] = Material is considered non-friable solely in an intact and undisturbed state, however, may be rendered friable if pulverized or crumbled while in dry state.

Samples collected by **Adelaide** June 6, 2023

HA	Identified ACM	ACM Location(s)	Approx. Qty.	Condition	Friable? (Yes or No)
PACM	Electrical Wire Insulation and Panels	Throughout	Unknown	Unknown	No

HA	Identified ACM	ACM Location(s)	Approx. Qty.	Condition	Friable? (Yes or No)
PACM	Bathroom Mirror Mastic	Men's and Women's Bathrooms and Locker Rooms	11 Mirrors	Good	No

2.2 Summary of Identified Non-ACM

Samples collected by **Adelaide** June 6, 2023

Identified Non-ACM	Sample Location(s)
12x12 Brown/Red Mottled Floor Tile	2nd Floor
Black Floor Mastic	
2x4 Ceiling Tile – Large and Small Holes	
Debris on Top of Ceiling Tiles	
2x4 Ceiling Tile – Squiggles and Holes	
CMU Mortar	Throughout
4" Black Covebase and Mastic	
Yellow Carpet Mastic	2nd Floor
12x12 Green Mottled Floor Tile	
Drywall Ceiling and Joint Compound	Throughout
12x12 Brown and White Mottled Floor Tile	2nd Floor
12x12 White with Gray Specks Floor Tile	
Terrazzo Shower Base	Locker Rooms
Sealant at Shower	
Exterior Door Glazing Compound	Throughout
Exterior Door Sealant	
Concrete	
Brick Mortar	
Exterior Vertical Sealant	
Pin Mastic on Ductwork	Boiler Room
Wall Tile – Grout and Mudset	Kitchen
Floor Tile – Grout and Mudset	
Exterior Door Caulk	Throughout
Exterior Louver Caulk	

2.3 Summary of Identified LBP

Based on review of the data generated by the Viken Pb200e X-Ray Fluorescence (XRF) Analyzer(s), the following surfaces tested were identified as lead-based, as defined by HUD/EPA (equal to or in excess of 1.0 milligram per square centimeter):

Readings collected by **Adelaide** June 6, 2023

Location of LBP	LBP Component	Substrate	Color	Condition	Readings (mg/cm2)
NO Lead-based Paints identified above HUD/EPA standards of readings collected in reference to the above-mentioned scope of work.					

2.4 Summary of Identified PCB-containing Materials

Samples collected by **Adelaide** June 6, 2023

Sample #	Location / Description	Material Matrix	Color	Substrate	Analytical Result
NO PCB-containing materials were identified above the USEPA 40 CFR 761 threshold of 50 ppm(mg/kg) of samples collected/analyzed in reference to the above-mentioned scope of work.					

2.5 Observations

ASBESTOS-CONTAINING MATERIALS (ACM)
A visual inspection was performed, and homogeneous material types were established based on appearance, color and texture. The findings presented in this report are based upon reasonably available information and observed site conditions at the time the assessment was performed. The findings and conclusions of this report are not meant to be indicative of future conditions at the site and does not warrant against conditions that were not evident from visual observations or historical information obtained from others.

On June 6, 2023, representative bulk sampling was performed on suspect building materials for laboratory analysis and the following is a summary of installed building materials sampled as per the scope of work provided:

- Ceiling Materials – Ceiling Tiles, Drywall, Joint Compound.
- Wall Materials – CMU Mortar, Brick Mortar, Covebase and Mastic, Grout, Mudset
- Flooring Materials – Floor Tiles, Mastics, Grout, Mudset
- Miscellaneous Materials – Terrazzo, Sealants, Glazing Compound, Concrete, Pin Mastic
- Non-suspect Materials (not sampled) – Fiberglass Insulation, Wood, Glass, Metal.

3.0 Asbestos-containing Materials (ACM)

3.1 Field Procedures and Analysis Methodology

Guidelines used for the inspection were established by the U.S. Environmental Protection Agency (EPA) in the Guidance for Controlling Asbestos Containing Materials in Buildings, Office of Pesticides and Toxic Substances, DOC# 560/5-85-024 and 40 CFR Part 763, Asbestos Hazard Emergency Response Act (AHERA) and Title 12 NYCRR Part 56-5.1. Field information was organized as per the AHERA concept of a

homogeneous area (HA); that is, suspect Asbestos-containing Materials (ACM) with similar age, appearance, and texture were grouped together, sampled and assessed for condition.

For the purposes of this inspection, suspect ACM has been placed in three material categories: thermal, surfacing, and miscellaneous. 1) Surfacing materials are those that are sprayed on, troweled on or otherwise applied to surfaces for fireproofing, acoustical, or decorative purposes (e.g., wall and ceiling plaster). 2) Thermal materials are those applied to heat pipes or other structural components to prevent heat loss or gain or prevent water condensation (e.g., pipe and fitting insulation, duct insulation, boiler flue). 3) Miscellaneous materials are interior building materials on structural components, structural members or fixtures, such as floor and ceiling tiles, etc. and do not include surfacing material or thermal system insulation.

SURFACING MATERIALS

Surfacing materials were grouped into homogeneous sampling areas. A homogeneous area contains material that is uniform in color and texture and appears identical in every other respect. Materials installed at different times belong to different sampling areas. Homogeneous areas were determined on per floor basis.

The following protocol was used for determining the number of samples to be collected:

- At least three bulk samples were collected from each homogeneous area that is 1,000 square feet or less.
- At least five bulk samples were collected from each homogeneous area that is greater than 1,000 square feet but less than or equal to 5,000 square feet.
- At least seven bulk samples were collected from each homogeneous area that is greater than 5,000 square feet.

THERMAL SYSTEM INSULATION (TSI)

The concept of homogeneous sampling areas applies equally well to thermal insulation as to surfacing material. A "typical" building may contain multiple insulated pipe runs from any combination of the following categories:

- Hot water supply and/or return
- Cold water supply
- Chilled water supply
- Steam supply and/or return
- Roof or system drain

The following protocol was used for determining the number of samples to be collected.

- Collect at least three bulk samples from each homogeneous area of thermal system insulation.
- Collect at least one bulk sample from each homogeneous area of patched thermal system insulation if the patched section is less than 6 linear or square feet.
- In a manner sufficient to determine whether the material is ACM or not ACM, collect a minimum of three bulk samples from each homogeneous insulated mechanical system tee, elbow, and valve.

Bulk samples are not collected from any homogeneous area where the certified inspector has determined that the thermal system insulation is fiberglass, foam glass, or rubber.

MISCELLANEOUS MATERIALS

Miscellaneous materials are grouped into different homogeneous areas and at least two bulk samples are collected from each homogeneous area as per the clarification letter from the EPA and the Professional Abatement Contractors of New York, Inc in November of 2007.

Samples collected were analyzed by a laboratory approved under the New York State Department of Health Environmental Laboratory Approval Program (NYSDOH ELAP). Samples were analyzed in the laboratory by Polarized Light Microscopy (PLM), Polarized Light Microscopy-NOB (PLM-NOB) and/or Quantitative Transmission Electron Microscopy (QTEM), as required. Sample collection and laboratory analysis were conducted in compliance with the requirements of Title 12 NYCRR Part 56-5.1, 29 CFR 1926.1101 and standard EPA & OSHA accepted methods. Samples consisting of multiple layers were separated and analyzed independently in the laboratory.

3.2 Regulatory Guidelines and Requirements for ACM

FEDERAL

In accordance with the Clean Air Act (CAA), the U.S. Environmental Protection Agency (EPA) established National Emission Standards for hazardous Air Pollutants (NESHAP) to protect the public from exposure to airborne pollutants. Asbestos was one of the air pollutants, which was addressed under the NESHAP 40 CFR Part 61. The purpose of asbestos NESHAP regulations is to protect the public health by minimizing the release of asbestos when facilities, which contain ACM, are being renovated or demolished. EPA is responsible for enforcing regulations related to asbestos during renovations and demolition, however, the CAA allows the EPA to delegate this authority to State and Local Agencies. Even after EPA delegate's responsibility to a state or Local agency, EPA retains the authority to oversee agency performance and to enforce NESHAP regulations as appropriate.

NEW YORK STATE

Asbestos in New York State is regulated under the Labor Law Section 906, Part 56 of Title 12 of the Official Compilation of Codes, Rules, and Regulations. Within the department and for the purpose of the Department of Labor, this part (rule) is known as Industrial Code Rule No. 56 (ICR 56) relating to hazards to the public safety and health, during the removal, encapsulation, or disturbance of friable asbestos, or any handling of ACM that may result in the release of asbestos fiber.

As specified in Title 12 NYCRR Part 56-5.1 (h) and (i), "If the building/structure asbestos survey finds that the portion of the building/structure to be demolished, renovated, remodeled, or have repair work contains ACM, PACM, suspect miscellaneous ACM assumed to be ACM, or asbestos material, which is impacted by the work, the owner or the owner's agent shall conduct, or cause to have conducted, asbestos removal performed by a licensed asbestos abatement contractor in conformance with all standards set forth in this Part. All ACM, PACM, suspect miscellaneous ACM assumed to be ACM, or asbestos material impacted by the demolition, renovation, remodeling or repair project shall be removed as per this Part, prior to access or disturbance by other uncertified trades or personnel. No demolition, renovation, remodeling or repair work shall be commenced by any owner or the owner's agent prior to the completion of the asbestos abatement in accordance with the notification requirements of this Part…All building/structure owners and asbestos abatement contractors on a demolition, renovation, remodeling, or repair project, which includes work covered by this part, shall inform all trades on the work site about PACM, ACM, asbestos material and suspect miscellaneous ACM…Bids may be advertised and contracts

awarded for demolition, remodeling, renovation, or repair work, but no work on the current intermediate portion of the project shall commence on the demolition, renovation, remodeling or repair work by any owner or agent prior to completion of all necessary asbestos abatement work for the current intermediate portion of the entire project, in conformance with all standards set forth in this Part." All work conducted should be in accordance with all legal requirements, including but not limited to U.S. Environmental Protection Agency (EPA) National Emissions Standards for Hazardous Air Pollutants (NESHAP) [40 CFR Part 61], New York State Industrial Code Rule 56 Asbestos Regulations (ICR 56) and Chapter 1 of Title 15 of the Rules of the City of New York Regulations, as applicable. Advance notification of the asbestos project to the USEPA, NYSDOL, and NYCDEP may be required.

CONCEALED ACM

In addition to the ACMs identified at the site, there is a possibility that concealed suspect ACM may exist at the building/structure. As such, if any concealed suspect ACM is encountered during future construction related activities, the work should immediately stop. Prior to resuming the work, the suspect ACM should either be 1) Sampled by an appropriately-certified asbestos professional and submitted to an Approved NYSDOH ELAP laboratory for asbestos analysis or 2) Presumed to be ACM (PACM) and removed by a licensed asbestos abatement contractor for disposal in accordance with all applicable regulations.

4.0 Lead-based Paint (LBP)

4.1 Applicable Standards/Guidelines for LBP

The U.S Department of Housing and Urban Development (HUD) defines the action level for lead-based paint as a lead content equal to or greater than 1.0 milligrams of lead per square centimeter of painted surface (≥1.0 mg Pb/cm^2) when measured with an XRF analyzer or 0.5 percent by weight when chemically tested. This definition is described in the HUD "Lead-Based Paint: Interim Guidelines for Hazard Identification and Abatement in Public and Indian Housing, September 1990". The state of New York's definition of the action level for lead-based paint is consistent with the level established by HUD.

Please note that although the HUD defines lead-based paint as paint having lead concentrations equal or greater than 1.0 mg/cm2, the Occupational Safety and Health Administration (OSHA) considers any concentration of lead in paint to be lead-containing paint. Regardless of the lead concentrations in paint, the contractor shall comply with 29 CFR 1926.62, OSHA regulations, and take precautionary measures for dust control and limit employee exposure to lead dust during the renovations.

Painted surfaces that would be impacted by planned activities such as drilling, cutting, scrapping, etc. and create dust should be properly addressed by following safe work practices, good housekeeping procedures and/or following proper abatement procedures. Grinding and sanding of paint without HEPA filter exhaust, open flame gas fired torch, unconfined abrasive blasting, and chemical strippers containing methylene chloride or other human carcinogenic chemicals are not recommended.

The Federal Resource Conservation and Recovery Act (RCRA) regulation governs the handling, transportation, and disposal of hazardous materials. Every demolition/renovation debris generator has the responsibility to determine whether the debris exhibits one or more of the characteristic wastes listed in subpart C of 40 CFR Part 261. In the case of demolition debris, lead in LBP is a characteristic waste, and therefore, it is the responsibility of the renovation/demolition debris generator to characterize the waste

prior to its disposal and, if found to be hazardous waste as defined by Federal Statutes, to be properly handled and disposed.

Metal objects painted with LBP are exempt from disposal regulations applicable to lead, provided they are properly recycled. All metal objects that are painted with LBP should be sent to a certified recycling facility.

This report is not Lead-based Paint abatement specification and should not be used for specifying removal methods or techniques.

4.2 XRF Information

Viken Pb200e X-Ray Fluorescence (XRF) Analyzer(s) were used to survey the building/structure or portion thereof identified to be demolished, renovated, remodeled or repaired for the presence of LBP. The Viken Pb200e XRF Analyzer(s) are using a sealed source of Co-57 with 6mCi sources, meeting HUD requirements for the analysis of paint films. During the analysis, the intensity of the x-rays is converted by the instrument's internal software into an estimate of the concentration of lead in the substance being analyzed. The results are interpreted as concentrations of lead in milligrams per square centimeter. This device is a field-screening tool, used to collect multiple readings in a short period of time. The method of measurement is based on spectrometric analysis of lead x-ray fluorescence within a controlled depth of interrogation. The reading is an estimate of lead content in all layers of paint. The results are displayed in milligrams per square centimeter (mg/cm2). The device(s) used for this inspection were the Viken Pb200e X-Ray Fluorescence (XRF) Analyzer(s) Serial Number 2104, Source date 4/1/23, Serial number 2231, Source date 5/15/22, Serial number 2595, Source date 2/15/23 and/or Serial number 2901, Source date 2/15/23.

5.0 PolyChlorinated Biphenyls (PCB)

5.1 Background and Protocol for PCBs

PolyChlorinated Biphenyls (PCB) are a group of manmade chemicals. PCBs were widely used in building materials and electrical products in the past. The U.S. Environmental Protection Agency banned the manufacturing and certain uses of PCBs in 1978, but buildings constructed or renovated between 1950 and 1978 may still have building materials and electrical products that contain PCBs. Examples of products that may contain PCBs include caulk, paint, glues, plastics, fluorescent lighting ballasts, transformers and capacitors.

PCBs are currently prohibited from being used in caulk and other commodities (U.S. EPA, 40 CFR 761). However, prior to 1977, PCBs were present in some caulking materials used in the construction of schools and other buildings. Studies have shown that concentrations of PCB can exceed 1% (10,000 ppm) by weight in some caulk materials. An investigation of 24 buildings in the Greater Boston Area revealed that one-third of the buildings tested (8 of 24) contained caulking materials with polychlorinated biphenyl (PCB) content exceeding 50 ppm by weight with an average concentration of 15,600 ppm or 1.5% (Herrick et al., 2004). These buildings included schools and other public buildings.

The U.S. EPA regulates the disposal of caulk, as well as soil and other materials contaminated with PCBs from caulk, if the concentration of PCBs exceeds 50 ppm. Such materials must be disposed at an appropriate approved or permitted facility.

U.S. EPA regulation 40 CFR 761 defines "PCB remediation waste" to include contaminated soil, and specifies a clean-up level of <1ppm without further conditions for unrestricted use in "high occupancy areas" (i.e., areas where individuals may be present for 335 hours or more per year). PCB caulk is defined as a PCB bulk product waste, and its disposal is subject to U.S. EPA regulations under the Toxic Substances Control Act (40 CFR761.62).

This protocol has been developed in consultation with the New York State Department of Health, Division of Environmental Health Assessment, Bureau of Toxic Substance Assessment to address concerns about properly managing caulk containing PCBs that will be disturbed during building renovation and maintenance.

CAULK SAMPLE COLLECTION

Buildings constructed or renovated between 1950 and 1977 have a potential to contain PCBs in existing caulk. Representative samples of caulking materials from these buildings prior to renovation or demolition work should be tested to determine whether the caulk is contaminated with PCBs. Professional judgement should be used to design the sampling plan for characterizing caulk throughout the building. The consultant should pay particular attention to construction and maintenance records and to the appearance of caulking materials (likenesses and differences). Samples should be taken from window frames or expansion joints that have not been repaired or replaced since 1977. Depending on specific information provided in the workplan developed by the project manager, such as window placement, compositing of some caulk samples might be appropriate. Caulk from different time periods or that have a different appearance should not be composited together.

It is important to note that caulk used during the time period of interest may also contain asbestos or lead. Therefore, the work plan should include testing, handling and disposal requirements appropriate for such regulated materials.

SOIL SAMPLE COLLECTION

Buildings constructed or renovated between 1950 and 1977, which have undergone further renovation after 1977, may have residual PCB contamination in adjacent soils. An adequate representation of surface soils should be tested to assess the potential for residual PCB contamination.

When designing a representative soil sampling plan, the likelihood of soil contamination from deteriorated or deteriorating caulk should be considered. Caulk that has in the past dried out and fallen to the ground is the most important source of soil contamination. Thus, sampling should include soil beneath windows where caulk has obviously deteriorated or been replaced because of previous deterioration. Areas subject to the stress of sun and prevailing weather (typically the southern and western side of each structure) should be included for sampling. These samples would provide a conservative evaluation of soil conditions due to an increased potential for material failure, possibly resulting in contamination of soil. Also, if earlier renovation or demolition work may have stockpiled potentially contaminated caulk in other school areas, the school should consider having soils in those areas tested as well.

Soil sampling should focus on areas of the building where ”banks” or “gangs” of windows exist/were replaced and areas of the structure where large expansion joints are located. This would provide a conservative evaluation of potential soil contamination and permit efficient sampling.

Any obvious pieces of caulk encountered during the collection of soil samples should be removed from the soil, categorized (with respect to location and depth) and treated as a separate potential sample.

Depth – At each soil sample location, soil should be collected in depth intervals of 0-2 inches, 2-6 inches and 6-12 inches. The surface soil sample (0-2 inches) should be collected from below the vegetative surface layer, if present.

Distance from Structure – Samples should be collected within 1 foot of the building and 5 feet from the building.

Samples should be collected in a manner that prevents cross-contamination. Augers or driven core samplers should be avoided, as any caulk caught on the edge of this type of tool could be driven to lower intervals. Using a designated trowel for each sample location and each interval of depth is encouraged. If the sampling tool is field cleaned between samples, do so in a manner that does not add solvent contamination to the environment.

NOTE
Sampling was performed by **Adelaide** in compliance with protocols outlined by New York State Education Department (NYSED) and USEPA 40 CFR 761, as described above. Only one sample per homogeneous area was required for analysis of suspect PCB-containing materials. Bulk sample(s) were properly packaged and forwarded, with associated Chain of Custody (COC), to York Analytical Laboratories, Inc., for analysis using method SW846-3550B/8082. The analysis will determine if the suspect material will be classified as PCB-containing at or above 50 ppm or mg/kg as per the EPA regulations. Copies of the analytical results are contained within attached appendices for review.

6.0 General Discussion

All construction personnel as well as individuals who have access to locations where asbestos-containing materials (ACM), lead-based paints (LBP) and/or polychlorinated biphenyls (PCB) exists should be informed of its presence and the proper work practices in these areas. Conspicuous labeling of all ACM is suggested to ensure personnel is adequately informed. Personnel should be informed not to rest, lean or store material or equipment on or near these surfaces and not to cut, saw, drill, sand or disturb ACM. All removal, disturbance, and repair of ACM should be performed in compliance with Title 12 NYCRR Part 56 by persons properly trained to handle ACM. Facility custodial and maintenance personnel should receive training commensurate with their work activities; as defined in 29 CFR 1910.1001.

7.0 Disclaimers

Adelaide certifies that the information contained within this report is based solely upon site observations and the results of laboratory analysis for samples collected during this survey/assessment. These observations and results are time dependent, subject to changing site conditions and revisions to Federal, State and Local regulations. **Adelaide** warrants that these findings have been promulgated after being prepared in general accordance with generally accepted practices in the abatement industries. **Adelaide** also recognizes that inspection laboratory data is not usually sufficient to make all abatement and management decisions. No other warranties are expressed or implied.

The materials sampled, as part of this survey, were limited to building materials potential affected by the provided scope of work only. All building materials outside the scope of work that have the potential to be disturbed, impacted, or if the scope of work is to change, are to be presumed asbestos-containing materials (PACM). Identified PACM **must** either be sampled by a licensed NYS Asbestos Inspector and/or abated/removed and disposed of by a licensed NYS Asbestos Abatement Contractor.

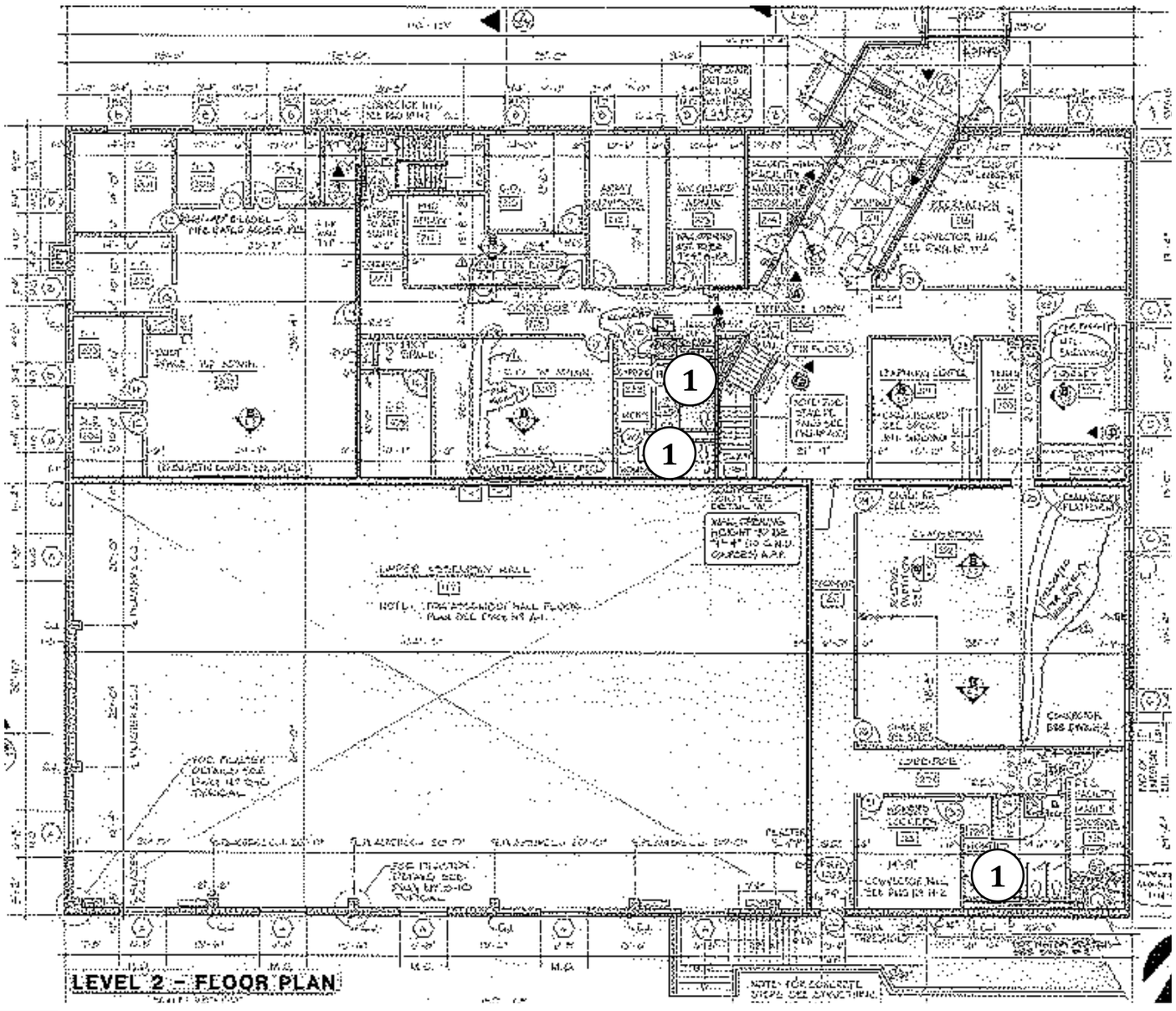
Due to the potential for concealed Asbestos-containing Materials (ACM) and/or other regulated materials, this report should not be construed to represent all ACM and/or regulated materials within the site(s). All quantities of ACM and/or other regulated materials identified, and all dimensions listed within this report are approximate and should be verified On-site.

This report is generated for the exclusive use of the client and is not designed to serve as a specification for abatement. The owner is strongly encouraged to contract with a consultant having a current Asbestos Project Designer Certificate as issued by New York State Department of Labor for the preparation of contract specifications, work plans, and/or drawings prior to requesting bids for the abatement or removal of the materials identified in this report.

NYSDOH issued an Interim Guidance Letter, on July 9, 2013, which outlined the approved testing alternative for materials containing vermiculite. Specifically, "...Where TSI, surfacing materials, or other PACM or miscellaneous suspect ACM contain greater than 10% vermiculite, Item 198.6 may be used to evaluate the asbestos content of the material; provided, however, that any test results using this method must be reported with the following conspicuous disclaimer: *"This method does not remove vermiculite and may underestimate the level of asbestos present in a sample containing greater than 10% vermiculite."* On July 22, 2014, NYSDOH issued a Regulatory Guidance Letter outlining the new approved analytical methods for testing sprayed-on fireproofing (SOFP) that contains vermiculite. NYSDOH authorized the use of ***two*** analytical methods to evaluate the asbestos content of SOFP that contains vermiculite. As per NYSDOH Guidelines, *"After October 31, 2014, one of the new methods **must** be used to test SOF-V, regardless of the percent of vermiculite."* On May 6, 2016, NYSDOH issued a Regulatory Guidance Letter outlining the new protocol for analytical procedure for surfacing materials (ie. plaster, stucco, etc.) that contain vermiculite. As per NYSDOH Guidelines, "*The original July 2013 and July 2014 letters addressed SOF-V only. Both NYS DOH's Item 198.8 and RJ Lee Group Method 055 shall now be applied to test for vermiculite in other Surfacing Material (SM) as defined in 12 NYCRR Part 56 (NYS Industrial Code Rule 56).*"

APPENDIX A

ACM LOCATION MAP(S)



ACM LEGEND: (see report for details)	
1	Assumed Mirror Mastic
PACM	Electrical Wire and Panels Throughout

Second Floor Plans - Asbestos Locations

Drawing Not to Scale

Adelaide ENVIRONMENTAL HEALTH
1511 Route 22
Brewster, NY 10509
Phone: (845) 278-7710
Fax: (845) 278-7750

CLIENT:
Greg Springer
Bergmann: Architects, Engineers, Planners
18 Corporate Woods Blvd., Suite 400
Albany, New York 12211

(Client) Project #

SURVEY LOCATION:
Yonkers Armory
2 Quincy Place
Yonkers, New York 10701

DATE: 6/13/2023

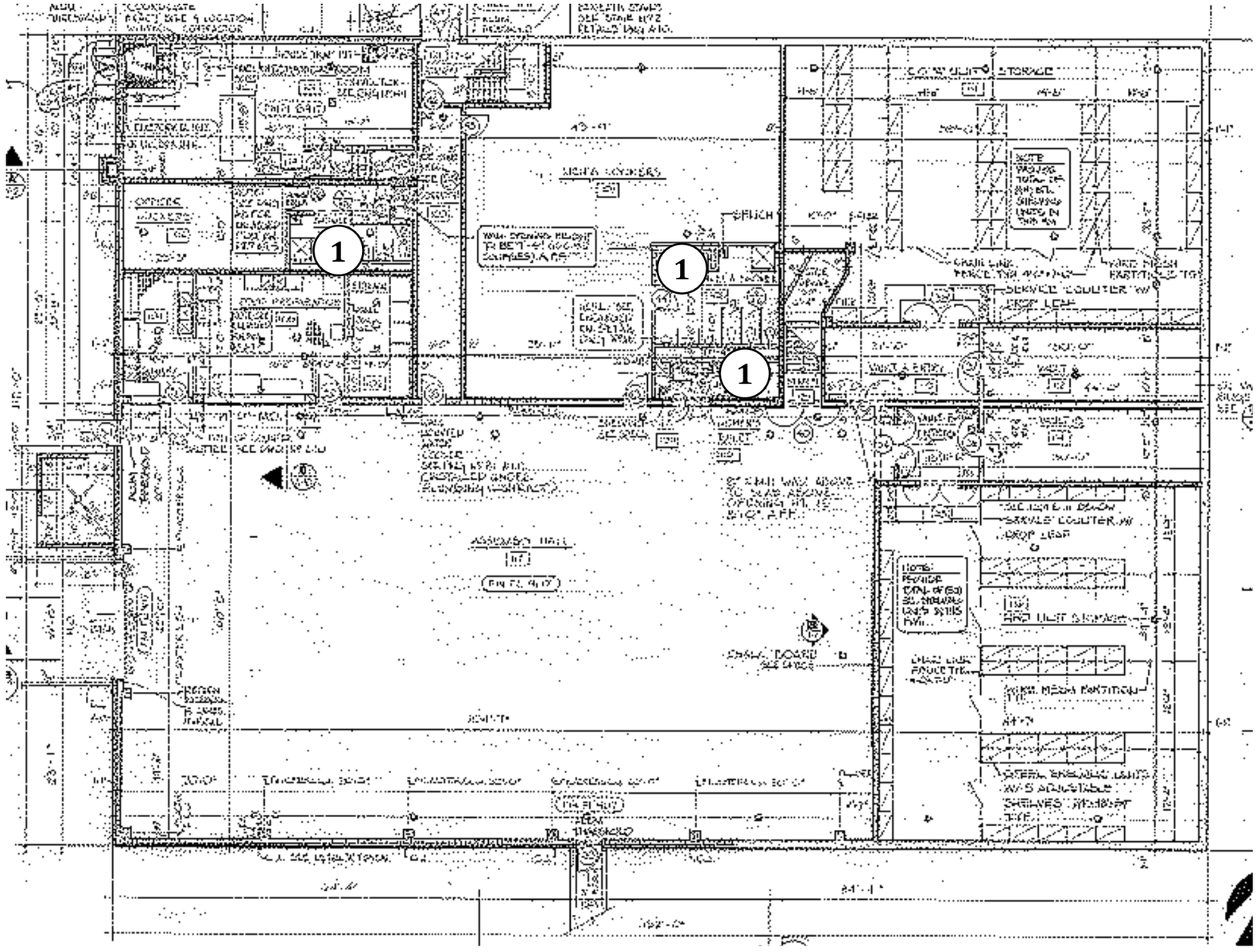
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ISSUED FOR:
Asbestos, Lead & PCB Survey

ADELAIDE PROJECT NO.:
BA:23168.00-IN

DRAWING PREPARED BY:
JPF

ASB-01



ACM LEGEND: (see report for details)	
1	Assumed Mirror Mastic
PACM	Electrical Wire and Panels Throughout

First Floor Plans - Asbestos Locations

Drawing Not to Scale

Adelaide ENVIRONMENTAL HEALTH
1511 Route 22
Brewster, NY 10509
Phone: (845) 278-7710
Fax: (845) 278-7750

CLIENT:
Greg Springer
Bergmann: Architects, Engineers, Planners
18 Corporate Woods Blvd., Suite 400
Albany, New York 12211

(Client) Project #

SURVEY LOCATION:
Yonkers Armory
2 Quincy Place
Yonkers, New York 10701

DATE: 6/13/2023

DRAWING VERSION: No. 1

ISSUED FOR:
Asbestos, Lead & PCB Survey

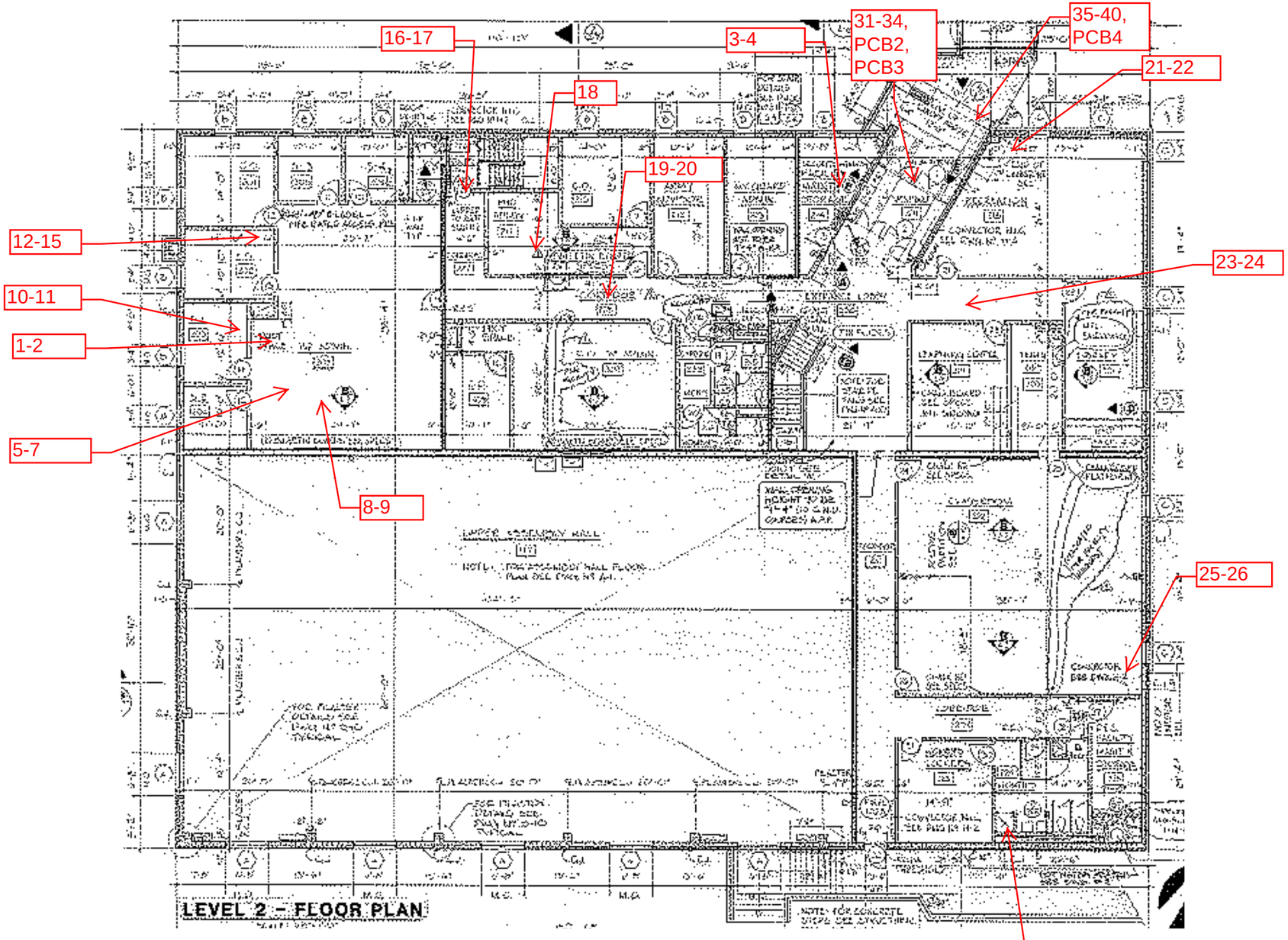
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BA:23168.00-IN

DRAWING PREPARED BY:
JPF

ASB-02

APPENDIX B

SAMPLE LOCATION MAP(S)



Second Floor Plans - Sample Locations

Drawing Not to Scale

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Phone: (845) 278-7710
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CLIENT:
Greg Springer
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Albany, New York 12211

(Client) Project #

SURVEY LOCATION:
Yonkers Armory
2 Quincy Place
Yonkers, New York 10701

DATE: 6/13/2023

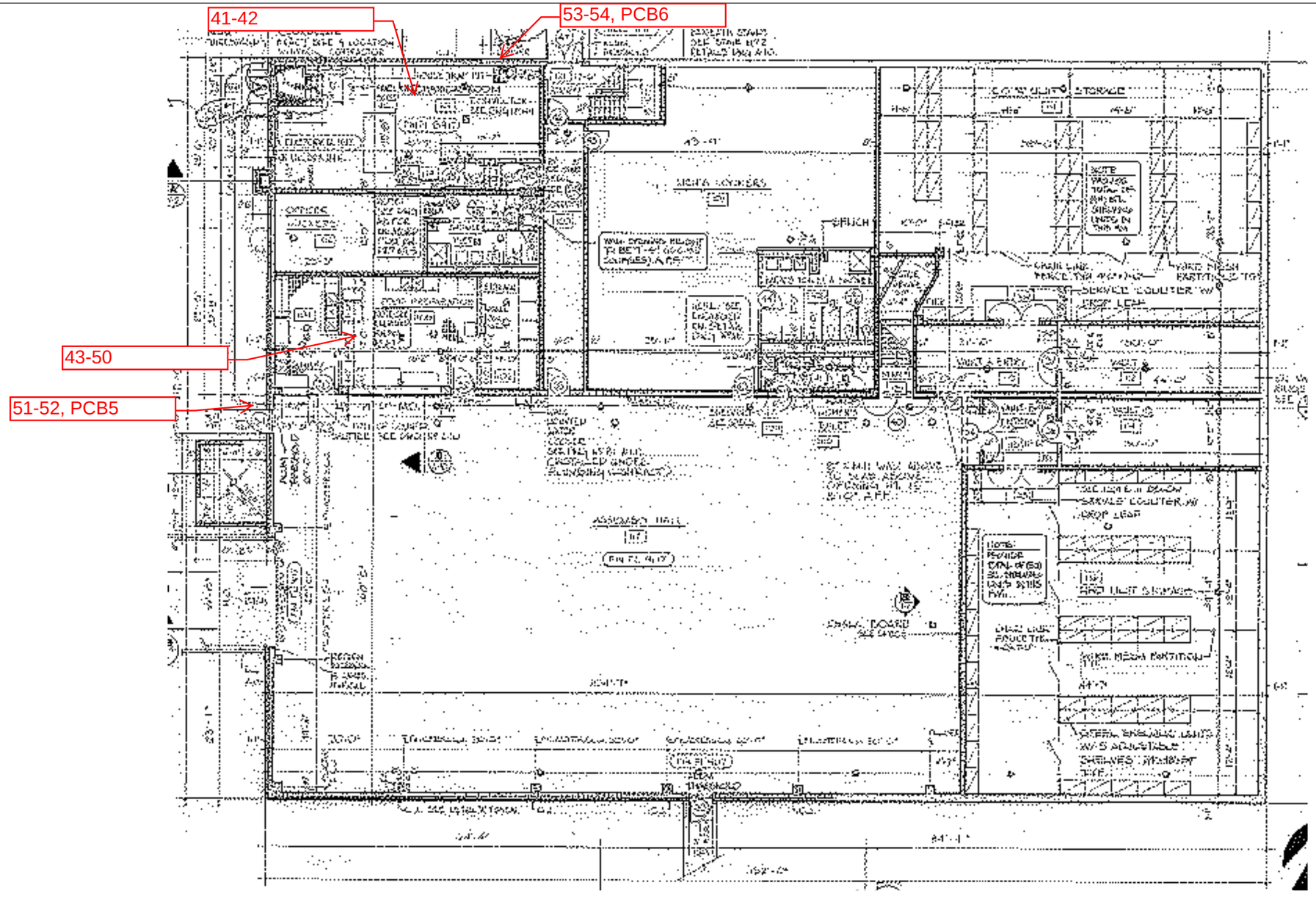
DRAWING VERSION: No. 1

ISSUED FOR:
Asbestos, Lead & PCB Survey

ADELAIDE PROJECT NO.:
BA:23168.00-IN

DRAWING PREPARED BY:
JPF

SL-01



First Floor Plans - Sample Locations

Drawing Not to Scale

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CLIENT:
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Bergmann: Architects, Engineers, Planners
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Albany, New York 12211

(Client) Project #

SURVEY LOCATION:
Yonkers Armory
2 Quincy Place
Yonkers, New York 10701

DATE: 6/13/2023

DRAWING VERSION: No. 1

ISSUED FOR:
Asbestos, Lead & PCB Survey

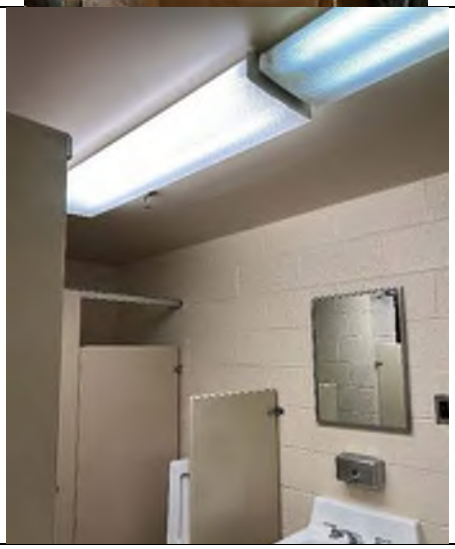
ADELAIDE PROJECT NO.:
BA:23168.00-IN

DRAWING PREPARED BY:
JPF

SL-02

APPENDIX C

ACM PHOTO(S)

PACM Electrical Wire Insulation and Panels	
PACM Electrical Wire Insulation and Panels	
PACM Mirror Mastic	

