PROJECT MANUAL

KITTINGER HALL BOILER ROOM UPGRADES (REBID)

Erie County Community College

North Campus
6205 Main Street
Williamsville, NY,14221
DATE: October 26, 2026

PROJECT #: 2025-956-02
REBID DATE: November 17, 2026

MARK C. POLONCARZ
COUNTY EXECUTIVE

DEPARTMENT OF PUBLIC WORKS
OFFICE OF THE COMMISSIONER

WILLIAM E. GEARY
COMMISSIONER OF PUBLIC WORKS

ERIE COUNTY DEPARTMENT OF PUBLIC WORKS
OFFICE OF THE COMMISSIONER

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COUNTY OF ERIE
NOTICE TO BIDDERS
SUNY ECC North Campus Kittinger Hall Boiler Upgrades Project (REBID)
ECDPW PROJECT NO. 2025-956-02

Separate Sealed bids for Electrical Construction work at the above County facility will be received by the County's Commissioner of Public Works in Suite 1400 of the Rath County Office Building, 95 Franklin Street, Buffalo, New York 14202 until 10:30 AM local time on Tuesday, November 17, 2026; at which time they will be opened and read aloud.

The bidding documents, specifications, and drawings may be downloaded from the Erie.gov website http://www.erie.gov/dpw/, ON-LINE BID RETRIEVAL, or examined at the following offices:

Erie County Department of Public Works
Office of the Commissioner
Rath County Office Building
95 Franklin Street, Suite 1400
Buffalo, NY 14202

Construction Exchange of Buffalo & WNY
2660 William Street
Cheektowaga, NY 14227
http://www.conexbuff.com/

Bids will not be accepted unless the bid package is downloaded directly from www.erie.gov/dpw so that contact information is captured by ECDPW for bid addenda and communication.

A Pre-Bid Conference/Site visit will be held at 9:00AM on Thursday, October 29, 2026. Contractors are to convene at ECC North Campus Kittinger Hall faculty lounge K125 to review the scope of the project and respond to questions from the bidders.

Each proposal must be accompanied by a Bid Bond of five percent (5%) of the amount of the bid payable unconditionally to the County of Erie.

The Contractor's attention is drawn to the provisions in the General Conditions establishing a Service-Disabled Veteran Owned Business/Minority/Women Business Utilization requirement for this project. Contractors are advised that by submitting a signed and sealed bid proposal they are agreeing and committing to the SDVOB/WBE/MBE requirements contained in this project.

The Contractor's attention is further drawn to requirements for Contractor's participation in a New York State Certified Apprenticeship Training Program. **In addition, the Contractor shall be advised that provisions set forth by Erie County Executive Order #18 ("EO #18") may apply.**

Attention of bidders is called to the fact that if a prospective bidder is not registered as a bidder with the Office of the Commissioner of Public Works by virtue of his/her downloading of the bidding documents, then notices of contract addenda or other significant matters related to the contract proposal or bid will not be communicated to said prospective bidder.

The County of Erie reserves the right to reject any or all bids and waive any informality.

WILLIAM E. GEARY
Commissioner of Public Works
Rath County Office Building
95 Franklin Street, Suite 1400
Buffalo, NY 14202

DATED: October 26, 2026

Natalie Tan

Natalie Tan, Assistant Architect
95 Franklin Street
Buffalo NY 14202

Schedule Year	2026
Date Requested	07/31/2026
PRC#	2026022915

Location	SUNY Erie North Campus
Project ID#	2025-956-02
Project Type	Replace hot water heating plant and relocate existing electrical equipment/switchgear

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

INFORMATION FOR BIDDERS

1. THE PROJECT CONSISTS OF:

A. Mechanical Plumbing Construction Work, including but not limited to Replacement of Boilers, Hot Water Heaters including all piping, controls, upgrades to the boiler room, TAB, Commissioning, associated General Construction work including but not limited to abatement, exterior envelope modifications and restoration, interior and exterior finishes, and temporary facilities.

B. (REBID) Electrical Construction Work, including but not limited to relocation of electrical switchgear within the boiler room to enable the boiler upgrades, power, distribution, fire alarm and lighting.

2. RECEIPT AND OPENING OF PROPOSALS

A. Sealed bids for Electrical Construction work (REBID) will be received by the Department of Public Works, Office of the Commissioner, 14th Floor, Rath County Office Building, 95 Franklin Street, Buffalo NY 14202 until 10:30am local time on Tuesday, November 17, 2026 at which time they will be publicly opened and read aloud.

3. ARCHITECT/ENGINEER

A. For the purpose of this contract, the Prime Consultants defined in the General Conditions, shall be: IBC Engineering DPC.

B. Direct all inquiries concerning these documents to:

Name: Robert Eimer, PE

Address: 2495 Main Street, Suite 318, Buffalo, NY 14214

Phone: 716-836-2315 ext. 234

Cell Phone: 716-863-8219

Fax: 716-836-2319

E-Mail: reimer@ibceng.com

4. SITE VISITATION / PRE-BID CONFERENCE

A. A Pre-Bid Conference will be held at 9:00 AM on Thursday October 29, 2026 at ECC North Campus Kittinger Hall to review the scope of the project and respond to any questions from bidders.

B. Prospective Bidders shall assemble promptly on the date indicated at Kittinger Hall faculty lounge K125.

5. PREPARATION OF PROPOSALS

A. Submit proposal on the enclosed form. Enclose in sealed envelope bearing the title of the work and the name of the Bidder. Bidders shall submit all of the following to be considered :

1) Proposal Form, included herein, inclusive of the following:

1) Base Bid Price

    a) The Base Bid Price is inclusive of any associated allowances for a given Contract within the Project. If allowances are associated with the Project, note that the contractor is to include an overhead and profit markup for the entirety of a Lump-Sum Allowance. See Specification 012100 – Allowances included in the Project Manual for more information.

2) Completion Time

3) Alternate Pricing (if applicable)

4) Unit Pricing (if applicable)

5) Substitutions (if applicable)

6) Acknowledgement of all Addenda

7) Non-Collusive Bidding Certificate

8) Company information with Owner Signature

9) Apprenticeship Certification (if applicable; see the proposal form and Section 10 of the General Conditions for more information)

10) Contractors Own Workforce – See Section 3.18 of the General Conditions for more information

11) Equal Pay Certification - See Sections 8.04 and 8.07 of the General Conditions for more information

12) Erie County Executive Order #18 Attestation and Statement of Workforce (if applicable; See the proposal form and Section 8.08 of the General Conditions for more information)

13) Drug and Alcohol Testing Compliance Form

2) Experience Questionnaire conforming to the New York Vendor Responsibility Questionnaire For-Profit Construction (Form CCA-2) as included within the project manual.

    1) **NOTE** – Failure to submit the competed Responsibility Questionnaire referenced above with the sealed bid proposal shall render the bid non-responsive and the bid shall not be considered in accordance with Erie County Local Law 2-2021.

        a) See Appendix D for the fill version of Local Law 2-2021.

    2) Form CCA-2 is to be provided with the sealed bid proposal in its entirety, inclusive of Attachments A and B.

a) **Attachment C titled 'FINANCIAL INFORMATION' will only be required to be provided by the awarded contractor, prior to final contract execution, at the request of the County.** Failure to project Attachment C at the request of the County may result in termination or cancelled execution of the contract associated with a given Project.

3) If the contractor is already enrolled in the New York State's VendRep system, the contractor is permitted to print out their packet from the State's system, in its entirety inclusive of Attachments A and B, to provide within their respective sealed bid proposal submission.

4) All documents related to the CCA-2 Questionnaire can be found in the front end of the project manual and can also be found at the link below

https://www.osc.state.ny.us/state-vendors/vendrep/profit-construction-questionnaire-cca-2

3) Erie County Minority/Women Business Enterprise & Service-Disabled Veteran Owned Business Utilization Report – Part A included herein (if applicable; See the proposal form and Section 8.06 of the General Conditions for more information).

4) Bid Bond in an amount not less than five percent (5%) of the base bid.

5) Public Work Contractor and Subcontractor Registration. 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.