APPENDIX D

ASBESTOS ANALYTICAL RESULTS

Table I
Summary of Bulk Asbestos Analysis Results

OGSX:23168.00-IN; Yonkers Armory; 2 Quincy Place, Yonkers, New York 10701

AmeriSci Sample #	Client Sample#	HG Area	Sample Weight (gram)	Heat Sensitive Organic %	Acid Soluble Inorganic %	Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
01	1	1	0.226	17.4	81.7	0.9	NAD	NAD
Location: 2nd Floor - Room 207 - 12 x 12 F.T. - Brown / Red Mottled								
02	2	1	0.195	16.3	82.6	1.0	NAD	NAD
Location: 2nd Floor - Room 207 - 12 x 12 F.T. - Brown / Red Mottled								
03	3	2	0.142	79.8	15.9	4.3	NAD	NAD
Location: 2nd Floor - Room 214 - 12 x 12 F.T. - Black Mastic								
04	4	2	0.157	80.5	13.2	6.3	NAD	NAD
Location: 2nd Floor - Room 214 - 12 x 12 F.T. - Black Mastic								
05	5	3	0.188	24.9	12.0	63.1	NAD	NAD
Location: 2nd Floor - Room 214 - 2 x 4 C.T. - Large + Small Holes								
06	6	3	0.132	26.0	22.1	51.9	NAD	NAD
Location: 2nd Floor - Room 214 - 2 x 4 C.T. - Large + Small Holes								
07	7	4	0.227	55.4	18.6	26.0	NAD	NAD
Location: 2nd Floor - Room 214 - Debris On Top Of C.T.								
08	8	5	0.137	27.2	25.5	47.3	NAD	NAD
Location: 2nd Floor - Room 214 - 2 x 4 C.T. - Squiggles + Holes								
09	9	5	0.159	28.1	21.5	50.4	NAD	NAD
Location: 2nd Floor - Room 214 - 2 x 4 C.T. - Squiggles + Holes								
10	10	6	----	----	----	----	NAD	NA
Location: 2nd Floor - Room 214 - CMU Mortar								
11	11	6	----	----	----	----	NAD	NA
Location: 2nd Floor - Room 214 - CMU Mortar								
12L1	12	7	0.222	62.5	37.0	0.5	NAD	NAD
Location: 2nd Floor - Room 202 - Cove Base - 4" Black								
12L2	12	7	0.222	45.9	49.1	5.0	NAD	NAD
Location: 2nd Floor - Room 202 - Cove Base - 4" Black Mastic								
13L1	13	7	0.212	62.4	37.1	0.5	NAD	NAD
Location: 2nd Floor - Room 202 - Cove Base - 4" Black								
13L2	13	7	0.282	45.7	46.4	7.9	NAD	NAD
Location: 2nd Floor - Room 202 - Cove Base - 4" Black Mastic								
14	14	8	0.234	57.9	4.8	37.4	NAD	NAD
Location: 2nd Floor - Room 202 - Yellow Carpet Mastic								

See Reporting notes on last page

Table I
Summary of Bulk Asbestos Analysis Results

OGSX:23168.00-IN; Yonkers Armory; 2 Quincy Place, Yonkers, New York 10701

AmeriSci Sample #	Client Sample#	HG Area	Sample Weight (gram)	Heat Sensitive Organic %	Acid Soluble Inorganic %	Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
15	15	8	0.161	57.4	24.3	18.3	NAD	NAD
Location: 2nd Floor - Room 202 - Yellow Carpet Mastic								
16	16	9	0.265	17.6	79.9	2.5	NAD	NAD
Location: 2nd Floor - Hallway - 12 x 12 F.T. - Green Mottled								
17	17	9	0.280	16.9	82.3	0.8	NAD	NAD
Location: 2nd Floor - Hallway - 12 x 12 F.T. - Green Mottled								
18	18	10	0.423	26.8	11.1	62.1	NAD	NAD
Location: 2nd Floor - Room 211 - Debris Above C.T.								
19	19	11	----	----	----	----	NAD	NA
Location: 2nd Floor - Hallway - Drywall Ceiling								
20	20	11	----	----	----	----	NAD	NA
Location: 2nd Floor - Hallway - Drywall Ceiling								
21	21	12	0.239	20.8	61.7	17.5	NAD	NAD
Location: 2nd Floor - Room 218 - 12 x 12 F.T. - Brown + White Mottled								
22	22	12	0.260	19.8	59.2	21.0	NAD	NAD
Location: 2nd Floor - Room 218 - 12 x 12 F.T. - Brown + White Mottled								
23	23	13	----	----	----	----	NAD	NA
Location: 2nd Floor - Hallway - Joint Compound								
24	24	13	----	----	----	----	NAD	NA
Location: 2nd Floor - Hallway - Joint Compound								
25	25	14	0.208	19.6	72.6	7.8	NAD	NAD
Location: 2nd Floor - Room 222 - 12 x 12 F.T. - White W/ Gray Specks								
26	26	14	0.244	20.7	60.9	18.5	NAD	NAD
Location: 2nd Floor - Room 222 - 12 x 12 F.T. - White W/ Gray Specks								
27	27	15	----	----	----	----	NAD	NA
Location: 2nd Floor - Rm. 223 - Womens Locker - Terrazzo Shower Base								
28	28	15	----	----	----	----	NAD	NA
Location: 2nd Floor - Rm. 223 - Womens Locker - Terrazzo Shower Base								
29	29	16	0.141	32.0	65.3	2.7	NAD	NAD
Location: 2nd Floor - Rm. 223 - Womens Locker - Sealant At Shower								
30	30	16	0.140	30.7	67.0	2.4	NAD	NAD
Location: 2nd Floor - Rm. 223 - Womens Locker - Sealant At Shower								

See Reporting notes on last page

Table I
Summary of Bulk Asbestos Analysis Results

OGSX:23168.00-IN; Yonkers Armory; 2 Quincy Place, Yonkers, New York 10701

AmeriSci Sample #	Client Sample#	HG Area	Sample Weight (gram)	Heat Sensitive Organic %	Acid Soluble Inorganic %	Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
31	31	17	0.217	29.3	67.7	3.0	NAD	NAD
Location: 2nd Floor - Entrance Doors - Glazing Compound								
32	32	17	0.237	29.2	67.2	3.6	NAD	NAD
Location: 2nd Floor - Entrance Doors - Glazing Compound								
33	33	18	0.187	44.1	53.5	2.4	NAD	NAD
Location: 2nd Floor - Entrance Doors - Exterior Sealant								
34	34	18	0.157	44.9	52.6	2.6	NAD	NAD
Location: 2nd Floor - Entrance Doors - Exterior Sealant								
35	35	19	----	----	----	----	NAD	NA
Location: 2nd Floor - Concrete								
36	36	19	----	----	----	----	NAD	NA
Location: 2nd Floor - Concrete								
37	37	20	----	----	----	----	NAD	NA
Location: 2nd Floor - Brick Mortar								
38	38	20	----	----	----	----	NAD	NA
Location: 2nd Floor - Brick Mortar								
39	39	21	0.171	65.1	26.9	8.0	NAD	NAD
Location: 2nd Floor - Exterior Vertical Sealant								
40	40	21	0.184	65.2	25.9	8.9	NAD	NAD
Location: 2nd Floor - Exterior Vertical Sealant								
41	41	22	0.124	72.9	11.4	15.7	NAD	NAD
Location: 1st Floor - Boiler Room - Pin Mastic On Duct								
42	42	22	0.182	73.9	8.4	17.7	NAD	NAD
Location: 1st Floor - Boiler Room - Pin Mastic On Duct								
43	43	23	----	----	----	----	NAD	NA
Location: 1st Floor - Kitchen - Wall Tile - Grout								
44	44	23	----	----	----	----	NAD	NA
Location: 1st Floor - Kitchen - Wall Tile - Grout								
45	45	24	----	----	----	----	NAD	NA
Location: 1st Floor - Kitchen - Wall Tile - Mudset								
46	46	24	----	----	----	----	NAD	NA
Location: 1st Floor - Kitchen - Wall Tile - Mudset								

See Reporting notes on last page

Table I
Summary of Bulk Asbestos Analysis Results

OGSX:23168.00-IN; Yonkers Armory; 2 Quincy Place, Yonkers, New York 10701

AmeriSci Sample #	Client Sample#	HG Area	Sample Weight (gram)	Heat Sensitive Organic %	Acid Soluble Inorganic %	Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
47	47	25	----	----	----	----	NAD	NA
Location: 1st Floor - Kitchen - Floor Tile - Grout								
48	48	25	----	----	----	----	NAD	NA
Location: 1st Floor - Kitchen - Floor Tile - Grout								
49	49	26	----	----	----	----	NAD	NA
Location: 1st Floor - Kitchen - Floor Tile - Mudset								
50	50	26	----	----	----	----	NAD	NA
Location: 1st Floor - Kitchen - Floor Tile - Mudset								
51	51	27	0.187	62.0	27.5	10.6	NAD	NAD
Location: 1st Floor - Exterior - Door Caulk								
52	52	27	0.206	64.6	22.3	13.1	NAD	NAD
Location: 1st Floor - Exterior - Door Caulk								
53	53	28	0.170	60.7	11.7	27.6	NAD	NAD
Location: 1st Floor - Exterior - Louver Caulk								
54	54	28	0.103	59.9	5.8	34.2	NAD	NAD
Location: 1st Floor - Exterior - Louver Caulk								

Analyzed by: Gabriella Morozov 

Date: 6/8/2023

Reviewed by: Gabriella Morozov 

**Quantitative Analysis (Semi/Full); Bulk Asbestos Analysis - PLM by Appd E to Subpt E, 40 CFR 763 or NYSDOH ELAP 198.1 for New York friable samples or NYSDOH ELAP 198.6 for New York NOB samples; TEM (Semi/Full) by EPA 600/R-93/116 (or NYSDOH ELAP 198.4; for New York samples). Analysis using Hitachi, Model H7000-Noran 7 System, Microscope, Serial #: 747-05-06. NAD = no asbestos detected during a quantitative analysis; NA = not analyzed; Trace = <1%; (SOF-V) = Sprayed On Fireproofing containing Vermiculite; (SM-V) = Surfacing Material containing Vermiculite; Quantitation for beginning weights of <0.1 grams should be considered as qualitative only; Qualitative Analysis: Asbestos analysis results of "Present" or "NVA = No Visible Asbestos" represents results for Qualitative PLM or TEM Analysis only (no accreditation coverage available from any regulatory agency for qualitative analyses): NVLAP (PLM) 200546-0, NYSDOH ELAP Lab 11480, NJ Lab ID #NY031.

Warning Note: PLM limitation, only TEM will resolve fibers <0.25 micrometers in diameter. TEM bulk analysis is representative of the fine grained matrix material and may not be representative of non-uniformly dispersed debris for which PLM evaluation is recommended (i.e. soils and other heterogenous materials).

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

PLM Bulk Asbestos Report

Adelaide Environmental Health
Attn: John Soter
1511 Rte. 22, Suite C24

Brewster, NY 10509

Date Received 06/07/23
Date Examined 06/08/23
ELAP # 11480

AmeriSci Job # 223061619
P.O. #
Page 1 **of** 10

RE: OGSX:23168.00-IN; Yonkers Armory; 2 Quincy Place, Yonkers, New York 10701

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
1	223061619-01	***No***	NAD
1	**Location:** 2nd Floor - Room 207 - 12 x 12 F.T. - Brown / Red Mottled		(by NYS ELAP 198.6) by Kensen Caro on 06/08/23
Analyst Description: Brown/Red, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 0.9%			
2	223061619-02	***No***	NAD
1	**Location:** 2nd Floor - Room 207 - 12 x 12 F.T. - Brown / Red Mottled		(by NYS ELAP 198.6) by Kensen Caro on 06/08/23
Analyst Description: Brown/Red, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 1%			
3	223061619-03	***No***	NAD
2	**Location:** 2nd Floor - Room 214 - 12 x 12 F.T. - Black Mastic		(by NYS ELAP 198.6) by Kensen Caro on 06/08/23
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 4.3%			
4	223061619-04	***No***	NAD
2	**Location:** 2nd Floor - Room 214 - 12 x 12 F.T. - Black Mastic		(by NYS ELAP 198.6) by Kensen Caro on 06/08/23
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 6.3%			
5	223061619-05	***No***	NAD
3	**Location:** 2nd Floor - Room 214 - 2 x 4 C.T. - Large + Small Holes		(by NYS ELAP 198.6) by Kensen Caro on 06/08/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 63.1%			

See Reporting notes on last page

PLM Bulk Asbestos Report

OGSX:23168.00-IN; Yonkers Armory; 2 Quincy Place, Yonkers, New York 10701

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
6 3	223061619-06 **Location:** 2nd Floor - Room 214 - 2 x 4 C.T. - Large + Small Holes	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 06/08/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 51.9%			
7 4	223061619-07 **Location:** 2nd Floor - Room 214 - Debris On Top Of C.T.	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 06/08/23
Analyst Description: Black, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 26%			
8 5	223061619-08 **Location:** 2nd Floor - Room 214 - 2 x 4 C.T. - Squiggles + Holes	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 06/08/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 47.3%			
9 5	223061619-09 **Location:** 2nd Floor - Room 214 - 2 x 4 C.T. - Squiggles + Holes	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 06/08/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 50.4%			
10 6	223061619-10 **Location:** 2nd Floor - Room 214 - CMU Mortar	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 06/08/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			
11 6	223061619-11 **Location:** 2nd Floor - Room 214 - CMU Mortar	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 06/08/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			

See Reporting notes on last page

PLM Bulk Asbestos Report

OGSX:23168.00-IN; Yonkers Armory; 2 Quincy Place, Yonkers, New York 10701

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
12 7	223061619-12L1 **Location:** 2nd Floor - Room 202 - Cove Base - 4" Black	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 06/08/23
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 0.5%			
12 7	223061619-12L2 **Location:** 2nd Floor - Room 202 - Cove Base - 4" Black Mastic	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 06/08/23
Analyst Description: Cream, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 5%			
13 7	223061619-13L1 **Location:** 2nd Floor - Room 202 - Cove Base - 4" Black	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 06/08/23
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 0.5%			
13 7	223061619-13L2 **Location:** 2nd Floor - Room 202 - Cove Base - 4" Black Mastic	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 06/08/23
Analyst Description: Cream, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 7.9%			
14 8	223061619-14 **Location:** 2nd Floor - Room 202 - Yellow Carpet Mastic	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 06/08/23
Analyst Description: Yellow, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 37.4%			
15 8	223061619-15 **Location:** 2nd Floor - Room 202 - Yellow Carpet Mastic	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 06/08/23
Analyst Description: Yellow, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 18.3%			

See Reporting notes on last page

PLM Bulk Asbestos Report

OGSX:23168.00-IN; Yonkers Armory; 2 Quincy Place, Yonkers, New York 10701

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
16 9	223061619-16 **Location:** 2nd Floor - Hallway - 12 x 12 F.T. - Green Mottled	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 06/08/23
Analyst Description: Green, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 2.5%			
17 9	223061619-17 **Location:** 2nd Floor - Hallway - 12 x 12 F.T. - Green Mottled	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 06/08/23
Analyst Description: Green, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 0.8%			
18 10	223061619-18 **Location:** 2nd Floor - Room 211 - Debris Above C.T.	***No***	NAD [1] (by NYS ELAP 198.6) by Kensen Caro on 06/08/23
Analyst Description: Black, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 62.1%			
19 11	223061619-19 **Location:** 2nd Floor - Hallway - Drywall Ceiling	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 06/08/23
Analyst Description: Gray/Brown, Heterogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose 15%, Non-fibrous 85%			
20 11	223061619-20 **Location:** 2nd Floor - Hallway - Drywall Ceiling	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 06/08/23
Analyst Description: Gray/Brown, Heterogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose 15%, Non-fibrous 85%			
21 12	223061619-21 **Location:** 2nd Floor - Room 218 - 12 x 12 F.T. - Brown + White Mottled	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 06/08/23
Analyst Description: Brown, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 17.5%			

See Reporting notes on last page

PLM Bulk Asbestos Report

OGSX:23168.00-IN; Yonkers Armory; 2 Quincy Place, Yonkers, New York 10701

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
22 12	223061619-22 **Location:** 2nd Floor - Room 218 - 12 x 12 F.T. - Brown + White Mottled	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 06/08/23
Analyst Description: Brown, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 21%			
23 13	223061619-23 **Location:** 2nd Floor - Hallway - Joint Compound	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 06/08/23
Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			
24 13	223061619-24 **Location:** 2nd Floor - Hallway - Joint Compound	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 06/08/23
Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			
25 14	223061619-25 **Location:** 2nd Floor - Room 222 - 12 x 12 F.T. - White W/ Gray Specks	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 06/08/23
Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 7.8%			
26 14	223061619-26 **Location:** 2nd Floor - Room 222 - 12 x 12 F.T. - White W/ Gray Specks	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 06/08/23
Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 18.5%			
27 15	223061619-27 **Location:** 2nd Floor - Rm. 223 - Womens Locker - Terrazzo Shower Base	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 06/08/23
Analyst Description: White/Gray, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			

See Reporting notes on last page

PLM Bulk Asbestos Report

OGSX:23168.00-IN; Yonkers Armory; 2 Quincy Place, Yonkers, New York 10701

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
28 15	223061619-28 **Location:** 2nd Floor - Rm. 223 - Womens Locker - Terrazzo Shower Base	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 06/08/23
Analyst Description: White/Gray, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			
29 16	223061619-29 **Location:** 2nd Floor - Rm. 223 - Womens Locker - Sealant At Shower	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 06/08/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 2.7%			
30 16	223061619-30 **Location:** 2nd Floor - Rm. 223 - Womens Locker - Sealant At Shower	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 06/08/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 2.4%			
31 17	223061619-31 **Location:** 2nd Floor - Entrance Doors - Glazing Compound	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 06/08/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 3%			
32 17	223061619-32 **Location:** 2nd Floor - Entrance Doors - Glazing Compound	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 06/08/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 3.6%			
33 18	223061619-33 **Location:** 2nd Floor - Entrance Doors - Exterior Sealant	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 06/08/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 2.4%			

See Reporting notes on last page

PLM Bulk Asbestos Report

OGSX:23168.00-IN; Yonkers Armory; 2 Quincy Place, Yonkers, New York 10701

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
34 18	223061619-34 **Location:** 2nd Floor - Entrance Doors - Exterior Sealant	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 06/08/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 2.6%			
35 19	223061619-35 **Location:** 2nd Floor - Concrete	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 06/08/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			
36 19	223061619-36 **Location:** 2nd Floor - Concrete	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 06/08/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			
37 20	223061619-37 **Location:** 2nd Floor - Brick Mortar	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 06/08/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			
38 20	223061619-38 **Location:** 2nd Floor - Brick Mortar	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 06/08/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			
39 21	223061619-39 **Location:** 2nd Floor - Exterior Vertical Sealant	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 06/08/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 8%			

See Reporting notes on last page

PLM Bulk Asbestos Report

OGSX:23168.00-IN; Yonkers Armory; 2 Quincy Place, Yonkers, New York 10701

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
40 21	223061619-40 **Location:** 2nd Floor - Exterior Vertical Sealant	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 06/08/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 8.9%			
41 22	223061619-41 **Location:** 1st Floor - Boiler Room - Pin Mastic On Duct	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 06/08/23
Analyst Description: Dark Brown, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 15.7%			
42 22	223061619-42 **Location:** 1st Floor - Boiler Room - Pin Mastic On Duct	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 06/08/23
Analyst Description: Dark Brown, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 17.7%			
43 23	223061619-43 **Location:** 1st Floor - Kitchen - Wall Tile - Grout	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 06/08/23
Analyst Description: White, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			
44 23	223061619-44 **Location:** 1st Floor - Kitchen - Wall Tile - Grout	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 06/08/23
Analyst Description: White, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			
45 24	223061619-45 **Location:** 1st Floor - Kitchen - Wall Tile - Mudset	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 06/08/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			

See Reporting notes on last page

PLM Bulk Asbestos Report

OGSX:23168.00-IN; Yonkers Armory; 2 Quincy Place, Yonkers, New York 10701

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
46 24	223061619-46 **Location:** 1st Floor - Kitchen - Wall Tile - Mudset	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 06/08/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			
47 25	223061619-47 **Location:** 1st Floor - Kitchen - Floor Tile - Grout	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 06/08/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			
48 25	223061619-48 **Location:** 1st Floor - Kitchen - Floor Tile - Grout	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 06/08/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			
49 26	223061619-49 **Location:** 1st Floor - Kitchen - Floor Tile - Mudset	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 06/08/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			
50 26	223061619-50 **Location:** 1st Floor - Kitchen - Floor Tile - Mudset	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 06/08/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			
51 27	223061619-51 **Location:** 1st Floor - Exterior - Door Caulk	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 06/08/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 10.6%			

See Reporting notes on last page

PLM Bulk Asbestos Report

OGSX:23168.00-IN; Yonkers Armory; 2 Quincy Place, Yonkers, New York 10701

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
52 27	223061619-52 **Location:** 1st Floor - Exterior - Door Caulk	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 06/08/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 13.1%			
53 28	223061619-53 **Location:** 1st Floor - Exterior - Louver Caulk	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 06/08/23
Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 27.6%			
54 28	223061619-54 **Location:** 1st Floor - Exterior - Louver Caulk	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 06/08/23
Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 34.2%			

Reporting Notes:

(1) Analysis Results For Soil, Dust, Or Debris May Be Highly Variable Because Of The Heterogeneous Nature Of These Samples

Analyzed by: Kensen Caro
Date: 6/8/2023

Reviewed by: Gabriella Morozov

*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_____

Adelaide Environmental Health Associates, Inc
1454 Rte. 22, Suite B202
Brewster, NY 10509
845-278-7710
845-278-7750 - fax

Site Address: Yonkers Armory	Date: 6/6/2023	Inspector: Jason Fullum
2 Quincy Place	Client Project #	
Yonkers, New York 10701	Project #: OGSX:23168.00-IN	

Sample ID #	Homogeneous Area	Floor Level	Sample Location/Description	Quantity (In Feet)	Friable Non Friable	Condition g, d, sd
1	1	2	Room 207 - 12x12 F.T. - Brown Red Mottled	980SF	NF	G
2	1	2				
3	2	2	Room 214 - - Black Mastic			
4	2	2				
5	3	2	- 2x4 C.T. - Large + Small Holes		NF	
6	3	2				
7	4	2	- Debris on Top of C.T.			SD
8	5	2	- 2x4 C.T. - Scissles + Holes			G
9	5	2				
10	6	2	- CMU Mortar			
11	6	2				
12	7	2	Room 202 - Coveblase - 4" Black + Mastic			
13	7	2				

Special Instructions/ Turnaround Time: 223061619

Stop at 1st Positive per Homogenous Area ***24 HR TAT***
Fax Results to 845-278-7750
E-Mail results to AdelaideLabResults@Adelaidellc.com and Jfullum@adelaidellc.com

Relinquished by:
Received by: Alexandra Vargas 6-7-23 1030
Relinquished by:
Received by:

Adelaide Environmental Health Associates, Inc
1454 Rte. 22, Suite B202
Brewster, NY 10509
845-278-7710
845-278-7750 - fax

Site Address: Yonkers Armory	Date: 6/6/2023	Inspector: Jason Fullum
2 Quincy Place	Client Project #	
Yonkers, New York 10701	Project #: OGSX:23168.00-IN	

Sample ID #	Homogeneous Area	Floor Level	Sample Location/Description	Quantity (In Feet)	Friable Non Friable	Condition g, d, sd
14	8	2	Room 202 - Yellow Carpet Mastic		NF	G
15	8	2	↓ ↓		↓	↓
16	9	2	Hallway - 12x12 F.T. - Green Mottled			
17	9	2	↓ ↓ ↓			
18	10	2	Room 211 - Debris above C.T.		F	SD
19	10	2	Hallway - Drywall Ceiling		F	G
20	11	2	↓ ↓		F	
21	12	2	Room 218 - 12x12 F.T. - Brown + White Mottled		NF	
22	12	2	↓ ↓ ↓		↓	
23	13	2	Hallway - Joint Compound		F	
24	13	2	↓ ↓		F	
25	14	2	Room 222 - 12x12 F.T. - White w/ Gray Specks		NF	
26	14	2	↓ ↓		↓	↓

Special Instructions/ Turnaround Time: 23061619

Stop at 1st Positive per Homogenous Area ***24 HR TAT***
Fax Results to 845-278-7750
E-Mail results to AdelaideLabResults@Adelaidellc.com and Jfullum@adelaidellc.com

Relinquished by:
Received by: Alexandra Vaccaro 6/23 1030
Relinquished by:
Received by:

Adelaide Environmental Health Associates, Inc
1454 Rte. 22, Suite B202
Brewster, NY 10509
845-278-7710
845-278-7750 - fax

Site Address: Yonkers Armory	Date: 6/6/2023	Inspector: Jason Fullum
2 Quincy Place	Client Project #	
Yonkers, New York 10701	Project #: OGSX:23168.00-IN	

Sample ID #	Homogeneous Area	Floor Level	Sample Location/Description	Quantity (In Feet)	Friable Non Friable	Condition g, d, sd
27	15	2	Rm. 223 - Women locker - Terrazzo Shower Pan		NF	D
28	15	2				D
29	16	2	- Sealant at Shower			D
30	16	2				D
31	17	2	Entrance Doors - Door Glazing Compound		NF	
32	17	2				
33	18	2	- Exterior Sealant			
34	18	2				
35	19	2	Concrete			
36	19	2				
37	20	2	Brick Mortar			
38	20	2				
39	21	2	Exterior Vertical Sealant			
40	21	2				

Special Instructions/ Turnaround Time: 223061619

Stop at 1st Positive per Homogenous Area ***24 HR TAT***
Fax Results to 845-278-7750
E-Mail results to AdelaideLabResults@Adelaidellc.com and Jfullum@adelaidellc.com

Relinquished by:
Received by: Alexandra Vuic 6/7/23 1030
Relinquished by:
Received by:

Adelaide Environmental Health Associates, Inc
1454 Rte. 22, Suite B202
Brewster, NY 10509
845-278-7710
845-278-7750 - fax

Site Address: Yonkers Armory	Date: 6/6/2023	Inspector: Jason Fullum
2 Quincy Place	Client Project #	
Yonkers, New York 10701	Project #: OGSX:23168.00-IN	

Sample ID #	Homogeneous Area	Floor Level	Sample Location/Description	Quantity (In Feet)	Friable Non Friable	Condition g, d, sd
41	22	1	Boiler Room - Pipe Mastic on Duct		NF	D
42	22	1				D
43	23	1	Kitchen - Wall Tile - Grout			
44	23	1				
45	24	1	- Mudset			
46	24	1				
47	25	1	- Floor Tile - Grout			
48	25	1				
49	26	1	- Mudset			
50	26	1				
51	27	1	Exterior - Door Caulk			
52	27	1				
53	28	1	- Louver Caulk			
54	28	1				

Special Instructions/ Turnaround Time: 223061619

Stop at 1st Positive per Homogenous Area ***24 HR TAT***
Fax Results to 845-278-7750
E-Mail results to AdelaideLabResults@Adelaidellc.com and Jfullum@adelaidellc.com

Relinquished by:
Received by: Alexandra Vian 6/23 1030
Relinquished by:
Received by:

APPENDIX E

XRF READINGS

Adelaide Environmental Heath Associates Inc.
1511 Route 22, Suite C-24
Brewster, New York 10509
Adelaide Project# BA:23168.00-IN
Project Name: Yonkers Armory
Inspector: Jason Fullum

Reading #	Date	Time	Space Type	Floor	Room	Component	Side	Substrate	Color	Condition	Lead Concentration (mg/cm2)	Result
1	6/6/2023	9:04:22	Armory		Calibration						0.9	Negative
2	6/6/2023	9:04:34	Armory		Calibration						0.9	Negative
3	6/6/2023	9:04:46	Armory		Calibration						0.9	Negative
4	6/6/2023	9:23:29	Armory	2nd Floor	207	Wall	A	CMU	Beige	Intact	-0.2	Negative
5	6/6/2023	9:24:00	Armory	2nd Floor	207	Door Case	A	Metal	Black	Intact	0.4	Negative
6	6/6/2023	9:24:27	Armory	2nd Floor	207	Door	A	Metal	Red	Intact	0.1	Negative
7	6/6/2023	9:25:07	Armory	2nd Floor	201	Door	A	Metal	Red	Intact	0	Negative
8	6/6/2023	9:25:31	Armory	2nd Floor	201	Door Case	A	Metal	Black	Intact	0.5	Negative
9	6/6/2023	9:25:58	Armory	2nd Floor	201	Wall	B	CMU	Black	Intact	-0.2	Negative
10	6/6/2023	10:29:25	Armory	2nd Floor	Hallway	Wall	B	CMU	Beige	Intact	-0.3	Negative
11	6/6/2023	10:30:21	Armory	2nd Floor	Hallway	Ceiling	Ceiling	Sheetrock	Beige	Intact	0.1	Negative
12	6/6/2023	11:18:54	Armory	2nd Floor	Hallway	Stair Handrail	A	Metal	Red	Intact	0.1	Negative
13	6/6/2023	11:19:20	Armory	2nd Floor	Hallway	Stair Stringer	A	Metal	Red	Intact	0.1	Negative
14	6/6/2023	11:19:35	Armory	2nd Floor	Hallway	Stair Riser	A	Metal	Red	Intact	0.2	Negative
15	6/6/2023	11:21:42	Armory	2nd Floor	Hallway	Ceiling	Ceiling	Sheetrock	Off White	Intact	0.1	Negative
16	6/6/2023	11:28:51	Armory	2nd Floor	Bathroom	Floor	Floor	Concrete	Grey	Intact	0	Negative
17	6/6/2023	11:30:19	Armory	2nd Floor	Bathroom	Floor	Floor	Concrete	Red	Intact	0	Negative
18	6/6/2023	11:30:37	Armory	2nd Floor	Bathroom	Floor	Floor	Concrete	Yellow	Intact	0	Negative
19	6/6/2023	11:31:02	Armory	2nd Floor	Bathroom	Wall	A	CMU	Yellow	Intact	-0.2	Negative
20	6/6/2023	11:31:26	Armory	2nd Floor	Bathroom	Ceiling	Ceiling	Sheetrock	Yellow	Intact	-0.2	Negative
21	6/6/2023	11:41:55	Armory	2nd Floor	223	Wall	D	CMU	Off White	Intact	-0.1	Negative
22	6/6/2023	11:42:25	Armory	2nd Floor	223	Door	A	Metal	Red	Intact	0	Negative
23	6/6/2023	11:42:48	Armory	2nd Floor	223	Door Case	A	Metal	Black	Intact	0.4	Negative
24	6/6/2023	11:43:21	Armory	2nd Floor	223	Floor	Floor	Concrete	Red	Intact	0	Negative
25	6/6/2023	11:43:50	Armory	2nd Floor	223	Wall	B	CMU	Yellow	Intact	-0.3	Negative
26	6/6/2023	11:45:02	Armory	2nd Floor	223	Ceiling	Ceiling	Sheetrock	Yellow	Intact	0	Negative
27	6/6/2023	13:30:04	Armory	1st Floor	Bathroom	Floor	Floor	Concrete	Green	Intact	0.2	Negative
28	6/6/2023	13:30:37	Armory	1st Floor	Bathroom	Wall	A	CMU	Beige	Intact	-0.1	Negative
29	6/6/2023	13:31:07	Armory	1st Floor	Bathroom	Ceiling	Ceiling	Sheetrock	Beige	Intact	-0.2	Negative
30	6/6/2023	13:33:44	Armory	1st Floor	Exterior	roll up door rail	C	Metal	Green	Intact	0	Negative
31	6/6/2023	13:34:32	Armory	1st Floor	Exterior	Door	C	Metal	Green	Intact	0.1	Negative
32	6/6/2023	13:34:50	Armory	1st Floor	Exterior	Exterior Door	C	Metal	Green	Intact	-0.1	Negative
33	6/6/2023	13:35:08	Armory	1st Floor	Exterior	Exterior Door Case	C	Metal	Green	Intact	0.4	Negative
34	6/6/2023	14:01:04	Armory	1st Floor	Exterior	Window Case	B	Metal	Green	Intact	0	Negative
35	6/6/2023	14:05:06	Armory		Calibration						0.9	Negative
36	6/6/2023	14:05:18	Armory		Calibration						1	Positive
37	6/6/2023	14:05:30	Armory		Calibration						1	Positive

APPENDIX F

PCB ANALYTICAL RESULTS

PHOENIX
Environmental Laboratories, Inc.

Thursday, June 15, 2023

Attn: Stephanie Soter
Adelaide Environmental Health Assoc,Inc
1511 Route 22, Suite C24
Brewster, NY 10509

Project ID: YONKERS ARMORY 23168.00
SDG ID: GCO21952
Sample ID#s: CO21952 - CO21957

This laboratory is in compliance with the NELAC requirements of procedures used except where indicated.

This report contains results for the parameters tested, under the sampling conditions described on the Chain Of Custody, as received by the laboratory. This report is incomplete unless all pages indicated in the pagination at the bottom of the page are included.

All soils, solids and sludges are reported on a dry weight basis unless otherwise noted in the sample comments.

A scanned version of the COC form accompanies the analytical report and is an exact duplicate of the original.

If you are the client above and have any questions concerning this testing, please do not hesitate to contact Phoenix Client Services at ext.200. The contents of this report cannot be discussed with anyone other than the client listed above without their written consent.

Sincerely yours,

Phyllis Shiller
Laboratory Director

NELAC - #NY11301
CT Lab Registration #PH-0618
MA Lab Registration #M-CT007
ME Lab Registration #CT-007
NH Lab Registration #213693-A,B
NJ Lab Registration #CT-003
NY Lab Registration #11301
PA Lab Registration #68-03530
RI Lab Registration #63
VT Lab Registration #VT11301

PHOENIX

Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102 Fax (860) 645-0823

ACCREDITED IN ACCORDANCE WITH nelac NY # 11301

Sample Id Cross Reference

June 15, 2023

SDG I.D.: GCO21952

Project ID: YONKERS ARMORY 23168.00

Client Id	Lab Id	Matrix
PCB1-WOMENS SHOWER	CO21952	BULK
PCB2-GLAZING	CO21953	CAULK
PCB3-EXT. DOOR CAULK	CO21954	CAULK
PCB4-EXT. SEALANT	CO21955	CAULK
PCB5- EXT. DOOR CAULK	CO21956	CAULK
PCB 6-LOUVER CAULK	CO21957	CAULK

PHOENIX

Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102 Fax (860) 645-0823

ACCREDITED IN ACCORDANCE WITH nelac NY # 11301

Analysis Report

June 15, 2023

FOR: Attn: Stephanie Soter
Adelaide Environmental Health Assoc,Inc
1511 Route 22, Suite C24
Brewster, NY 10509

Sample Information		Custody Information		Date	Time
Matrix:	BULK	Collected by:		06/06/23	
Location Code:	ADELAIDE	Received by:	MMN	06/07/23	17:16
Rush Request:	Standard	Analyzed by:	see "By" below		
P.O.#:					

Laboratory Data

SDG ID: GCO21952
Phoenix ID: CO21952

Project ID: YONKERS ARMORY 23168.00
Client ID: PCB1-WOMENS SHOWER

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Extraction for PCB	Completed				06/08/23	R/AW/SB/I	SW3540C
PCB (Soxhlet SW3540C)							
PCB-1016	ND	2900	ug/Kg	1	06/09/23	SC	SW8082A
PCB-1221	ND	2900	ug/Kg	1	06/09/23	SC	SW8082A
PCB-1232	ND	2900	ug/Kg	1	06/09/23	SC	SW8082A
PCB-1242	ND	2900	ug/Kg	1	06/09/23	SC	SW8082A
PCB-1248	ND	2900	ug/Kg	1	06/09/23	SC	SW8082A
PCB-1254	ND	2900	ug/Kg	1	06/09/23	SC	SW8082A
PCB-1260	ND	2900	ug/Kg	1	06/09/23	SC	SW8082A
PCB-1262	ND	2900	ug/Kg	1	06/09/23	SC	SW8082A
PCB-1268	ND	2900	ug/Kg	1	06/09/23	SC	SW8082A
QA/QC Surrogates							
% DCBP	55		%	1	06/09/23	SC	30 - 150 %
% DCBP (Confirmation)	40		%	1	06/09/23	SC	30 - 150 %
% TCMX	52		%	1	06/09/23	SC	30 - 150 %
% TCMX (Confirmation)	47		%	1	06/09/23	SC	30 - 150 %

Project ID: YONKERS ARMORY 23168.00 Phoenix I.D.: CO21952
Client ID: PCB1-WOMENS SHOWER

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference

RL/PQL=Reporting/Practical Quantitation Level (Equivalent to NELAC LOQ, Limit of Quantitation) ND=Not Detected at RL/PQL
BRL=Below Reporting Level L=Biased Low
QA/QC Surrogates: Surrogates are compounds (preceeded with a %) added by the lab to determine analysis efficiency. Surrogate results(%) listed in the report are not "detected" compounds.

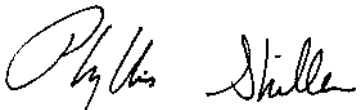
Comments:

Results are reported on an ``as received`` basis, and are not corrected for dry weight.

PCB Comment:
Due to limited sample an elevated RL was reported.

All soils, solids and sludges are reported on a dry weight basis unless otherwise noted in the sample comments.

If you are the client above and have any questions concerning this testing, please do not hesitate to contact Phoenix Client Services at ext.200.
The contents of this report cannot be discussed with anyone other than the client listed above without their written consent.



Phyllis Shiller, Laboratory Director
June 15, 2023
Reviewed and Released by: Rashmi Makol, Project Manager

PHOENIX

Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102 Fax (860) 645-0823

ACCREDITED IN ACCORDANCE WITH NY #11301

Analysis Report

June 15, 2023

FOR: Attn: Stephanie Soter
Adelaide Environmental Health Assoc,Inc
1511 Route 22, Suite C24
Brewster, NY 10509

Sample Information		Custody Information		Date	Time
Matrix:	CAULK	Collected by:		06/06/23	
Location Code:	ADELAIDE	Received by:	MMN	06/07/23	17:16
Rush Request:	Standard	Analyzed by:	see "By" below		
P.O.#:					

Laboratory Data

SDG ID: GCO21952
Phoenix ID: CO21953

Project ID: YONKERS ARMORY 23168.00
Client ID: PCB2-GLAZING

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Caulk Extraction for PCB	Completed				06/08/23	R/AW/SB/I	SW3540C
PCB (Soxhlet SW3540C)							
PCB-1016	ND	930	ug/Kg	1	06/09/23	SC	SW8082A
PCB-1221	ND	930	ug/Kg	1	06/09/23	SC	SW8082A
PCB-1232	ND	930	ug/Kg	1	06/09/23	SC	SW8082A
PCB-1242	ND	930	ug/Kg	1	06/09/23	SC	SW8082A
PCB-1248	ND	930	ug/Kg	1	06/09/23	SC	SW8082A
PCB-1254	ND	930	ug/Kg	1	06/09/23	SC	SW8082A
PCB-1260	ND	930	ug/Kg	1	06/09/23	SC	SW8082A
PCB-1262	ND	930	ug/Kg	1	06/09/23	SC	SW8082A
PCB-1268	ND	930	ug/Kg	1	06/09/23	SC	SW8082A
QA/QC Surrogates							
% DCBP	54		%	1	06/09/23	SC	30 - 150 %
% DCBP (Confirmation)	52		%	1	06/09/23	SC	30 - 150 %
% TCMX	57		%	1	06/09/23	SC	30 - 150 %
% TCMX (Confirmation)	55		%	1	06/09/23	SC	30 - 150 %

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference

RL/PQL=Reporting/Practical Quantitation Level (Equivalent to NELAC LOQ, Limit of Quantitation) ND=Not Detected at RL/PQL
BRL=Below Reporting Level L=Biased Low
QA/QC Surrogates: Surrogates are compounds (preceeded with a %) added by the lab to determine analysis efficiency. Surrogate results(%) listed in the report are not "detected" compounds.

Comments:

Results are reported on an ``as received`` basis, and are not corrected for dry weight.

All soils, solids and sludges are reported on a dry weight basis unless otherwise noted in the sample comments.

If you are the client above and have any questions concerning this testing, please do not hesitate to contact Phoenix Client Services at ext.200.
The contents of this report cannot be discussed with anyone other than the client listed above without their written consent.



Phyllis Shiller, Laboratory Director
June 15, 2023
Reviewed and Released by: Rashmi Makol, Project Manager

Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102 Fax (860) 645-0823

NY # 11301

Analysis Report

June 15, 2023

FOR: Attn: Stephanie Soter
Adelaide Environmental Health Assoc,Inc
1511 Route 22, Suite C24
Brewster, NY 10509

Sample Information		Custody Information		Date	Time
Matrix:	CAULK	Collected by:		06/06/23	
Location Code:	ADELAIDE	Received by:	MMN	06/07/23	17:16
Rush Request:	Standard	Analyzed by:	see "By" below		
P.O.#:					

Laboratory Data

SDG ID: GCO21952
Phoenix ID: CO21954

Project ID: YONKERS ARMORY 23168.00
Client ID: PCB3-EXT. DOOR CAULK

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Caulk Extraction for PCB	Completed				06/08/23	R/AW/SB/I	SW3540C
PCB (Soxhlet SW3540C)							
PCB-1016	ND	880	ug/Kg	1	06/09/23	SC	SW8082A
PCB-1221	ND	880	ug/Kg	1	06/09/23	SC	SW8082A
PCB-1232	ND	880	ug/Kg	1	06/09/23	SC	SW8082A
PCB-1242	ND	880	ug/Kg	1	06/09/23	SC	SW8082A
PCB-1248	ND	880	ug/Kg	1	06/09/23	SC	SW8082A
PCB-1254	ND	880	ug/Kg	1	06/09/23	SC	SW8082A
PCB-1260	ND	880	ug/Kg	1	06/09/23	SC	SW8082A
PCB-1262	ND	880	ug/Kg	1	06/09/23	SC	SW8082A
PCB-1268	ND	880	ug/Kg	1	06/09/23	SC	SW8082A
QA/QC Surrogates							
% DCBP	39		%	1	06/09/23	SC	30 - 150 %
% DCBP (Confirmation)	34		%	1	06/09/23	SC	30 - 150 %
% TCMX	31		%	1	06/09/23	SC	30 - 150 %
% TCMX (Confirmation)	31		%	1	06/09/23	SC	30 - 150 %

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference

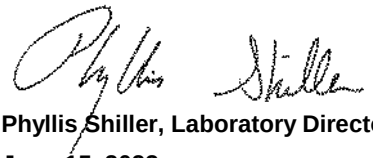
RL/PQL=Reporting/Practical Quantitation Level (Equivalent to NELAC LOQ, Limit of Quantitation) ND=Not Detected at RL/PQL
BRL=Below Reporting Level L=Biased Low
QA/QC Surrogates: Surrogates are compounds (preceeded with a %) added by the lab to determine analysis efficiency. Surrogate results(%) listed in the report are not "detected" compounds.

Comments:

Results are reported on an ``as received`` basis, and are not corrected for dry weight.

All soils, solids and sludges are reported on a dry weight basis unless otherwise noted in the sample comments.