Projects subject to Article 8 of the Labor Law include those covered by Labor Law Sections 224-a (public subsidy funded projects), 224-d (renewable energy systems), 224-e (broadband projects), 224-f (climate risk-related and energy transition projects, and roadway excavations.)

Contractors need to register before submitting any new bids or commencing new work on a covered project on or after December 30, 2024. Subcontractors need to register before commencing new work on a covered project on or after December 30, 2024. NYSDOL encourages all contractors and subcontractors to register as soon as possible to obtain a Certificate of Registration to avoid negatively impacting a bidding period or project schedule.

https://dol.ny.gov/public-work-contractor-and-subcontractor-registry-landing

B. In case of a difference between the stipulated amount of the proposal written in words and the stipulated amount written in figures, the stipulated amount stated in written words shall govern.

C. Proposals shall not contain any recapitulations of the work to be done. Alternate proposals will not be considered unless called for. Oral proposals or modifications will not be considered.

D. Any Bidder may withdraw their proposal, either personally or by fax or written request, at any time prior to the scheduled closing time for receipt of proposals.

E. All proposal forms submitted by a bidder requiring a bidder's signature must bear an original signature signed in ink. Proposals submitted without original signatures will be rejected.

6. AWARD OR REJECTION

A. The Contract for each phase of the work will be awarded to the lowest qualified responsible Bidder. The Owner reserves the right to reject any or all proposals or to waive any informality. All proposals shall be good for 90 days from date of opening.

1) For the purposes of bidding and planning when the work can begin, the Notice To Proceed can expect to be issued within 90 days of the bid opening and therefore all work specified within a given contract shall be planned accordingly by the lowest responsible bidder to commence without delay or extra compensation from the County within that timeframe. Once the Notice To Proceed is issued, the contractor is responsible for completing the work within the specified completion time on the bid proposal by the contractor, unless otherwise approved by the County.

B. For the purpose of determining the lowest responsible bidder, the County shall compare all base bids plus any add or any deduct Alternate Bid items. Unit prices set forth in the proposal shall not be considered in determining the lowest responsible bidder.

C. The County reserves the right to accept or reject any and all Alternate Bid Items in any order. The low-bidder will be determined based on the base scope of work and the alternates selected by the Owner, if applicable.

D. The County reserves the right to deem a contractor “Non-responsible” in accordance with Erie County Local Law No. 2-2021

7. INTERPRETATION OF DOCUMENTS

A. If any person contemplating submitting a proposal is in doubt as to the true meaning of any part of the Drawings, Specifications or other Contract Documents, or finds discrepancies in or omissions from the Drawings or Specifications, he may submit to the Architect - Engineer a written request for an interpretation or correction thereof. The person submitting the request will be responsible for its prompt delivery. Any interpretation or correction of the documents will be made only by Addendum duly issued and a copy of the Addendum will be forwarded to each person receiving a set of the Contract Documents. Neither the Owner nor the Architect - Engineer will be responsible for any other explanations or interpretations of the Contract Documents.

8. ADDENDA

A. Any Addenda issued during the time of bidding shall be covered in the proposal, and shall be made a part of the Contract Documents. Receipt of each Addendum shall be acknowledged in the proposal.

B. A final addendum will be issued no later than Thursday, November 12, 2026. Requests for interpretation or correction (RFI) shall be submitted to the Architect no later than 5:00 PM on Tuesday, November 10, 2026..

9. BID BOND

A. Each proposal must be accompanied by a Bid Bond in form similar to American Institute of Architects Document No. A-310 in an amount not less than five percent (5%) of the base bid.

B. Should the Bidder, if awarded the Contract, fail to execute the Agreement within five (5) days in accordance with the proposal and other Contract Documents the Bid Bond amount shall be forfeited to the Owner as liquidated damages caused by such failures.

10. PERFORMANCE AND LABOR AND MATERIAL PAYMENT BOND

A. The bidder or bidders whose proposal is accepted shall furnish a Performance and Labor and Materials Payment Bond to the County of Erie in the penal amount of 100% of the contract price, if the contract is based upon a time and material price, or 100% of the estimated cost if the contract is based upon a unit price, such bond to be duly executed by the bidder as principal and by a duly incorporated company authorized to guarantee the performance of contracts and to do business in the State of New York, as surety. The Bond shall be on a form approved by the County Attorney, a copy of which is included herein.

11. QUALIFICATIONS OF BIDDERS

A. The Bidder shall submit all documents as described in Section 5 above.

B. All prospective bidders are hereby notified that they must be able to prove to the satisfaction of the Owner that they are a responsible bidder and have the skill and experience, as well as the necessary facilities, ample financial resources, organization and general reliability to do the work to be performed under the provisions of the contract in a satisfactory manner and within the time specified.

C. At the request of the Owner, within forty-eight hours (48) after the opening of the proposals, the lowest three bidders, if requested, must submit, in duplicate, to the Owner a current financial statement certified to be true and correct by a certified public accountant or an officer or principal of the bidder.

D. Each bidder must be prepared to show to the satisfaction of the Owner that he has sufficient liquid assets available for the project upon which he is bidding. The Owner does not regard credit, borrowed money, equity in real estate, life insurance, reserves representing pre-payment of taxes and life insurance, and other expenses, deposits held as security for other contracts, capital of proposed sub-contractors, capital stock of the contractor, and similar items, as liquid assets available for the work to be performed under the contract.

E. A bidder must also be prepared to prove to the satisfaction of the Owner that he has successfully completed a contract of similar work in an amount of not less than 25 percent of the amount of the proposed contract.

F. Each bidder must comply promptly with all requests by the Owner for information and must actively cooperate with the Owner in its efforts to determine whether the bidder is qualified.

G. The award of the contract shall not be construed as a guarantee by the Owner that the plant, equipment and the general scheme of operations and other data submitted by the bidder with or after their proposal is either adequate or suitable for the satisfactory performance of the work.

12. ACKNOWLEDGEMENTS

A. All acknowledgements of Contractor and Owner, Principal and Surety shall be subject to the approval of the Erie County Attorney, State of New York.

13. EQUIVALENT MATERIAL OR EQUIPMENT

A. Whenever a specific material or equipment item is named in the plans or specifications, the Contractor shall furnish the material or equipment thus named, unless: (1) in the Bid, the contractor names another item which he proposes as the full equivalent of the named item, and in executing the Contract the Owner accepts such substitution; or (2) the Owner subsequently approves a substitution during the course of project construction by Change Order.

14. LIST OF PROPOSED SUBCONTRACTORS

A. The low bidder, or three low bidders if requested, shall submit a complete list of sub-contractors he proposes to use not later than 48 hours after receipt of bid proposals.

B. Sub-contractor list shall be delivered to the Architect with a copy for the Owner.

C. Execution of the Contract by the Owner without objection to any name on said list shall constitute an acceptance of the same. Should the Owner request that a different sub-contractor be proposed for any phase of the work, the bidder shall comply with such requests until a sub-contractor acceptable to the Owner is proposed. No sub-contractor approved by the Owner may be replaced unless replacement is approved by the Owner.

15. NON-COLLUSIVE BIDDING CERTIFICATE

A. Attention of all bidders is called to provisions of State Law requiring the bid itself to contain a certificate that there has been no collusion in the preparation or submittal of such bid. (See pertinent portion of Proposal Form.)

16. SALES TAX EXEMPTION

A. The Owner is an exempt organization under the Tax Law and is exempt from payment of Sales and Compensating Use Taxes of the State of New York and cities and counties of the State on all materials sold to the Owner pursuant to the provisions of the Contract. These taxes are not to be included in bids.

1. Section 115 (a) (15) of the Tax Law provides that tangible personal property sold to a Contractor for use in erecting a structure or building for an exempt organization is exempt from the Sales and Compensating Use Tax of the State of New York and of cities and counties of the State provided such tangible personal property is to become an integral component part of such structure, building, or real property.

2. There is no exemption from the Sales or Use Tax on sales or charges to a Contractor or sub-contractor for the purchase or lease of supplies, machinery, equipment, tools, services, etc., used or consumed in the completion of the Contract. The Contractor and its sub-contractors shall be responsible for and pay any and all applicable taxes including Sales and Compensating Use Taxes on such items.