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Phyllis Shiller, Laboratory Director
June 15, 2023
Reviewed and Released by: Rashmi Makol, Project Manager

Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102 Fax (860) 645-0823

NY # 11301

Analysis Report

June 15, 2023

FOR: Attn: Stephanie Soter
Adelaide Environmental Health Assoc,Inc
1511 Route 22, Suite C24
Brewster, NY 10509

Sample Information		Custody Information		Date	Time
Matrix:	CAULK	Collected by:		06/06/23	
Location Code:	ADELAIDE	Received by:	MMN	06/07/23	17:16
Rush Request:	Standard	Analyzed by:	see "By" below		
P.O.#:					

Laboratory Data

SDG ID: GCO21952
Phoenix ID: CO21955

Project ID: YONKERS ARMORY 23168.00
Client ID: PCB4-EXT. SEALANT

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Caulk Extraction for PCB	Completed				06/08/23	R/AW/SB/I	SW3540C
PCB (Soxhlet SW3540C)							
PCB-1016	ND	960	ug/Kg	1	06/09/23	SC	SW8082A
PCB-1221	ND	960	ug/Kg	1	06/09/23	SC	SW8082A
PCB-1232	ND	960	ug/Kg	1	06/09/23	SC	SW8082A
PCB-1242	ND	960	ug/Kg	1	06/09/23	SC	SW8082A
PCB-1248	ND	960	ug/Kg	1	06/09/23	SC	SW8082A
PCB-1254	ND	960	ug/Kg	1	06/09/23	SC	SW8082A
PCB-1260	ND	960	ug/Kg	1	06/09/23	SC	SW8082A
PCB-1262	ND	960	ug/Kg	1	06/09/23	SC	SW8082A
PCB-1268	ND	960	ug/Kg	1	06/09/23	SC	SW8082A
QA/QC Surrogates							
% DCBP	41		%	1	06/09/23	SC	30 - 150 %
% DCBP (Confirmation)	35		%	1	06/09/23	SC	30 - 150 %
% TCMX	36		%	1	06/09/23	SC	30 - 150 %
% TCMX (Confirmation)	36		%	1	06/09/23	SC	30 - 150 %

Project ID: YONKERS ARMORY 23168.00 Phoenix I.D.: CO21955
Client ID: PCB4-EXT. SEALANT

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference

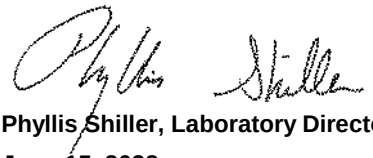
RL/PQL=Reporting/Practical Quantitation Level (Equivalent to NELAC LOQ, Limit of Quantitation) ND=Not Detected at RL/PQL
BRL=Below Reporting Level L=Biased Low
QA/QC Surrogates: Surrogates are compounds (preceeded with a %) added by the lab to determine analysis efficiency. Surrogate results(%) listed in the report are not "detected" compounds.

Comments:

Results are reported on an ``as received`` basis, and are not corrected for dry weight.

All soils, solids and sludges are reported on a dry weight basis unless otherwise noted in the sample comments.

If you are the client above and have any questions concerning this testing, please do not hesitate to contact Phoenix Client Services at ext.200.
The contents of this report cannot be discussed with anyone other than the client listed above without their written consent.



Phyllis Shiller, Laboratory Director
June 15, 2023
Reviewed and Released by: Rashmi Makol, Project Manager

PHOENIX

Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102 Fax (860) 645-0823

ACCREDITED IN ACCORDANCE WITH nelac NY # 11301

Analysis Report

June 15, 2023

FOR: Attn: Stephanie Soter
Adelaide Environmental Health Assoc,Inc
1511 Route 22, Suite C24
Brewster, NY 10509

Sample Information		Custody Information		Date	Time
Matrix:	CAULK	Collected by:		06/06/23	
Location Code:	ADELAIDE	Received by:	MMN	06/07/23	17:16
Rush Request:	Standard	Analyzed by:	see "By" below		
P.O.#:					

Laboratory Data

SDG ID: GCO21952
Phoenix ID: CO21956

Project ID: YONKERS ARMORY 23168.00
Client ID: PCB5- EXT. DOOR CAULK

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Caulk Extraction for PCB	Completed				06/08/23	R/AW/SB/I	SW3540C
PCB (Soxhlet SW3540C)							
PCB-1016	ND	600	ug/Kg	1	06/09/23	SC	SW8082A
PCB-1221	ND	600	ug/Kg	1	06/09/23	SC	SW8082A
PCB-1232	ND	600	ug/Kg	1	06/09/23	SC	SW8082A
PCB-1242	ND	600	ug/Kg	1	06/09/23	SC	SW8082A
PCB-1248	ND	600	ug/Kg	1	06/09/23	SC	SW8082A
PCB-1254	ND	600	ug/Kg	1	06/09/23	SC	SW8082A
PCB-1260	ND	600	ug/Kg	1	06/09/23	SC	SW8082A
PCB-1262	ND	600	ug/Kg	1	06/09/23	SC	SW8082A
PCB-1268	ND	600	ug/Kg	1	06/09/23	SC	SW8082A
QA/QC Surrogates							
% DCBP	43		%	1	06/09/23	SC	30 - 150 %
% DCBP (Confirmation)	36		%	1	06/09/23	SC	30 - 150 %
% TCMX	39		%	1	06/09/23	SC	30 - 150 %
% TCMX (Confirmation)	38		%	1	06/09/23	SC	30 - 150 %

Project ID: YONKERS ARMORY 23168.00 Phoenix I.D.: CO21956
Client ID: PCB5- EXT. DOOR CAULK

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference

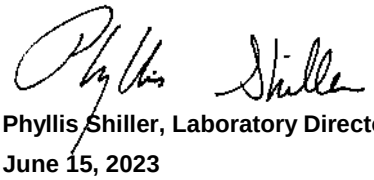
RL/PQL=Reporting/Practical Quantitation Level (Equivalent to NELAC LOQ, Limit of Quantitation) ND=Not Detected at RL/PQL
BRL=Below Reporting Level L=Biased Low
QA/QC Surrogates: Surrogates are compounds (preceeded with a %) added by the lab to determine analysis efficiency. Surrogate results(%) listed in the report are not "detected" compounds.

Comments:

Results are reported on an ``as received`` basis, and are not corrected for dry weight.

All soils, solids and sludges are reported on a dry weight basis unless otherwise noted in the sample comments.

If you are the client above and have any questions concerning this testing, please do not hesitate to contact Phoenix Client Services at ext.200.
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Phyllis Shiller, Laboratory Director
June 15, 2023
Reviewed and Released by: Rashmi Makol, Project Manager

PHOENIX

Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102 Fax (860) 645-0823

ACCREDITED IN ACCORDANCE WITH NY #11301

Analysis Report

June 15, 2023

FOR: Attn: Stephanie Soter
Adelaide Environmental Health Assoc,Inc
1511 Route 22, Suite C24
Brewster, NY 10509

Sample Information		Custody Information		Date	Time
Matrix:	CAULK	Collected by:		06/06/23	
Location Code:	ADELAIDE	Received by:	MMN	06/07/23	17:16
Rush Request:	Standard	Analyzed by:	see "By" below		
P.O.#:					

Laboratory Data

SDG ID: GCO21952
Phoenix ID: CO21957

Project ID: YONKERS ARMORY 23168.00
Client ID: PCB 6-LOUVER CAULK

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference	
Caulk Extraction for PCB	Completed				06/12/23	Q/AC1	SW3540C	
PCB (Soxhlet SW3540C)								
PCB-1016	ND	940	ug/Kg	1	06/13/23	SC	SW8082A	
PCB-1221	ND	940	ug/Kg	1	06/13/23	SC	SW8082A	
PCB-1232	ND	940	ug/Kg	1	06/13/23	SC	SW8082A	
PCB-1242	ND	940	ug/Kg	1	06/13/23	SC	SW8082A	
PCB-1248	ND	940	ug/Kg	1	06/13/23	SC	SW8082A	
PCB-1254	ND	940	ug/Kg	1	06/13/23	SC	SW8082A	
PCB-1260	ND	940	ug/Kg	1	06/13/23	SC	SW8082A	
PCB-1262	ND	940	ug/Kg	1	06/13/23	SC	SW8082A	
PCB-1268	ND	940	ug/Kg	1	06/13/23	SC	SW8082A	
QA/QC Surrogates								
% DCBP	17		%	1	06/13/23	SC	30 - 150 %	3
% DCBP (Confirmation)	17		%	1	06/13/23	SC	30 - 150 %	3
% TCMX	17		%	1	06/13/23	SC	30 - 150 %	3
% TCMX (Confirmation)	17		%	1	06/13/23	SC	30 - 150 %	3

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference

3 = This parameter exceeds laboratory specified limits.

RL/PQL=Reporting/Practical Quantitation Level (Equivalent to NELAC LOQ, Limit of Quantitation) ND=Not Detected at RL/PQL
BRL=Below Reporting Level L=Biased Low
QA/QC Surrogates: Surrogates are compounds (preceeded with a %) added by the lab to determine analysis efficiency. Surrogate results(%) listed in the report are not "detected" compounds.

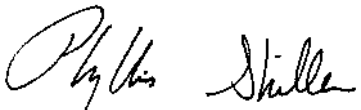
Comments:

Results are reported on an ``as received`` basis, and are not corrected for dry weight.

PCB Comment:
Poor surrogate recovery was observed for PCBs. Sample was re-extracted with similar results.

All soils, solids and sludges are reported on a dry weight basis unless otherwise noted in the sample comments.

If you are the client above and have any questions concerning this testing, please do not hesitate to contact Phoenix Client Services at ext.200.
The contents of this report cannot be discussed with anyone other than the client listed above without their written consent.



Phyllis Shiller, Laboratory Director
June 15, 2023
Reviewed and Released by: Rashmi Makol, Project Manager

PHOENIX

Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102

ACCREDITED IN ACCORDANCE WITH nelac NY # 11301

QA/QC Report

June 15, 2023

QA/QC Data

SDG I.D.: GCO21952

Parameter	Blank	Blk RL	LCS %	LCSD %	LCS RPD	MS %	MSD %	MS RPD	% Rec Limits	% RPD Limits
QA/QC Batch 681421 (ug/Kg), QC Sample No: CO21956 10X (CO21952, CO21953, CO21954, CO21955, CO21956)										
Polychlorinated Biphenyls - Bulk										
PCB-1016	ND	170	99	91	8.4				40 - 140	30
PCB-1221	ND	170							40 - 140	30
PCB-1232	ND	170							40 - 140	30
PCB-1242	ND	170							40 - 140	30
PCB-1248	ND	170							40 - 140	30
PCB-1254	ND	170							40 - 140	30
PCB-1260	ND	170	106	107	0.9				40 - 140	30
PCB-1262	ND	170							40 - 140	30
PCB-1268	ND	170							40 - 140	30
% DCBP (Surrogate Rec)	107	%	111	106	4.6				30 - 150	30
% DCBP (Surrogate Rec) (Confirm	102	%	101	102	1.0				30 - 150	30
% TCMX (Surrogate Rec)	89	%	95	87	8.8				30 - 150	30
% TCMX (Surrogate Rec) (Confirm	82	%	89	82	8.2				30 - 150	30
Comment:										
A LCS and LCS Duplicate were performed instead of a matrix spike and matrix spike duplicate.										
QA/QC Batch 681903 (ug/Kg), QC Sample No: CO21957 10X (CO21957)										
Polychlorinated Biphenyls										
PCB-1016	ND	170	101	105	3.9				40 - 140	30
PCB-1221	ND	170							40 - 140	30
PCB-1232	ND	170							40 - 140	30
PCB-1242	ND	170							40 - 140	30
PCB-1248	ND	170							40 - 140	30
PCB-1254	ND	170							40 - 140	30
PCB-1260	ND	170	115	121	5.1				40 - 140	30
PCB-1262	ND	170							40 - 140	30
PCB-1268	ND	170							40 - 140	30
% DCBP (Surrogate Rec)	104	%	100	109	8.6				30 - 150	30
% DCBP (Surrogate Rec) (Confirm	109	%	103	111	7.5				30 - 150	30
% TCMX (Surrogate Rec)	99	%	95	103	8.1				30 - 150	30
% TCMX (Surrogate Rec) (Confirm	98	%	95	102	7.1				30 - 150	30
Comment:										
A LCS and LCS Duplicate were performed instead of a matrix spike and matrix spike duplicate.										

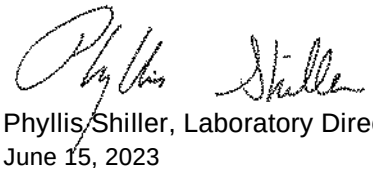
QA/QC Data

SDG I.D.: GCO21952

Parameter	Blank	Blk RL	LCS %	LCSD %	LCS RPD	MS %	MSD %	MS RPD	% Rec Limits	% RPD Limits

If there are any questions regarding this data, please call Phoenix Client Services at extension 200.

RPD - Relative Percent Difference
LCS - Laboratory Control Sample
LCSD - Laboratory Control Sample Duplicate
MS - Matrix Spike
MS Dup - Matrix Spike Duplicate
NC - No Criteria
Intf - Interference



Phyllis Shiller, Laboratory Director
June 15, 2023

Thursday, June 15, 2023

Criteria: None

State: NY

Sample Criteria Exceedances Report

GCO21952 - ADELAIDE

SampNo	Acode	Phoenix Analyte	Criteria	Result	RL	Criteria	RL Criteria	Analysis Units
CO21952	$PCB_SOXR	PCB-1268	NY / Requested PCB RL /	ND	2900	1000	1000	ug/Kg
CO21952	$PCB_SOXR	PCB-1262	NY / Requested PCB RL /	ND	2900	1000	1000	ug/Kg
CO21952	$PCB_SOXR	PCB-1260	NY / Requested PCB RL /	ND	2900	1000	1000	ug/Kg
CO21952	$PCB_SOXR	PCB-1254	NY / Requested PCB RL /	ND	2900	1000	1000	ug/Kg
CO21952	$PCB_SOXR	PCB-1248	NY / Requested PCB RL /	ND	2900	1000	1000	ug/Kg
CO21952	$PCB_SOXR	PCB-1242	NY / Requested PCB RL /	ND	2900	1000	1000	ug/Kg
CO21952	$PCB_SOXR	PCB-1232	NY / Requested PCB RL /	ND	2900	1000	1000	ug/Kg
CO21952	$PCB_SOXR	PCB-1221	NY / Requested PCB RL /	ND	2900	1000	1000	ug/Kg
CO21952	$PCB_SOXR	PCB-1016	NY / Requested PCB RL /	ND	2900	1000	1000	ug/Kg

Phoenix Laboratories does not assume responsibility for the data contained in this exceedance report. It is provided as an additional tool to identify requested criteria exceedences. All efforts are made to ensure the accuracy of the data (obtained from appropriate agencies). A lack of exceedence information does not necessarily suggest conformance to the criteria. It is ultimately the site professional's responsibility to determine appropriate compliance.

Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102 Fax (860) 645-0823

ACCREDITED IN ACCORDANCE WITH nelac NY # 11301

Analysis Comments

June 15, 2023 SDG I.D.: GCO21952

The following analysis comments are made regarding exceptions to criteria not already noted in the Analysis Report or QA/QC Report:

PCB Narration

AU-ECD5 06/13/23-1: CO21957

The following Continuing Calibration compounds did not meet % deviation criteria:
Samples: CO21957
Preceding CC 613B016 - None.
Succeeding CC 613B029 - DCBP SURR 23%L (15%)

Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102 Fax (860) 645-0823

ACCREDITED IN ACCORDANCE WITH nelac NY # 11301

NY Temperature Narration

June 15, 2023

SDG I.D.: GCO21952

The samples in this delivery group were received at 1.1°C.
(Note acceptance criteria for relevant matrices is above freezing up to 6°C)

Cooler: Yes ☐ No ☐
Coolant: IPK ☐ ICE ☐ No ☐
Temp ____ °C Pg ____ of ____

NY/NJ/PA CHAIN OF CUSTODY RECORD

PHOENIX Environmental Laboratories, Inc.

587 East Middle Turnpike, P.O. Box 370, Manchester, CT 06040
Email: Makrina Nolan, makrina@phoenixlabs.com Fax (860) 645-0823
Client Services (860) 645-1102

Contact Options:
☐ Phone:
☐ Fax:
☐ Email:

Customer: Adelaide
Address: 1511 Rte 22, Ste C24
Somerset, NJ 10505

Project: Yankee Armory 23168.00
Report to:
Invoice to:
QUOTE # :

Project P.O:

This section MUST be completed with Bottle Quantities.

Sampler's Signature: _____ Date: 6/6/23

Client Sample - Information / Identification

Matrix Code:
DW=Drinking Water GW=Ground Water SW=Surface Water WW=Waste Water
RW=Raw Water SE=Sediment SL=Sludge S=Soil SD=Solid W=Wipe
OIL=Oil B=Bulk L=Liquid

Analysis Request

PHOENIX USE ONLY SAMPLE #	Customer Sample Identification	Sample Matrix	Date Sampled	Time Sampled	*MS/MSD (May be billable at analysis unit rate)	PCB's	BAS	GL Amber 8 oz. [ ] wt H_3PO_4 [ ] $NaHSO_4$	Soil VOA Vials [ ] methanol [ ] H_2O	GL Soil container ( ) oz	40 ml VOA Vial [ ] As is [ ] HCl	GL Amber 1000ml [ ] As is [ ] H_2SO_4	PL As is [ ] 250ml [ ] 500ml [ ] 1000ml	PL H_2SO_4 [ ] 250ml [ ] 500ml [ ] 1000ml	PL NaOH 250ml	PL HNO_3 250ml	Bacteria Bottle w/thio	Bacteria Bottle as is
21952	PCB1-Women Shower		6/6/23			X	1											
21953	PCB2-Glazing Compd		6/6/23			X	1											
21954	PCB3-Ext. Door Caulk		6/6/23			X	1											
21955	PCB4-Ext. Vert. Sealant		6/6/23			X	1											
21956	PCB5-Ext. Door Caulk		6/6/23			X	1											
21957	PCB6-Louver Caulk		6/6/23			X	1											

Relinquished by:	Accepted by:	Date:	Time:
		6.7.23	1000
		6-7-23	15:45
		6/7/23	17:16

Turnaround:
☐ 1 Day*
☐ 2 Days*
☐ 3 Days*
☐ 4 Days*
☐ 5 Days*
☐ Standard
* SURCHARGE APPLIES
7 DAYS

NJ
☐ Res. Criteria
☐ Non-Res. Criteria
☐ Impact to GW Soil Cleanup Criteria
☐ Impact to GW soil screen Criteria
☐ GW Criteria

NY
☐ TOGS GW
☐ CP-51 SOIL
☐ 375SCO Unrestricted Soil
☐ 375SCO Residential Soil
☐ 375SCO Residential Restricted Soil
☐ 375SCO Commercial Soil
☐ 375SCO Industrial Soil
☐ Subpart 5 DW

PA
☐ Clean Fill Limits
☐ PA-GW
☐ Reg Fill Limits
☐ PA Soil Restricted
☐ PA Soil non-restricted

State Samples Collected?
NY

Data Package:
☐ NJ Reduced Deliv. *
☐ NY Enhanced (ASP B) *
☐ Other

Comments, Special Requirements or Regulations:

Data Format:
☐ Phoenix Std Report ☐ EQuIS
☐ Excel ☐ NJ Hazsite EDD
☐ PDF ☐ NY EZ EDD (ASP)
☐ GIS/Key ☐ Other

*MS/MSD are considered site samples and will be billed as such in accordance with the prices quoted.

APPENDIX G

PERSONNEL AND LABORATORY CERTIFICATIONS

[redacted]

DIVISION OF SAFETY & HEALTH LIC[redacted]US, BLDG. 12, ALBANY, NY 12226

ASBESTOS HANDLING LICENSE

Adelaide Environmental Health Associates, Inc.
1511 Route 22, Suite C24, Brewster, NY, 10509

License Number: 29305
License Class: RESTRICTED
Date of Issue: 06/07/2023
Expiration Date: 07/31/2024
Duly Authorized Representative: John Soter

This license has been issued in accordance with applicable provisions of Article 30 of the Labor Law of New York State and of the New York State Codes, Rules and Regulations (12 NYCRR Part 56). It is subject to suspension or revocation for a (1) serious violation of state, federal or local laws with regard to the conduct of an asbestos project, or (2) demonstrated lack of responsibility in the conduct of any job involving asbestos or asbestos material.

This license is valid only for the contractor named above and this license or a photocopy must be prominently displayed at the asbestos project worksite. This license verifies that all persons employed by the licensee on an asbestos project in New York State have been issued an Asbestos Certificate, appropriate for the type of work they perform, by the New York State Department of Labor.

Amy Phillips, Director
For the Commissioner of Labor

United States Environmental Protection Agency

This is to certify that

ADELAIDE ENVIRONMENTAL HEALTH ASSOCIATES INC

has fulfilled the requirements of the Toxic Substances Control Act (TSCA) Section 402, and has received certification to conduct lead-based paint activities pursuant to 40 CFR Part 745.226

In the Jurisdiction of:

All EPA Administered Lead-based Paint Activities Program States, Tribes and Territories

This certification is valid from the date of issuance and expires September 08, 2025

LBP-15081-2

Certification #

August 25, 2022

Issued On

Michelle Price, Chief

Lead, Heavy Metals, and Inorganics Branch

United States Environmental Protection Agency

This is to certify that

Adelaide Environmental Health Associates, Inc

has fulfilled the requirements of the Toxic Substances Control Act (TSCA) Section 402, and has received certification to conduct lead-based paint renovation, repair, and painting activities pursuant to 40 CFR Part 745.89

In the Jurisdiction of:

All EPA Administered States, Tribes, and Territories

This certification is valid from the date of issuance and expires December 05, 2027

NAT-15081-3

Certification #

August 03, 2022

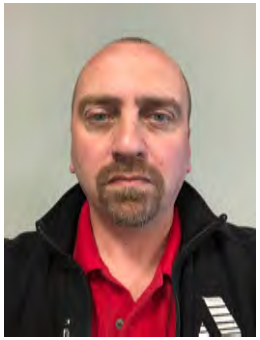
Issued On

Michelle Price, Chief

Lead, Heavy Metals, and Inorganics Branch

United States Environmental Protection Agency

This is to certify that



Jason P Fullum

has fulfilled the requirements of the Toxic Substances Control Act (TSCA) Section 402, and has received certification to conduct lead-based paint activities pursuant to 40 CFR Part 745.226 as:

Risk Assessor

In the Jurisdiction of:

All EPA Administered Lead-based Paint Activities Program States, Tribes and Territories

This certification is valid from the date of issuance and expires July 11, 2023

LBP-R-12098-2

Certification #

May 07, 2020

Issued On

Susan Schulz, Acting Chief

Chemicals and Multimedia Programs Branch

STATE OF NEW YORK - DEPARTMENT OF LABOR
ASBESTOS CERTIFICATE

N.Y.S



JASON P FULLUM
CLASS(EXPIRES)
C ATEC(02/24) D INSP(02/24)
E MGPL(02/24) H PM (02/24)
I PD (02/24)

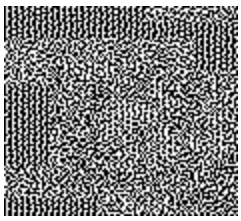
CERT# 97-20574
DMV# 375065936

MUST BE CARRIED ON ASBESTOS PROJECTS

EYES BLU
HAIR BRO
HGT 5' 11"

IF FOUND RETURN TO:
NYSDOL - L&C UNIT
ROOM 161A BUILDING 12
STATE OFFICE CAMPUS
ALBANY NY 12240

NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER



Expires 12:01 AM April 01, 2024
Issued April 01, 2022
Revised March 30, 2023

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

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

MS. KAROL H. LU
AMERICA SCIENCE TEAM NEW YORK, INC
117 EAST 30TH ST
NEW YORK, NY 10016

NY Lab Id No: 11480

is hereby APPROVED as an Environmental Laboratory for the category
ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE
All approved subcategories and/or analytes are listed below:

Miscellaneous

Asbestos in Friable Material	Item 198.1 of Manual
	EPA 600/M4/82/020
Asbestos in Non-Friable Material-PLM	Item 198.6 of Manual (NOB by PLM)
Asbestos in Non-Friable Material-TEM	Item 198.4 of Manual



Serial No.: 66402

Property of the New York State Department of Health. Certificates are valid only at the address shown and must be conspicuously posted by the laboratory. Continued accreditation depends on the laboratory's successful ongoing participation in the Program. Consumers may verify a laboratory's accreditation status online at https://apps.health.ny.gov/pubdoh/applinks/wc/elappublicweb/, by phone (518) 485-5570 or by email to elap@health.ny.gov.

NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER

Expires 12:01 AM April 01, 2024
Issued April 01, 2022
Revised March 30, 2023

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

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

MS. PHYLLIS SHILLER
PHOENIX ENVIRONMENTAL LABS
587 EAST MIDDLE TURNPIKE
MANCHESTER, CT 06040

NY Lab Id No: 11301

is hereby APPROVED as an Environmental Laboratory in conformance with the National Environmental Laboratory Accreditation Conference Standards (2016) for the category ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE
All approved analytes are listed below:

Polychlorinated Biphenyls

Aroclor 1262 (PCB-1262)	EPA 8082A
Aroclor 1262 (PCB-1262) in Oil	EPA 8082A
Aroclor 1268 (PCB-1268)	EPA 8082A
Aroclor 1268 (PCB-1268) in Oil	EPA 8082A
PCB 101	EPA 8082A
PCB 105	EPA 8082A
PCB 118	EPA 8082A
PCB 128	EPA 8082A
PCB 138	EPA 8082A
PCB 153	EPA 8082A
PCB 170	EPA 8082A
PCB 18	EPA 8082A
PCB 180	EPA 8082A
PCB 183	EPA 8082A
PCB 184	EPA 8082A
PCB 187	EPA 8082A
PCB 195	EPA 8082A
PCB 206	EPA 8082A
PCB 209	EPA 8082A
PCB 28	EPA 8082A
PCB 44	EPA 8082A
PCB 49	EPA 8082A
PCB 52	EPA 8082A
PCB 66	EPA 8082A
PCB 8	EPA 8082A
PCB 87	EPA 8082A
PCB Congeners, Total	EPA 8082A

Serial No.: 66336

Property of the New York State Department of Health. Certificates are valid only at the address shown and must be conspicuously posted by the laboratory. Continued accreditation depends on the laboratory's successful ongoing participation in the Program. Consumers may verify a laboratory's accreditation status online at https://apps.health.ny.gov/pubdoh/applinks/wc/elappublicweb/, by phone (518) 485-5570 or by email to elap@health.ny.gov.

NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER

Expires 12:01 AM April 01, 2024
Issued April 01, 2022
Revised March 30, 2023

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

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

MS. PHYLLIS SHILLER
PHOENIX ENVIRONMENTAL LABS
587 EAST MIDDLE TURNPIKE
MANCHESTER, CT 06040

NY Lab Id No: 11301

is hereby APPROVED as an Environmental Laboratory in conformance with the National Environmental Laboratory Accreditation Conference Standards (2016) for the category ENVIRONMENTAL ANALYSES AIR AND EMISSIONS
All approved analytes are listed below:

Acrylates	
Acrylonitrile	EPA TO-15
Methyl methacrylate	EPA TO-15
Chlorinated Hydrocarbons	
1,2,4-Trichlorobenzene	EPA TO-15
Hexachlorobutadiene	EPA TO-15
Hexachloroethane	EPA TO-15
Metals I	
Lead, Total	EPA 29 (6010)
	EPA 7010
Polychlorinated Biphenyls	
PCBs and Aroclors	EPA TO-10A
Polynuclear Aromatics	
Naphthalene	EPA TO-15
Purgeable Aromatics	
1,2,4-Trimethylbenzene	EPA TO-15
1,2-Dichlorobenzene	EPA TO-15
1,3,5-Trimethylbenzene	EPA TO-15
1,3-Dichlorobenzene	EPA TO-15
1,4-Dichlorobenzene	EPA TO-15
2-Chlorotoluene	EPA TO-15
Benzene	EPA TO-15
Chlorobenzene	EPA TO-15
Ethyl benzene	EPA TO-15
Isopropylbenzene	EPA TO-15
m/p-Xylenes	EPA TO-15

Serial No.: 66338

Property of the New York State Department of Health. Certificates are valid only at the address shown and must be conspicuously posted by the laboratory. Continued accreditation depends on the laboratory's successful ongoing participation in the Program. Consumers may verify a laboratory's accreditation status online at https://apps.health.ny.gov/pubdoh/applinks/wc/elappublicweb/, by phone (518) 485-5570 or by email to elap@health.ny.gov.

Kathy Hochul, Governor

Roberta Reardon, Commissioner

Contract Management

Contract Awards
Contract Management - 35th Fl.
Corning Tower
Empire State Plaza
Albany NY 12242

Schedule Year	2026 through 2027
Date Requested	08/21/2026
PRC#	2026024953

Location	State Armory
Project ID#	47477
Project Type	Renovate Armory

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 2026 through June 2027. 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

Contract Management

Contract Awards
Contract Management - 35th Fl.
Corning Tower
Empire State Plaza
Albany NY 12242

Schedule Year	2026 through 2027
Date Requested	08/21/2026
PRC#	2026024953

Location	State Armory
Project ID#	47477
Project Type	Renovate Armory

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):
Labor Law Section 220-i requires that contractors obtain a Contractor Registry certificate of registration prior to bidding on or commencing work on a public or private project subject to prevailing wage requirements. Subcontractors also are prohibited from commencing work on covered employment unless they have received a Contractor Registry certificate. Contractors are required to submit their Certificate of Registration with their bid materials. A public database is available online to confirm registration 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-subcontractorregistry-
landing.

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. 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. Please Note: Updates to the Wage Schedule shall be made on a quarterly basis.

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

Westchester County General Construction

Boilermaker — 08/01/2026

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:	07/01/2026	01/01/2027
Boilermaker	$ 70.38	$ 71.88
Repairs & Renovations	70.38	71.88

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 — 08/01/2026

JOB DESCRIPTION Broadband **DISTRICT** 4

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Putnam, Queens, Richmond, Rockland, Suffolk, Westchester

PARTIAL COUNTIES
Orange: Entire County except 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(1)-TELEDATA

Per Hour:	07/01/2026	08/04/2026
Field Tech Install/Repair*	$ 55.59	$ 57.26

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: EXCLUDES work within ten(10) feet of High Voltage (600 Volts and over) transmussion lines. Please see LINEMAN rates.
*NOTE: Does not include the operation of equipment. Please see OPERATING ENGINEER rates.
*NOTE: Does not include groundmen/flagger/flagmen. Please see LABORER/LABORER-HEAVY/HIGHWAY rates.

SUPPLEMENTAL BENEFITS
Per Hour:

$ 23.54

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-Dist1

Carpenter — 08/01/2026

JOB DESCRIPTION Carpenter **DISTRICT** 8

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Putnam, Queens, Richmond, Rockland, Suffolk, Westchester

WAGES
Per hour: 07/01/2026

Piledriver	$ 62.59 + 10.16*
Dockbuilder	$ 62.59 + 10.16*

*This portion of the benefit is NOT subject to the SAME PREMIUM as shown for overtime.

SUPPLEMENTAL BENEFITS
Per hour:

Journeyworker $ 47.48

OVERTIME PAY
See (B, E2, O) on OVERTIME PAGE

HOLIDAY
Paid: See (1) on HOLIDAY PAGE.

Paid: for 1st & 2nd yr.
Apprentices See (5,6,11,13,25)

Overtime: See (5,6,11,13,25) on HOLIDAY PAGE.

REGISTERED APPRENTICES
Wages per hour
(1)year terms:

1st	2nd	3rd	4th
$ 28.98 + 5.66*	$ 34.58 + 5.66*	$ 42.96 + 5.66*	$ 51.35 + 5.66*

*This portion of the benefit is NOT subject to the SAME PREMIUM as shown for overtime.

Supplemental benefits per hour:

All Terms: $ 34.03

8-1556 Db

Carpenter — 08/01/2026

JOB DESCRIPTION Carpenter **DISTRICT** 8

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Queens, Richmond, Rockland, Suffolk, Westchester

WAGES
Per hour: 07/01/2026

Carpet/Resilient
Floor Coverer $ 60.05
+ 8.39*

*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:
$ 42.24

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
$ 26.54	$ 29.60	$ 34.05	$ 42.40
+ 2.00*	+ 2.54*	+ 3.00*	+ 3.94*

*This portion of the benefit is NOT subject to the SAME PREMIUM as shown for overtime.

Supplemental benefits per hour:

1st	2nd	3rd	4th
$ 16.91	$ 18.13	$ 21.67	$ 22.98

8-2287

Carpenter 08/01/2026

JOB DESCRIPTION Carpenter **DISTRICT** 8

ENTIRE COUNTIES
Bronx, Dutchess, Kings, Nassau, New York, Orange, Putnam, Queens, Richmond, Rockland, Suffolk, Westchester

WAGES
Per Hour: 07/01/2026

Marine Construction:

Marine Diver $ 77.46
+ 10.16*

Marine Tender $ 57.00
+ 10.16*

*This portion of the benefit is NOT subject to the SAME PREMIUM as shown for overtime

SUPPLEMENTAL BENEFITS
Per Hour:

Journeyworker $ 47.48

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	$ 28.98
	+ 5.66*
2nd year	34.58
	+ 5.66*
3rd year	42.96
	+ 5.66*
4th year	51.35
	+ 5.66*

*This portion of the benefit is NOT subject to the SAME PREMIUM as shown for overtime.

Supplemental Benefits
Per Hour:

All terms	$ 34.03

8-1456MC

Carpenter — 08/01/2026

JOB DESCRIPTION Carpenter **DISTRICT** 8

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Putnam, Queens, Richmond, Rockland, Suffolk, Westchester

WAGES
Per hour: 07/01/2026

Building

Millwright	$ 62.03
	+ 13.12*

*This portion of the benefit is NOT subject to the SAME PREMIUM as shown for overtime.

SUPPLEMENTAL BENEFITS
Per hour:

Millwright	$ 46.66

OVERTIME PAY
See (B, E, Q) on OVERTIME PAGE

HOLIDAY
Paid: See (18,19) on HOLIDAY PAGE.

Overtime: See (5,6,8,11,13,15,18,19,25) on HOLIDAY PAGE.

REGISTERED APPRENTICES
Wages per hour:
One (1) year terms:

1st.	2nd.	3rd.	4th.
$ 33.04	$ 38.89	$ 44.74	$ 56.44
+ 7.08*	+ 8.25*	+ 9.42*	+ 11.76*

*This portion of the benefit is NOT subject to the SAME PREMIUM as shown for overtime.

Supplemental benefits per hour:
One (1) year terms:

1st.	2nd.	3rd.	4th.
$ 31.81	$ 34.34	$ 37.52	$ 41.94

8-740.1

Carpenter — 08/01/2026

JOB DESCRIPTION Carpenter **DISTRICT** 8

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk, Westchester

WAGES
Per Hour:

	07/01/2026
Timberman	$ 57.59
	+ 10.42*

*This portion of the benefit is NOT subject to the SAME PREMIUM as shown for overtime.

SUPPLEMENTAL BENEFITS
Per Hour:
$ 46.79

OVERTIME PAY
See (B, E, E2, Q) on OVERTIME PAGE

HOLIDAY
Overtime: See (5, 6, 11, 13, 25) on HOLIDAY PAGE
Paid: See (1) on HOLIDAY PAGE.

Paid: for 1st & 2nd yr.
Apprentices See (5,6,11,13,25)

Overtime: See (5,6,11,13,25) on HOLIDAY PAGE.

REGISTERED APPRENTICES
Wages per hour:
One (1) year terms:

1st	2nd	3rd	4th
$ 26.96	$ 32.07	$ 39.72	$ 47.38
+ 5.71*	+ 5.71*	+ 5.71*	+ 5.71*

*This portion of the benefit is NOT subject to the SAME PREMIUM as shown for overtime.

Supplemental benefits per hour:
All terms $ 33.78

8-1556 Tm

Carpenter — 08/01/2026

JOB DESCRIPTION Carpenter **DISTRICT** 8

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Queens, Richmond, Rockland, Westchester

PARTIAL COUNTIES
Orange: South of but including the following, Waterloo Mills, Slate Hill, New Hampton, Goshen, Blooming Grove, Mountainville, east to the Hudson River.
Putnam: South of but including the following, Cold Spring, TompkinsCorner, Mahopac, Croton Falls, east to Connecticut border.
Suffolk: West of Port Jefferson and Patchogue Road to Route 112 to the Atlantic Ocean.

WAGES

Per hour:	07/01/2026	10/18/2026
Core Drilling:		
Driller	$ 48.78	Additional
	+ 3.85*	+ $2.63
Driller Helper	$ 38.15	
	+ 3.85*	

Note: Hazardous Waste Pay Differential:
For Level C, an additional 15% above wage rate per hour
For Level B, an additional 15% above wage rate per hour
For Level A, an additional 15% above wage rate per hour
Note: Additional $3.00 per hour to be paid when required to work on water

*This portion of the benefit is NOT subject to the SAME PREMIUM as shown for overtime.

SUPPLEMENTAL BENEFITS
Per hour:

Driller and Helper $ 32.37

OVERTIME PAY
See (B, G, P) on OVERTIME PAGE

HOLIDAY
Paid: See (5, 6, 13, 25) on HOLIDAY PAGE
Overtime: See (5, 6, 13, 25) on HOLIDAY PAGE

8-1536-CoreDriller

Carpenter - Building / Heavy&Highway — 08/01/2026

JOB DESCRIPTION Carpenter - Building / Heavy&Highway **DISTRICT** 11

ENTIRE COUNTIES
Putnam, Rockland, Westchester

WAGES
WAGES:(per hour)
Applies to CARPENTER BUILDING/HEAVY & HIGHWAY/TUNNEL:

	07/01/2026
Base Wage	$ 43.68
	+$6.69*

*For all hours paid straight or premium.

SHIFT WORK
SHIFT DIFFERENTIAL: When it is mandated by a Government Agency irregular or off shift can be worked. The Carpenter shall receive an additional fifteen percent (15%) of wage plus applicable benefits.

SUPPLEMENTAL BENEFITS
Per hour:

Journeyworker $ 33.11

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 an employee is entitled to a paid holiday, the employee is paid the Holiday wage and supplemental benefits whether they work or not. If an employee works the Holiday, the employee will receive holiday pay (including supplemental benefits), plus the applicable premium wage for working the Holiday. If an 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
$ 21.84	$ 26.21	$ 30.58	$ 34.94
+3.86*	+3.86*	+3.86*	+3.86*

*For all hours paid straight or premium

SUPPLEMENTAL BENEFITS per hour:

All terms $ 17.76

11-279.1B/HH

Electrician — 08/01/2026

JOB DESCRIPTION Electrician **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, New York, Queens, Richmond, Westchester

WAGES

Per hour:	07/01/2026	03/12/2027
Service Technician	$ 39.45	$ 40.45

Service and Maintenance on Alarm and Security Systems.

Maintenance, repair and /or replacement of defective (or damaged) equipment on, but not limited to, Burglar - Fire - Security - CCTV - Card Access - Life Safety Systems and associated devices. (Whether by service contract of T&M by customer request.)

SUPPLEMENTAL BENEFITS

Per hour:		
Journeyworker:	$ 23.33	$ 24.11

OVERTIME PAY
See (B, E, Q) on OVERTIME PAGE

HOLIDAY
Paid: See (5, 6, 11, 15, 16, 17, 25, 26) on HOLIDAY PAGE
Overtime: See (5, 6, 11, 15, 16, 17, 25, 26) on HOLIDAY PAGE

9-3H

Electrician 08/01/2026

JOB DESCRIPTION Electrician **DISTRICT** 8

ENTIRE COUNTIES
Westchester

WAGES

Per hour:	07/01/2026	04/15/2027
Electrician/A-Technician	$ 58.75	$ 60.75
Teledata	58.75	60.75

See "M" rate for all work necessary to retrofit, service, maintain and repair all kinds of lighting fixtures and local lighting controls.

Note: On a job where employees are required to work on bridges over navigable waters, transmission towers, light poles, bosun chairs, swinging scaffolds , etc. 40 feet or more above the water or ground or under compressed air, or tunnel projects under construction or where assisted breathing apparatus is required, they will be paid at the rate of time and one-half for such work except on normal pole line or building construction work.

SUPPLEMENTAL BENEFITS

Per hour:		
Journeyworker	$ 65.07	$ 67.55

OVERTIME PAY
See (A, G, *J, P) on OVERTIME PAGE
*NOTE: Emergency work on Sunday and Holidays is at the time and one-half overtime rate.

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 8, 11, 15, 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
(1) year terms at the following wage rates:

	07/01/2026	04/15/2027
1st term	$ 18.00	$ 18.00
2nd term	19.50	19.50
3rd term	21.00	21.00
4th term	22.50	22.50
MIJ 1-12 months	28.25	28.25

MIJ 13-18 months	31.75	31.75

Supplemental Benefits per hour:

	07/01/2026	04/15/2027
1st term	$ 15.23	$ 15.73
2nd term	18.75	19.25
3rd term	19.77	20.27
4th term	20.78	21.28
MIJ 1-12 months	16.56	17.06
MIJ 13-18 months	17.02	17.52

8-3/W

Electrician — 08/01/2026

JOB DESCRIPTION Electrician **DISTRICT** 8

ENTIRE COUNTIES
Westchester

WAGES
Per hour

	07/01/2026	04/15/2027
Electrician - M	$ 34.25	$ 34.25

"M" rate for all work necessary to retrofit, service, maintain and repair all kinds of lighting fixtures and local lighting controls.

SUPPLEMENTAL BENEFITS

	07/01/2026	04/15/2027
Electrician - M	$ 17.35	$ 17.85

OVERTIME PAY
See (B, G, *J, P) on OVERTIME PAGE
*Note: Emergency work on Sunday and Holidays is at the time and one-half overtime rate.

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 8, 11, 15, 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.

8-3m

Elevator Constructor — 08/01/2026

JOB DESCRIPTION Elevator Constructor **DISTRICT** 4

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk

PARTIAL COUNTIES
Rockland: Entire County except for the Township of Stony Point
Westchester: Entire County except for the Townships of Bedford, Lewisboro, Cortland, Mt. Kisco, North Salem, Pound Ridge, Somers and Yorktown.

WAGES
Per hour:

	07/01/2026	03/17/2027
Elevator Constructor	$ 86.43	$ 89.76
Modernization & Service/Repair	$ 68.06	$ 70.72

SUPPLEMENTAL BENEFITS
Per Hour:

Elevator Constructor	$ 48.96	$ 50.27

Modernization & Service/Repairs	$ 47.73	$ 49.00

OVERTIME PAY
Constructor See (D, M, T) on OVERTIME PAGE.

Modern/Service See (B, E5, P) on OVERTIME PAGE.

HOLIDAY
Paid: See (5, 6, 8, 11, 15, 16, 25) on HOLIDAY PAGE
Overtime: See (5, 6, 8, 11, 15, 16, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES
WAGES PER HOUR:

6 MONTH TERMS:

1st Term*	2nd & 3rd Term*	4th & 5th Term	6th & 7th Term	8th & 9th Term
50%	50%	55%	65%	75%

* Note: 1st, 2nd, 3rd Terms are based on average of the Constructor, the Modernization and the Service/Repair wage.
Terms 4 thru 9 Based on the Journeyworker's wage of classification they are working in.

SUPPLEMENTAL BENEFITS:

	07/01/2026	03/17/2027
Elevator Constructor		
1st Term	$0.00	$ 0.00
2nd & 3rd Term	37.66	38.42
4th & 5th Term	38.80	39.62
6th & 7th Term	40.60	41.50
8th & 9th Term	42.39	43.39
Modernization & Service/Repair		
1st Term	$0.00	$ 0.00
2nd & 3rd Term	37.63	38.39
4th & 5th Term	38.37	39.17
6th & 7th Term	40.09	40.98
8th & 9th Term	41.81	42.79

Elevator Constructor — 08/01/2026

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	07/01/2026	01/01/2027
Mechanic	$ 76.12	$ 79.37
Helper	70% of Mechanic Wage Rate	70% of Mechanic Wage Rate

SUPPLEMENTAL BENEFITS
Per hour

Journeyworker	$ 38.985*	$ 39.535*

*NOTE: Add 6% of regular hourly rate for all hours worked. Add 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: 1 year terms at the following percentage of the Elevator Constructor Mechanic wage.

0-6 months	6-12 months	2nd year	3rd year	4th year
50%	55%	65%	70%	80%

SUPPLEMENTAL BENEFITS per hour:

0-6 months: 6% of the regular hourly apprentice rate paid, no additional supplemental benefits.

All other terms: Same as Journeyworker

1-138

Glazier — 08/01/2026

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:

	07/01/2026	11/01/2026
Glazier	$ 66.22	$ 67.20
Scaffolding, including swing scaffold	71.22	72.20
*Mechanical Equipment	67.23	68.20
**Repair & Maintenance	32.82	33.47

*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 $202,000.

SUPPLEMENTAL BENEFITS
Per hour:

Glazier, Scaffolding and Mechanical Equipment	$ 44.81	$ 45.74
Repair & Maintenance	$ 26.01	$26.37

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:

	07/01/2026	11/01/2026
1st term	$ 23.68	$ 24.06
2nd term	32.23	32.74
3rd term	42.89	43.55
4th term	52.47	53.23

Supplemental Benefits:
(Per hour)

1st term	$ 20.18	$ 20.56
2nd term	28.85	29.39
3rd term	34.77	35.45
4th term	38.18	38.95

8-1087 (DC9 NYC)

Insulator - Heat & Frost — 08/01/2026

JOB DESCRIPTION Insulator - Heat & Frost **DISTRICT** 8

ENTIRE COUNTIES
Dutchess, Orange, Putnam, Rockland, Westchester

WAGES

Per hour:	07/01/2026
Insulator/Fire Stop Work*	$ 64.27
Discomfort & Additional Training**	67.32

*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:	$ 39.85
Discomfort & Additional Training:	$ 41.89

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
$ 35.09	$ 40.92	$ 46.76	$ 52.60

Discomfort & Additional Training Apprentices:

1st	2nd	3rd	4th
$ 36.61	$ 42.75	$ 48.89	$ 55.04

Supplemental Benefits paid per hour:

Insulator Apprentices:

1st term	$ 20.33
2nd term	24.23
3rd term	28.13
4th term	32.05

Discomfort & Additional Training Apprentices:

1st term	$ 21.34
2nd term	25.46
3rd term	29.56

4th term	33.68

8-91

Ironworker **08/01/2026**

JOB DESCRIPTION Ironworker **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk, Westchester

WAGES

Per Hour:	07/01/2026	01/01/2027 Additional
Stone Derrickmen Rigger	$ 78.46	$ 1.84
Stone Handset Derrickman	$ 76.51	$ 1.64

SUPPLEMENTAL BENEFITS

Per hour:	
Stone Derrickmen Rigger	$ 49.02
Stone Handset Derrickman	$ 48.01

OVERTIME PAY
See (B, D1, *E, Q, **V) on OVERTIME PAGE
*Time and one-half shall be paid for all work on Saturday up to eight (8) hours and double time shall be paid for all work thereafter.
** Benefits same premium as wages on Holidays only

HOLIDAY
Paid: See (18) on HOLIDAY PAGE
Overtime: See (5, 6, 8, 25) on HOLIDAY PAGE
Work stops at schedule lunch break with full day's pay.

REGISTERED APPRENTICES
Wage per hour:

Stone Derrickmen Rigger:

	1st	2nd	3rd	4th
07/01/2026	$ 38.98	$ 55.17	$ 61.37	$ 67.56

Supplemental Benefits:
Per hour:

07/01/2026	$ 24.77	$ 37.34	$ 37.34	$ 37.34

Stone Handset:

1/2 year terms at the following hourly wage rate:

	1st	2nd	3rd	4th
07/01/2026	$ 37.51	$ 53.51	$ 59.51	$ 65.51

Supplemental Benefits:
Per hour:

07/01/2026	$ 24.75	$ 36.90	$ 36.90	$ 36.90

9-197D/R

Ironworker **08/01/2026**

JOB DESCRIPTION Ironworker **DISTRICT** 4

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk, Westchester

WAGES

Per Hour:	07/01/2026	01/01/2027 Additional
Ornamental	$ 48.65	$ 1.05*
Chain Link Fence	48.65	

Guide Rail 48.65

* To be allocated at a later date.

SUPPLEMENTAL BENEFITS
Per hour:
Journeyworker: $ 68.84

OVERTIME PAY
See (B, B1, Q, V) on OVERTIME PAGE

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES
1 year terms at the following wages per hour:

1st	2nd	3rd	4th
$ 25.98	$ 28.45	$ 30.80	$ 34.39

Supplemental Benefits per hour:

1st	2nd	3rd	4th
$ 17.29	$ 18.29	$ 19.29	$ 21.29

4-580-Or

Ironworker — 08/01/2026

JOB DESCRIPTION Ironworker **DISTRICT** 4

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk, Westchester

WAGES
PER HOUR:

	07/01/2026	01/01/2027
Ironworker:		Additional
Structural, Bridges, Machinery	$ 59.45	1.38*

* To be allocated at a later date.

SUPPLEMENTAL BENEFITS
Per hour paid:

Journeyman $ 95.26

OVERTIME PAY
See (B, B1, Q, *V) on OVERTIME PAGE
*NOTE: Benefits are calculated for every hour paid.

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 18, 19) on HOLIDAY PAGE

REGISTERED APPRENTICES
6 month terms at the following wages per hour:

	1st	2nd	3rd-6th
07/01/2026	$ 30.87	$ 31.47	$ 32.08

Supplemental Benefits

PER HOUR PAID: $ 69.08

4-40/361-Str

Ironworker — 08/01/2026

JOB DESCRIPTION Ironworker **DISTRICT** 4

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk, Westchester

PARTIAL COUNTIES
Rockland: Southern section - south of Convent Road and east of Blue Hills Road.

WAGES

Per hour:	07/01/2026
Reinforcing & Metal Lathing:	$ 58.85

SUPPLEMENTAL BENEFITS

Per hour:	
Reinforcing & Metal Lathing	$ 46.42

OVERTIME PAY
See (B, E, Q, *X) on OVERTIME PAGE
Wages Per Hour:

At Time & One Half	$ 87.35
At Double Time	115.85

Supplemental Benefit Premiums for Overtime Hours worked:

At Time & One Half	$ 52.77
At Double Time	59.27

*Only $24.00 per hour for non worked hours

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 11, 13, 20, 21, 22, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES
(1) year terms at the following Wages Per Hour:

	1st	2nd	3rd	4th
Straight time	$ 22.55	$ 25.00	$ 28.00	$ 30.00
At Time & One Half	33.05	36.60	41.10	44.10
At Double Time	46.65	51.80	57.80	61.80

SUPPLEMENTAL BENEFITS Per Hour:

1st	2nd	3rd	4th
$ 18.17	$ 18.22	$ 17.22	$ 17.22

4-46Reinf

Laborer - Building — 08/01/2026

JOB DESCRIPTION Laborer - Building **DISTRICT** 8

ENTIRE COUNTIES
Putnam, Westchester

WAGES

Per hour	07/01/2026
Laborer	$ 46.26
"Base Wage"	$ 46.16**
Laborer/Asbestos & Hazardous Materials Removal	$ 50.35*
"Base Wage"	$ 50.25**

* Abatement/Removal of:
- Lead based or lead containing paint on materials to be repainted is classified as Painter.
- Asbestos containing roofs and roofing material is classified as Roofer.

** Overtime premiums are calculated using Laborer "Base Wage"

NOTE: Upgrade/Material condition work plan for work performed during non-outage under a wage formula of 90% wage/100% fringe benefits at nuclear power plants.

SUPPLEMENTAL BENEFITS

Per hour:	07/01/2026
Journeyworker	$ 34.10

OVERTIME PAY
See (B, E, E2, Q, *V) on OVERTIME PAGE
*Note: For Sundays and Holidays worked benefits are at the same premium as wages.

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
LABORER ONLY
Hourly terms at the following wage:

	Level A	Level B	Level C	Level D
	0-1000	1001-2000	2001-3000	3001-4000
07/01/2026	$ 30.60	$ 35.35	$ 40.05	$ 42.05

Supplemental Benefits per hour:

Apprentices	
All terms	$ 25.95

8-235/B

Laborer - Heavy&Highway **08/01/2026**

JOB DESCRIPTION Laborer - Heavy&Highway **DISTRICT** 8

ENTIRE COUNTIES
Putnam, Westchester

WAGES
PUTNAM: APPLIES TO ALL HEAVY & HIGHWAY WORK EXCLUDING HIGHWAYS, STREETS, AND BRIDGES

GROUP I: Blaster, Quarry Master, Curbs/Asphalt Screedman, Pipe Jacking and Boring Operations Operator, Qualified Dead Condition Pipe Fuser (B Mechanic)

GROUP II: Burner, Drillers(jumbo, joy, wagon, air track, hydraulic), Drill Operator, Self Contained Rotary Drill, Curbs, Raker, Bar Person, Concrete Finisher.

GROUP III: Pavement Breakers, Jeeper Operator, Jack Hammer, Pneumatic Tools (all), Gas Driller, Guniting, Railroad Spike Puller, Pipelayer, Chain Saw, Deck winches on scows, Power Buggy Operator, Power Wheelbarrow Operator, Bar Person Helper, Compressed Airlance, Water Jet Lance.

GROUP IV: Concrete Laborers, Asph. Worker, Rock Scaler, Vibrator Oper., Bit Grinder, Air Tamper, Pumps, Epoxy (adhesives, fillers and troweled on), Barco Rammer, Concrete Grinder, Crack Router Operator, Guide Rail-digging holes and placing concrete and demolition when not to be replaced, distribution of materials and tightening of bolts.

GROUP V: Drillers Helpers, Common Laborer, Mason Tenders, Signal Person, Pit Person, Truck Spotter, Powder Person, Landscape/Nursery Person, Dump Person, Temp. Heat.

GROUP VIA: Asbestos/Toxic Waste Laborer-All removal (Roads, Tunnels, Landfills, etc.) Confined space laborer, Bio-remediation, Phyto-remediation, Lead or Hazardous material, Abatement Laborer.

Wages:(per hour)	07/01/2026
GROUP I	$ 53.95*
GROUP II	52.49*
GROUP III	52.05*
GROUP IV	51.68*
GROUP V	51.30*

GROUP VIA	53.46*
Operator Qualified	
Gas Mechanic(A Mech)	64.76*
Operator Qualified	
Gas Mechanic(1st yr.)	57.95*
Flagperson	44.43*

*NOTE: To calculate overtime premiums, deduct $0.12 from above wages

SHIFT WORK
A shift premium will be paid on Public Work contracts for off-shift or irregular shift work when mandated by the NYS D.O.T. or other Governmental Agency contracts. Employees shall receive an additional 15% per hour above current rate for all off-shift and irregular shift work. Premium pay shall be calculated using the 15% per hour differential as base rate.

SUPPLEMENTAL BENEFITS
Per hour:
Journeyworker: $ 30.58

OVERTIME PAY
See (B, E, P, R, S) 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 Overtime: 5, 6 - Code 'S' applies
For Holiday Overtime: 8, 15, 25, 26 - Code 'R' applies

REGISTERED APPRENTICES

1st term	2nd term	3rd term	4th term
1-1000hrs	1001-2000hrs	2001-3000hrs	3001-4000hrs
$ 33.35	$ 38.48	$ 43.61	$ 48.74

Supplemental Benefits per hour:
$ 26.42

8-60H/H

Laborer - Tunnel — 08/01/2026

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)

	07/01/2026
Class 1	$ 60.30
Class 2	62.45
Class 4	68.85
Class 5	53.15

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	$ 39.23
Benefit 2	55.66
Benefit 3	72.08

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 — 08/01/2026

JOB DESCRIPTION Lineman Electrician **DISTRICT** 6

ENTIRE COUNTIES
Westchester

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 electrical overhead and underground distribution and maintenance work and overhead and underground transmission line work, electrical substations, switching structures, continuous pipe-type underground fluid or gas filled transmission conduit and cable installations, maintenance jobs or projects, railroad catenary installations and maintenance, third rail installations, the bonding of rails and the installation of fiber optic cable. Includes access matting for line work.

Per hour:	07/01/2026	05/03/2027	05/01/2028
Group A:			
Lineman, Tech, Welder	$ 67.64	$ 70.24	$ 73.01
Crane, Crawler Backhoe	67.64	70.24	73.01
Cable Splicer-Pipe Type	74.40	77.26	80.31
Cert. Welder-Pipe Type	71.02	73.75	76.66
Group B:			
Digging Mach Operator	$ 60.88	$ 63.22	$ 65.71
Group C:			
Tractor Trailer Driver	$ 57.49	$ 59.70	$ 62.06
Groundman, Truck Driver	54.11	56.19	58.41
Equipment Mechanic	54.11	56.19	58.41
Group D:			
Flagger	$ 37.20	$ 38.63	$ 40.16

Additional 3% per hour above regular rate for entire crew when a helicopter is used. This will increase to 5% on May 3, 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:

	07/01/2026	05/03/2027	05/01/2028
Group A	$ 32.91*	$ 34.41*	$ 35.91*
Group B	$ 28.91*	$ 30.41*	$ 31.91*
Group C	$ 28.51*	$ 29.71*	$ 30.91*
Group D	$ 28.41*	$ 29.54*	$ 30.67*

*NOTE: Plus 7% of the hourly wage paid. The 7% is based on the straight time rate or the premium time rate.

OVERTIME PAY

See (B, E, Q, X) on OVERTIME PAGE. NOTE: Double time for emergency work designated by the Contracting Agency.
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:

	07/01/2026	05/03/2027	05/01/2028
All terms:	$ 28.41*	$ 29.54*	$ 30.67*

*NOTE: Plus 7% of the hourly wage paid. The 7% is based on the straight time rate or the premium time rate.

6-1249aWest

Lineman Electrician - Teledata — 08/01/2026

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:	07/01/2026	01/04/2027	01/03/2028	01/01/2029
Cable Splicer	$ 42.03	$ 43.30	$ 44.59	$ 45.93
Installer, Repairman	39.89	41.09	42.32	43.59
Teledata Lineman	39.89	41.09	42.32	43.59
Tech., Equip. Operator	39.89	41.09	42.32	43.59
Groundman/Flagger	21.14	21.78	22.43	23.10

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	$ 6.18 plus 4%*	$ 6.43 plus 5%*	$ 6.43 plus 6%*	$ 6.68 plus 7%*

*NOTE: The percentage (%) listed above is based on the hourly wage paid, straight time rate or premium time 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 — 08/01/2026

JOB DESCRIPTION Lineman Electrician - Traffic Signal, Lighting **DISTRICT** 6

ENTIRE COUNTIES
Westchester

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/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:	07/01/2026	05/03/2027	05/01/2028
Group A:			
Lineman, Technician	$ 61.18	$ 63.52	$ 66.01
Crane, Crawler Backhoe	61.18	63.52	66.01
Certified Welder	64.24	66.70	69.31
Group B:			
Digging Machine	$ 55.06	$ 57.17	$ 59.41
Group C:			
Tractor Trailer Driver	$ 52.00	$ 53.99	$ 56.11
Groundman, Truck Driver	48.94	50.82	52.81
Equipment Mechanic	48.94	50.82	52.81
Group D:			

Flagger	$ 36.71	$ 38.11	$ 39.61

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:

	07/01/2026	05/03/2027	05/01/2028
Group A	$ 32.91*	$ 34.41*	$ 35.91*
Group B	$ 28.91*	$ 30.41*	$ 31.91*
Group C	$ 28.51*	$ 29.71*	$ 30.91*
Group D	$ 28.41*	$ 29.54*	$ 30.67*

*NOTE: Plus 7% of the hourly wage paid. The 7% is based on the straight time rate or the premium time rate.

OVERTIME PAY
See (B, E, Q, X) on OVERTIME PAGE. NOTE: Double time for emergency work designated by the Contracting Agency.
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:

	07/01/2026	05/03/2027	05/01/2028
All terms:	$ 28.41*	$ 29.54*	$ 30.67*

*NOTE: Plus 7% of the hourly wage paid. The 7% is based on the straight time rate or the premium time rate.

6-1249aWestLT

Mason - Building — 08/01/2026

JOB DESCRIPTION Mason - Building **DISTRICT** 11

ENTIRE COUNTIES
Putnam, Rockland, Westchester

PARTIAL COUNTIES
Orange: Only the Township of Tuxedo.

WAGES
Per hour:

	07/01/2026
Bricklayer	$ 50.15
Cement Mason	50.15
Plasterer/Stone Mason	50.15
Pointer/Caulker	50.15

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:

Journeyworker	$ 40.15

OVERTIME PAY
OVERTIME:

Cement Mason	See (B, E, Q, W) on OVERTIME PAGE.
All Others	See (B, E, E2, 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 Journeyworker'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 Journeyworker supplements

1st	2nd	3rd	4th	5th	6th	7th	8th
50%	55%	60%	65%	70%	75%	80%	85%

11-5wp-b

Mason - Building — 08/01/2026

JOB DESCRIPTION Mason - Building **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk, Westchester

WAGES
Building

Wages per hour:	07/01/2026	01/01/2027 Additional
Mosaic & Terrazzo Mechanic	$ 62.82	$ 1.06
Mosaic & Terrazzo Finisher	61.22	

SUPPLEMENTAL BENEFITS
Per hour:

Mosaic & Terrazzo Mechanic	$ 31.91* + $11.63
Mosaic & Terrazzo Finisher	$ 31.91* + 11.61

*This portion of benefits subject to same premium rate as shown for overtime wages.

OVERTIME PAY
See (A, E, Q) on OVERTIME PAGE
Deduct $7.00 from hourly wages before calculating overtime.

HOLIDAY

Paid:	See (1) on HOLIDAY PAGE
Overtime:	See (5, 6, 8, 11, 15, 16, 25) on HOLIDAY PAGE

Easter Sunday is an observed holiday.Holidays falling on a Saturday will be observed on that Saturday. Holidays falling on a Sunday will be celebrated on the Monday.

REGISTERED APPRENTICES

Wages Per hour:

	1st 0-1500	2nd 1501-3000	3rd 3001-3750	4th 3751-4500	5th 4501-5250	6th 5251-6000
07/01/2026	$25.90	$33.30	$40.85	$42.00	$50.56	$57.05

Supplemental Benefits per hour:

07/01/2026	$7.26* + 4.07	$9.33* + 5.23	$15.99* + 6.98	$24.31* + 8.14	$25.21* + 9.32	$28.21* + 10.46

*This portion of benefits subject to same premium rate as shown for overtime wages.

9-7/3

Mason - Building — 08/01/2026

JOB DESCRIPTION Mason - Building **DISTRICT** 9

ENTIRE COUNTIES

Bronx, Kings, Nassau, New York, Queens, Richmond, Rockland, Suffolk, Westchester

WAGES

Per hour:	07/01/2026	12/07/2026 Additional	06/07/2027 Additional
Tile Setters	$ 66.35	$ 1.28	$ 1.41

SUPPLEMENTAL BENEFITS

Per Hour:

$ 30.56*
+8.56

*This portion of benefits subject to same premium rate as shown for overtime wages.

OVERTIME PAY

See (B, *E, Q, V) on OVERTIME PAGE
Work beyond 10 hours on Saturday shall be paid at double the hourly wage rate.

HOLIDAY

Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 11, 15, 16, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES

Wage per hour:

750 hour terms at the following wage rate:

	1st 1-750	2nd 751-1500	3rd 1501-2250	4th 2251-3000	5th 3001-3750	6th 3751-4500	7th 4501-5250	8th 5251-6000	9th 6001-6750	10th 6501-7000
07/01/2026	$23.09	$28.32	$35.65	$40.86	$44.67	$48.38	$52.23	$57.45	$59.83	$66.35

Supplemental Benefits per hour:

	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
07/01/2026	$13.05* + $.77	$13.05* + $.82	$16.16* + $.93	$16.16* + $.98	$17.16* +$1.45	$18.66* +$1.51	$19.66* +$1.94	$19.66* +$1.99	$19.96* +$4.59	$30.56* +$8.56

*This portion of benefits subject to same premium rate as shown for overtime wages.

9-7/52

Mason - Building — 08/01/2026

JOB DESCRIPTION Mason - Building **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk, Westchester

WAGES

Per hour:	07/01/2026	01/04/2027 Additional
Building-Marble Restoration:		
Marble, Stone & Terrazzo Polisher	$ 48.72	$ 0.57

SUPPLEMENTAL BENEFITS

Per Hour:	
Journeyworker	
Building-Marble Restoration:	
Marble, Stone & Polisher	$ 32.78

OVERTIME PAY
See (B, *E, Q, V) on OVERTIME PAGE
* On Saturdays, 8th hour and successive hours paid at double hourly rate.

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 8, 11, 15, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES
WAGES per hour:

900 hour term at the following wage:

	1st 1-900	2nd 901-1800	3rd 1801-2700	4th 2701
07/01/2026	$ 34.10	$ 38.97	$ 43.84	$ 48.72
Supplemental Benefits Per Hour:				
07/01/2026	$ 31.28	$ 31.78	$ 32.29	$ 32.78

9-7/24-MP

Mason - Building — 08/01/2026

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:

	07/01/2026	01/04/2027 Additional
Marble Cutters & Setters	$ 65.61	$ 0.75

SUPPLEMENTAL BENEFITS
Per Hour:

Journeyworker	$ 41.38

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+
07/01/2026	$28.35	$42.51	$46.05	$49.59	$53.14	$55.76	$65.61	$65.61

Supplemental Benefits per hour:

	1st	2nd	3rd	4th	5th	6th	7th	8th
07/01/2026	$27.95	$30.68	$31.37	$32.05	$32.73	$39.34	$41.38	$41.38

9-7/4

Mason - Building — 08/01/2026

JOB DESCRIPTION Mason - Building **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Queens, Richmond, Rockland, Suffolk, Westchester

WAGES

Per hour:	07/01/2026	12/07/2026 Additional	06/07/2027 Additional
Tile Finisher	$ 50.93	$ 1.05*	$ 1.15*

*To be allocated at a later date.

SUPPLEMENTAL BENEFITS
Per Hour:
$ 27.16*
+ $8.37

* This portion of benefits is subject to same premium rate as shown for overtime wages.

OVERTIME PAY
See (A, *E, Q) on OVERTIME PAGE
*Double time rate after 10 hours on Saturdays

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 11, 15, 16, 25) on HOLIDAY PAGE

9-7/88-tf

Mason - Building — 08/01/2026

JOB DESCRIPTION Mason - Building **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk, Westchester

WAGES

Per hour:	07/01/2026	01/04/2027 Additional
Marble, Stone, Maintenance Finishers:	$ 28.56	$ 0.41

Note 1: An additional $2.00 per hour for time spent grinding floor using "60 grit" and below.
Note 2: Flaming equipment operator shall be paid an additional $25.00 per day.

SUPPLEMENTAL BENEFITS
Per Hour:

Marble, Stone
Maintenance Finishers: $ 16.54

OVERTIME PAY
See (B, *E, Q, V) on OVERTIME PAGE

*Double hourly rate after 8 hours on Saturday

HOLIDAY
Paid: See (5, 6, 8, 11, 15, 25) on HOLIDAY PAGE
Overtime: See (5, 6, 8, 11, 15, 25) on HOLIDAY PAGE
1st term apprentice gets paid for all observed holidays.

REGISTERED APPRENTICES
WAGES per hour:

	07/01/2026
0-750	$ 23.78
751-1500	24.43
1501-2250	25.07
2251-3000	25.70
3001-3750	26.65
3751-4500	27.93
4501+	28.56

Supplemental Benefits:
Per hour:

0-750	$ 12.61
751-1500	13.12
1501-2250	13.65
2251-3000	14.18
3001-3750	14.97
3751-4500	16.01
4501+	16.54

9-7/24M-MF

Mason - Building / Heavy&Highway — 08/01/2026

JOB DESCRIPTION Mason - Building / Heavy&Highway **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk, Westchester

WAGES
Per hour:

	07/01/2026	01/04/2027 Additional
Marble-Finisher	$ 51.04	$ 0.53

SUPPLEMENTAL BENEFITS
Journeyworker:
Per hour

Marble- Finisher	$ 38.46

OVERTIME PAY
See (B, E, Q, V) on OVERTIME PAGE
Work beyond 8 hours on a Saturday shall be paid at double the rate.

HOLIDAY
Overtime: See (5, 6, 8, 11, 15, 16, 25) on HOLIDAY PAGE
When an observed holiday falls on a Sunday, it will be observed the next day.

9-7/20-MF

Mason - Heavy&Highway — 08/01/2026

JOB DESCRIPTION Mason - Heavy&Highway **DISTRICT** 11

ENTIRE COUNTIES
Putnam, Rockland, Westchester

PARTIAL COUNTIES
Orange: Only the Township of Tuxedo.

WAGES
Per hour:

	07/01/2026
Bricklayer	$ 50.65
Cement Mason	50.65
Marble/Stone Mason	50.65

Plasterer	50.65
Pointer/Caulker	50.65

Additional $1.00 per hour for power saw work
Additional $0.50 per hour for swing scaffold or staging work

SUPPLEMENTAL BENEFITS
Per hour:

Journeyworker	$ 40.15

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 Journeyworker'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 Journeyworker's supplements

1st	2nd	3rd	4th	5th	6th	7th	8th
50%	55%	60%	65%	70%	75%	80%	85%

11-5WP-H/H

Operating Engineer - Building — 08/01/2026

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) 07/01/2026

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:	07/01/2026
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 is subject to double the rate after 7 hours on Saturdays.
Code "B" applies to Heavy Construction and Steel Erection and is subject to 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 08/01/2026

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)

	07/01/2026	03/01/2027
GROUP I		
Cranes- up to 49 tons	$ 71.19	$ 73.11
Cranes- 50 tons to 99 tons	73.69	75.69
Cranes- 100 tons and over	84.27	86.64
GROUP I-A	62.20	63.80
GROUP I-B	57.24	58.67
GROUP II	59.98	61.50
GROUP III-A	57.75	59.20
GROUP III-B	54.93	56.28
GROUP IV-A	57.16	58.58
GROUP IV-B	48.17	49.28
GROUP V	52.01	53.25
Group VI-A	61.05	62.61
GROUP VI-B		
Utility Man	49.30	50.45
Warehouse Man	51.72	52.95

An additional 20% of wage to be paid 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	$ 34.42	$ 36.17

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 - Heavy&Highway 08/01/2026

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:	07/01/2026	03/01/2027
Group I	$ 72.77	$ 75.10
Group I-A	63.97	65.99
Group I-B	67.49	69.64
Group II-A	61.21	63.14
Group II-B	63.17	65.17
Group III	60.12	62.01
Group IV	54.49	56.18
Group IV-B	46.59	48.01
Group V		
Engineer All Tower, Climbing and Cranes of 100 Tons	82.61	85.29
Hoist Engineer(Steel)	74.67	77.07
Engineer(Pile Driver)	79.73	82.31
Jersey Spreader, Pavement Breaker (Air Ram)Post Hole Digger	62.66	64.64

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 and 3rd shifts on all government mandated off-shift work

SUPPLEMENTAL BENEFITS

Per hour:

Journeyworker:	$ 38.08 up to 40 Hours	$ 39.68 up to 40 hours
	After 40 hours $ 27.63* PLUS $ 1.45 on all hours worked	After 40 hours $ 28.68* PLUS $ 1.50 on all hours worked

*This amount is subject to premium

OVERTIME PAY
See (B, E, P, *R, **U) on OVERTIME PAGE
* For Holiday codes 8,15,25,26 code R applies
** For Holiday codes 5 & 6 code U applies

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	$ 38.38	$ 39.59
2nd term	44.78	46.19
3rd term	51.18	52.79
4th term	57.57	59.39

Supplemental Benefits per hour:

	$ 29.08	$ 30.18

8-137HH

Operating Engineer - Heavy&Highway — 08/01/2026

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:	07/01/2026
Party Chief	$ 85.77
Instrument Man	63.48
Rodman	53.53

SUPPLEMENTAL BENEFITS
Per Hour: 07/01/2026

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

Operating Engineer - Heavy&Highway - Tunnel 08/01/2026

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)

	07/01/2026	03/01/2027
GROUP I	$ 72.77	$ 75.10
GROUP I-A	63.97	65.99
GROUP I-B	67.49	69.64
GROUP II-A	61.21	63.14
GROUP II-B	63.17	65.17
GROUP III	60.12	62.01
GROUP IV-A	54.49	56.18
GROUP IV-B	46.59	48.01

GROUP V-A		
Engineer-Cranes	82.61	85.29
Engineer-Pile Driver	79.73	82.31
Hoist Engineer	74.67	77.07
Jersey Spreader/Post Hole Digger	62.66	64.64

An additional 20% of wage to be paid 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 and 3rd shifts
on all government mandated off-shift work

SUPPLEMENTAL BENEFITS
Per hour:
Journeyworker:

$ 38.08 up to 40 hours	$ 39.68 up to 40 hours
After 40 hours: $27.63 plus $1.45 on all hours worked	After 40 hours: $28.68 plus $1.50 on all hours worked

OVERTIME PAY
See (E, P, *R, **T, ***U) on OVERTIME PAGE
*For Holiday codes 8, 15, 25, 26, code R applies.
**For Holiday code 28, code T applies.
***For Holiday codes 5 & 6, code U applies.

HOLIDAY
Paid: See (5, 6, 8, 15, 25, 26) on HOLIDAY PAGE
Overtime: See (5, 6, 8, 15, 25, 26) on HOLIDAY PAGE
For Holiday codes 5 & 6, code U applies.
For Holiday codes 8, 15, 25, 26, code R applies.
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	$ 38.38	$ 39.59
2nd term	44.78	46.19
3rd term	51.18	52.79
4th term	57.57	59.39
Supplemental Benefits per hour:		
All terms	$ 29.08	$ 30.18

8-137Tun

Operating Engineer - Marine Dredging — 08/01/2026

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:	07/01/2026	10/01/2026

CLASS A1 Deck Captain, Leverman, Mechanical Dredge Operator, Licensed Tug Operator with MOTV	$ 48.48	$ 49.94
CLASS A2 Crane Operator (360 swing)	43.20	44.50
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	41.93	43.18
CLASS B2 Certified Welder	39.46	40.65
CLASS C1 Drag Barge Operator, Steward, Mate, Assistant Fill Placer	38.38	39.53
CLASS C2 Boat Operator	37.15	38.26
CLASS D Shoreman, Deckhand, Oiler, Rodman, Scowman, Cook, Messman, Porter/Janitor	30.86	31.79

SUPPLEMENTAL BENEFITS
Per Hour:
THE FOLLOWING SUPPLEMENTAL BENEFITS APPLY TO ALL CATEGORIES

All Classes:	7% of Hourly Straight time wage + $12.00.	7.5% 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 - Consulting Engineer — 08/01/2026

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: Survey Classifications	07/01/2026
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

Painter — 08/01/2026

JOB DESCRIPTION Painter **DISTRICT** 8

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Putnam, Queens, Richmond, Suffolk, Westchester

WAGES

Per hour:	07/01/2026	05/01/2027 Additional
Brush	$ 55.76	$2.77*
Abatement/Removal of lead based or lead containing paint on materials to be repainted.	55.76	
Spray & Scaffold	$ 58.76	
Fire Escape	58.76	
Decorator	58.76	
Paperhanger/Wall Coverer	57.27	

*To be allocated at a later date.

SHIFT WORK
Agency/Government mandated off-shift work to be paid at time and one-half the hourly wage.

SUPPLEMENTAL BENEFITS
Per hour:

Paperhanger	$ 39.86
All others	36.72
Paperhanger Premium	45.26
Premium	41.23**

**Applies only to "All others" category, not paperhanger journeyworker.

OVERTIME PAY
See (A, F, R) on OVERTIME PAGE

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 16, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES
One (1) year terms at the following wage rate.

Per hour:	07/01/2026
Appr 1st term...	$ 21.18
Appr 2nd term...	27.40
Appr 3rd term...	33.30
Appr 4th term...	44.67

Supplemental benefits:
Per Hour:

Appr 1st term...	$ 18.06
Appr 2nd term...	22.14
Appr 3rd term...	25.59

Appr 4th term... 32.55

8-NYDC9-B/S

Painter 08/01/2026

JOB DESCRIPTION Painter **DISTRICT** 8

ENTIRE COUNTIES
Putnam, Suffolk, Westchester

PARTIAL COUNTIES
Nassau: All of Nassau except the areas described below: Atlantic Beach, Ceaderhurst, East Rockaway, Gibson, Hewlett, Hewlett Bay, Hewlett Neck, Hewlett Park, Inwood, Lawrence, Lido Beach, Long Beach, parts of Lynbrook, parts of Oceanside, parts of Valley Stream, and Woodmere. Starting on the South side of Sunrise Hwy in Valley Stream running east to Windsor and Rockaway Ave., Rockville Centre is the boundary line up to Lawson Blvd. turn right going west all the above territory. Starting at Union Turnpike and Lakeville Rd. going north to Northern Blvd. the west side of Lakeville road to Northern blvd. At Northern blvd. going east the district north of Northern blvd. to Port Washington Blvd. West of Port Washington blvd.to St.Francis Hospital then north of first traffic light to Port Washington and Sands Point, Manor HAven, Harbour Acres.

WAGES

Per hour:	07/01/2026	05/01/2027
		Additional
Drywall Taper:	$ 55.76	$ 2.77*
Scaffold:	$ 58.76	

* To be allocated a later date.

SHIFT WORK
Agency/Government mandated off-shift work to be paid at time and one-half hourly wage

SUPPLEMENTAL BENEFITS
Per hour:
Journeyworker $ 36.72

OVERTIME PAY
See (A, F, R) on OVERTIME PAGE

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 16, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES
Wages - Per Hour:

1500 hour terms at the following wage rate:

1st term	$ 21.18
2nd term	27.40
3rd term	33.30
4th term	44.67

Supplemental Benefits - Per hour:
One year term (1500 hours) at the following dollar amount.

1st year	$ 18.06
2nd year	22.14
3rd year	25.59
4th year	32.55

8-NYDCT9-DWT

Painter - Bridge & Structural Steel 08/01/2026

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:	07/01/2026	10/01/2026
	$ 57.00*	Additional
	+ 12.90**	+ 3.64***

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:

$ 13.49
+ 31.67*

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.

	07/01/2026
1st year	$ 22.80* + 5.64**
2nd year	$ 34.20* + 7.74**
3rd year	$ 45.60* + 10.31**

*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).

Supplemental Benefits - Per hour:

1st year	$ 13.74
2nd year	$ 8.09* + 18.99
3rd year	$ 10.79* + 25.34

*Portion not applicable to May 1st to November 15th and Nov 16th to April 30th period mentioned above.

8-DC-9/806/155-BrSS

Painter - Line Striping **08/01/2026**

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):	07/01/2026	04/01/2027
Striping-Machine Operator*	$ 36.93	$ 38.45
Linerman Thermoplastic	44.44	46.22

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:	$ 24.95	$ 25.60
Linerman Thermoplastic:	24.95	25.60

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:

	07/01/2026
1st Term:	$ 21.18
2nd Term:	27.40
3rd Term:	33.30

Supplemental Benefits per hour:

1st term:	$ 18.06
2nd term:	22.14
3rd term:	25.59

8-1456-LS

Painter - Metal Polisher 08/01/2026

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

	07/01/2026
Metal Polisher	$ 41.33
Metal Polisher*	42.43
Metal Polisher**	45.33

*Note: Applies on New Construction & complete renovation
** Note: Applies when working on scaffolds over 34 feet.

SUPPLEMENTAL BENEFITS
Per Hour:

Journeyworker:
All classifications $ 13.99

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:

	07/01/2026
1st year	$ 20.67
2nd year	22.73
3rd year	24.80
1st year*	$ 21.06
2nd year*	23.17
3rd year*	25.34
1st year**	$ 23.17
2nd year**	25.23
3rd year**	27.30

*Note: Applies on New Construction & complete renovation
** Note: Applies when working on scaffolds over 34 feet.

Supplemental benefits:
Per hour:

1st year	$ 9.19
2nd year	9.19
3rd year	9.19

8-8A/28A-MP

Plumber — 08/01/2026

JOB DESCRIPTION Plumber **DISTRICT** 8

ENTIRE COUNTIES
Putnam, Westchester

WAGES
Per hour:

	07/01/2026
Plumber and Steamfitter	$ 66.83

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 $ 46.79

OVERTIME PAY
See (B, E, E2, Q, V) on OVERTIME PAGE
OVERTIME:... See 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 wages:

1st Term	$ 24.95
2nd Term	28.59
3rd Term	33.07
4th Term	47.01
5th Term	50.42

Supplemental Benefits per hour:

1st term	$ 19.16
2nd term	21.42
3rd term	25.44
4th term	33.77
5th term	35.82

8-21.1-ST

Plumber - HVAC / Service — 08/01/2026

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: 07/01/2026

HVAC Service	$ 45.43
	+ $ 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
$ 33.34

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.
$ 20.56	$ 24.42	$ 30.35	$ 37.33	$ 40.63
+$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 07/01/2026

1st term	$ 22.81
2nd term	24.68
3rd term	26.69
4th term	29.49
5th term	31.46

8-21.1&2-SF/Re/AC

Plumber - Jobbing & Alterations — 08/01/2026

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:	07/01/2026
Journeyworker:	$ 52.14

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	$ 38.99

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	$ 22.32
2nd year	24.83
3rd year	27.16
4th year	38.07
5th year	40.25

Supplemental Benefits per hour:

1st year	$ 13.07
2nd year	15.31
3rd year	19.67
4th year	26.65
5th year	28.88

8-21.3-J&A

Roofer 08/01/2026

JOB DESCRIPTION Roofer **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Dutchess, Kings, New York, Orange, Putnam, Queens, Richmond, Rockland, Sullivan, Ulster, Westchester

WAGES

Per Hour:	07/01/2026	05/01/2027 Additional
Roofer/Waterproofer	$ 52.50 + $7.00*	+ $ 3.00

* 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: $ 33.12

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
$ 18.38	$ 26.25	$ 31.50	$ 39.38
	+ 3.50*	+ 4.20*	+ 5.26*

Supplemental Benefits:

1st	2nd	3rd	4th
$ 4.32	$ 16.94	$ 20.17	$ 25.03

* This portion is not subjected to overtime premiums.

(1) year term apprentices indentured after 01/01/2023

1st	2nd	3rd	4th	5th
$ 19.95	$ 23.63	$ 26.25	$ 31.50	$ 39.38
	+ 3.16*	+ 3.50*	+ 4.20*	+ 5.26*

Supplemental Benefits:

1st	2nd	3rd	4th	5th
$ 8.15	$ 15.32	$ 16.94	$ 20.17	$ 25.03

* This portion is not subjected to overtime premiums.

9-8R

Sheetmetal Worker — 08/01/2026

JOB DESCRIPTION Sheetmetal Worker **DISTRICT** 8

ENTIRE COUNTIES
Dutchess, Orange, Putnam, Rockland, Sullivan, Ulster, Westchester

WAGES

	07/01/2026
SheetMetal Worker	$ 53.48
	+ 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:
12% increase for additional shifts for a minimum of five (5) days

SUPPLEMENTAL BENEFITS
Journeyworker $ 48.71

OVERTIME PAY
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
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

1st	2nd	3rd	4th	5th	6th	7th	8th
$ 21.80	$ 22.61	$ 25.12	$ 27.61	$ 30.13	$ 32.67	$ 35.65	$ 38.61
+ 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	$ 19.09
2nd term	23.39
3rd term	25.99
4th term	28.59
5th term	31.18
6th term	33.76

7th term	35.89
8th term	38.04

8-38

Sheetmetal Worker — 08/01/2026

JOB DESCRIPTION Sheetmetal Worker **DISTRICT** 4

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Queens, Richmond, Rockland, Suffolk, Westchester

WAGES
Per Hour:

	07/01/2026	08/01/2026
Sign Erector	$ 62.00	$ 64.00

NOTE: For Structurally Supported Overhead Highway Signs (See STRUCTURAL IRON WORKER CLASSIFICATION)

SUPPLEMENTAL BENEFITS
Per Hour:

Sign Erector	$ 59.58	$ 60.62

OVERTIME PAY
See (B, F, S) on OVERTIME PAGE

HOLIDAY
Paid: See (5, 6, 10, 11, 12, 16, 25) on HOLIDAY PAGE
Overtime: See (5, 6, 10, 11, 12, 16, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES
Per Hour:
6 month Terms at the following percentage of Sign Erectors wage rate:

1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
35%	40%	45%	50%	55%	60%	65%	70%	75%	80%

SUPPLEMENTAL BENEFITS Per Hour:

07/01/2026

1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
$ 19.04	$ 21.62	$ 24.21	$ 26.79	$36.17	$ 39.36	$ 43.50	$ 46.77	$ 50.05	$ 53.32

08/01/2026

1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
$ 19.45	$ 22.09	$ 24.72	$ 27.36	$36.81	$ 40.07	$ 44.29	$ 47.62	$ 50.95	$ 54.29

4-137-SE

Sprinkler Fitter — 08/01/2026

JOB DESCRIPTION Sprinkler Fitter **DISTRICT** 1

ENTIRE COUNTIES
Dutchess, Orange, Putnam, Rockland, Sullivan, Ulster, Westchester

WAGES
Per hour

	07/01/2026	01/01/2027	04/01/2027	01/01/2028
Sprinkler Fitter	$ 60.78	$ 60.78	$ 64.37	$ 64.37

SUPPLEMENTAL BENEFITS
Per hour

Journeyworker	$ 32.66	$ 33.66	$ 33.66	$ 34.66

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

One Half Year terms at the following wage per hour:

	07/01/2026	01/01/2027	04/01/2027	01/01/2028
1st Term	$ 30.87	$ 30.87	$ 32.42	$ 32.42
2nd Term	34.46	34.46	36.19	36.19
3rd Term	37.34	37.34	39.20	39.20
4th Term	40.21	40.21	42.22	42.22
5th Term	42.36	42.36	44.48	44.48
6th Term	45.95	45.95	48.25	48.25
7th Term	48.82	48.82	51.27	51.27
8th Term	51.70	51.70	54.28	54.28
9th Term	54.57	54.57	57.30	57.30
10th Term	57.44	57.44	60.31	60.31
Supplemental Benefits per hour:				
1st & 2nd Term	$ 10.23	$ 11.23	$ 11.23	$ 12.23
3rd & 4th Term	22.79	23.79	23.79	24.79
All Other Terms	23.04	24.04	24.04	25.04

1-669.2

Teamster - Building / Heavy&Highway — 08/01/2026

JOB DESCRIPTION Teamster - Building / Heavy&Highway **DISTRICT** 8

ENTIRE COUNTIES

Putnam, Westchester

WAGES

GROUP A: Straight Trucks (6-wheeler and 10-wheeler), A-frame, Winch, Dynamite Seeding, Mulching, Agitator, Water, Attenuator, Light Towers, Cement (all types), Suburban, Station Wagons, Cars, Pick Ups, any vehicle carrying materials of any kind.
GROUP AA: Tack Coat
GROUP B: Tractor & Trailers (all types).
GROUP BB: Tri-Axle,14 Wheeler
GROUP C: Low Boy (carrying equipment).
GROUP D: Fuel Trucks, Tire Trucks.
GROUP DD: Tow Truck/Flatbed Single axle.
GROUP E: Off-road Equipment (over 40 tons): Athey Wagons, Belly Dumps, Articulated Dumps, Trailer Wagons.
GROUP F: Off-road Equipment (over 40 tons) Euclid, DJB.
GROUP G: Off-road Equipment (under 40 tons) Athey Wagons, Belly Articulated Dumps, Trailer Wagons, Tracker/Crawler Dump Truck.
GROUP H: Off-road Equipment(under 40 tons), Euclid.
GROUP HH: Off-road Equipment(under 40 tons) D.J.B.
GROUP I: Off-road Equipment(under 40 tons) Darts.
GROUP II: Off-road Equipment(under 40 tons) RXS.

WAGES:(per hour)

	07/01/2026
GROUP A	$ 49.61*
GROUP AA	52.61*
GROUP B	50.23*
GROUP BB	49.73*
GROUP C	52.36*
GROUP D	50.06*
GROUP DD	38.74*
GROUP E	50.61*
GROUP F	51.61*
GROUP G	50.36*
GROUP H	50.98*
GROUP HH	51.36*
GROUP I	51.11*
GROUP II	51.48*

* To calculate premium wage, subtract $ .10 from the hourly wage.

Note: Fuel truck operators on construction sites addit. $5.00 per day.

For work on hazardous/toxic waste site addit. 20% of hourly rate.

Note: For aggregate and asphalt delivery, the applicable prevailing rate is based on the type of vehicle operated.

SHIFT WORK
When mandated by the contracting agency, DOT, or any governmental agency contracts shall receive a shift differential of fifteen (15%) above the wage rate for all work performed during the irregular shift.

SUPPLEMENTAL BENEFITS
Per hour:
Journeyworker

First 40 hours	$ 40.83
Over 40 hours	31.64

OVERTIME PAY
See (B, E, P, *R, **T) on OVERTIME PAGE
*For code (8,15,25,26) code R applies
**For code (5,6) code T applies

HOLIDAY
Paid: See (5, 6, 8, 15, 25, 26) on HOLIDAY PAGE
Overtime: See (5, 6, 8, 15, 25, 26) on HOLIDAY PAGE

8-456

Welder 08/01/2026

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 07/01/2026

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 08/14/2026

Article 8

AGENCY	Fiscal Officer	FEIN	EMPLOYER NAME	EMPLOYER DBA NAME	ADDRESS	DEBARMENT START DATE	DEBARMENT END DATE
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	DOL		ALEXANDER DELISA		411 THEODORE FREMND SUITE 206RYE NY 10580	09/03/2025	09/03/2030
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	*****8017	AMIN ELECTRICAL CORP.		97-23 218TH STREET QUEENS VILLAGE NY 11429	12/04/2025	12/04/2030
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 CASALE		20 HEATHER RIDGE ROAD TROY NY 12180	05/20/2025	05/20/2030
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	DOL	*****3932	B ROC CONSTRUCTION INC		7307 WOODSIDE ROAD VICTOR NY 14564	05/06/2025	05/06/2030
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		C.M.C CONTRACTORS, INC.		500 WEST PUTNAM AVE SUITE 400GREENWICH CT 06830	09/03/2025	09/03/2030
DOL	DOL		CARLOS F. ESCOBAR		411 THEODORE FREMD AVE SUITE 206RYE NY 10580	09/03/2025	09/03/2030
DOL	DOL		CARLOS FIGUEROA		411 THEODORE FREMND AVE SUITE 206RYE NY 10580	09/03/2025	09/03/2030
DOL	DOL	*****4155	CASA BUILDERS, INC.	FRIEDLANDER CONSTRUCTION	64 N PUTT CONNERS ROAD NEW PALTZ NY 12561	05/10/2023	05/10/2028
DOL	DOL		CESAREO TULA		120 SEARS AVE ELMSFORD NY 10523	09/26/2025	09/26/2030
DOL	DOL	*****2292	CHAMPION MAINTENANCE CONTRACTORS, INC.		211 SOUTH RIDGE STREET RYE BROOK NY 10573	09/03/2025	09/03/2030
DOL	NYC	*****2117	CHARAN ELECTRICAL ENTERPRISES		9-11 40TH AVENUE LONG ISLAND CITY NY 11101	09/26/2023	09/26/2028
DOL	DOL		CHARLES CASALE		55 MAIN AVENUE WYNANTSKILL NY 12198	05/20/2025	05/20/2030
DOL	DOL		CHARLES CASALE		55 MAIN AVENUE WYNANTSKILL NY 12198	05/20/2025	05/20/2030
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	*****7619	DANCO CONSTRUCTION UNLIMITED INC.		485 RAFT AVENUE HOLBROOK NY 11741	10/19/2021	10/19/2026
DOL	DOL		DANIEL DELISA		211 SOUTH RIDGE STREET RYE BROOK NY 10573	09/03/2025	09/03/2030
DOL	DOL		DANIEL LOHAN		6836 N. LEXINGTON LANE NILES IL 60714	05/28/2026	05/28/2031
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		DENISE NAGLE		36 OAKWOOD TRAIL S AL MONROE NY 10950	10/29/2025	10/29/2030

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DOL	DOL		DINA TAYLOR		64 N PUTT CONNERS RD NEW PALTZ NY 12561	05/10/2023	05/10/2028
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	NYC		ENRICO MANETTA		101 MALBA DR. WHITESTONE NY 11357	04/01/2026	04/01/2031
DOL	DOL		EUGENIUSZ "GINO" KUCHAR		195 KINGSLAND AVE BROOKLYN NY 11222	12/22/2023	12/22/2028
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	NYC		GHANSHYAM AMIN		97-23 218TH STREET QUEENS VILLAGE NY 11429	12/04/2025	12/04/2030
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		HENRY WICKE A/K/A HENRY WICKE, JR.		36 OAKWOOD TRAIL S AL MONROE NY 10950	10/29/2025	10/29/2030
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	*****6961	HUNTER ELEVATOR COMPANY, INC.		36 OAKWOOD TRAIL S AL MONROE NY 10950	10/29/2025	10/29/2030
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		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		JERRY DASTON		36 OAKWOOD TRAIL S AL MONROE NY 10950	10/29/2025	10/29/2030
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 NAGLE A/K/A JOHN NAGLE, JR.		36 OAKWOOD TRAIL S AL MONROE NY 10950	10/29/2025	10/29/2030
DOL	DOL		JONATHAN DELISA		411 THEODORE FREMND AVE SUITE 206RYE NY 10580	09/03/2025	09/03/2030
DOL	DOL		JORGE FIGUEROA		411 THEODORE FRMND AVE SUITE 206RYE NY 10580	09/03/2025	09/03/2030
DOL	DA		JOSEPH DEMASCO		33 DOLLARD DRIVE NORTH BABYLON NY 11703	01/30/2026	01/30/2031
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		KEAN INDUSTRIES, LLC		2345 RT. 52 SUITE 2NHOPEWELL JUNCTION NY 12533	12/18/2023	12/18/2028
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		LIZETTE PONCE		411 THEODORE FREMND AVE SUITE 206RYE NY 10580	09/03/2025	09/03/2030
DOL	NYC	*****7516	MANCO ENTERPRISES OF NY, INC.		44-17 54TH DR. MASPETH NY 11378	04/01/2026	04/01/2031
DOL	NYC	*****1783	MANETTA ENTERPISES, INC. D/B/A MANETTA INDUSTRIES		44-17 54TH DR. MASPETH NY 11378	04/01/2026	04/01/2031
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	DOL		NICHOLAS RAO		411 THEODORE FREMND AVE SUITE 206RYE NY 10580	09/03/2025	09/03/2030
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

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DOL	DOL		NIKOLA NTONI		3418 NORTHERN BLVD SUITE 5-27LONG ISLAND CITY NY 11101	12/13/2024	12/13/2029
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	*****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	*****2041	QUALITY STEEL ERECTORS INC.		6836 N. LEXINGTON LANE NILES IL 60714	05/28/2026	05/28/2031
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	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		ROSA GARCIA		411 THEODORE FRMND AVE SUITE 206RYE NY 10580	09/03/2025	09/03/2030
DOL	DOL	*****7172	RZ & AL INC.		198 RIDGE AVENUE VALLEY STREAM NY 11581	06/06/2022	06/06/2027
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	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		STEVEN DELISA		411 THEODORE FREMND AVE SUITE 206RYE NY 10580	09/03/2025	09/03/2030
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	*****4855	TECH INDUSTRIES LLC		20 HEATHER RIDGE ROAD TROY NY 12180	05/20/2025	05/20/2030
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	DOL	*****8485	TULA PLUMBING AND HEATING LLC		120 SEARS AVE ELMSFORD NY 10523	09/26/2025	09/26/2030
DOL	DOL	*****8210	UPSTATE CONCRETE & MASONRY CONTRACTING CO INC		449 WEST MOMBSHA ROAD MONROE NY 10950	06/06/2022	06/06/2027
DOL	DOL		VINCENT CORRAO		PO BOX 393 NANUET NY 10954	09/17/2024	09/17/2029
DOL	DOL		WILLIAM A BELL		7307 WOODSIDE ROAD VICTOR NY 14564	05/06/2025	05/06/2030
DOL	DOL	*****8266	WILLIAM CHRIS MCCLENDON	MCCLENDON ASPHALT PAVING	1646 FALLS STREET NIAGARA FALLS NY 14303	05/01/2023	05/01/2028

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DOL	DOL		WILLIAM CHRIS MCCLENDON		1646 FALLS STREET NIAGARA FALLS NY 14303	05/01/2023	05/01/2028
DOL	DOL		WILLIAM SCRIVENS		4192 SIR ANDREW CIRCLE DOYELSTOWN PA 18902	07/18/2024	07/18/2029
DOL	DOL	*****9494	WND CONSTRUCTION LLC		411 THEODORE FREMD AVENUE SUITE 206RYE NY 10580	09/03/2025	09/03/2030
DOL	DOL		XENOFON EFTHIMIADIS		29-10 38TH AVENUE LONG ISLAND CITY NY 11101	10/11/2023	10/11/2028

Adelaide
ENVIRONMENTAL HEALTH

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RENOVATION SURVEY
FOR
ASBESTOS-CONTAINING MATERIALS, LEAD-BASED PAINT & PCBs

PERFORMED AT:

Yonkers Armory
2 Quincy Place
Yonkers, New York 10701
Adelaide Project# BA:23168.00-IN
OGS Project# 47477

PREPARED FOR:

Greg Springer
Bergmann: Architects, Engineers, Planners
18 Corporate Woods Blvd., Suite 400
Albany, New York 12211

PREPARED BY:
Jason Fullum
June 15, 2023

REVIEWED BY:



Stephanie A. Soter
President

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1.0 Introduction

1.1 Scope of Work / Project Personnel

Adelaide Environmental Health Associates, Inc. **(Adelaide)** performed an Asbestos, Lead and PCB Survey for Building/Structure Demolition, Renovation, Remodeling and/or Repair, in conformance with ALL Federal, State and Local regulations for Bergmann:

SURVEY LOCATION(S):	Yonkers Armory, 2 Quincy Place, Yonkers, New York 10701
SURVEY DATE(S):	June 6, 2023
SCOPE OF WORK:	Entire building renovation excluding the roof.
SCOPE OF WORK BUILDING/ STRUCTURE PLANS UTILIZED:	As built drawings from 1985 were utilized for the inspection.
CERTIFIED ADELAIDE PERSONNEL:	Jason Fullum (NYS Asbestos Inspector/Cert. #97-20574 and EPA Lead-based Paint Risk Assessor/Cert. #LBP-R-12098-2)
SITE CONTACT(S):	Trentin Reese - Bergmann

1.2 Executive Summary

On June 6, 2023, **Adelaide** inspected the first floor, second floor and exterior areas that will be affected by the proposed scope of work for suspect ACM, LBP and PCBs.

SUSPECT HAZARDOUS MATERIAL	SAMPLE(S)/LAYER(S)/ READING(S) COLLECTED	SAMPLE(S) / HOMOGENEOUS AREA(S) IDENTIFIED POSITIVE
Asbestos-containing Materials (ACM):	56	0
Lead-based Paint (LBP):	31 (plus calibrations)	0
PolyChlorinated Biphenyls (PCB):	6	0

The following indicates assumed materials due to live electric at the time of the inspection.

- PACM electrical wiring insulation and panels, mirror mastic

There are **asbestos materials that will be impacted** by this scope of work as described in section 1.1. These materials are listed in section 2.1.

1.3 Conclusions and Recommendations

The following conclusions and recommendations are prepared by **Adelaide** as per the provided scope of work for Building/Structure Demolition, Renovation, Remodeling and/or Repair. Should the scope of work change, it is recommended that the findings be revisited to determine if additional sampling will be required to satisfy ALL Federal, State and Local regulations.

The materials sampled, as part of this survey, were limited to building materials potential affected by the provided scope of work only. All building materials outside the scope of work that have the potential to be disturbed, impacted, or if the scope of work is to change, are to be presumed asbestos-containing materials (PACM). Identified PACM **must** either be sampled by a licensed NYS Asbestos Inspector and/or abated/removed and disposed of by a licensed NYS Asbestos Abatement Contractor.

1.4 Asbestos-containing Materials (ACM)

- This survey concluded that the materials listed in Section 2.1 are assumed ***positive for asbestos***.

- There are asbestos materials that will be impacted by this scope of work. These materials are listed in section 2.1. Refer to Appendix A for the approximate location of the above materials in the affected scope of work.

- Subpart 56-5(h) of 12 NYCRR Part 56 requires that no demolition, renovation, remodeling, or repair work be commenced by any owner or the owner's agent prior to the completion of asbestos abatement. Asbestos abatement must be performed by an asbestos abatement contractor that maintains a current asbestos handling license and employs NYSDOL/NYCDEP certified asbestos handlers and supervisors. It is recommended that a 12 NYCRR 56 certified Project Monitor oversee abatement activities.

- Subpart 56-5(g) of 12 NYCRR Part 56 specifies requirements for transmittal of asbestos survey information by the owner or owner's agent. (1) One copy of the asbestos survey report shall be sent to the local government entity charged with issuing a permit for such demolition, renovation, remodeling, or repair work under applicable State or local laws. (2) If controlled demolition or pre-demolition activities will be performed, one copy of the asbestos survey report shall be submitted to the appropriate Asbestos Control Bureau district office. (3) One copy of the asbestos survey report must be kept on the construction site throughout the duration of the asbestos project and any associated demolition, renovation, remodeling, or repair project.

1.5 Lead-based Paint (LBP)

- This survey concluded that the readings summarized in Section 2.3 and Appendix E tested ***negative for lead-based paint.***

1.6 PolyChlorinated Biphenyls (PCB)

- This survey concluded that the materials listed in Section 2.4 and Appendix F tested ***negative for PCBs.***

2.0 Summary of Hazardous Materials

2.1 Summary of Identified ACM/PACM

KEY: **ACM** = Materials containing greater than 1% of asbestos; **HA** = Homogeneous Area; **LF** = Linear Feet; **SF** = Square Feet; **PACM** = Presumed Asbestos-containing Materials; **Friable** = ACM capable of being released into air, and which can be crumbled, pulverized, powdered, crushed or exposed by hand-pressure; [A] = Material is considered non-friable solely in an intact and undisturbed state, however, may be rendered friable if pulverized or crumbled while in dry state.

Samples collected by **Adelaide** June 6, 2023

HA	Identified ACM	ACM Location(s)	Approx. Qty.	Condition	Friable? (Yes or No)
PACM	Electrical Wire Insulation and Panels	Throughout	Unknown	Unknown	No

HA	Identified ACM	ACM Location(s)	Approx. Qty.	Condition	Friable? (Yes or No)
PACM	Bathroom Mirror Mastic	Men's and Women's Bathrooms and Locker Rooms	11 Mirrors	Good	No

2.2 Summary of Identified Non-ACM

Samples collected by **Adelaide** June 6, 2023

Identified Non-ACM	Sample Location(s)
12x12 Brown/Red Mottled Floor Tile	2nd Floor
Black Floor Mastic	
2x4 Ceiling Tile – Large and Small Holes	
Debris on Top of Ceiling Tiles	
2x4 Ceiling Tile – Squiggles and Holes	
CMU Mortar	Throughout
4" Black Covebase and Mastic	
Yellow Carpet Mastic	2nd Floor
12x12 Green Mottled Floor Tile	
Drywall Ceiling and Joint Compound	Throughout
12x12 Brown and White Mottled Floor Tile	2nd Floor
12x12 White with Gray Specks Floor Tile	
Terrazzo Shower Base	Locker Rooms
Sealant at Shower	
Exterior Door Glazing Compound	Throughout
Exterior Door Sealant	
Concrete	
Brick Mortar	
Exterior Vertical Sealant	
Pin Mastic on Ductwork	Boiler Room
Wall Tile – Grout and Mudset	Kitchen
Floor Tile – Grout and Mudset	
Exterior Door Caulk	Throughout
Exterior Louver Caulk	

2.3 Summary of Identified LBP

Based on review of the data generated by the Viken Pb200e X-Ray Fluorescence (XRF) Analyzer(s), the following surfaces tested were identified as lead-based, as defined by HUD/EPA (equal to or in excess of 1.0 milligram per square centimeter):

Readings collected by **Adelaide** June 6, 2023

Location of LBP	LBP Component	Substrate	Color	Condition	Readings (mg/cm2)
NO Lead-based Paints identified above HUD/EPA standards of readings collected in reference to the above-mentioned scope of work.					

2.4 Summary of Identified PCB-containing Materials

Samples collected by **Adelaide** June 6, 2023

Sample #	Location / Description	Material Matrix	Color	Substrate	Analytical Result
NO PCB-containing materials were identified above the USEPA 40 CFR 761 threshold of 50 ppm(mg/kg) of samples collected/analyzed in reference to the above-mentioned scope of work.					

2.5 Observations

ASBESTOS-CONTAINING MATERIALS (ACM)
A visual inspection was performed, and homogeneous material types were established based on appearance, color and texture. The findings presented in this report are based upon reasonably available information and observed site conditions at the time the assessment was performed. The findings and conclusions of this report are not meant to be indicative of future conditions at the site and does not warrant against conditions that were not evident from visual observations or historical information obtained from others.

On June 6, 2023, representative bulk sampling was performed on suspect building materials for laboratory analysis and the following is a summary of installed building materials sampled as per the scope of work provided:

- Ceiling Materials – Ceiling Tiles, Drywall, Joint Compound.
- Wall Materials – CMU Mortar, Brick Mortar, Covebase and Mastic, Grout, Mudset
- Flooring Materials – Floor Tiles, Mastics, Grout, Mudset
- Miscellaneous Materials – Terrazzo, Sealants, Glazing Compound, Concrete, Pin Mastic
- Non-suspect Materials (not sampled) – Fiberglass Insulation, Wood, Glass, Metal.

3.0 Asbestos-containing Materials (ACM)

3.1 Field Procedures and Analysis Methodology

Guidelines used for the inspection were established by the U.S. Environmental Protection Agency (EPA) in the Guidance for Controlling Asbestos Containing Materials in Buildings, Office of Pesticides and Toxic Substances, DOC# 560/5-85-024 and 40 CFR Part 763, Asbestos Hazard Emergency Response Act (AHERA) and Title 12 NYCRR Part 56-5.1. Field information was organized as per the AHERA concept of a

homogeneous area (HA); that is, suspect Asbestos-containing Materials (ACM) with similar age, appearance, and texture were grouped together, sampled and assessed for condition.

For the purposes of this inspection, suspect ACM has been placed in three material categories: thermal, surfacing, and miscellaneous. 1) Surfacing materials are those that are sprayed on, troweled on or otherwise applied to surfaces for fireproofing, acoustical, or decorative purposes (e.g., wall and ceiling plaster). 2) Thermal materials are those applied to heat pipes or other structural components to prevent heat loss or gain or prevent water condensation (e.g., pipe and fitting insulation, duct insulation, boiler flue). 3) Miscellaneous materials are interior building materials on structural components, structural members or fixtures, such as floor and ceiling tiles, etc. and do not include surfacing material or thermal system insulation.

SURFACING MATERIALS

Surfacing materials were grouped into homogeneous sampling areas. A homogeneous area contains material that is uniform in color and texture and appears identical in every other respect. Materials installed at different times belong to different sampling areas. Homogeneous areas were determined on per floor basis.

The following protocol was used for determining the number of samples to be collected:

- At least three bulk samples were collected from each homogeneous area that is 1,000 square feet or less.
- At least five bulk samples were collected from each homogeneous area that is greater than 1,000 square feet but less than or equal to 5,000 square feet.
- At least seven bulk samples were collected from each homogeneous area that is greater than 5,000 square feet.

THERMAL SYSTEM INSULATION (TSI)

The concept of homogeneous sampling areas applies equally well to thermal insulation as to surfacing material. A "typical" building may contain multiple insulated pipe runs from any combination of the following categories:

- Hot water supply and/or return
- Cold water supply
- Chilled water supply
- Steam supply and/or return
- Roof or system drain

The following protocol was used for determining the number of samples to be collected.

- Collect at least three bulk samples from each homogeneous area of thermal system insulation.
- Collect at least one bulk sample from each homogeneous area of patched thermal system insulation if the patched section is less than 6 linear or square feet.
- In a manner sufficient to determine whether the material is ACM or not ACM, collect a minimum of three bulk samples from each homogeneous insulated mechanical system tee, elbow, and valve.

Bulk samples are not collected from any homogeneous area where the certified inspector has determined that the thermal system insulation is fiberglass, foam glass, or rubber.

MISCELLANEOUS MATERIALS

Miscellaneous materials are grouped into different homogeneous areas and at least two bulk samples are collected from each homogeneous area as per the clarification letter from the EPA and the Professional Abatement Contractors of New York, Inc in November of 2007.

Samples collected were analyzed by a laboratory approved under the New York State Department of Health Environmental Laboratory Approval Program (NYSDOH ELAP). Samples were analyzed in the laboratory by Polarized Light Microscopy (PLM), Polarized Light Microscopy-NOB (PLM-NOB) and/or Quantitative Transmission Electron Microscopy (QTEM), as required. Sample collection and laboratory analysis were conducted in compliance with the requirements of Title 12 NYCRR Part 56-5.1, 29 CFR 1926.1101 and standard EPA & OSHA accepted methods. Samples consisting of multiple layers were separated and analyzed independently in the laboratory.

3.2 Regulatory Guidelines and Requirements for ACM

FEDERAL

In accordance with the Clean Air Act (CAA), the U.S. Environmental Protection Agency (EPA) established National Emission Standards for hazardous Air Pollutants (NESHAP) to protect the public from exposure to airborne pollutants. Asbestos was one of the air pollutants, which was addressed under the NESHAP 40 CFR Part 61. The purpose of asbestos NESHAP regulations is to protect the public health by minimizing the release of asbestos when facilities, which contain ACM, are being renovated or demolished. EPA is responsible for enforcing regulations related to asbestos during renovations and demolition, however, the CAA allows the EPA to delegate this authority to State and Local Agencies. Even after EPA delegate's responsibility to a state or Local agency, EPA retains the authority to oversee agency performance and to enforce NESHAP regulations as appropriate.

NEW YORK STATE

Asbestos in New York State is regulated under the Labor Law Section 906, Part 56 of Title 12 of the Official Compilation of Codes, Rules, and Regulations. Within the department and for the purpose of the Department of Labor, this part (rule) is known as Industrial Code Rule No. 56 (ICR 56) relating to hazards to the public safety and health, during the removal, encapsulation, or disturbance of friable asbestos, or any handling of ACM that may result in the release of asbestos fiber.

As specified in Title 12 NYCRR Part 56-5.1 (h) and (i), "If the building/structure asbestos survey finds that the portion of the building/structure to be demolished, renovated, remodeled, or have repair work contains ACM, PACM, suspect miscellaneous ACM assumed to be ACM, or asbestos material, which is impacted by the work, the owner or the owner's agent shall conduct, or cause to have conducted, asbestos removal performed by a licensed asbestos abatement contractor in conformance with all standards set forth in this Part. All ACM, PACM, suspect miscellaneous ACM assumed to be ACM, or asbestos material impacted by the demolition, renovation, remodeling or repair project shall be removed as per this Part, prior to access or disturbance by other uncertified trades or personnel. No demolition, renovation, remodeling or repair work shall be commenced by any owner or the owner's agent prior to the completion of the asbestos abatement in accordance with the notification requirements of this Part…All building/structure owners and asbestos abatement contractors on a demolition, renovation, remodeling, or repair project, which includes work covered by this part, shall inform all trades on the work site about PACM, ACM, asbestos material and suspect miscellaneous ACM…Bids may be advertised and contracts

awarded for demolition, remodeling, renovation, or repair work, but no work on the current intermediate portion of the project shall commence on the demolition, renovation, remodeling or repair work by any owner or agent prior to completion of all necessary asbestos abatement work for the current intermediate portion of the entire project, in conformance with all standards set forth in this Part." All work conducted should be in accordance with all legal requirements, including but not limited to U.S. Environmental Protection Agency (EPA) National Emissions Standards for Hazardous Air Pollutants (NESHAP) [40 CFR Part 61], New York State Industrial Code Rule 56 Asbestos Regulations (ICR 56) and Chapter 1 of Title 15 of the Rules of the City of New York Regulations, as applicable. Advance notification of the asbestos project to the USEPA, NYSDOL, and NYCDEP may be required.

CONCEALED ACM

In addition to the ACMs identified at the site, there is a possibility that concealed suspect ACM may exist at the building/structure. As such, if any concealed suspect ACM is encountered during future construction related activities, the work should immediately stop. Prior to resuming the work, the suspect ACM should either be 1) Sampled by an appropriately-certified asbestos professional and submitted to an Approved NYSDOH ELAP laboratory for asbestos analysis or 2) Presumed to be ACM (PACM) and removed by a licensed asbestos abatement contractor for disposal in accordance with all applicable regulations.

4.0 Lead-based Paint (LBP)

4.1 Applicable Standards/Guidelines for LBP

The U.S Department of Housing and Urban Development (HUD) defines the action level for lead-based paint as a lead content equal to or greater than 1.0 milligrams of lead per square centimeter of painted surface (≥1.0 mg Pb/cm^2) when measured with an XRF analyzer or 0.5 percent by weight when chemically tested. This definition is described in the HUD "Lead-Based Paint: Interim Guidelines for Hazard Identification and Abatement in Public and Indian Housing, September 1990". The state of New York's definition of the action level for lead-based paint is consistent with the level established by HUD.

Please note that although the HUD defines lead-based paint as paint having lead concentrations equal or greater than 1.0 mg/cm2, the Occupational Safety and Health Administration (OSHA) considers any concentration of lead in paint to be lead-containing paint. Regardless of the lead concentrations in paint, the contractor shall comply with 29 CFR 1926.62, OSHA regulations, and take precautionary measures for dust control and limit employee exposure to lead dust during the renovations.

Painted surfaces that would be impacted by planned activities such as drilling, cutting, scrapping, etc. and create dust should be properly addressed by following safe work practices, good housekeeping procedures and/or following proper abatement procedures. Grinding and sanding of paint without HEPA filter exhaust, open flame gas fired torch, unconfined abrasive blasting, and chemical strippers containing methylene chloride or other human carcinogenic chemicals are not recommended.

The Federal Resource Conservation and Recovery Act (RCRA) regulation governs the handling, transportation, and disposal of hazardous materials. Every demolition/renovation debris generator has the responsibility to determine whether the debris exhibits one or more of the characteristic wastes listed in subpart C of 40 CFR Part 261. In the case of demolition debris, lead in LBP is a characteristic waste, and therefore, it is the responsibility of the renovation/demolition debris generator to characterize the waste

prior to its disposal and, if found to be hazardous waste as defined by Federal Statutes, to be properly handled and disposed.

Metal objects painted with LBP are exempt from disposal regulations applicable to lead, provided they are properly recycled. All metal objects that are painted with LBP should be sent to a certified recycling facility.

This report is not Lead-based Paint abatement specification and should not be used for specifying removal methods or techniques.

4.2 XRF Information

Viken Pb200e X-Ray Fluorescence (XRF) Analyzer(s) were used to survey the building/structure or portion thereof identified to be demolished, renovated, remodeled or repaired for the presence of LBP. The Viken Pb200e XRF Analyzer(s) are using a sealed source of Co-57 with 6mCi sources, meeting HUD requirements for the analysis of paint films. During the analysis, the intensity of the x-rays is converted by the instrument's internal software into an estimate of the concentration of lead in the substance being analyzed. The results are interpreted as concentrations of lead in milligrams per square centimeter. This device is a field-screening tool, used to collect multiple readings in a short period of time. The method of measurement is based on spectrometric analysis of lead x-ray fluorescence within a controlled depth of interrogation. The reading is an estimate of lead content in all layers of paint. The results are displayed in milligrams per square centimeter (mg/cm2). The device(s) used for this inspection were the Viken Pb200e X-Ray Fluorescence (XRF) Analyzer(s) Serial Number 2104, Source date 4/1/23, Serial number 2231, Source date 5/15/22, Serial number 2595, Source date 2/15/23 and/or Serial number 2901, Source date 2/15/23.

5.0 PolyChlorinated Biphenyls (PCB)

5.1 Background and Protocol for PCBs

PolyChlorinated Biphenyls (PCB) are a group of manmade chemicals. PCBs were widely used in building materials and electrical products in the past. The U.S. Environmental Protection Agency banned the manufacturing and certain uses of PCBs in 1978, but buildings constructed or renovated between 1950 and 1978 may still have building materials and electrical products that contain PCBs. Examples of products that may contain PCBs include caulk, paint, glues, plastics, fluorescent lighting ballasts, transformers and capacitors.

PCBs are currently prohibited from being used in caulk and other commodities (U.S. EPA, 40 CFR 761). However, prior to 1977, PCBs were present in some caulking materials used in the construction of schools and other buildings. Studies have shown that concentrations of PCB can exceed 1% (10,000 ppm) by weight in some caulk materials. An investigation of 24 buildings in the Greater Boston Area revealed that one-third of the buildings tested (8 of 24) contained caulking materials with polychlorinated biphenyl (PCB) content exceeding 50 ppm by weight with an average concentration of 15,600 ppm or 1.5% (Herrick et al., 2004). These buildings included schools and other public buildings.

The U.S. EPA regulates the disposal of caulk, as well as soil and other materials contaminated with PCBs from caulk, if the concentration of PCBs exceeds 50 ppm. Such materials must be disposed at an appropriate approved or permitted facility.

U.S. EPA regulation 40 CFR 761 defines "PCB remediation waste" to include contaminated soil, and specifies a clean-up level of <1ppm without further conditions for unrestricted use in "high occupancy areas" (i.e., areas where individuals may be present for 335 hours or more per year). PCB caulk is defined as a PCB bulk product waste, and its disposal is subject to U.S. EPA regulations under the Toxic Substances Control Act (40 CFR761.62).

This protocol has been developed in consultation with the New York State Department of Health, Division of Environmental Health Assessment, Bureau of Toxic Substance Assessment to address concerns about properly managing caulk containing PCBs that will be disturbed during building renovation and maintenance.

CAULK SAMPLE COLLECTION

Buildings constructed or renovated between 1950 and 1977 have a potential to contain PCBs in existing caulk. Representative samples of caulking materials from these buildings prior to renovation or demolition work should be tested to determine whether the caulk is contaminated with PCBs. Professional judgement should be used to design the sampling plan for characterizing caulk throughout the building. The consultant should pay particular attention to construction and maintenance records and to the appearance of caulking materials (likenesses and differences). Samples should be taken from window frames or expansion joints that have not been repaired or replaced since 1977. Depending on specific information provided in the workplan developed by the project manager, such as window placement, compositing of some caulk samples might be appropriate. Caulk from different time periods or that have a different appearance should not be composited together.

It is important to note that caulk used during the time period of interest may also contain asbestos or lead. Therefore, the work plan should include testing, handling and disposal requirements appropriate for such regulated materials.

SOIL SAMPLE COLLECTION

Buildings constructed or renovated between 1950 and 1977, which have undergone further renovation after 1977, may have residual PCB contamination in adjacent soils. An adequate representation of surface soils should be tested to assess the potential for residual PCB contamination.

When designing a representative soil sampling plan, the likelihood of soil contamination from deteriorated or deteriorating caulk should be considered. Caulk that has in the past dried out and fallen to the ground is the most important source of soil contamination. Thus, sampling should include soil beneath windows where caulk has obviously deteriorated or been replaced because of previous deterioration. Areas subject to the stress of sun and prevailing weather (typically the southern and western side of each structure) should be included for sampling. These samples would provide a conservative evaluation of soil conditions due to an increased potential for material failure, possibly resulting in contamination of soil. Also, if earlier renovation or demolition work may have stockpiled potentially contaminated caulk in other school areas, the school should consider having soils in those areas tested as well.

Soil sampling should focus on areas of the building where ”banks” or “gangs” of windows exist/were replaced and areas of the structure where large expansion joints are located. This would provide a conservative evaluation of potential soil contamination and permit efficient sampling.

Any obvious pieces of caulk encountered during the collection of soil samples should be removed from the soil, categorized (with respect to location and depth) and treated as a separate potential sample.

Depth – At each soil sample location, soil should be collected in depth intervals of 0-2 inches, 2-6 inches and 6-12 inches. The surface soil sample (0-2 inches) should be collected from below the vegetative surface layer, if present.

Distance from Structure – Samples should be collected within 1 foot of the building and 5 feet from the building.

Samples should be collected in a manner that prevents cross-contamination. Augers or driven core samplers should be avoided, as any caulk caught on the edge of this type of tool could be driven to lower intervals. Using a designated trowel for each sample location and each interval of depth is encouraged. If the sampling tool is field cleaned between samples, do so in a manner that does not add solvent contamination to the environment.

NOTE
Sampling was performed by **Adelaide** in compliance with protocols outlined by New York State Education Department (NYSED) and USEPA 40 CFR 761, as described above. Only one sample per homogeneous area was required for analysis of suspect PCB-containing materials. Bulk sample(s) were properly packaged and forwarded, with associated Chain of Custody (COC), to York Analytical Laboratories, Inc., for analysis using method SW846-3550B/8082. The analysis will determine if the suspect material will be classified as PCB-containing at or above 50 ppm or mg/kg as per the EPA regulations. Copies of the analytical results are contained within attached appendices for review.

6.0 General Discussion

All construction personnel as well as individuals who have access to locations where asbestos-containing materials (ACM), lead-based paints (LBP) and/or polychlorinated biphenyls (PCB) exists should be informed of its presence and the proper work practices in these areas. Conspicuous labeling of all ACM is suggested to ensure personnel is adequately informed. Personnel should be informed not to rest, lean or store material or equipment on or near these surfaces and not to cut, saw, drill, sand or disturb ACM. All removal, disturbance, and repair of ACM should be performed in compliance with Title 12 NYCRR Part 56 by persons properly trained to handle ACM. Facility custodial and maintenance personnel should receive training commensurate with their work activities; as defined in 29 CFR 1910.1001.

7.0 Disclaimers

Adelaide certifies that the information contained within this report is based solely upon site observations and the results of laboratory analysis for samples collected during this survey/assessment. These observations and results are time dependent, subject to changing site conditions and revisions to Federal, State and Local regulations. **Adelaide** warrants that these findings have been promulgated after being prepared in general accordance with generally accepted practices in the abatement industries. **Adelaide** also recognizes that inspection laboratory data is not usually sufficient to make all abatement and management decisions. No other warranties are expressed or implied.

The materials sampled, as part of this survey, were limited to building materials potential affected by the provided scope of work only. All building materials outside the scope of work that have the potential to be disturbed, impacted, or if the scope of work is to change, are to be presumed asbestos-containing materials (PACM). Identified PACM **must** either be sampled by a licensed NYS Asbestos Inspector and/or abated/removed and disposed of by a licensed NYS Asbestos Abatement Contractor.

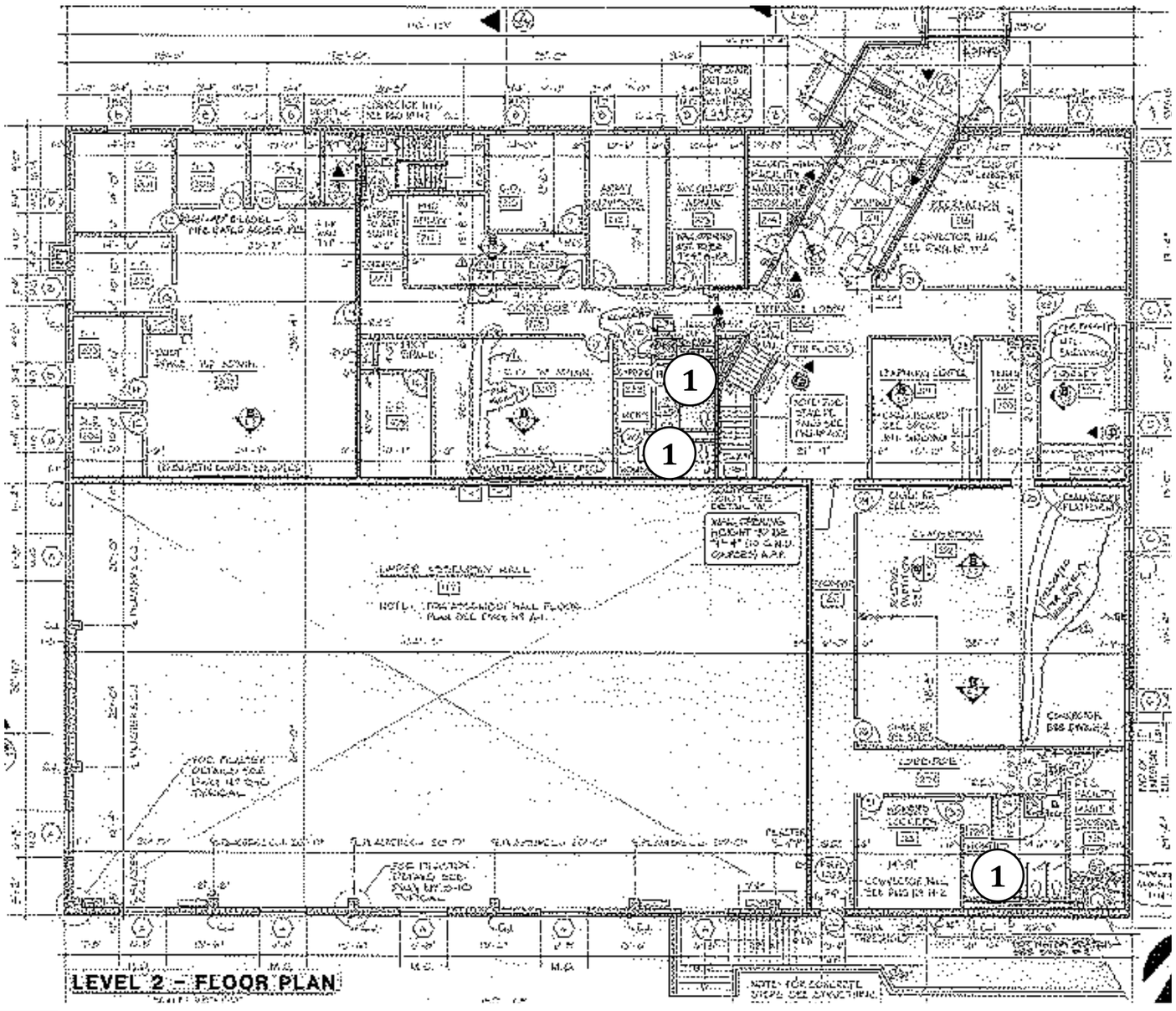
Due to the potential for concealed Asbestos-containing Materials (ACM) and/or other regulated materials, this report should not be construed to represent all ACM and/or regulated materials within the site(s). All quantities of ACM and/or other regulated materials identified, and all dimensions listed within this report are approximate and should be verified On-site.

This report is generated for the exclusive use of the client and is not designed to serve as a specification for abatement. The owner is strongly encouraged to contract with a consultant having a current Asbestos Project Designer Certificate as issued by New York State Department of Labor for the preparation of contract specifications, work plans, and/or drawings prior to requesting bids for the abatement or removal of the materials identified in this report.

NYSDOH issued an Interim Guidance Letter, on July 9, 2013, which outlined the approved testing alternative for materials containing vermiculite. Specifically, "...Where TSI, surfacing materials, or other PACM or miscellaneous suspect ACM contain greater than 10% vermiculite, Item 198.6 may be used to evaluate the asbestos content of the material; provided, however, that any test results using this method must be reported with the following conspicuous disclaimer: *"This method does not remove vermiculite and may underestimate the level of asbestos present in a sample containing greater than 10% vermiculite."* On July 22, 2014, NYSDOH issued a Regulatory Guidance Letter outlining the new approved analytical methods for testing sprayed-on fireproofing (SOFP) that contains vermiculite. NYSDOH authorized the use of ***two*** analytical methods to evaluate the asbestos content of SOFP that contains vermiculite. As per NYSDOH Guidelines, *"After October 31, 2014, one of the new methods **must** be used to test SOF-V, regardless of the percent of vermiculite."* On May 6, 2016, NYSDOH issued a Regulatory Guidance Letter outlining the new protocol for analytical procedure for surfacing materials (ie. plaster, stucco, etc.) that contain vermiculite. As per NYSDOH Guidelines, "*The original July 2013 and July 2014 letters addressed SOF-V only. Both NYS DOH's Item 198.8 and RJ Lee Group Method 055 shall now be applied to test for vermiculite in other Surfacing Material (SM) as defined in 12 NYCRR Part 56 (NYS Industrial Code Rule 56).*"

APPENDIX A

ACM LOCATION MAP(S)



ACM LEGEND: (see report for details)	
1	Assumed Mirror Mastic
PACM	Electrical Wire and Panels Throughout

Second Floor Plans - Asbestos Locations

Drawing Not to Scale

Adelaide ENVIRONMENTAL HEALTH
1511 Route 22
Brewster, NY 10509
Phone: (845) 278-7710
Fax: (845) 278-7750

CLIENT:
Greg Springer
Bergmann: Architects, Engineers, Planners
18 Corporate Woods Blvd., Suite 400
Albany, New York 12211

(Client) Project #

SURVEY LOCATION:
Yonkers Armory
2 Quincy Place
Yonkers, New York 10701

DATE: 6/13/2023

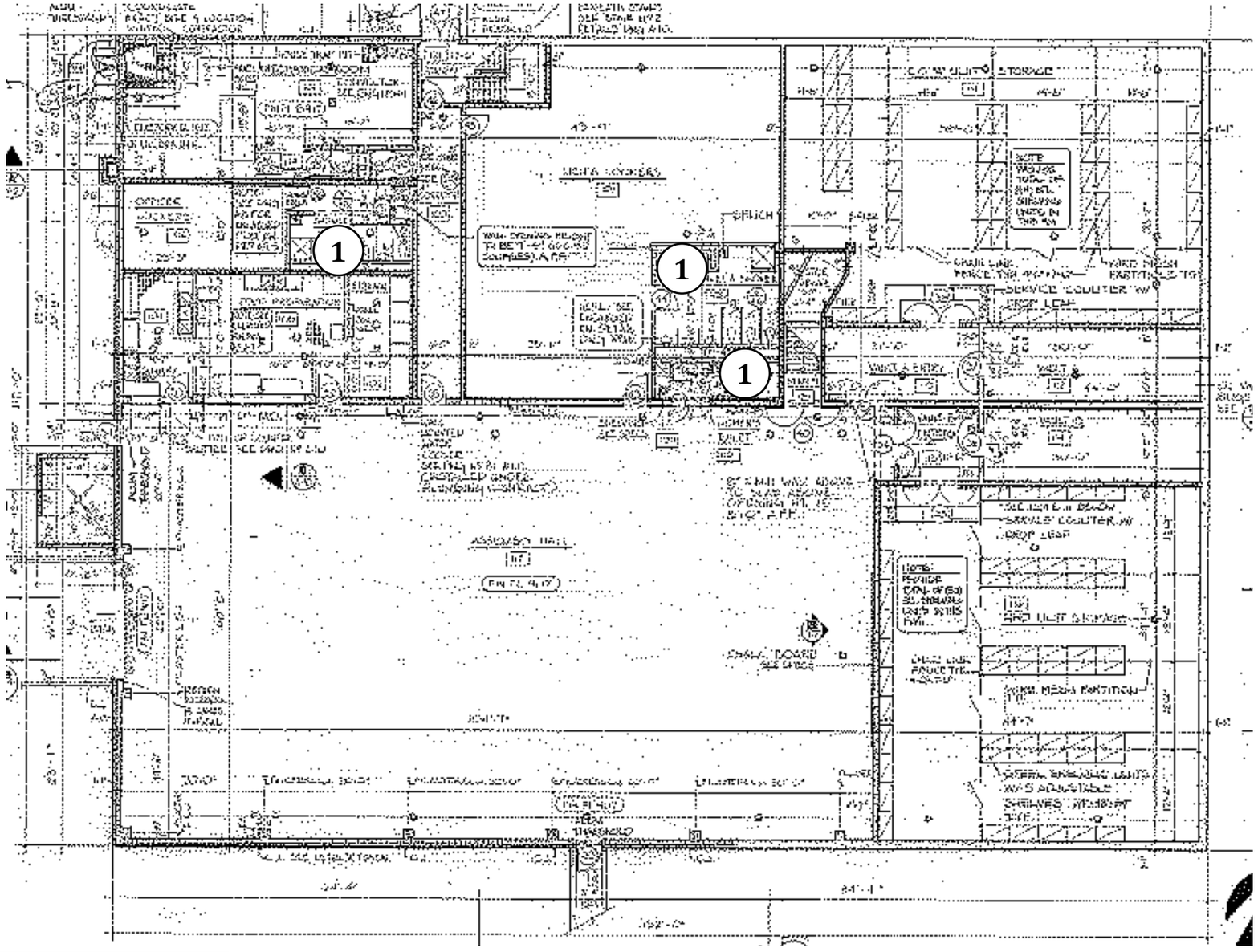
DRAWING VERSION: No. 1

ISSUED FOR:
Asbestos, Lead & PCB Survey

ADELAIDE PROJECT NO.:
BA:23168.00-IN

DRAWING PREPARED BY:
JPF

ASB-01



ACM LEGEND: (see report for details)	
1	Assumed Mirror Mastic
PACM	Electrical Wire and Panels Throughout

First Floor Plans - Asbestos Locations

Drawing Not to Scale

Adelaide ENVIRONMENTAL HEALTH
1511 Route 22
Brewster, NY 10509
Phone: (845) 278-7710
Fax: (845) 278-7750

CLIENT:
Greg Springer
Bergmann: Architects, Engineers, Planners
18 Corporate Woods Blvd., Suite 400
Albany, New York 12211

(Client) Project #

SURVEY LOCATION:
Yonkers Armory
2 Quincy Place
Yonkers, New York 10701

DATE: 6/13/2023

DRAWING VERSION: No. 1

ISSUED FOR:
Asbestos, Lead & PCB Survey

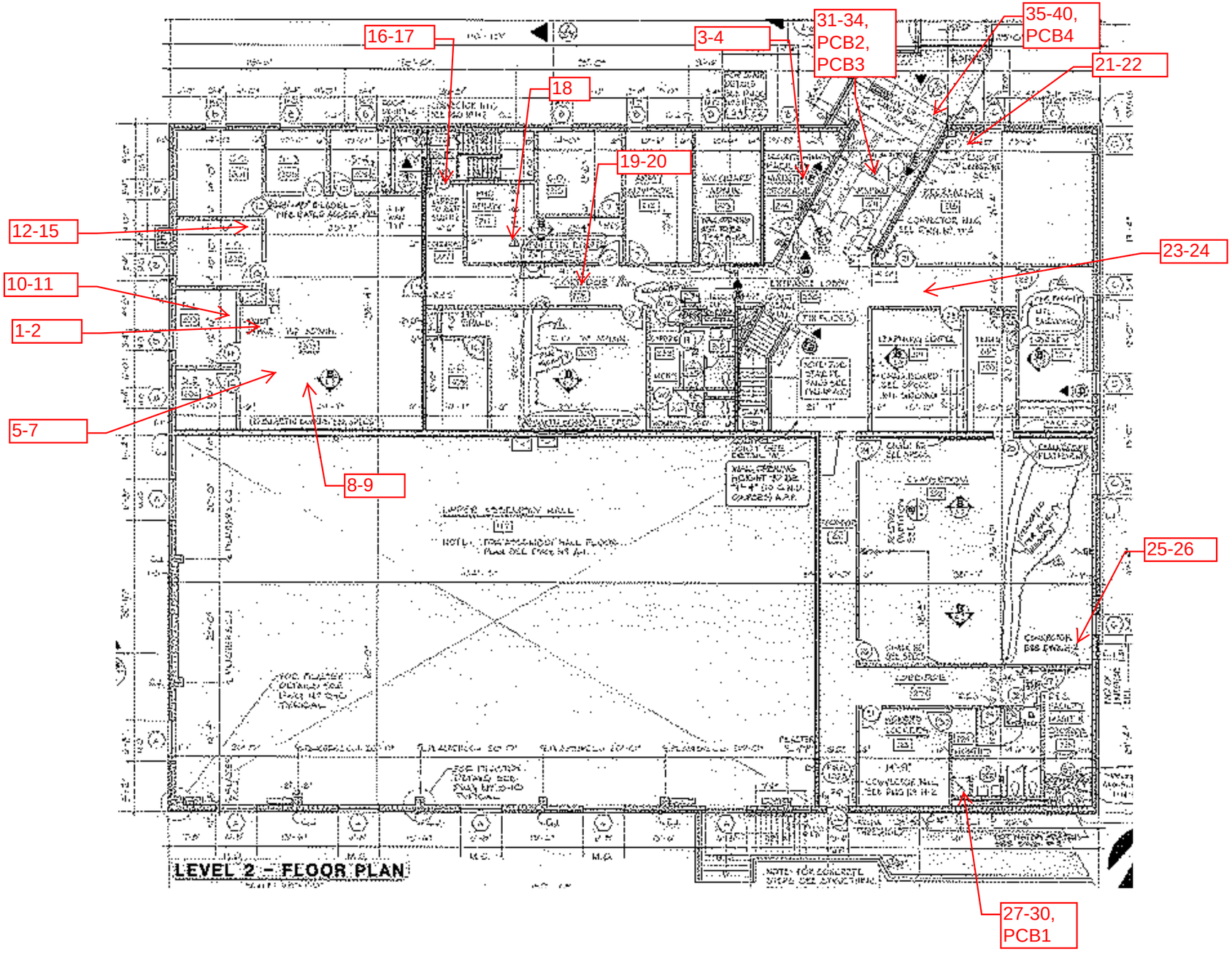
ADELAIDE PROJECT NO.:
BA:23168.00-IN

DRAWING PREPARED BY:
JPF

ASB-02

APPENDIX B

SAMPLE LOCATION MAP(S)



Second Floor Plans - Sample Locations

Drawing Not to Scale

Adelaide ENVIRONMENTAL HEALTH
1511 Route 22
Brewster, NY 10509
Phone: (845) 278-7710
Fax: (845) 278-7750

CLIENT:
Greg Springer
Bergmann: Architects, Engineers, Planners
18 Corporate Woods Blvd., Suite 400
Albany, New York 12211

(Client) Project #

SURVEY LOCATION:
Yonkers Armory
2 Quincy Place
Yonkers, New York 10701

DATE: 6/13/2023

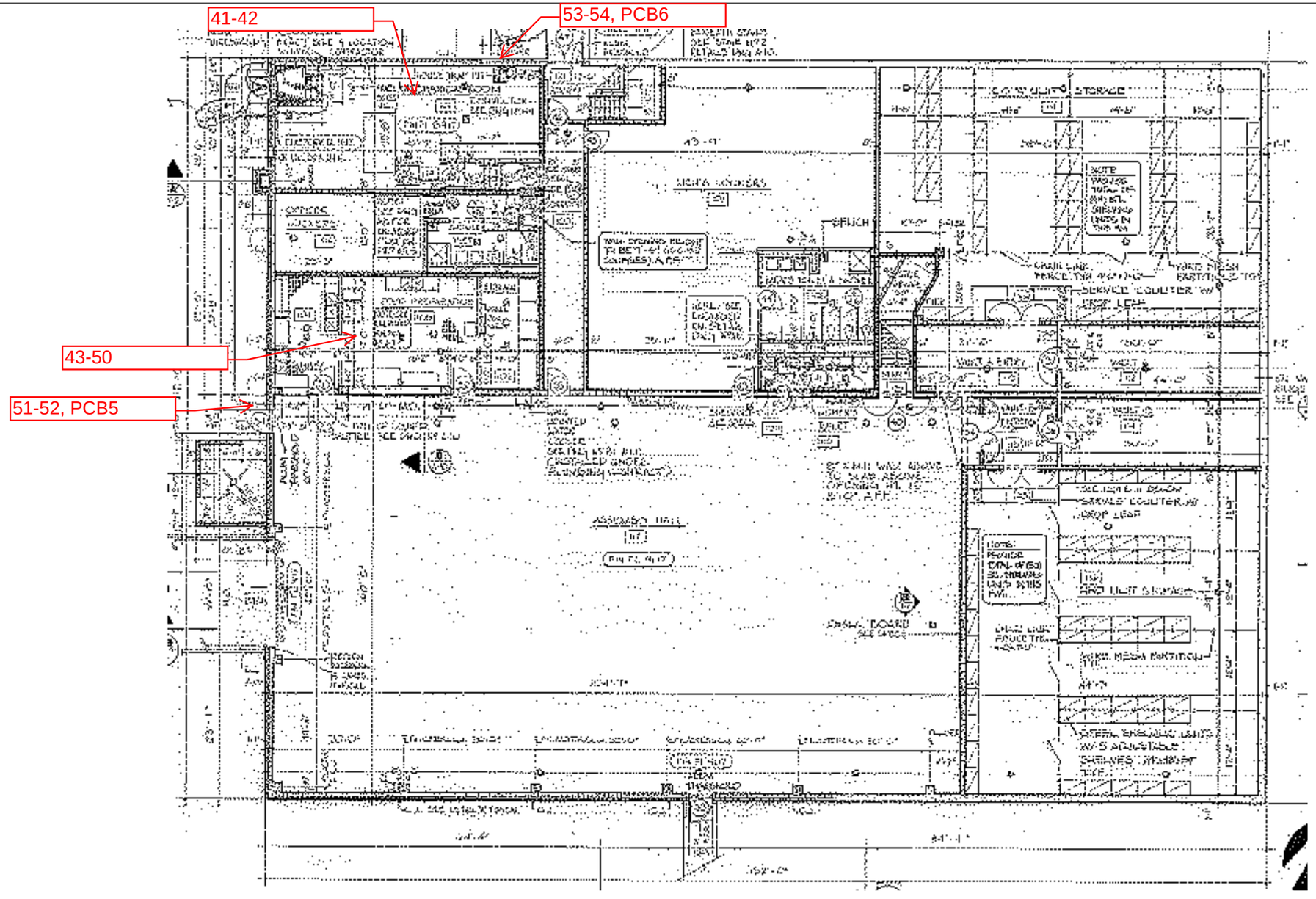
DRAWING VERSION: No. 1

ISSUED FOR:
Asbestos, Lead & PCB Survey

ADELAIDE PROJECT NO.:
BA:23168.00-IN

DRAWING PREPARED BY:
JPF

SL-01



First Floor Plans - Sample Locations

Drawing Not to Scale

Adelaide ENVIRONMENTAL HEALTH
1511 Route 22
Brewster, NY 10509
Phone: (845) 278-7710
Fax: (845) 278-7750

CLIENT:
Greg Springer
Bergmann: Architects, Engineers, Planners
18 Corporate Woods Blvd., Suite 400
Albany, New York 12211

(Client) Project #

SURVEY LOCATION:
Yonkers Armory
2 Quincy Place
Yonkers, New York 10701

DATE: 6/13/2023

DRAWING VERSION: No. 1

ISSUED FOR:
Asbestos, Lead & PCB Survey

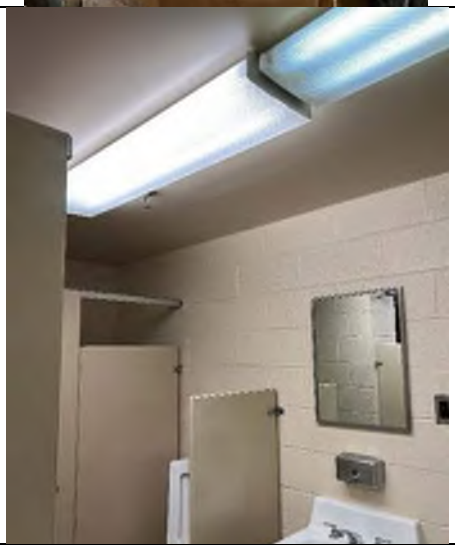
ADELAIDE PROJECT NO.:
BA:23168.00-IN

DRAWING PREPARED BY:
JPF

SL-02

APPENDIX C

ACM PHOTO(S)

PACM Electrical Wire Insulation and Panels	
PACM Electrical Wire Insulation and Panels	
PACM Mirror Mastic	

APPENDIX D

ASBESTOS ANALYTICAL RESULTS

Table I
Summary of Bulk Asbestos Analysis Results

OGSX:23168.00-IN; Yonkers Armory; 2 Quincy Place, Yonkers, New York 10701

AmeriSci Sample #	Client Sample#	HG Area	Sample Weight (gram)	Heat Sensitive Organic %	Acid Soluble Inorganic %	Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
01	1	1	0.226	17.4	81.7	0.9	NAD	NAD
Location: 2nd Floor - Room 207 - 12 x 12 F.T. - Brown / Red Mottled								
02	2	1	0.195	16.3	82.6	1.0	NAD	NAD
Location: 2nd Floor - Room 207 - 12 x 12 F.T. - Brown / Red Mottled								
03	3	2	0.142	79.8	15.9	4.3	NAD	NAD
Location: 2nd Floor - Room 214 - 12 x 12 F.T. - Black Mastic								
04	4	2	0.157	80.5	13.2	6.3	NAD	NAD
Location: 2nd Floor - Room 214 - 12 x 12 F.T. - Black Mastic								
05	5	3	0.188	24.9	12.0	63.1	NAD	NAD
Location: 2nd Floor - Room 214 - 2 x 4 C.T. - Large + Small Holes								
06	6	3	0.132	26.0	22.1	51.9	NAD	NAD
Location: 2nd Floor - Room 214 - 2 x 4 C.T. - Large + Small Holes								
07	7	4	0.227	55.4	18.6	26.0	NAD	NAD
Location: 2nd Floor - Room 214 - Debris On Top Of C.T.								
08	8	5	0.137	27.2	25.5	47.3	NAD	NAD
Location: 2nd Floor - Room 214 - 2 x 4 C.T. - Squiggles + Holes								
09	9	5	0.159	28.1	21.5	50.4	NAD	NAD
Location: 2nd Floor - Room 214 - 2 x 4 C.T. - Squiggles + Holes								
10	10	6	----	----	----	----	NAD	NA
Location: 2nd Floor - Room 214 - CMU Mortar								
11	11	6	----	----	----	----	NAD	NA
Location: 2nd Floor - Room 214 - CMU Mortar								
12L1	12	7	0.222	62.5	37.0	0.5	NAD	NAD
Location: 2nd Floor - Room 202 - Cove Base - 4" Black								
12L2	12	7	0.222	45.9	49.1	5.0	NAD	NAD
Location: 2nd Floor - Room 202 - Cove Base - 4" Black Mastic								
13L1	13	7	0.212	62.4	37.1	0.5	NAD	NAD
Location: 2nd Floor - Room 202 - Cove Base - 4" Black								
13L2	13	7	0.282	45.7	46.4	7.9	NAD	NAD
Location: 2nd Floor - Room 202 - Cove Base - 4" Black Mastic								
14	14	8	0.234	57.9	4.8	37.4	NAD	NAD
Location: 2nd Floor - Room 202 - Yellow Carpet Mastic								

See Reporting notes on last page

Table I
Summary of Bulk Asbestos Analysis Results

OGSX:23168.00-IN; Yonkers Armory; 2 Quincy Place, Yonkers, New York 10701

AmeriSci Sample #	Client Sample#	HG Area	Sample Weight (gram)	Heat Sensitive Organic %	Acid Soluble Inorganic %	Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
15	15	8	0.161	57.4	24.3	18.3	NAD	NAD
Location: 2nd Floor - Room 202 - Yellow Carpet Mastic								
16	16	9	0.265	17.6	79.9	2.5	NAD	NAD
Location: 2nd Floor - Hallway - 12 x 12 F.T. - Green Mottled								
17	17	9	0.280	16.9	82.3	0.8	NAD	NAD
Location: 2nd Floor - Hallway - 12 x 12 F.T. - Green Mottled								
18	18	10	0.423	26.8	11.1	62.1	NAD	NAD
Location: 2nd Floor - Room 211 - Debris Above C.T.								
19	19	11	----	----	----	----	NAD	NA
Location: 2nd Floor - Hallway - Drywall Ceiling								
20	20	11	----	----	----	----	NAD	NA
Location: 2nd Floor - Hallway - Drywall Ceiling								
21	21	12	0.239	20.8	61.7	17.5	NAD	NAD
Location: 2nd Floor - Room 218 - 12 x 12 F.T. - Brown + White Mottled								
22	22	12	0.260	19.8	59.2	21.0	NAD	NAD
Location: 2nd Floor - Room 218 - 12 x 12 F.T. - Brown + White Mottled								
23	23	13	----	----	----	----	NAD	NA
Location: 2nd Floor - Hallway - Joint Compound								
24	24	13	----	----	----	----	NAD	NA
Location: 2nd Floor - Hallway - Joint Compound								
25	25	14	0.208	19.6	72.6	7.8	NAD	NAD
Location: 2nd Floor - Room 222 - 12 x 12 F.T. - White W/ Gray Specks								
26	26	14	0.244	20.7	60.9	18.5	NAD	NAD
Location: 2nd Floor - Room 222 - 12 x 12 F.T. - White W/ Gray Specks								
27	27	15	----	----	----	----	NAD	NA
Location: 2nd Floor - Rm. 223 - Womens Locker - Terrazzo Shower Base								
28	28	15	----	----	----	----	NAD	NA
Location: 2nd Floor - Rm. 223 - Womens Locker - Terrazzo Shower Base								
29	29	16	0.141	32.0	65.3	2.7	NAD	NAD
Location: 2nd Floor - Rm. 223 - Womens Locker - Sealant At Shower								
30	30	16	0.140	30.7	67.0	2.4	NAD	NAD
Location: 2nd Floor - Rm. 223 - Womens Locker - Sealant At Shower								

See Reporting notes on last page

Table I
Summary of Bulk Asbestos Analysis Results

OGSX:23168.00-IN; Yonkers Armory; 2 Quincy Place, Yonkers, New York 10701

AmeriSci Sample #	Client Sample#	HG Area	Sample Weight (gram)	Heat Sensitive Organic %	Acid Soluble Inorganic %	Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
31	31	17	0.217	29.3	67.7	3.0	NAD	NAD
Location: 2nd Floor - Entrance Doors - Glazing Compound								
32	32	17	0.237	29.2	67.2	3.6	NAD	NAD
Location: 2nd Floor - Entrance Doors - Glazing Compound								
33	33	18	0.187	44.1	53.5	2.4	NAD	NAD
Location: 2nd Floor - Entrance Doors - Exterior Sealant								
34	34	18	0.157	44.9	52.6	2.6	NAD	NAD
Location: 2nd Floor - Entrance Doors - Exterior Sealant								
35	35	19	----	----	----	----	NAD	NA
Location: 2nd Floor - Concrete								
36	36	19	----	----	----	----	NAD	NA
Location: 2nd Floor - Concrete								
37	37	20	----	----	----	----	NAD	NA
Location: 2nd Floor - Brick Mortar								
38	38	20	----	----	----	----	NAD	NA
Location: 2nd Floor - Brick Mortar								
39	39	21	0.171	65.1	26.9	8.0	NAD	NAD
Location: 2nd Floor - Exterior Vertical Sealant								
40	40	21	0.184	65.2	25.9	8.9	NAD	NAD
Location: 2nd Floor - Exterior Vertical Sealant								
41	41	22	0.124	72.9	11.4	15.7	NAD	NAD
Location: 1st Floor - Boiler Room - Pin Mastic On Duct								
42	42	22	0.182	73.9	8.4	17.7	NAD	NAD
Location: 1st Floor - Boiler Room - Pin Mastic On Duct								
43	43	23	----	----	----	----	NAD	NA
Location: 1st Floor - Kitchen - Wall Tile - Grout								
44	44	23	----	----	----	----	NAD	NA
Location: 1st Floor - Kitchen - Wall Tile - Grout								
45	45	24	----	----	----	----	NAD	NA
Location: 1st Floor - Kitchen - Wall Tile - Mudset								
46	46	24	----	----	----	----	NAD	NA
Location: 1st Floor - Kitchen - Wall Tile - Mudset								

See Reporting notes on last page

Table I
Summary of Bulk Asbestos Analysis Results

OGSX:23168.00-IN; Yonkers Armory; 2 Quincy Place, Yonkers, New York 10701

AmeriSci Sample #	Client Sample#	HG Area	Sample Weight (gram)	Heat Sensitive Organic %	Acid Soluble Inorganic %	Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
47	47	25	----	----	----	----	NAD	NA
Location: 1st Floor - Kitchen - Floor Tile - Grout								
48	48	25	----	----	----	----	NAD	NA
Location: 1st Floor - Kitchen - Floor Tile - Grout								
49	49	26	----	----	----	----	NAD	NA
Location: 1st Floor - Kitchen - Floor Tile - Mudset								
50	50	26	----	----	----	----	NAD	NA
Location: 1st Floor - Kitchen - Floor Tile - Mudset								
51	51	27	0.187	62.0	27.5	10.6	NAD	NAD
Location: 1st Floor - Exterior - Door Caulk								
52	52	27	0.206	64.6	22.3	13.1	NAD	NAD
Location: 1st Floor - Exterior - Door Caulk								
53	53	28	0.170	60.7	11.7	27.6	NAD	NAD
Location: 1st Floor - Exterior - Louver Caulk								
54	54	28	0.103	59.9	5.8	34.2	NAD	NAD
Location: 1st Floor - Exterior - Louver Caulk								

Analyzed by: Gabriella Morozov 

Date: 6/8/2023

Reviewed by: Gabriella Morozov 

**Quantitative Analysis (Semi/Full); Bulk Asbestos Analysis - PLM by Appd E to Subpt E, 40 CFR 763 or NYSDOH ELAP 198.1 for New York friable samples or NYSDOH ELAP 198.6 for New York NOB samples; TEM (Semi/Full) by EPA 600/R-93/116 (or NYSDOH ELAP 198.4; for New York samples). Analysis using Hitachi, Model H7000-Noran 7 System, Microscope, Serial #: 747-05-06. NAD = no asbestos detected during a quantitative analysis; NA = not analyzed; Trace = <1%; (SOF-V) = Sprayed On Fireproofing containing Vermiculite; (SM-V) = Surfacing Material containing Vermiculite; Quantitation for beginning weights of <0.1 grams should be considered as qualitative only; Qualitative Analysis: Asbestos analysis results of "Present" or "NVA = No Visible Asbestos" represents results for Qualitative PLM or TEM Analysis only (no accreditation coverage available from any regulatory agency for qualitative analyses): NVLAP (PLM) 200546-0, NYSDOH ELAP Lab 11480, NJ Lab ID #NY031.

Warning Note: PLM limitation, only TEM will resolve fibers <0.25 micrometers in diameter. TEM bulk analysis is representative of the fine grained matrix material and may not be representative of non-uniformly dispersed debris for which PLM evaluation is recommended (i.e. soils and other heterogenous materials).

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

PLM Bulk Asbestos Report

Adelaide Environmental Health
Attn: John Soter
1511 Rte. 22, Suite C24

Brewster, NY 10509

Date Received 06/07/23
Date Examined 06/08/23
ELAP # 11480

AmeriSci Job # 223061619
P.O. #
Page 1 **of** 10

RE: OGSX:23168.00-IN; Yonkers Armory; 2 Quincy Place, Yonkers, New York 10701

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
1	223061619-01	***No***	NAD
1	**Location:** 2nd Floor - Room 207 - 12 x 12 F.T. - Brown / Red Mottled		(by NYS ELAP 198.6) by Kensen Caro on 06/08/23
Analyst Description: Brown/Red, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 0.9%			
2	223061619-02	***No***	NAD
1	**Location:** 2nd Floor - Room 207 - 12 x 12 F.T. - Brown / Red Mottled		(by NYS ELAP 198.6) by Kensen Caro on 06/08/23
Analyst Description: Brown/Red, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 1%			
3	223061619-03	***No***	NAD
2	**Location:** 2nd Floor - Room 214 - 12 x 12 F.T. - Black Mastic		(by NYS ELAP 198.6) by Kensen Caro on 06/08/23
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 4.3%			
4	223061619-04	***No***	NAD
2	**Location:** 2nd Floor - Room 214 - 12 x 12 F.T. - Black Mastic		(by NYS ELAP 198.6) by Kensen Caro on 06/08/23
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 6.3%			
5	223061619-05	***No***	NAD
3	**Location:** 2nd Floor - Room 214 - 2 x 4 C.T. - Large + Small Holes		(by NYS ELAP 198.6) by Kensen Caro on 06/08/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 63.1%			

See Reporting notes on last page

PLM Bulk Asbestos Report

OGSX:23168.00-IN; Yonkers Armory; 2 Quincy Place, Yonkers, New York 10701

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
6 3	223061619-06 **Location:** 2nd Floor - Room 214 - 2 x 4 C.T. - Large + Small Holes	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 06/08/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 51.9%			
7 4	223061619-07 **Location:** 2nd Floor - Room 214 - Debris On Top Of C.T.	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 06/08/23
Analyst Description: Black, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 26%			
8 5	223061619-08 **Location:** 2nd Floor - Room 214 - 2 x 4 C.T. - Squiggles + Holes	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 06/08/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 47.3%			
9 5	223061619-09 **Location:** 2nd Floor - Room 214 - 2 x 4 C.T. - Squiggles + Holes	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 06/08/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 50.4%			
10 6	223061619-10 **Location:** 2nd Floor - Room 214 - CMU Mortar	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 06/08/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			
11 6	223061619-11 **Location:** 2nd Floor - Room 214 - CMU Mortar	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 06/08/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			

See Reporting notes on last page

PLM Bulk Asbestos Report

OGSX:23168.00-IN; Yonkers Armory; 2 Quincy Place, Yonkers, New York 10701

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
12 7	223061619-12L1 **Location:** 2nd Floor - Room 202 - Cove Base - 4" Black	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 06/08/23
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 0.5%			
12 7	223061619-12L2 **Location:** 2nd Floor - Room 202 - Cove Base - 4" Black Mastic	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 06/08/23
Analyst Description: Cream, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 5%			
13 7	223061619-13L1 **Location:** 2nd Floor - Room 202 - Cove Base - 4" Black	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 06/08/23
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 0.5%			
13 7	223061619-13L2 **Location:** 2nd Floor - Room 202 - Cove Base - 4" Black Mastic	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 06/08/23
Analyst Description: Cream, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 7.9%			
14 8	223061619-14 **Location:** 2nd Floor - Room 202 - Yellow Carpet Mastic	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 06/08/23
Analyst Description: Yellow, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 37.4%			
15 8	223061619-15 **Location:** 2nd Floor - Room 202 - Yellow Carpet Mastic	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 06/08/23
Analyst Description: Yellow, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 18.3%			

See Reporting notes on last page

PLM Bulk Asbestos Report

OGSX:23168.00-IN; Yonkers Armory; 2 Quincy Place, Yonkers, New York 10701

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
16 9	223061619-16 **Location:** 2nd Floor - Hallway - 12 x 12 F.T. - Green Mottled	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 06/08/23
Analyst Description: Green, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 2.5%			
17 9	223061619-17 **Location:** 2nd Floor - Hallway - 12 x 12 F.T. - Green Mottled	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 06/08/23
Analyst Description: Green, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 0.8%			
18 10	223061619-18 **Location:** 2nd Floor - Room 211 - Debris Above C.T.	***No***	NAD [1] (by NYS ELAP 198.6) by Kensen Caro on 06/08/23
Analyst Description: Black, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 62.1%			
19 11	223061619-19 **Location:** 2nd Floor - Hallway - Drywall Ceiling	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 06/08/23
Analyst Description: Gray/Brown, Heterogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose 15%, Non-fibrous 85%			
20 11	223061619-20 **Location:** 2nd Floor - Hallway - Drywall Ceiling	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 06/08/23
Analyst Description: Gray/Brown, Heterogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose 15%, Non-fibrous 85%			
21 12	223061619-21 **Location:** 2nd Floor - Room 218 - 12 x 12 F.T. - Brown + White Mottled	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 06/08/23
Analyst Description: Brown, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 17.5%			

See Reporting notes on last page

PLM Bulk Asbestos Report

OGSX:23168.00-IN; Yonkers Armory; 2 Quincy Place, Yonkers, New York 10701

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
22 12	223061619-22 **Location:** 2nd Floor - Room 218 - 12 x 12 F.T. - Brown + White Mottled	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 06/08/23
Analyst Description: Brown, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 21%			
23 13	223061619-23 **Location:** 2nd Floor - Hallway - Joint Compound	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 06/08/23
Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			
24 13	223061619-24 **Location:** 2nd Floor - Hallway - Joint Compound	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 06/08/23
Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			
25 14	223061619-25 **Location:** 2nd Floor - Room 222 - 12 x 12 F.T. - White W/ Gray Specks	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 06/08/23
Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 7.8%			
26 14	223061619-26 **Location:** 2nd Floor - Room 222 - 12 x 12 F.T. - White W/ Gray Specks	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 06/08/23
Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 18.5%			
27 15	223061619-27 **Location:** 2nd Floor - Rm. 223 - Womens Locker - Terrazzo Shower Base	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 06/08/23
Analyst Description: White/Gray, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			

See Reporting notes on last page

PLM Bulk Asbestos Report

OGSX:23168.00-IN; Yonkers Armory; 2 Quincy Place, Yonkers, New York 10701

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
28 15	223061619-28 **Location:** 2nd Floor - Rm. 223 - Womens Locker - Terrazzo Shower Base	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 06/08/23
Analyst Description: White/Gray, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			
29 16	223061619-29 **Location:** 2nd Floor - Rm. 223 - Womens Locker - Sealant At Shower	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 06/08/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 2.7%			
30 16	223061619-30 **Location:** 2nd Floor - Rm. 223 - Womens Locker - Sealant At Shower	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 06/08/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 2.4%			
31 17	223061619-31 **Location:** 2nd Floor - Entrance Doors - Glazing Compound	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 06/08/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 3%			
32 17	223061619-32 **Location:** 2nd Floor - Entrance Doors - Glazing Compound	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 06/08/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 3.6%			
33 18	223061619-33 **Location:** 2nd Floor - Entrance Doors - Exterior Sealant	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 06/08/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 2.4%			

See Reporting notes on last page

PLM Bulk Asbestos Report

OGSX:23168.00-IN; Yonkers Armory; 2 Quincy Place, Yonkers, New York 10701

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
34 18	223061619-34 **Location:** 2nd Floor - Entrance Doors - Exterior Sealant	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 06/08/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 2.6%			
35 19	223061619-35 **Location:** 2nd Floor - Concrete	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 06/08/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			
36 19	223061619-36 **Location:** 2nd Floor - Concrete	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 06/08/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			
37 20	223061619-37 **Location:** 2nd Floor - Brick Mortar	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 06/08/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			
38 20	223061619-38 **Location:** 2nd Floor - Brick Mortar	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 06/08/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			
39 21	223061619-39 **Location:** 2nd Floor - Exterior Vertical Sealant	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 06/08/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 8%			

See Reporting notes on last page

PLM Bulk Asbestos Report

OGSX:23168.00-IN; Yonkers Armory; 2 Quincy Place, Yonkers, New York 10701

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
40 21	223061619-40 **Location:** 2nd Floor - Exterior Vertical Sealant	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 06/08/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 8.9%			
41 22	223061619-41 **Location:** 1st Floor - Boiler Room - Pin Mastic On Duct	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 06/08/23
Analyst Description: Dark Brown, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 15.7%			
42 22	223061619-42 **Location:** 1st Floor - Boiler Room - Pin Mastic On Duct	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 06/08/23
Analyst Description: Dark Brown, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 17.7%			
43 23	223061619-43 **Location:** 1st Floor - Kitchen - Wall Tile - Grout	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 06/08/23
Analyst Description: White, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			
44 23	223061619-44 **Location:** 1st Floor - Kitchen - Wall Tile - Grout	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 06/08/23
Analyst Description: White, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			
45 24	223061619-45 **Location:** 1st Floor - Kitchen - Wall Tile - Mudset	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 06/08/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			

See Reporting notes on last page

PLM Bulk Asbestos Report

OGSX:23168.00-IN; Yonkers Armory; 2 Quincy Place, Yonkers, New York 10701

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
46 24	223061619-46 **Location:** 1st Floor - Kitchen - Wall Tile - Mudset	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 06/08/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			
47 25	223061619-47 **Location:** 1st Floor - Kitchen - Floor Tile - Grout	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 06/08/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			
48 25	223061619-48 **Location:** 1st Floor - Kitchen - Floor Tile - Grout	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 06/08/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			
49 26	223061619-49 **Location:** 1st Floor - Kitchen - Floor Tile - Mudset	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 06/08/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			
50 26	223061619-50 **Location:** 1st Floor - Kitchen - Floor Tile - Mudset	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 06/08/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			
51 27	223061619-51 **Location:** 1st Floor - Exterior - Door Caulk	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 06/08/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 10.6%			

See Reporting notes on last page

PLM Bulk Asbestos Report

OGSX:23168.00-IN; Yonkers Armory; 2 Quincy Place, Yonkers, New York 10701

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
52 27	223061619-52 **Location:** 1st Floor - Exterior - Door Caulk	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 06/08/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 13.1%			
53 28	223061619-53 **Location:** 1st Floor - Exterior - Louver Caulk	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 06/08/23
Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 27.6%			
54 28	223061619-54 **Location:** 1st Floor - Exterior - Louver Caulk	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 06/08/23
Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 34.2%			

Reporting Notes:

(1) Analysis Results For Soil, Dust, Or Debris May Be Highly Variable Because Of The Heterogeneous Nature Of These Samples

Analyzed by: Kensen Caro
Date: 6/8/2023

Reviewed by: Gabriella Morozov

*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_____

Adelaide Environmental Health Associates, Inc
1454 Rte. 22, Suite B202
Brewster, NY 10509
845-278-7710
845-278-7750 - fax

Site Address: Yonkers Armory	Date: 6/6/2023	Inspector: Jason Fullum
2 Quincy Place	Client Project #	
Yonkers, New York 10701	Project #: OGSX:23168.00-IN	

Sample ID #	Homogeneous Area	Floor Level	Sample Location/Description	Quantity (In Feet)	Friable Non Friable	Condition g, d, sd
1	1	2	Room 207 - 12x12 F.T. - Brown Red Mottled	980SF	NF	G
2	1	2				
3	2	2	Room 214 - - Black Mastic			
4	2	2				
5	3	2	- 2x4 C.T. - Large + Small Holes		NF	
6	3	2				
7	4	2	- Debris on Top of C.T.			SD
8	5	2	- 2x4 C.T. - Scissles + Holes			G
9	5	2				
10	6	2	- CMU Mortar			
11	6	2				
12	7	2	Room 202 - Coveblase - 4" Black + Mastic			
13	7	2				

Special Instructions/ Turnaround Time: 223061619

Stop at 1st Positive per Homogenous Area ***24 HR TAT***
Fax Results to 845-278-7750
E-Mail results to AdelaideLabResults@Adelaidellc.com and Jfullum@adelaidellc.com

Relinquished by:
Received by: Alexandra Vargas 6-7-23 1030
Relinquished by:
Received by:

Adelaide Environmental Health Associates, Inc
1454 Rte. 22, Suite B202
Brewster, NY 10509
845-278-7710
845-278-7750 - fax

Site Address: Yonkers Armory	Date: 6/6/2023	Inspector: Jason Fullum
2 Quincy Place	Client Project #	
Yonkers, New York 10701	Project #: OGSX:23168.00-IN	

Sample ID #	Homogeneous Area	Floor Level	Sample Location/Description	Quantity (In Feet)	Friable Non Friable	Condition g, d, sd
14	8	2	Room 202 - Yellow Carpet Mastic		NF	G
15	8	2	↓ ↓		↓	↓
16	9	2	Hallway - 12x12 F.T. - Green Mottled			
17	9	2	↓ ↓ ↓			
18	10	2	Room 211 - Debris above C.T.		F	SD
19	10	2	Hallway - Drywall Ceiling		F	G
20	11	2	↓ ↓		F	
21	12	2	Room 218 - 12x12 F.T. - Brown + White Mottled		NF	
22	12	2	↓ ↓ ↓		↓	
23	13	2	Hallway - Joint Compound		F	
24	13	2	↓ ↓		F	
25	14	2	Room 222 - 12x12 F.T. - White w/ Gray Specks		NF	
26	14	2	↓ ↓		↓	↓

Special Instructions/ Turnaround Time: 23061619

Stop at 1st Positive per Homogenous Area ***24 HR TAT***
Fax Results to 845-278-7750
E-Mail results to AdelaideLabResults@Adelaidellc.com and Jfullum@adelaidellc.com

Relinquished by:
Received by: Alexandra Vaccaro 6/23 1030
Relinquished by:
Received by:

Adelaide Environmental Health Associates, Inc
1454 Rte. 22, Suite B202
Brewster, NY 10509
845-278-7710
845-278-7750 - fax

Site Address: Yonkers Armory	Date: 6/6/2023	Inspector: Jason Fullum
2 Quincy Place	Client Project #	
Yonkers, New York 10701	Project #: OGSX:23168.00-IN	

Sample ID #	Homogeneous Area	Floor Level	Sample Location/Description	Quantity (In Feet)	Friable Non Friable	Condition g, d, sd
27	15	2	Rm. 223 - Women locker - Terrazzo Shower Pan		NF	D
28	15	2				D
29	16	2	- Sealant at Shower			D
30	16	2				D
31	17	2	Entrance Doors - Door Glazing Compound		NF	
32	17	2				
33	18	2	- Exterior Sealant			
34	18	2				
35	19	2	Concrete			
36	19	2				
37	20	2	Brick Mortar			
38	20	2				
39	21	2	Exterior Vertical Sealant			
40	21	2				

Special Instructions/ Turnaround Time: 223061619

Stop at 1st Positive per Homogenous Area ***24 HR TAT***
Fax Results to 845-278-7750
E-Mail results to AdelaideLabResults@Adelaidellc.com and Jfullum@adelaidellc.com

Relinquished by:
Received by: Alexandra Vuic 6/7/23 1030
Relinquished by:
Received by:

Adelaide Environmental Health Associates, Inc
1454 Rte. 22, Suite B202
Brewster, NY 10509
845-278-7710
845-278-7750 - fax

Site Address: Yonkers Armory	Date: 6/6/2023	Inspector: Jason Fullum
2 Quincy Place	Client Project #	
Yonkers, New York 10701	Project #: OGSX:23168.00-IN	

Sample ID #	Homogeneous Area	Floor Level	Sample Location/Description	Quantity (In Feet)	Friable Non Friable	Condition g, d, sd
41	22	1	Boiler Room - Pipe Mastic on Duct		NF	D
42	22	1				D
43	23	1	Kitchen - Wall Tile - Grout			
44	23	1				
45	24	1	- Mudset			
46	24	1				
47	25	1	- Floor Tile - Grout			
48	25	1				
49	26	1	- Mudset			
50	26	1				
51	27	1	Exterior - Door Caulk			
52	27	1				
53	28	1	- Louver Caulk			
54	28	1				

Special Instructions/ Turnaround Time: 223061619

Stop at 1st Positive per Homogenous Area ***24 HR TAT***
Fax Results to 845-278-7750
E-Mail results to AdelaideLabResults@Adelaidellc.com and Jfullum@adelaidellc.com

Relinquished by:
Received by: Alexandra Vian 6/23 1030
Relinquished by:
Received by:

APPENDIX E

XRF READINGS

Adelaide Environmental Heath Associates Inc.
1511 Route 22, Suite C-24
Brewster, New York 10509
Adelaide Project# BA:23168.00-IN
Project Name: Yonkers Armory
Inspector: Jason Fullum

Reading #	Date	Time	Space Type	Floor	Room	Component	Side	Substrate	Color	Condition	Lead Concentration (mg/cm2)	Result
1	6/6/2023	9:04:22	Armory		Calibration						0.9	Negative
2	6/6/2023	9:04:34	Armory		Calibration						0.9	Negative
3	6/6/2023	9:04:46	Armory		Calibration						0.9	Negative
4	6/6/2023	9:23:29	Armory	2nd Floor	207	Wall	A	CMU	Beige	Intact	-0.2	Negative
5	6/6/2023	9:24:00	Armory	2nd Floor	207	Door Case	A	Metal	Black	Intact	0.4	Negative
6	6/6/2023	9:24:27	Armory	2nd Floor	207	Door	A	Metal	Red	Intact	0.1	Negative
7	6/6/2023	9:25:07	Armory	2nd Floor	201	Door	A	Metal	Red	Intact	0	Negative
8	6/6/2023	9:25:31	Armory	2nd Floor	201	Door Case	A	Metal	Black	Intact	0.5	Negative
9	6/6/2023	9:25:58	Armory	2nd Floor	201	Wall	B	CMU	Black	Intact	-0.2	Negative
10	6/6/2023	10:29:25	Armory	2nd Floor	Hallway	Wall	B	CMU	Beige	Intact	-0.3	Negative
11	6/6/2023	10:30:21	Armory	2nd Floor	Hallway	Ceiling	Ceiling	Sheetrock	Beige	Intact	0.1	Negative
12	6/6/2023	11:18:54	Armory	2nd Floor	Hallway	Stair Handrail	A	Metal	Red	Intact	0.1	Negative
13	6/6/2023	11:19:20	Armory	2nd Floor	Hallway	Stair Stringer	A	Metal	Red	Intact	0.1	Negative
14	6/6/2023	11:19:35	Armory	2nd Floor	Hallway	Stair Riser	A	Metal	Red	Intact	0.2	Negative
15	6/6/2023	11:21:42	Armory	2nd Floor	Hallway	Ceiling	Ceiling	Sheetrock	Off White	Intact	0.1	Negative
16	6/6/2023	11:28:51	Armory	2nd Floor	Bathroom	Floor	Floor	Concrete	Grey	Intact	0	Negative
17	6/6/2023	11:30:19	Armory	2nd Floor	Bathroom	Floor	Floor	Concrete	Red	Intact	0	Negative
18	6/6/2023	11:30:37	Armory	2nd Floor	Bathroom	Floor	Floor	Concrete	Yellow	Intact	0	Negative
19	6/6/2023	11:31:02	Armory	2nd Floor	Bathroom	Wall	A	CMU	Yellow	Intact	-0.2	Negative
20	6/6/2023	11:31:26	Armory	2nd Floor	Bathroom	Ceiling	Ceiling	Sheetrock	Yellow	Intact	-0.2	Negative
21	6/6/2023	11:41:55	Armory	2nd Floor	223	Wall	D	CMU	Off White	Intact	-0.1	Negative
22	6/6/2023	11:42:25	Armory	2nd Floor	223	Door	A	Metal	Red	Intact	0	Negative
23	6/6/2023	11:42:48	Armory	2nd Floor	223	Door Case	A	Metal	Black	Intact	0.4	Negative
24	6/6/2023	11:43:21	Armory	2nd Floor	223	Floor	Floor	Concrete	Red	Intact	0	Negative
25	6/6/2023	11:43:50	Armory	2nd Floor	223	Wall	B	CMU	Yellow	Intact	-0.3	Negative
26	6/6/2023	11:45:02	Armory	2nd Floor	223	Ceiling	Ceiling	Sheetrock	Yellow	Intact	0	Negative
27	6/6/2023	13:30:04	Armory	1st Floor	Bathroom	Floor	Floor	Concrete	Green	Intact	0.2	Negative
28	6/6/2023	13:30:37	Armory	1st Floor	Bathroom	Wall	A	CMU	Beige	Intact	-0.1	Negative
29	6/6/2023	13:31:07	Armory	1st Floor	Bathroom	Ceiling	Ceiling	Sheetrock	Beige	Intact	-0.2	Negative
30	6/6/2023	13:33:44	Armory	1st Floor	Exterior	roll up door rail	C	Metal	Green	Intact	0	Negative
31	6/6/2023	13:34:32	Armory	1st Floor	Exterior	Door	C	Metal	Green	Intact	0.1	Negative
32	6/6/2023	13:34:50	Armory	1st Floor	Exterior	Exterior Door	C	Metal	Green	Intact	-0.1	Negative
33	6/6/2023	13:35:08	Armory	1st Floor	Exterior	Exterior Door Case	C	Metal	Green	Intact	0.4	Negative
34	6/6/2023	14:01:04	Armory	1st Floor	Exterior	Window Case	B	Metal	Green	Intact	0	Negative
35	6/6/2023	14:05:06	Armory		Calibration						0.9	Negative
36	6/6/2023	14:05:18	Armory		Calibration						1	Positive
37	6/6/2023	14:05:30	Armory		Calibration						1	Positive

APPENDIX F

PCB ANALYTICAL RESULTS

PHOENIX
Environmental Laboratories, Inc.

Thursday, June 15, 2023

Attn: Stephanie Soter
Adelaide Environmental Health Assoc,Inc
1511 Route 22, Suite C24
Brewster, NY 10509

Project ID: YONKERS ARMORY 23168.00
SDG ID: GCO21952
Sample ID#s: CO21952 - CO21957

This laboratory is in compliance with the NELAC requirements of procedures used except where indicated.

This report contains results for the parameters tested, under the sampling conditions described on the Chain Of Custody, as received by the laboratory. This report is incomplete unless all pages indicated in the pagination at the bottom of the page are included.

All soils, solids and sludges are reported on a dry weight basis unless otherwise noted in the sample comments.

A scanned version of the COC form accompanies the analytical report and is an exact duplicate of the original.

If you are the client above and have any questions concerning this testing, please do not hesitate to contact Phoenix Client Services at ext.200. The contents of this report cannot be discussed with anyone other than the client listed above without their written consent.

Sincerely yours,

Phyllis Shiller
Laboratory Director

NELAC - #NY11301
CT Lab Registration #PH-0618
MA Lab Registration #M-CT007
ME Lab Registration #CT-007
NH Lab Registration #213693-A,B
NJ Lab Registration #CT-003
NY Lab Registration #11301
PA Lab Registration #68-03530
RI Lab Registration #63
VT Lab Registration #VT11301

PHOENIX

Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102 Fax (860) 645-0823

ACCREDITED IN ACCORDANCE WITH nelac NY # 11301

Sample Id Cross Reference

June 15, 2023

SDG I.D.: GCO21952

Project ID: YONKERS ARMORY 23168.00

Client Id	Lab Id	Matrix
PCB1-WOMENS SHOWER	CO21952	BULK
PCB2-GLAZING	CO21953	CAULK
PCB3-EXT. DOOR CAULK	CO21954	CAULK
PCB4-EXT. SEALANT	CO21955	CAULK
PCB5- EXT. DOOR CAULK	CO21956	CAULK
PCB 6-LOUVER CAULK	CO21957	CAULK

PHOENIX

Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102 Fax (860) 645-0823

ACCREDITED IN ACCORDANCE WITH nelac NY # 11301

Analysis Report

June 15, 2023

FOR: Attn: Stephanie Soter
Adelaide Environmental Health Assoc,Inc
1511 Route 22, Suite C24
Brewster, NY 10509

Sample Information		Custody Information		Date	Time
Matrix:	BULK	Collected by:		06/06/23	
Location Code:	ADELAIDE	Received by:	MMN	06/07/23	17:16
Rush Request:	Standard	Analyzed by:	see "By" below		
P.O.#:					

Laboratory Data

SDG ID: GCO21952
Phoenix ID: CO21952

Project ID: YONKERS ARMORY 23168.00
Client ID: PCB1-WOMENS SHOWER

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Extraction for PCB	Completed				06/08/23	R/AW/SB/I	SW3540C
PCB (Soxhlet SW3540C)							
PCB-1016	ND	2900	ug/Kg	1	06/09/23	SC	SW8082A
PCB-1221	ND	2900	ug/Kg	1	06/09/23	SC	SW8082A
PCB-1232	ND	2900	ug/Kg	1	06/09/23	SC	SW8082A
PCB-1242	ND	2900	ug/Kg	1	06/09/23	SC	SW8082A
PCB-1248	ND	2900	ug/Kg	1	06/09/23	SC	SW8082A
PCB-1254	ND	2900	ug/Kg	1	06/09/23	SC	SW8082A
PCB-1260	ND	2900	ug/Kg	1	06/09/23	SC	SW8082A
PCB-1262	ND	2900	ug/Kg	1	06/09/23	SC	SW8082A
PCB-1268	ND	2900	ug/Kg	1	06/09/23	SC	SW8082A
QA/QC Surrogates							
% DCBP	55		%	1	06/09/23	SC	30 - 150 %
% DCBP (Confirmation)	40		%	1	06/09/23	SC	30 - 150 %
% TCMX	52		%	1	06/09/23	SC	30 - 150 %
% TCMX (Confirmation)	47		%	1	06/09/23	SC	30 - 150 %

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference

RL/PQL=Reporting/Practical Quantitation Level (Equivalent to NELAC LOQ, Limit of Quantitation) ND=Not Detected at RL/PQL
BRL=Below Reporting Level L=Biased Low
QA/QC Surrogates: Surrogates are compounds (preceeded with a %) added by the lab to determine analysis efficiency. Surrogate results(%) listed in the report are not "detected" compounds.

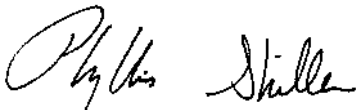
Comments:

Results are reported on an ``as received`` basis, and are not corrected for dry weight.

PCB Comment:
Due to limited sample an elevated RL was reported.

All soils, solids and sludges are reported on a dry weight basis unless otherwise noted in the sample comments.

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Phyllis Shiller, Laboratory Director
June 15, 2023
Reviewed and Released by: Rashmi Makol, Project Manager

PHOENIX

Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102 Fax (860) 645-0823

ACCREDITED IN ACCORDANCE WITH NY #11301

Analysis Report

June 15, 2023

FOR: Attn: Stephanie Soter
Adelaide Environmental Health Assoc,Inc
1511 Route 22, Suite C24
Brewster, NY 10509

Sample Information		Custody Information		Date	Time
Matrix:	CAULK	Collected by:		06/06/23	
Location Code:	ADELAIDE	Received by:	MMN	06/07/23	17:16
Rush Request:	Standard	Analyzed by:	see "By" below		
P.O.#:					

Laboratory Data

SDG ID: GCO21952
Phoenix ID: CO21953

Project ID: YONKERS ARMORY 23168.00
Client ID: PCB2-GLAZING

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Caulk Extraction for PCB	Completed				06/08/23	R/AW/SB/I	SW3540C
PCB (Soxhlet SW3540C)							
PCB-1016	ND	930	ug/Kg	1	06/09/23	SC	SW8082A
PCB-1221	ND	930	ug/Kg	1	06/09/23	SC	SW8082A
PCB-1232	ND	930	ug/Kg	1	06/09/23	SC	SW8082A
PCB-1242	ND	930	ug/Kg	1	06/09/23	SC	SW8082A
PCB-1248	ND	930	ug/Kg	1	06/09/23	SC	SW8082A
PCB-1254	ND	930	ug/Kg	1	06/09/23	SC	SW8082A
PCB-1260	ND	930	ug/Kg	1	06/09/23	SC	SW8082A
PCB-1262	ND	930	ug/Kg	1	06/09/23	SC	SW8082A
PCB-1268	ND	930	ug/Kg	1	06/09/23	SC	SW8082A
QA/QC Surrogates							
% DCBP	54		%	1	06/09/23	SC	30 - 150 %
% DCBP (Confirmation)	52		%	1	06/09/23	SC	30 - 150 %
% TCMX	57		%	1	06/09/23	SC	30 - 150 %
% TCMX (Confirmation)	55		%	1	06/09/23	SC	30 - 150 %

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference

RL/PQL=Reporting/Practical Quantitation Level (Equivalent to NELAC LOQ, Limit of Quantitation) ND=Not Detected at RL/PQL
BRL=Below Reporting Level L=Biased Low
QA/QC Surrogates: Surrogates are compounds (preceeded with a %) added by the lab to determine analysis efficiency. Surrogate results(%) listed in the report are not "detected" compounds.

Comments:

Results are reported on an ``as received`` basis, and are not corrected for dry weight.

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Phyllis Shiller, Laboratory Director
June 15, 2023
Reviewed and Released by: Rashmi Makol, Project Manager

Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102 Fax (860) 645-0823

NY #11301

Analysis Report

June 15, 2023

FOR: Attn: Stephanie Soter
Adelaide Environmental Health Assoc,Inc
1511 Route 22, Suite C24
Brewster, NY 10509

Sample Information		Custody Information		Date	Time
Matrix:	CAULK	Collected by:		06/06/23	
Location Code:	ADELAIDE	Received by:	MMN	06/07/23	17:16
Rush Request:	Standard	Analyzed by:	see "By" below		
P.O.#:					

Laboratory Data

SDG ID: GCO21952
Phoenix ID: CO21954

Project ID: YONKERS ARMORY 23168.00
Client ID: PCB3-EXT. DOOR CAULK

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Caulk Extraction for PCB	Completed				06/08/23	R/AW/SB/I	SW3540C
PCB (Soxhlet SW3540C)							
PCB-1016	ND	880	ug/Kg	1	06/09/23	SC	SW8082A
PCB-1221	ND	880	ug/Kg	1	06/09/23	SC	SW8082A
PCB-1232	ND	880	ug/Kg	1	06/09/23	SC	SW8082A
PCB-1242	ND	880	ug/Kg	1	06/09/23	SC	SW8082A
PCB-1248	ND	880	ug/Kg	1	06/09/23	SC	SW8082A
PCB-1254	ND	880	ug/Kg	1	06/09/23	SC	SW8082A
PCB-1260	ND	880	ug/Kg	1	06/09/23	SC	SW8082A
PCB-1262	ND	880	ug/Kg	1	06/09/23	SC	SW8082A
PCB-1268	ND	880	ug/Kg	1	06/09/23	SC	SW8082A
QA/QC Surrogates							
% DCBP	39		%	1	06/09/23	SC	30 - 150 %
% DCBP (Confirmation)	34		%	1	06/09/23	SC	30 - 150 %
% TCMX	31		%	1	06/09/23	SC	30 - 150 %
% TCMX (Confirmation)	31		%	1	06/09/23	SC	30 - 150 %

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference

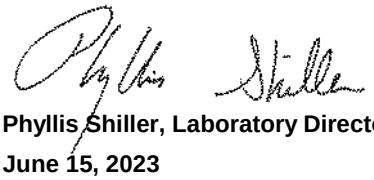
RL/PQL=Reporting/Practical Quantitation Level (Equivalent to NELAC LOQ, Limit of Quantitation) ND=Not Detected at RL/PQL
BRL=Below Reporting Level L=Biased Low
QA/QC Surrogates: Surrogates are compounds (preceeded with a %) added by the lab to determine analysis efficiency. Surrogate results(%) listed in the report are not "detected" compounds.

Comments:

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Phyllis Shiller, Laboratory Director
June 15, 2023
Reviewed and Released by: Rashmi Makol, Project Manager

Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102 Fax (860) 645-0823

NY # 11301

Analysis Report

June 15, 2023

FOR: Attn: Stephanie Soter
Adelaide Environmental Health Assoc,Inc
1511 Route 22, Suite C24
Brewster, NY 10509

Sample Information		Custody Information		Date	Time
Matrix:	CAULK	Collected by:		06/06/23	
Location Code:	ADELAIDE	Received by:	MMN	06/07/23	17:16
Rush Request:	Standard	Analyzed by:	see "By" below		
P.O.#:					

Laboratory Data

SDG ID: GCO21952
Phoenix ID: CO21955

Project ID: YONKERS ARMORY 23168.00
Client ID: PCB4-EXT. SEALANT

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Caulk Extraction for PCB	Completed				06/08/23	R/AW/SB/I	SW3540C
PCB (Soxhlet SW3540C)							
PCB-1016	ND	960	ug/Kg	1	06/09/23	SC	SW8082A
PCB-1221	ND	960	ug/Kg	1	06/09/23	SC	SW8082A
PCB-1232	ND	960	ug/Kg	1	06/09/23	SC	SW8082A
PCB-1242	ND	960	ug/Kg	1	06/09/23	SC	SW8082A
PCB-1248	ND	960	ug/Kg	1	06/09/23	SC	SW8082A
PCB-1254	ND	960	ug/Kg	1	06/09/23	SC	SW8082A
PCB-1260	ND	960	ug/Kg	1	06/09/23	SC	SW8082A
PCB-1262	ND	960	ug/Kg	1	06/09/23	SC	SW8082A
PCB-1268	ND	960	ug/Kg	1	06/09/23	SC	SW8082A
QA/QC Surrogates							
% DCBP	41		%	1	06/09/23	SC	30 - 150 %
% DCBP (Confirmation)	35		%	1	06/09/23	SC	30 - 150 %
% TCMX	36		%	1	06/09/23	SC	30 - 150 %
% TCMX (Confirmation)	36		%	1	06/09/23	SC	30 - 150 %

Project ID: YONKERS ARMORY 23168.00 Phoenix I.D.: CO21955

Client ID: PCB4-EXT. SEALANT

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference

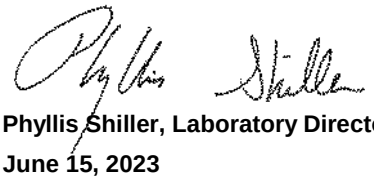
RL/PQL=Reporting/Practical Quantitation Level (Equivalent to NELAC LOQ, Limit of Quantitation) ND=Not Detected at RL/PQL
BRL=Below Reporting Level L=Biased Low
QA/QC Surrogates: Surrogates are compounds (preceeded with a %) added by the lab to determine analysis efficiency. Surrogate results(%) listed in the report are not "detected" compounds.

Comments:

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Phyllis Shiller, Laboratory Director

June 15, 2023

Reviewed and Released by: Rashmi Makol, Project Manager

PHOENIX

Environmental Laboratories, Inc.
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ACCREDITED IN ACCORDANCE WITH nelac NY # 11301

Analysis Report

June 15, 2023

FOR: Attn: Stephanie Soter
Adelaide Environmental Health Assoc,Inc
1511 Route 22, Suite C24
Brewster, NY 10509

Sample Information		Custody Information		Date	Time
Matrix:	CAULK	Collected by:		06/06/23	
Location Code:	ADELAIDE	Received by:	MMN	06/07/23	17:16
Rush Request:	Standard	Analyzed by:	see "By" below		
P.O.#:					

Laboratory Data

SDG ID: GCO21952
Phoenix ID: CO21956

Project ID: YONKERS ARMORY 23168.00
Client ID: PCB5- EXT. DOOR CAULK

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Caulk Extraction for PCB	Completed				06/08/23	R/AW/SB/I	SW3540C
PCB (Soxhlet SW3540C)							
PCB-1016	ND	600	ug/Kg	1	06/09/23	SC	SW8082A
PCB-1221	ND	600	ug/Kg	1	06/09/23	SC	SW8082A
PCB-1232	ND	600	ug/Kg	1	06/09/23	SC	SW8082A
PCB-1242	ND	600	ug/Kg	1	06/09/23	SC	SW8082A
PCB-1248	ND	600	ug/Kg	1	06/09/23	SC	SW8082A
PCB-1254	ND	600	ug/Kg	1	06/09/23	SC	SW8082A
PCB-1260	ND	600	ug/Kg	1	06/09/23	SC	SW8082A
PCB-1262	ND	600	ug/Kg	1	06/09/23	SC	SW8082A
PCB-1268	ND	600	ug/Kg	1	06/09/23	SC	SW8082A
QA/QC Surrogates							
% DCBP	43		%	1	06/09/23	SC	30 - 150 %
% DCBP (Confirmation)	36		%	1	06/09/23	SC	30 - 150 %
% TCMX	39		%	1	06/09/23	SC	30 - 150 %
% TCMX (Confirmation)	38		%	1	06/09/23	SC	30 - 150 %

Project ID: YONKERS ARMORY 23168.00 Phoenix I.D.: CO21956

Client ID: PCB5- EXT. DOOR CAULK

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference

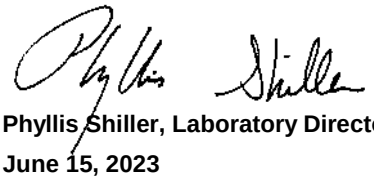
RL/PQL=Reporting/Practical Quantitation Level (Equivalent to NELAC LOQ, Limit of Quantitation) ND=Not Detected at RL/PQL
BRL=Below Reporting Level L=Biased Low
QA/QC Surrogates: Surrogates are compounds (preceeded with a %) added by the lab to determine analysis efficiency. Surrogate results(%) listed in the report are not "detected" compounds.

Comments:

Results are reported on an ``as received`` basis, and are not corrected for dry weight.

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Phyllis Shiller, Laboratory Director

June 15, 2023

Reviewed and Released by: Rashmi Makol, Project Manager

PHOENIX

Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102 Fax (860) 645-0823

ACCREDITED IN ACCORDANCE WITH NY #11301

Analysis Report

June 15, 2023

FOR: Attn: Stephanie Soter
Adelaide Environmental Health Assoc,Inc
1511 Route 22, Suite C24
Brewster, NY 10509

Sample Information		Custody Information		Date	Time
Matrix:	CAULK	Collected by:		06/06/23	
Location Code:	ADELAIDE	Received by:	MMN	06/07/23	17:16
Rush Request:	Standard	Analyzed by:	see "By" below		
P.O.#:					

Laboratory Data

SDG ID: GCO21952
Phoenix ID: CO21957

Project ID: YONKERS ARMORY 23168.00
Client ID: PCB 6-LOUVER CAULK

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference	
Caulk Extraction for PCB	Completed				06/12/23	Q/AC1	SW3540C	
PCB (Soxhlet SW3540C)								
PCB-1016	ND	940	ug/Kg	1	06/13/23	SC	SW8082A	
PCB-1221	ND	940	ug/Kg	1	06/13/23	SC	SW8082A	
PCB-1232	ND	940	ug/Kg	1	06/13/23	SC	SW8082A	
PCB-1242	ND	940	ug/Kg	1	06/13/23	SC	SW8082A	
PCB-1248	ND	940	ug/Kg	1	06/13/23	SC	SW8082A	
PCB-1254	ND	940	ug/Kg	1	06/13/23	SC	SW8082A	
PCB-1260	ND	940	ug/Kg	1	06/13/23	SC	SW8082A	
PCB-1262	ND	940	ug/Kg	1	06/13/23	SC	SW8082A	
PCB-1268	ND	940	ug/Kg	1	06/13/23	SC	SW8082A	
QA/QC Surrogates								
% DCBP	17		%	1	06/13/23	SC	30 - 150 %	3
% DCBP (Confirmation)	17		%	1	06/13/23	SC	30 - 150 %	3
% TCMX	17		%	1	06/13/23	SC	30 - 150 %	3
% TCMX (Confirmation)	17		%	1	06/13/23	SC	30 - 150 %	3

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference

3 = This parameter exceeds laboratory specified limits.

RL/PQL=Reporting/Practical Quantitation Level (Equivalent to NELAC LOQ, Limit of Quantitation) ND=Not Detected at RL/PQL
BRL=Below Reporting Level L=Biased Low
QA/QC Surrogates: Surrogates are compounds (preceeded with a %) added by the lab to determine analysis efficiency. Surrogate results(%) listed in the report are not "detected" compounds.

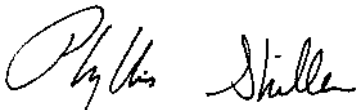
Comments:

Results are reported on an ``as received`` basis, and are not corrected for dry weight.

PCB Comment:
Poor surrogate recovery was observed for PCBs. Sample was re-extracted with similar results.

All soils, solids and sludges are reported on a dry weight basis unless otherwise noted in the sample comments.

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Phyllis Shiller, Laboratory Director
June 15, 2023
Reviewed and Released by: Rashmi Makol, Project Manager

Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102

NY # 11301

QA/QC Report

June 15, 2023

QA/QC Data

SDG I.D.: GCO21952

Parameter	Blank	Blk RL	LCS %	LCSD %	LCS RPD	MS %	MSD %	MS RPD	% Rec Limits	% RPD Limits
QA/QC Batch 681421 (ug/Kg), QC Sample No: CO21956 10X (CO21952, CO21953, CO21954, CO21955, CO21956)										
Polychlorinated Biphenyls - Bulk										
PCB-1016	ND	170	99	91	8.4				40 - 140	30
PCB-1221	ND	170							40 - 140	30
PCB-1232	ND	170							40 - 140	30
PCB-1242	ND	170							40 - 140	30
PCB-1248	ND	170							40 - 140	30
PCB-1254	ND	170							40 - 140	30
PCB-1260	ND	170	106	107	0.9				40 - 140	30
PCB-1262	ND	170							40 - 140	30
PCB-1268	ND	170							40 - 140	30
% DCBP (Surrogate Rec)	107	%	111	106	4.6				30 - 150	30
% DCBP (Surrogate Rec) (Confirm	102	%	101	102	1.0				30 - 150	30
% TCMX (Surrogate Rec)	89	%	95	87	8.8				30 - 150	30
% TCMX (Surrogate Rec) (Confirm	82	%	89	82	8.2				30 - 150	30
Comment:										
A LCS and LCS Duplicate were performed instead of a matrix spike and matrix spike duplicate.										
QA/QC Batch 681903 (ug/Kg), QC Sample No: CO21957 10X (CO21957)										
Polychlorinated Biphenyls										
PCB-1016	ND	170	101	105	3.9				40 - 140	30
PCB-1221	ND	170							40 - 140	30
PCB-1232	ND	170							40 - 140	30
PCB-1242	ND	170							40 - 140	30
PCB-1248	ND	170							40 - 140	30
PCB-1254	ND	170							40 - 140	30
PCB-1260	ND	170	115	121	5.1				40 - 140	30
PCB-1262	ND	170							40 - 140	30
PCB-1268	ND	170							40 - 140	30
% DCBP (Surrogate Rec)	104	%	100	109	8.6				30 - 150	30
% DCBP (Surrogate Rec) (Confirm	109	%	103	111	7.5				30 - 150	30
% TCMX (Surrogate Rec)	99	%	95	103	8.1				30 - 150	30
% TCMX (Surrogate Rec) (Confirm	98	%	95	102	7.1				30 - 150	30
Comment:										
A LCS and LCS Duplicate were performed instead of a matrix spike and matrix spike duplicate.										

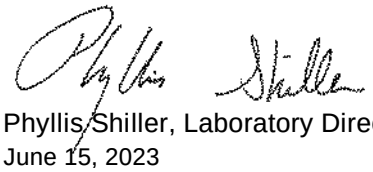
QA/QC Data

SDG I.D.: GCO21952

Parameter	Blank	Blk RL	LCS %	LCSD %	LCS RPD	MS %	MSD %	MS RPD	% Rec Limits	% RPD Limits

If there are any questions regarding this data, please call Phoenix Client Services at extension 200.

RPD - Relative Percent Difference
LCS - Laboratory Control Sample
LCSD - Laboratory Control Sample Duplicate
MS - Matrix Spike
MS Dup - Matrix Spike Duplicate
NC - No Criteria
Intf - Interference



Phyllis Shiller, Laboratory Director
June 15, 2023

Thursday, June 15, 2023

Criteria: None

State: NY

Sample Criteria Exceedances Report

GCO21952 - ADELAIDE

SampNo	Acode	Phoenix Analyte	Criteria	Result	RL	Criteria	RL Criteria	Analysis Units
CO21952	$PCB_SOXR	PCB-1268	NY / Requested PCB RL /	ND	2900	1000	1000	ug/Kg
CO21952	$PCB_SOXR	PCB-1262	NY / Requested PCB RL /	ND	2900	1000	1000	ug/Kg
CO21952	$PCB_SOXR	PCB-1260	NY / Requested PCB RL /	ND	2900	1000	1000	ug/Kg
CO21952	$PCB_SOXR	PCB-1254	NY / Requested PCB RL /	ND	2900	1000	1000	ug/Kg
CO21952	$PCB_SOXR	PCB-1248	NY / Requested PCB RL /	ND	2900	1000	1000	ug/Kg
CO21952	$PCB_SOXR	PCB-1242	NY / Requested PCB RL /	ND	2900	1000	1000	ug/Kg
CO21952	$PCB_SOXR	PCB-1232	NY / Requested PCB RL /	ND	2900	1000	1000	ug/Kg
CO21952	$PCB_SOXR	PCB-1221	NY / Requested PCB RL /	ND	2900	1000	1000	ug/Kg
CO21952	$PCB_SOXR	PCB-1016	NY / Requested PCB RL /	ND	2900	1000	1000	ug/Kg

Phoenix Laboratories does not assume responsibility for the data contained in this exceedance report. It is provided as an additional tool to identify requested criteria exceedences. All efforts are made to ensure the accuracy of the data (obtained from appropriate agencies). A lack of exceedence information does not necessarily suggest conformance to the criteria. It is ultimately the site professional's responsibility to determine appropriate compliance.

Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102 Fax (860) 645-0823

NY # 11301

Analysis Comments

June 15, 2023 SDG I.D.: GCO21952

The following analysis comments are made regarding exceptions to criteria not already noted in the Analysis Report or QA/QC Report:

PCB Narration

AU-ECD5 06/13/23-1: CO21957

The following Continuing Calibration compounds did not meet % deviation criteria:
Samples: CO21957
Preceding CC 613B016 - None.
Succeeding CC 613B029 - DCBP SURR 23%L (15%)

Environmental Laboratories, Inc.
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ACCREDITED IN ACCORDANCE WITH nelac NY # 11301

NY Temperature Narration

June 15, 2023

SDG I.D.: GCO21952

The samples in this delivery group were received at 1.1°C.
(Note acceptance criteria for relevant matrices is above freezing up to 6°C)

Cooler: Yes ☐ No ☐
Coolant: IPK ☐ ICE ☐ No ☐
Temp ____ °C Pg ____ of ____

NY/NJ/PA CHAIN OF CUSTODY RECORD

PHOENIX Environmental Laboratories, Inc.

587 East Middle Turnpike, P.O. Box 370, Manchester, CT 06040
Email: Makrina Nolan, makrina@phoenixlabs.com Fax (860) 645-0823
Client Services (860) 645-1102

Contact Options:
☐ Phone:
☐ Fax:
☐ Email:

Customer: Adelaide
Address: 1511 Rte 22, Ste C24
Somerset, NJ 10505

Project: Yankee Armory 23168.00
Report to:
Invoice to:
QUOTE # :

Project P.O:

This section MUST be completed with Bottle Quantities.

Sampler's Signature: _____ Date: 6/6/23

Client Sample - Information / Identification

Matrix Code:
DW=Drinking Water GW=Ground Water SW=Surface Water WW=Waste Water
RW=Raw Water SE=Sediment SL=Sludge S=Soil SD=Solid W=Wipe
OIL=Oil B=Bulk L=Liquid

Analysis Request

PHOENIX USE ONLY SAMPLE #	Customer Sample Identification	Sample Matrix	Date Sampled	Time Sampled	*MS/MSD (May be billable at analysis unit rate)	PCB's	BAS	GL Amber 8 oz. [ ] wt H_3PO_4 [ ] $NaHSO_4$	Soil VOA Vials [ ] methanol [ ] H_2O	GL Soil container ( ) oz	40 ml VOA Vial [ ] As is [ ] HCl	GL Amber 1000ml [ ] As is [ ] H_2SO_4	PL As is [ ] 250ml [ ] 500ml [ ] 1000ml	PL H_2SO_4 [ ] 250ml [ ] 500ml [ ] 1000ml	PL NaOH 250ml	PL HNO_3 250ml	Bacteria Bottle w/thio	Bacteria Bottle as is
21952	PCB1-Women Shower		6/6/23			X	1											
21953	PCB2-Glazing Compd		6/6/23			X	1											
21954	PCB3-Ext. Door Caulk		6/6/23			X	1											
21955	PCB4-Ext. Vert. Sealant		6/6/23			X	1											
21956	PCB5-Ext. Door Caulk		6/6/23			X	1											
21957	PCB6-Louver Caulk		6/6/23			X	1											

Relinquished by:	Accepted by:	Date:	Time:
		6.7.23	1000
		6-7-23	15:45
		6/7/23	17:16

Turnaround:
☐ 1 Day*
☐ 2 Days*
☐ 3 Days*
☐ 4 Days*
☐ 5 Days*
☐ Standard
* SURCHARGE APPLIES
7 DAYS

NJ
☐ Res. Criteria
☐ Non-Res. Criteria
☐ Impact to GW Soil Cleanup Criteria
☐ Impact to GW soil screen Criteria
☐ GW Criteria

NY
☐ TOGS GW
☐ CP-51 SOIL
☐ 375SCO Unrestricted Soil
☐ 375SCO Residential Soil
☐ 375SCO Residential Restricted Soil
☐ 375SCO Commercial Soil
☐ 375SCO Industrial Soil
☐ Subpart 5 DW

PA
☐ Clean Fill Limits
☐ PA-GW
☐ Reg Fill Limits
☐ PA Soil Restricted
☐ PA Soil non-restricted

State Samples Collected?
NY

Data Package:
☐ NJ Reduced Deliv. *
☐ NY Enhanced (ASP B) *
☐ Other

Comments, Special Requirements or Regulations:

Data Format:
☐ Phoenix Std Report ☐ EQuIS
☐ Excel ☐ NJ Hazsite EDD
☐ PDF ☐ NY EZ EDD (ASP)
☐ GIS/Key ☐ Other

*MS/MSD are considered site samples and will be billed as such in accordance with the prices quoted.

APPENDIX G

PERSONNEL AND LABORATORY CERTIFICATIONS

WE ARE YOUR DOL

NEW YORK STATE | Department of Labor

DIVISION OF SAFETY & HEALTH LICENSE AND CERTIFICATE UNIT, STATE OFFICE CAMPUS, BLDG. 12, ALBANY, NY 12226

ASBESTOS HANDLING LICENSE

Adelaide Environmental Health Associates, Inc.
1511 Route 22, Suite C24, Brewster, NY, 10509

License Number: 29305
License Class: RESTRICTED
Date of Issue: 06/07/2023
Expiration Date: 07/31/2024
Duly Authorized Representative: John Soter

This license has been issued in accordance with applicable provisions of Article 30 of the Labor Law of New York State and of the New York State Codes, Rules and Regulations (12 NYCRR Part 56). It is subject to suspension or revocation for a (1) serious violation of state, federal or local laws with regard to the conduct of an asbestos project, or (2) demonstrated lack of responsibility in the conduct of any job involving asbestos or asbestos material.

This license is valid only for the contractor named above and this license or a photocopy must be prominently displayed at the asbestos project worksite. This license verifies that all persons employed by the licensee on an asbestos project in New York State have been issued an Asbestos Certificate, appropriate for the type of work they perform, by the New York State Department of Labor.

Amy Phillips, Director
For the Commissioner of Labor

United States Environmental Protection Agency

This is to certify that

ADELAIDE ENVIRONMENTAL HEALTH ASSOCIATES INC

has fulfilled the requirements of the Toxic Substances Control Act (TSCA) Section 402, and has received certification to conduct lead-based paint activities pursuant to 40 CFR Part 745.226

In the Jurisdiction of:

All EPA Administered Lead-based Paint Activities Program States, Tribes and Territories

This certification is valid from the date of issuance and expires September 08, 2025

LBP-15081-2

Certification #

August 25, 2022

Issued On

Michelle Price, Chief

Lead, Heavy Metals, and Inorganics Branch

United States Environmental Protection Agency

This is to certify that

Adelaide Environmental Health Associates, Inc

has fulfilled the requirements of the Toxic Substances Control Act (TSCA) Section 402, and has received certification to conduct lead-based paint renovation, repair, and painting activities pursuant to 40 CFR Part 745.89

In the Jurisdiction of:

All EPA Administered States, Tribes, and Territories

This certification is valid from the date of issuance and expires December 05, 2027

NAT-15081-3

Certification #

August 03, 2022

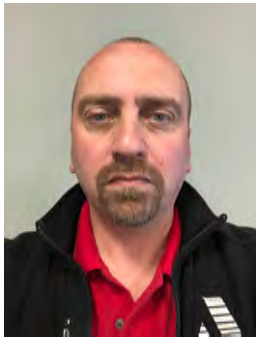
Issued On

Michelle Price, Chief

Lead, Heavy Metals, and Inorganics Branch

United States Environmental Protection Agency

This is to certify that



Jason P Fullum

has fulfilled the requirements of the Toxic Substances Control Act (TSCA) Section 402, and has received certification to conduct lead-based paint activities pursuant to 40 CFR Part 745.226 as:

Risk Assessor

In the Jurisdiction of:

All EPA Administered Lead-based Paint Activities Program States, Tribes and Territories

This certification is valid from the date of issuance and expires July 11, 2023

LBP-R-12098-2

Certification #

May 07, 2020

Issued On

Susan Schulz, Acting Chief

Chemicals and Multimedia Programs Branch

STATE OF NEW YORK - DEPARTMENT OF LABOR
ASBESTOS CERTIFICATE

N.Y.S



JASON P FULLUM
CLASS(EXPIRES)
C ATEC(02/24) D INSP(02/24)
E MGPL(02/24) H PM (02/24)
I PD (02/24)

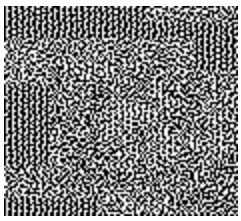
CERT# 97-20574
DMV# 375065936

MUST BE CARRIED ON ASBESTOS PROJECTS

EYES BLU
HAIR BRO
HGT 5' 11"

IF FOUND RETURN TO:
NYSDOL - L&C UNIT
ROOM 161A BUILDING 12
STATE OFFICE CAMPUS
ALBANY NY 12240

NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER



Expires 12:01 AM April 01, 2024
Issued April 01, 2022
Revised March 30, 2023

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

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

MS. KAROL H. LU
AMERICA SCIENCE TEAM NEW YORK, INC
117 EAST 30TH ST
NEW YORK, NY 10016

NY Lab Id No: 11480

is hereby APPROVED as an Environmental Laboratory for the category
ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE
All approved subcategories and/or analytes are listed below:

Miscellaneous

Asbestos in Friable Material	Item 198.1 of Manual
	EPA 600/M4/82/020
Asbestos in Non-Friable Material-PLM	Item 198.6 of Manual (NOB by PLM)
Asbestos in Non-Friable Material-TEM	Item 198.4 of Manual



Serial No.: 66402

Property of the New York State Department of Health. Certificates are valid only at the address shown and must be conspicuously posted by the laboratory. Continued accreditation depends on the laboratory's successful ongoing participation in the Program. Consumers may verify a laboratory's accreditation status online at https://apps.health.ny.gov/pubdoh/applinks/wc/elappublicweb/, by phone (518) 485-5570 or by email to elap@health.ny.gov.

NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER

Expires 12:01 AM April 01, 2024
Issued April 01, 2022
Revised March 30, 2023

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

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

MS. PHYLLIS SHILLER
PHOENIX ENVIRONMENTAL LABS
587 EAST MIDDLE TURNPIKE
MANCHESTER, CT 06040

NY Lab Id No: 11301

is hereby APPROVED as an Environmental Laboratory in conformance with the National Environmental Laboratory Accreditation Conference Standards (2016) for the category ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE
All approved analytes are listed below:

Polychlorinated Biphenyls

Aroclor 1262 (PCB-1262)	EPA 8082A
Aroclor 1262 (PCB-1262) in Oil	EPA 8082A
Aroclor 1268 (PCB-1268)	EPA 8082A
Aroclor 1268 (PCB-1268) in Oil	EPA 8082A
PCB 101	EPA 8082A
PCB 105	EPA 8082A
PCB 118	EPA 8082A
PCB 128	EPA 8082A
PCB 138	EPA 8082A
PCB 153	EPA 8082A
PCB 170	EPA 8082A
PCB 18	EPA 8082A
PCB 180	EPA 8082A
PCB 183	EPA 8082A
PCB 184	EPA 8082A
PCB 187	EPA 8082A
PCB 195	EPA 8082A
PCB 206	EPA 8082A
PCB 209	EPA 8082A
PCB 28	EPA 8082A
PCB 44	EPA 8082A
PCB 49	EPA 8082A
PCB 52	EPA 8082A
PCB 66	EPA 8082A
PCB 8	EPA 8082A
PCB 87	EPA 8082A
PCB Congeners, Total	EPA 8082A

Serial No.: 66336

Property of the New York State Department of Health. Certificates are valid only at the address shown and must be conspicuously posted by the laboratory. Continued accreditation depends on the laboratory's successful ongoing participation in the Program. Consumers may verify a laboratory's accreditation status online at https://apps.health.ny.gov/pubdoh/applinks/wc/elappublicweb/, by phone (518) 485-5570 or by email to elap@health.ny.gov.

NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER

Expires 12:01 AM April 01, 2024
Issued April 01, 2022
Revised March 30, 2023

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

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

MS. PHYLLIS SHILLER
PHOENIX ENVIRONMENTAL LABS
587 EAST MIDDLE TURNPIKE
MANCHESTER, CT 06040

NY Lab Id No: 11301

is hereby APPROVED as an Environmental Laboratory in conformance with the National Environmental Laboratory Accreditation Conference Standards (2016) for the category ENVIRONMENTAL ANALYSES AIR AND EMISSIONS
All approved analytes are listed below:

Acrylates	
Acrylonitrile	EPA TO-15
Methyl methacrylate	EPA TO-15
Chlorinated Hydrocarbons	
1,2,4-Trichlorobenzene	EPA TO-15
Hexachlorobutadiene	EPA TO-15
Hexachloroethane	EPA TO-15
Metals I	
Lead, Total	EPA 29 (6010)
	EPA 7010
Polychlorinated Biphenyls	
PCBs and Aroclors	EPA TO-10A
Polynuclear Aromatics	
Naphthalene	EPA TO-15
Purgeable Aromatics	
1,2,4-Trimethylbenzene	EPA TO-15
1,2-Dichlorobenzene	EPA TO-15
1,3,5-Trimethylbenzene	EPA TO-15
1,3-Dichlorobenzene	EPA TO-15
1,4-Dichlorobenzene	EPA TO-15
2-Chlorotoluene	EPA TO-15
Benzene	EPA TO-15
Chlorobenzene	EPA TO-15
Ethyl benzene	EPA TO-15
Isopropylbenzene	EPA TO-15
m/p-Xylenes	EPA TO-15

Serial No.: 66338

Property of the New York State Department of Health. Certificates are valid only at the address shown and must be conspicuously posted by the laboratory. Continued accreditation depends on the laboratory's successful ongoing participation in the Program. Consumers may verify a laboratory's accreditation status online at https://apps.health.ny.gov/pubdoh/applinks/wc/elappublicweb/, by phone (518) 485-5570 or by email to elap@health.ny.gov.

NEW YORK STATE OF OPPORTUNITY. Office of General Services

Design and Construction
Division of Construction, 35th Floor, Corning Tower
The Governor Nelson A. Rockefeller Empire State Plaza
Albany, New York 12242
Phone: (518) 474-0331 FAX: (518) 474-8201

SCHEDULE OF SUBMITTALS

PROJECT NO.: 47477-H

FACILITY: YONKERS ARMORY

CONTRACTOR:

PROJECT MANAGER: KELLY PERIARD

DESIGN CONSULTANT: A&J CONSULTING ENGINEERING SERVICES PC

ENGINEER-IN-CHARGE:

LEGEND

PACK: SUBMITTAL PACKAGE

SD: SHOP DRAWINGS

PD: PRODUCT DATA

EPD: ENVIRONMENTAL PRODUCT DECLARATION

SAM: SAMPLES

QCS: QUALITY CONTROL SUBMITTALS

LEED: LEED SUBMITTALS

CCS: CONTRACT CLOSEOUT SUBMITTALS

SUBMITTAL REVIEW RESPONSIBILITY:
F: OGS FIELD OFFICE
F/O: OGS FIELD OFFICE / OFFICE (ALBANY)
D: CONSULTANT / DESIGNER
S: OGS SCHEDULING DEPARTMENT
RSM: Regional Safety Manager

INSTRUCTIONS TO THE CONTRACTOR

1. Refer to **Section 013300 Submittals** of the Project Manual for general requirements regarding submittals and to **Section 017716 - CONTRACT CLOSEOUT** for project closeout submittals.
2. Refer to Sections of the specifications indicated herein for details of the requirements for each submittal listed.
3. Indicate in the rows (spaces) following each item:
a. Critical submittals and long lead items (mark with an 'X'). Some critical submittals may already be identified by the design team. Confirm that these are critical submittals.
b. The date the item will be submitted, and date approval is required (allow at least 3 weeks), and the date delivery of the material or equipment is necessary for completion of the work in accordance with the Progress Schedule. The date entered for the submittal is the last date a substitution will be considered. Proposed substitutions must be made prior to the date entered if more than one substitution is to be submitted for approval. Spaces which contain N/A do not require dates.
4. An example of a Submittal Transmittal (BDC-42) can be located at: http://www.ogs.ny.gov/BU/DC/forms/ContractorConstForms.asp
5. Submit Contract Closeout Submittals (CCS) prior to final inspection.

INSTRUCTIONS TO THE CONSULTANT / DESIGNER

1. Cut and paste required information from each Division (Div.X) tab and place in the S.O.S. tab.
2. Delete Division (Div.X) tabs after the S.O.S. tab has been in-filled.
3. Indicate F, F/O or D in column E. Items in Div.1 have defaults that can be modified as necessary.
4. Indicate items that are critical submittals in column F.
Note:
The following list of submittals is furnished for your convenience in scheduling submittals. The list is not warranted to be complete and does not take precedence over the contract documents. Enter additional submittals, as required and modify this schedule to the specific project. This S.O.S. will be used to populate the submittals website log.

SCHEDULE OF SUBMITTALS

PROJECT NO.: 47477-H

SUBMITTALS FOR APPROVAL				Send to:	Critical Submittals
Spec Section	Sub Section	Type	Description	F F/O D S	Mark "X" for all that apply
007213			**GENERAL CONDITIONS**		
007213	**6.1**	**PD**	ARTICLE 6: Designate in writing competent supervision and/or management representatives as required - include contact number in case of an emergency after work hours, including weekends and holidays (see 011000 Summary of Work)	F	
007213	**8.1**	**PD**	ARTICLE 8: Permits and licenses	F	
011100			**SAFETY**		
011100	**1.4 A**	**QCS**	Site Specific Safety Plan	RSM	
011100	**1.4 B**	**QCS**	Employee Safety Orientation Training and Documentation	D/F	
013300			**SUBMITTALS**		
013300	**1.6**	**PD**	Schedule of Submittals Acknowledgement	F	X
017329			**REMOVALS, CUTTING AND PATCHING**		
017329	**1.6 A**	**QCS**	Qualification Data: Professional Engineer.	F	
017329	**1.6 B**	**QCS**	Schedule of Selective Demolition Actiities	F	
017329	**1.6 C**	**QCS**	Predemolition Photographs or Video	F	
017716			**CONTRACT CLOSEOUT**		
017716	**1.4**	**CCS**	Project Record Documents	F	
017716	**1.5**	**CCS**	Operation and Maintenance	F	
017716	**1.6**	**CCS**	Warranties	F	
017716	**1.7**	**CCS**	Spare Parts and Maintenance Materials	F	
017900			**VIDEO TRAINING PROGRAMS**		
017900	**1.3 A**	**CCS**	Instruction Program	F	
017900	**1.3 B**	**CCS**	Documentation: Attendance Roster, Evaluations	F	
				F	
230130.52			**EXISTING HVAC AIR DISTRIBUTION SYSTEM CLEANING**		
230130.52	**2.1**	**PD**	Cleaning Methods	D	
230130.52	**2.2**	**PD**	Debris Collection Equipment	D	
230130.52	**2.3**	**PD**	Agitation System	D	
230130.52	**2.4**	**PD**	Cleaning Agents	D	
230130.52	**2.5**	**PD**	Insulation Repair Coating	D	
230130.52	**2.6**	**PD**	Antimicrobial Surface Treatment	D	
230130.52	**1.4 F 1**	**QCS**	Project Assessment Report and Work Plan	D/F	
230130.52	**1.4 F 2**	**QCS**	Duct Cleaning Procedure	D/F	
230130.52	**1.4 F 3**	**QCS**	Duct Cleaning Contractor Qualifications Data	D/F	
230130.52	**1.4 F 4**	**QCS**	Supervisor's Qualifications Data	D/F	

SCHEDULE OF SUBMITTALS

PROJECT NO.: 47477-H

SUBMITTALS FOR APPROVAL				Send to:	Critical Submittals
Spec Section	Sub Section	Type	Description	F F/O D S	Mark "X" for all that apply
230130.52	**1.5 A**	**QCS**	Qualification Data	D,F	
230130.52	**1.5 B**	**QCS**	Field Quality-Control Reports	D,F	
230130.52	**1.6 A 1**	**CCS**	Final Report consisting of locations, conditions, verification reports and sample analysis.	F	
230516			**EXPANSION FITTINGS AND LOOPS FOR HVAC PIPING**		
230516	**2.2**	**PD**	Packed Expansion Joints	D	
230516	**2.3**	**PD**	Grooved-Joint Expansion Joints	D	
230516	**2.4**	**PD**	Alignment Guides and Anchors	D	
230516	**1.3 E**	**QCS**	Welding Certificates	D/F	
230516	**1.4 A**	**CCS**	Maintenance Data	F	
230517			**SLEEVES AND SLEEVE SEALS FOR HVAC PIPING**		
230517	**2.1**	**PD**	Sleeves	D	
230517	**2.2**	**PD**	Stack-Sleeve Fittings	D	
230517	**2.3**	**PD**	Sleeve-Seal Systems	D	
230517	**2.4**	**PD**	Sleeve-Seal Fittings	D	
230517	**2.5**	**PD**	Grout	D	
230517	**2.6**	**PD**	Silicone Sealants	D	
230517	**1.3 E**	**EPD**	Environmental Product Declaration	D	
230517	**1.3 F**	**QCS**	Field Quality-Control Reports	D	
230519			**METERS AND GAGES FOR HVAC PIPING**		
230519	**1.3 E**	**SD**	Shop Drawings: Include diagrams for power, signal, and control wiring	D	
230519	**2.1**	**PD**	Bimetallic-Actuated Thermometers	D	
230519	**2.2**	**PD**	Filled-System Thermometers	D	
230519	**2.3**	**PD**	Liquid-In-Glass Thermometers	D	
230519	**2.4**	**PD**	Duct-Thermometer Mounting Brackets	D	
230519	**2.5**	**PD**	Thermowells	D	
230519	**2.6**	**PD**	Dial-Type Pressure Gages	D	
230519	**2.7**	**PD**	Gage Attachments	D	
230519	**2.8**	**PD**	Test Plugs	D	
230519	**2.9**	**PD**	Test-Plug Kits	D	
230519	**2.10**	**PD**	Sight Flow Indicators	D	
230519	**1.3 F**	**QCS**	Product Certificates	D	
230519	**1.4 A**	**CCS**	Operation and Maintenance Data	F	
230523.11			**GLOBE VALVES FOR HVAC PIPING**		
230523.11	**2.2**	**PD**	Bronze Angle Valves	D	
230523.11	**2.3**	**PD**	Bronze Globe Valves	D	
230523.11	**2.4**	**PD**	Iron Globe Valves	D	
230523.14			**CHECK VALVES FOR HVAC PIPING**		
230523.14	**2.2**	**PD**	Bronze Lift Check Valves	D	
230523.14	**2.3**	**PD**	Bronze Swing Check Valves	D	

SCHEDULE OF SUBMITTALS

PROJECT NO.: 47477-H

SUBMITTALS FOR APPROVAL				Send to:	Critical Submittals
Spec Section	Sub Section	Type	Description	F F/O D S	Mark "X" for all that apply
230523.14	**1.4 E**	**QCS**	Valve Schedule	D	
230529			**HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT**		
230529	**1.3 E**	**SD**	Shop Drawings: Show fabrication and installation details	D	
230529	**2.1**	**PD**	Metal Pipe Hangers and Supports	D	
230529	**2.2**	**PD**	Trapeze Pipe Hangers	D	
230529	**2.3**	**PD**	Fiberglass Pipe Hangers	D	
230529	**2.4**	**PD**	Plastic Pipe Hangers	D	
230529	**2.5**	**PD**	Metal Framing Systems	D	
230529	**2.6**	**PD**	Fiberglass Strut Systems	D	
230529	**2.7**	**PD**	Thermal-Hanger Shield Systems	D	
230529	**2.8**	**PD**	Fastener Systems	D	
230529	**2.9**	**PD**	Pipe Stands	D	
230529	**2.10**	**PD**	Equipment Supports	D	
230529	**2.11**	**PD**	Outdoor Equipment Stands	D	
230529	**1.3 F**	**QCS**	Welding Certificates	F	
230548.13			**VIBRATION CONTROLS FOR HVAC**		
230548.13	**1.4 E**	**SD**	Shop Drawings: Detail fabrication and assembly of equipment bases, and Vibration Isolation Base Details.	D	
230548.13	**2.2**	**PD**	Elastomeric Isolation Pads	D	
230548.13	**2.3**	**PD**	Elastomeric Isolation Mounts	D	
230548.13	**2.4**	**PD**	Restrained Elastomeric Isolation Mounts	D	
230548.13	**2.5**	**PD**	Open-Spring Isolators	D	
230548.13	**2.6**	**PD**	Restrained-Spring Isolators	D	
230548.13	**2.7**	**PD**	Housed-Restrained-Spring Isolators	D	
230548.13	**2.8**	**PD**	Pipe-Riser Resilient Support	D	
230548.13	**2.9**	**PD**	Resilient Pipe Guides	D	
230548.13	**2.10**	**PD**	Air-Spring Isolators	D	
230548.13	**2.11**	**PD**	Restrained-Air-Spring Isolators	D	
230548.13	**2.12**	**PD**	Elastomeric Hangers	D	
230548.13	**2.13**	**PD**	Spring Hangers	D	
230548.13	**2.14**	**PD**	Snubbers	D	
230548.13	**2.15**	**PD**	Restraints - Rigid Type	D	
230548.13	**2.16**	**PD**	Restraint Accessories	D	
230548.13	**2.17**	**PD**	Vibration Isolation Equipment Bases	D	
230548.13	**1.4 F**	**QCS**	Delegated-Design Submittal	D	
230548.13	**1.4 H**	**QCS**	Qualification Data: For testing agency.	D	
230548.13	**1.4 I**	**QCS**	Welding Certificates	F	
230548.13	**1.4 J**	**QCS**	Field Quality-Control Reports	D	
230548.13	**1.4 K**	**QCS**	Operation and Maintenance Data	F	
230553			**IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT**		
230553	**2.1**	**PD**	Equipment Labels	D/F	
230553	**2.2**	**PD**	Warning Signs and Labels	D	
230553	**2.3**	**PD**	Pipe Labels	D	
230553	**2.4**	**PD**	Duct Labels	D	
230553	**2.5**	**PD**	Stencils	D	

SCHEDULE OF SUBMITTALS

PROJECT NO.: 47477-H

SUBMITTALS FOR APPROVAL				Send to:	Critical Submittals
Spec Section	Sub Section	Type	Description	F F/O D S	Mark "X" for all that apply
230553	**2.6**	**PD**	Valve Tags	D	
230553	**2.7**	**PD**	Valve Service Identification Chart Frames	D	
230553	**2.8**	**PD**	Warning Tags	D	
230553	**1.3 E**	**SAM**	For color, letter style, and graphic representation required for each identification material and device.	D	
230553	**1.3 F**	**QCS**	Equipment Label Schedule	D	
230553	**1.3 G**	**QCS**	Valve Numbering Scheme	D	
230553	**1.3 H**	**QCS**	Valve Schedules	D	
230800			**COMMISSIONING OF HVAC**		
230800	**1.5 B**	**PD**	Draft Forms	D	
230800	**1.5 C**	**QCS**	Test Reports	D	
230800	**1.5 D**	**QCS**	Field Reports	D	
230800	**1.6 A**	**CCS**	Project Record Documents	D	
230800	**1.6 B**	**CCS**	Operation and Maintenance Data	F	
230923.11			**CONTROL VALVES**		
230923.11	**1.4 A**	**CCS**	Operation and Maintenance Data	F	
233300	**2.10**	**PD**	Flexible Connectors	D	
233300	**2.11**	**PD**	Duct Accessory Hardware	D	
233300	**1.3 G**	**QCS**	Source Quality-Control Reports	D	
233300	**1.5**	**QCS**	Maintenance Material Submittals	D/F	
230924	**1.5 D**	**SD**	Composite wiring and/or schematic diagrams of the modifications as proposed to be installed (standard diagrams will not be acceptable).	D/F	
230924	**2.1**	**PD**	Control Components	F	
230924	**2.2**	**PD**	Markers and Nameplates	F	
230924	**2.3**	**PD**	Wiring	F	
230924	**2.4**	**PD**	Accessories	D/F	
230924	**1.5 C**	**QCS**	Submittals Package: Submit the shop drawings, product data, and quality control submittals specified below at the same time as a package	F	
230924	**1.5 B**	**QCS**	Preliminary Submittal: Existing system test report	F	
230924	**1.5 F**	**QCS**	Company Field Advisor Data	F	
230924	**1.5 G 1**	**CCS**	System acceptance test report	D/F	
230924	**1.5 G 2**	**CCS**	Certificate: Affidavit, signed by the Company Field Advisor and notarized, certifying that the system meets the contract requirements and is operating properly	F	
230924	**1.5 G 3**	**CCS**	Operation and Maintenance Data	F	
232113			**HYDRONIC PIPING**		
232113	**1.3 D 1**	**PD**	Pipe and Tube	D	
232113	**1.3 D 2**	**PD**	Fittings	D	
232113	**1.3 D 3**	**PD**	Joining Materials	D	

SCHEDULE OF SUBMITTALS

PROJECT NO.: 47477-H

SUBMITTALS FOR APPROVAL				Send to:	Critical Submittals
Spec Section	Sub Section	Type	Description	F F/O D S	Mark "X" for all that apply
232113	**1.3 D 4**	**PD**	Transition Fittings	D	
232113	**1.3 D 5**	**PD**	Bypass Chemical Feeder	D	
232113	**1.3 E**	**EPD**	Environmental Product Declaration	D	
232113	**1.3 F**	**QCS**	Qualification Data: For Installer.	D	
232300	**2.4**	**PD**	Refrigerants	D	
232300	**1.3 F**	**QCS**	Welding Certificates	D	
232300	**1.3 G**	**QCS**	Field Quality-Control Reports	D	
232300	**1.4 A**	**CCS**	Operation and Maintenance Data	F	
232300	**1.3 E**	**SD**	Show layout of refrigerant piping and specialties; Show piping size and piping layout; Show interface and spatial relationships between piping and equipment	D/F	
232300	**1.3 D 1 b**	**PD**	Solenoid valves	D	
232300	**1.3 D 1 d**	**PD**	Filter dryers	D	
232300	**1.3 D 1 e**	**PD**	Strainers	D	
232300	**1.3 E**	**EPD**	Environmental Product Declaration	D	
232300	**1.3 D 1 f**	**PD**	Pressure-regulating valves	D	
232300	**1.3 F**	**QCS**	Welding Certificates	F	
232300	**1.3 G**	**QCS**	Field Quality-Control Reports	F	
233113			**METAL DUCTS**		
233300			**AIR DUCT ACCESSORIES**		
233300	**1.3 E 1**	**SD**	Full detailed drawings for duct accessories.	D	
233113	**2.2**	**PD**	Backdraft and Pressure Relief Dampers	D	
233113	**2.2**	**PD**	Double-Wall Rectangular Ducts And Fittings	D	
233113	**2.3**	**PD**	Single-Wall Round Ducts And Fittings	D	
233113	**2.4**	**PD**	Double-Wall Round and Flat-Oval Ducts And Fittings	D	
233113	**2.5**	**PD**	Sheet Metal Materials	D	
233113	**2.6**	**PD**	Duct Liner	D	
233113	**2.7**	**PD**	Sealant and Gaskets	D	
233113	**2.8**	**PD**	Hangers and Supports	D	
233113	**1.3 E**	**EPD**	Environmental Product Declaration	D	
233113	**1.3 G**	**QCS**	Delegated-Design Submittal	D	
233113	**1.3 H**	**QCS**	Welding certificates	F	
233113	**1.3 I**	**QCS**	Field quality-control reports	F	
233300			**AIR DUCT ACCESSORIES**		
233300	**1.3 E**	**SD**	Full detailed drawings for duct accessories.	D	
233300	**1.3 F**	**SD**	Coordination Drawings	D	
233300	**2.2**	**PD**	Backdraft and Pressure Relief Dampers	D	
233300	**2.3**	**PD**	Manual Volume Dampers	D	
233300	**2.4**	**PD**	Control Dampers	D	
233300	**2.5**	**PD**	Flange Connectors	D	
233300	**2.6**	**PD**	Turning Vanes	D	
233300	**2.7**	**PD**	Remote Damper Operators	D	
233300	**2.8**	**PD**	Duct-Mounted Access Doors	D	
233300	**2.9**	**PD**	Duct Access Panel Assemblies	D	

SCHEDULE OF SUBMITTALS

PROJECT NO.: 47477-H

SUBMITTALS FOR APPROVAL				Send to:	Critical Submittals
Spec Section	Sub Section	Type	Description	F F/O D S	Mark "X" for all that apply
233300	**2.10**	**PD**	Flexible Connectors	D	
233300	**2.11**	**PD**	Duct Accessory Hardware	D	
233300	**1.3 G**	**QCS**	Source Quality-Control Reports	D	
233300	**1.4 A**	**QCS**	Maintenance Material Submittals	F	
233300	**1.5 A**	**CCS**	Operation and Maintenance Data	F	
233346			**FLEXIBLE DUCTS**		
233346	**1.3 E**	**SD**	For Flexible Ducts	D	
233346	**1.3 F**	**SD**	Coordination Drawings	D	
233346	**2.2**	**PD**	Non-Insulated, Flexible Ducts	D	
233346	**2.3**	**PD**	Insulated, Flexible Ducts	D	
233346	**2.4**	**PD**	Flexible Duct Connectors	D	
233416			**CENTRIFUGAL HVAC FANS**		
233416	**1.3 E**	**SD**	Full detailed drawings of centrifugal HVAC fans.	D	
233416	**1.3 F**	**SD**	Coordination Drawings	D	
233416	**2.2**	**PD**	Backward-Inclined Centrifugal Fans	D	
233416	**2.3**	**PD**	Forward-Curved Centrifugal Fans	D	
233416	**2.4**	**PD**	Square In-Line Centrifugal Fans	D	
233416	**2.5**	**PD**	Tubular In-Line Centrifugal Fans	D	
233416	**2.6**	**PD**	Plenum Fans	D	
233416	**2.7**	**PD**	Motors	D	
233416	**1.3 G**	**QCS**	Field Quality-Control Reports	D	
233416	**1.5 A**	**QCS**	Maintenance Material Submittals	D/F	
233416	**1.4 A**	**CCS**	Operation and Maintenance Data	F	
233600			**AIR TERMINAL UNITS**		
233600	**1.3 E**	**SD**	Full detailed drawings for air terminal units.	D	
233600	**1.3 F**	**SD**	Coordination Drawings	D	
233600	**2.2**	**PD**	Modulating, Single-Duct Air Terminal Units	D	
233600	**2.3**	**PD**	Casing Liner	D	
233600	**1.3 G**	**QCS**	Field Quality-Control Reports	D	
233600	**1.5 A**	**QCS**	Maintenance Material Submittals	D/F	
233600	**1.4 A**	**CCS**	Operation and Maintenance Data	F	
233713.13			**AIR DIFFUSERS**		
233713.13	**1.3 H**	**SD**	Coordination Drawings	D	
233713.13	**1.3 E**	**SAM**	For each exposed product and for each color and texture specified. Actual size of smallest diffuser indicated	D	
233713.13	**1.3 F**	**SAM**	Samples for Initial Selection: For diffusers with factory-applied color finishes. Actual size of smallest diffuser indicated	D	
233713.13	**1.3 G**	**SAM**	Samples for Verification: For diffusers, in manufacturer's standard sizes to verify color selected. Actual size of smallest diffuser indicated	D	
233713.13	**2.1**	**PD**	Rectanglar and Square Ceiling Diffusers	D	
233713.13	**1.3 I**	**QCS**	Source quality-control reports	D	
233713.23			**REGISTERS AND GRILLES**		
233713.23	**1.3 H**	**SD**	Coordination Drawings	D	

SCHEDULE OF SUBMITTALS

PROJECT NO.: 47477-H

SUBMITTALS FOR APPROVAL				Send to:	Critical Submittals
Spec Section	Sub Section	Type	Description	F F/O D S	Mark "X" for all that apply
233713.23	**2.1**	**PD**	Registers	D	
233713.23	**2.2**	**PD**	Grilles	D	
237416.12	**1.4 G**	**QCS**	Manufacturer's Certificate	D,F	
237416.12	**1.4 H**	**QCS**	Manufacturer's Field Reports	D,F	
237416.12	**1.5 A**	**CCS**	Project Record Documents	D,F	
237416.12	**1.5 B**	**CCS**	Operation and Maintenance Data	D,F	
237416.11			**PACKAGED, SMALL-CAPACITY, ROOFTOP AIR-CONDITIONING UNITS**		
237416.11	**1.4 E**	**SD**	Full detailed drawings for each packaged, small-capacity, rooftop air-conditioning unit.	D	
237416.11	**1.4 F**	**SD**	Coordination Drawings	D	
237416.11	**2.4**	**PD**	Unit Casings	D	
237416.11	**2.5**	**PD**	Fan, Drives and Motors	D	
237416.11	**2.6**	**PD**	Coils	D	
237416.11	**2.7**	**PD**	Air Filtration	D	
237416.11	**2.8**	**PD**	Gas Furnaces	D	
237416.11	**2.9**	**PD**	Dampers	D	
237416.11	**2.10**	**PD**	Electrical Power Connections	D	
237416.11	**2.11**	**PD**	Controls	D	
237416.11	**2.12**	**PD**	Roof Curbs	D	
237416.11	**2.13**	**PD**	Accessories	D	
237416.11	**1.4 G**	**QCS**	Sample Warranty	D	
237416.11	**1.4 H**	**QCS**	Product Certificates	D	
237416.11	**1.4 I**	**QCS**	Source Quality-Control Reports	D	
237416.11	**1.4 J**	**QCS**	System Startup Reports	D	
237416.11	**1.4 K**	**QCS**	Field Quality-Control Reports	D	
237416.11	**1.6 A**	**QCS**	Maintenance Material Submittals	D,F	
237416.11	**1.5 A**	**CCS**	Operation and Maintenance Data	D,F	
237416.12			**PACKAGED, INTERMEDIATE-CAPACITY, ROOFTOP AIR CONDITIONING UNITS**		
237416.12	**2.1**	**PD**	Rooftop Air Conditioning Units	D	
237416.12	**1.4 E**	**QCS**	Test Reports	D	
237416.12	**1.4 F**	**QCS**	Manufacturer's Installation Instructions	D,F	
237416.12	**1.4 G**	**QCS**	Manufacturer's Certificate	D,F	
237416.12	**1.4 H**	**QCS**	Manufacturer's Field Reports	D,F	
237416.12	**1.5 A**	**CCS**	Project Record Documents	D,F	
237416.12	**1.5 B**	**CCS**	Operation and Maintenance Data	D,F	
238126			**SPLIT-SYSTEM AIR-CONDITIONERS**		
238126	**1.3 E**	**SD**	Full detailed drawings for central refrigeration units and rack-cooling units.	D	
238126	**2.2**	**PD**	Indoor Units (5 Tons or less)	D	
238126	**2.3**	**PD**	Outdoor Units (5 Tons or less)	D	
238126	**2.4**	**PD**	Accessories	D	
238126	**1.3 F**	**SAM**	Color Samples	D,F	
238126	**1.3 G**	**QCS**	Field Quality-Control Reports	D,F	
238126	**1.3 H**	**QCS**	Sample Warranty	D,F	
238126	**1.5 A**	**QCS**	Maintenance Material Submittal	D,F	

SCHEDULE OF SUBMITTALS

PROJECT NO.: 47477-H

SUBMITTALS FOR APPROVAL				Send to:	Critical Submittals
Spec Section	Sub Section	Type	Description	F F/O D S	Mark "X" for all that apply
238126	**1.4 A**	**CCS**	Operation and Maintenance Data	D,F	
238129			**VARIABLE-REFRIGERANT-FLOW HVAC SYSTEMS**		
238129	**1.4 E**	**SD**	Full detailed drawings for VRF HVAC Systems	D	
238129	**1.4 G**	**SD**	Coordination Drawings	D	
238129	**2.3**	**PD**	Indoor, Exposed, Wall-Mounted Units	D	
238129	**2.4**	**PD**	Indoor, Recessed, Ceiling-Mounted Units	D	
238129	**2.5**	**PD**	Indoor, Suspended, Ceiling-Mounted Units	D	
238129	**2.6**	**PD**	Outdoor, Air-Source Heat-Pump Units	D	
238129	**2.7**	**PD**	System Controls	D	
238129	**2.8**	**PD**	System Refrigerant and Oil	D	
238129	**2.9**	**PD**	System Condensate Drain Piping	D	
238129	**2.10**	**PD**	System Refrigerant Piping	D	
238129	**2.11**	**PD**	Metal Hangers and Supports	D	
238129	**2.12**	**PD**	Metal Framing Systems	D	
238129	**2.13**	**PD**	Fastener Systems	D	
238129	**2.14**	**PD**	Pipe Stands	D	
238129	**2.15**	**PD**	Outdoor Equipment Stands	D	
238129	**2.16**	**PD**	Miscellaneous Support Materials	D	
238129	**2.17**	**PD**	Piping and Tubing Insulation	D	
238129	**2.18**	**PD**	System Control Cable	D	
238129	**1.4 F**	**SAM**	Samples for Initial Selection: For fully and partially exposed indoor units with factory finishes viewable by occupants	D,F	
238129	**1.4 H**	**QCS**	Qualification Data	D,F	
238129	**1.4 I**	**QCS**	Product Certificates	D,F	
238129	**1.4 J**	**QCS**	Product Test Reports	D,F	
238129	**1.4 K**	**QCS**	Source Quality-Control Reports	D,F	
238129	**1.4 L**	**QCS**	Field Quality-Control Reports	D,F	
238129	**1.4 M**	**QCS**	Sample Warranty	D,F	
238129	**1.6**	**QCS**	Maintenance Material Submittal	D,F	
238129	**1.5 A**	**CCS**	Operation and Maintenance Data	D,F	
238129	**1.5 B**	**CCS**	Software and Firmware Operational Documentation	D,F	
238129	**1.6 A**	**CCS**	Maintenance Material Submittal	D,F	
238239.13			**CABINET UNIT HEATERS**		
238239.13	**1.4 F**	**SD**	Full detailed drawings for heaters	D	
238239.13	**2.4**	**PD**	Cabinets	D	
238239.13	**2.5**	**PD**	Coils	D	
238239.13	**2.6**	**PD**	Controls	D	
238239.13	**1.4 G**	**SAM**	For each exposed product and for each color and texture specified	D	
238239.13	**1.4 H**	**SAM**	Finish colors for units with factory-applied color finishes.	D	
238239.13	**1.4 I**	**SAM**	Finish colors for each type of cabinet unit heater indicated with factory applied color finishes.	D	
238239.13	**1.4 J**	**QCS**	Field Quality-Control Reports	D,F	
238239.13	**1.5**	**CCS**	Operation and Maintenance Data	D,F	
238239.19			**WALL AND CEILING UNIT HEATERS**		

SCHEDULE OF SUBMITTALS

PROJECT NO.: 47477-H

SUBMITTALS FOR APPROVAL				Send to:	Critical Submittals
Spec Section	Sub Section	Type	Description	F F/O D S	Mark "X" for all that apply
238239.19	**1.3 E**	**SD**	Full detailed drawings for heaters	D	
238239.19	**2.3**	**PD**	Cabinet	D	
238239.19	**2.4**	**PD**	Coil	D	
238239.19	**2.5**	**PD**	Fan and Motor	D	
238239.19	**2.6**	**PD**	Controls	D	
238239.19	**1.3 F**	**SAM**	For each exposed product and for each color and texture specified	D,F	
238239.19	**1.4**	**CCS**	Operation and Maintenance Data	D,F	

Design and Construction
n of Construction, 34th Floor, Corning Tower
nor Nelson A. Rockefeller Empire State Plaza
Albany, New York 12242
hone: (518) 474-0331 FAX: (518) 474-8201

Contractor's Projected Dates Allow at least 4 weeks for Approval (allows time for any resubmission)		
Projected Transmittal Date:	Projected Approval Date:	Projected Delivery Date:

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Projected Transmittal Date:	Projected Approval Date:	Projected Delivery Date:

SDVOB UTILIZATION PLAN

☐ **Initial Plan** ☐ **Revised plan** **Contract/Solicitation #** _____

INSTRUCTIONS: This Utilization Plan must contain a detailed description of the supplies and/or services to be provided by each NYS **Certified** Service-Disabled Veteran-Owned Business (SDVOB) under the contract. By submission of this Plan, the Bidder/Contractor commits to making good faith efforts in the utilization of SDVOB subcontractors and suppliers as required by the SDVOB goals contained in the Solicitation/Contract. Making false representations or providing information that shows a lack of good faith as part of, or in conjunction with, the submission of a Utilization Plan is prohibited by law and may result in penalties including, but not limited to, termination of a contract for cause, loss of eligibility to submit future bids, and/or withholding of payments. Firms that do not perform commercially useful functions may not be counted toward SDVOB utilization. Attach additional sheets if necessary.

BIDDER/CONTRACTOR INFORMATION		**SDVOB Goals In Contract**
Bidder/Contractor Name:	NYS Vendor ID:	%
Bidder/Contractor Address (Street, City, State and Zip Code):		
Bidder/Contractor Telephone Number:	Contract Work Location/Region:	
Contract Description/Title:		

CONTRACTOR INFORMATION			
Prepared by (Signature):	Name and Title of Preparer:	Telephone Number:	Date:
Email Address:			

If unable to meet the SDVOB goals set forth in the solicitation/contract, bidder/contractor must submit a request for waiver on the SDVOB Waiver Form.

SDVOB Subcontractor/Supplier Name:		
Please identify the person you contacted:	Federal Identification No.:	Telephone No.:
Address:	Email Address:	
Detailed description of work to be provided by subcontractor/supplier:		
Dollar Value of subcontracts/supplies/services (When $ value cannot be estimated, provide the estimated % of contract work the SDVOB will perform): $_____ or _____%		

SDVOB Subcontractor/Supplier Name:		
Please identify the person you contacted:	Federal Identification No.:	Telephone No.:
Address:	Email Address:	
Detailed Description of work to be provided by subcontractor/supplier:		
Dollar Value of subcontracts/supplies/services (When $ value cannot be estimated, provide the estimated % of contract work the SDVOB will perform): $_____ or _____%		

FOR OGS USE ONLY				
OGS Authorized Signature:		☐ **Accepted**	☐ **Accepted as Noted**	☐ **Notice of Deficiency**
NAME (Please Print):	**SDVOB %/$** ____	____	**Date Received:**	**Date Processed:**
Comments:				

NYS CERTIFIED SDVOB SUBCONTRACTOR/SUPPLIER INFORMATION: The directory of New York State Certified SDVOBs can be viewed at: https://ogs.ny.gov/Veterans/default.asp

Note: All listed Subcontractors/Suppliers will be contacted and verified by OGS.

ADDITIONAL SHEET

Bidder/Contractor Name:	**Contract/Solicitation #**_____

SDVOB Subcontractor/Supplier Name:		
Please identify the person you contacted:	Federal Identification No.:	Telephone No.:
Address:	Email Address:	
Detailed Description of work to be provided by subcontractor/supplier:		
Dollar Value of subcontracts/supplies/services (When $ value cannot be estimated, provide the estimated % of contract work the SDVOB will perform): $_____ or _____%		
SDVOB Subcontractor/Supplier Name:		
Please identify the person you contacted:	Federal Identification No.:	Telephone No.:
Address:	Email Address:	
Detailed Description of work to be provided by subcontractor/supplier:		
Dollar Value of subcontracts/supplies/services (When $ value cannot be estimated, provide the estimated % of contract work the SDVOB will perform): $_____ or _____%		
SDVOB Subcontractor/Supplier Name:		
Please identify the person you contacted:	Federal Identification No.:	Telephone No.:
Address:	Email Address:	
Detailed Description of work to be provided by subcontractor/supplier:		
Dollar Value of subcontracts/supplies/services (When $ value cannot be estimated, provide the estimated % of contract work the SDVOB will perform): $_____ or _____%		
SDVOB Subcontractor/Supplier Name:		
Please identify the person you contacted:	Federal Identification No.:	Telephone No.:
Address:	Email Address:	
Detailed Description of work to be provided by subcontractor/supplier:		
Dollar Value of subcontracts/supplies/services (When $ value cannot be estimated, provide the estimated % of contract work the SDVOB will perform)): $_____ or _____%		
SDVOB Subcontractor/Supplier Name:		
Please identify the person you contacted:	Federal Identification No.:	Telephone No.:
Address:	Email Address:	
Detailed Description of work to be provided by subcontractor/supplier:		
Dollar Value of subcontracts/supplies/services (When $ value cannot be estimated, provide the estimated % of contract work the SDVOB will perform): $_____ or _____%		

NEW YORK STATE OF OPPORTUNITY. | Office of General Services | Division of Service-Disabled Veterans' Business Development

Instructions for Completing the Monthly SDVOB Compliance Report – SDVOB 101

The SDVOB Monthly Reporting Form is to be completed by the Contractor/Vendor, and submitted by the 10th day of *each* month for the duration of the Contract. This form should include **all** (e.g. SDVOB and non SDVOB) Subcontractors and/or Suppliers assigned by the Contractor/Vendor to perform work during the contract. This reporting should also include payments made by your Subcontractors and/or Suppliers to SDVOB firms.

Complete the form as specified below.

Contract No.	Indicate the OGS Contract No.
Contractor/Vendor Name and Address	Provide your firm's name and address.
Federal ID No.	Enter your firm's Federal ID No.
Goals	Indicate SDVOB participation goals.
Reporting Period	Fill in the month and year of reporting period. One copy must be submitted with final payment application.
Description of Project	Briefly describe the work you are providing under the terms of this contract.
Firm Name and Address	Provide the name, address and phone number of **all** Subcontractors/Suppliers assigned by the Contractor/Vendor on this contract or purchase agreement(s).
Federal ID No.	Enter the Subcontractor's/Supplier's Federal ID No. If no Federal ID No. has been assigned, provide only the owner's last four (4) digits of his or her Social Security No.
Payment This Month	Indicate the amount paid *this month* to each Subcontractor/Supplier. If there was no income activity for a Subcontractor/Supplier, please check the box indicating "No Payment This Month."
Contract Amount	Enter the total contract amount or purchase agreement(s) amount for each Subcontractor/Supplier.
Description of Work/Supplies	Briefly describe the work performed or supplies provided by each Subcontractor/Supplier.

Submit to:

Design & Construction SDVOB Compliance Specialist
35th Floor, Corning Tower
Albany, New York 12242
Email: DCSDVOB@ogs.ny.gov

CONTRACTOR'S MONTHLY SDVOB COMPLIANCE REPORT (DUE ON THE 10TH DAY OF EACH MONTH FOR THE PRECEDING MONTH'S ACTIVITY AS EVIDENCE TOWARDS ACHIEVEMENT OF THE SDVOB GOALS ON THE CONTRACT)

Contract No.: _____

Contractor/Vendor Name, Address and Phone No.:	Contractor/Vendor Federal ID No.:	SDVOB Goals	Reporting Period	
	Description of Project:	%	Month	Year

Firm Name, Address and Phone Number (List All Firms)	Description of Work or Supplies Provided	Designation		Payment This Month	Contract Amount
Federal ID No.:		☐ SDVOB ☐ Sub ☐ Broker ☐ Joint Venture ☐ Written Contract	☐ Supplier ☐ Team ☐ Other ☐ No Written Contract	☐ No Payment This Month	
Federal ID No.:		☐ SDVOB ☐ Sub ☐ Broker ☐ Joint Venture ☐ Written Contract	☐ Supplier ☐ Team ☐ Other ☐ No Written Contract	☐ No Payment This Month	
Federal ID No.:		☐ SDVOB ☐ Sub ☐ Broker ☐ Joint Venture ☐ Written Contract	☐ Supplier ☐ Team ☐ Other ☐ No Written Contract	☐ No Payment This Month	
Federal ID No.:		☐ SDVOB ☐ Sub ☐ Broker ☐ Joint Venture ☐ Written Contract	☐ Supplier ☐ Team ☐ Other ☐ No Written Contract	☐ No Payment This Month	

_____ Signature

_____ Print Name and Title

_____ Date

Submission of this form constitutes the Contractor's acknowledgement as to the accuracy of the information contained herein. Failure to submit complete and accurate information may result in a finding of noncompliance, non-responsibility, suspension and/or termination of the Contract.

For OGS Use Only	
Reviewed By:	Date:

APPLICATION FOR WAIVER OF SDVOB PARTICIPATION GOAL

(must be submitted before requesting final payment on the Contract)

Section 1: Basic Information

Contractor's Name:	Federal Identification Number:
Street Address:	E-Mail Address:
City, State, Zip Code:	Telephone: ( ) -

Contract Number:	SDVOB CONTRACT GOALS %

Section 2: Type of SDVOB Waiver Requested

☐ Total	☐ Partial	If partial waiver, please enter the revised SDVOB percentage:	%

Please explain the reason for the waiver request:

Section 3: Supporting Documentation

Provide the following documentation as evidence of your good faith efforts to meet the SDVOB goals set forth in the contract and in support of your waiver application:

- ❑ **Attachment A.** Copies of solicitations to SDVOBs and any responses thereto.
- ❑ **Attachment B.** Explanation of the specific reasons each SDVOB that responded to Bidders/Contractors' solicitation was not selected.
- ❑ **Attachment C.** Dates of any pre-bid, pre-award or other meetings attended by Contractor, if any, scheduled by OGS with certified SDVOBs whom OGS determined were capable of fulfilling the SDVOB goals set forth in the contract.
- ❑ **Attachment D.** Information describing the specific steps undertaken to reasonably structure the contract scope of work for the purpose of subcontracting with, or obtaining supplies from, certified SDVOBs.
- ❑ **Attachment E.** Other information deemed relevant to the request.

Section 4: Signature and Contact Information

By signing and submitting this form, the contractor certifies that a good faith effort has been made to promote SDVOB participation pursuant to the SDVOB requirements set forth under the solicitation or Contract. Failure to submit complete and accurate information may result in a finding of noncompliance, non-responsibility, and a suspension or termination of the contract.

Prepared By: (Signature)	Date:
Name and Title of Preparer (Print or Type)	

For OGS Use Only	
Reviewed By:	Date:
Decision: ☐ Full SDVOB waiver granted ☐ Partial SDVOB waiver granted; revised SDVOB goal: _____ % ☐ SDVOB waiver denied	
Approved By:	Date:
Date Notice of Determination Sent:	
Comments	