17. BIDDING DOCUMENTS

A. Drawings, Specifications and other Bidding Documents must be downloaded from the Erie.gov website http://www.erie.gov/dpw/, ‘Bids, RFPs, RFQs’ then select ‘Bid Documents’, unless stated otherwise in the Notice to Bidders. Electronic pdf files of the Bid Documents will be available for each Prime Contract Bidder for purposes of preparing a bona fide Proposal.

18. EXISTING CONDITIONS

A. It shall be the responsibility of each and every bidder to thoroughly investigate all existing conditions and he shall acquaint themselves with existing conditions, insofar as it may affect their work and/or bidding.

B. The Bidder, before submitting a proposal, shall satisfy themselves fully as to the work called for on the Contract Documents, and to the working conditions and condition of the site, including the existence of other facilities and/or structures on, over or under the site which may interfere with, or make more difficult, the performance of the Contract.

C. The signature of the Bidder upon the proposal form shall constitute a certification to the Owner that such Bidder is fully informed regarding all the conditions affecting the work to be done, that such information was secured by personal investigation and that such Bidder accepts full responsibility for their bid.

D. If a Bidder should encounter any condition not provided for in the Contract Documents that will affect their bid or the performance of their contract obligations, should he be the successful bidder, he shall notify the Architect, in writing, at least five (5) days prior to opening of bids.

19. WAGE RATES

A. It is hereby agreed by the parties to this contract that all laborers, workmen and mechanics employed on the work done in performance of said contract shall be paid not less than the rate of wages listed on the current prevailing rate schedule issued by the New York State Department of Labor for the trade or occupation of such laborer, workmen, or mechanics, and any supplements thereto.

B. The wage rates and supplemental benefits to be paid such laborer, workmen or mechanics shall always be those prevailing at the time the work is being performed.

C. A copy of the current "Prevailing Rate Schedule" is attached hereto for convenience. The wage rates and supplemental benefits listed thereon are subject to change and may be superseded by any schedule hereafter issued by the New York State Department of Labor. Any such revised schedules shall be attached hereto and become a part of this contract, but this will in no way alter the contract amount or any provisions of said contract.

D. It is the responsibility of the Contractor to remain familiar with the currently applicable schedule.

E. Should the Contractor employ laborers, workmen or mechanics engaged in any trade for which a wage rate is not stipulated in the attached schedule, or any supplements thereto, he shall obtain the appropriate wage rate from the New York State Department of Labor before employing the laborer, workman or mechanic.

F. Section 220-a of the New York State Labor Law requires the Contractor and each of its sub-contractors to place on file with the Owner, certificates relating to the final payment of wages and supplements for Labors on this Project. Samples of the required certificates immediately follow this section and are designated as PICC-1 (Sub-contractor Certification) and PICC-2 (Prime Contractor Certification, pages 1 & 2). The Contractor and each of its sub-contractors acknowledge that no final payment can be made to the Contractor unless the necessary certifications, properly executed, accompany the final payment request.

G. If a Contractor or sub-contractor has had one final determination by the New York State Department of Labor that it willfully failed to pay or provide the prevailing rate of wages or supplements to its employees, the contractor or sub-contractor will be ineligible to tender a bid.

20. OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA)

A. It is the contractor responsibility to submit proof of OSHA 10 certification for all employees performing work on a job site associated with the Project. OSHA 10 certification can be submitted through the LCPtracker software system.

21. DRUG & ALCOHOL TESTING PROGRAM COMPLIANCE

A. Due to the safety-sensitive nature of the work that Commercial Driver Licensed (CDL) employees may perform on this project, the low bidder, if requested, shall submit acknowledgment of Drug and Alcohol Testing Compliance Form DA-1 included herein within three (3) days after receipt of proposals.

END OF SECTION (see attachment)

New York State Department of State
Division of Corporations, State Records and Uniform Commercial Code
One Commerce Plaza, 99 Washington Avenue
Albany, NY 12231-0001
www.dos.ny.gov

Local Law Filing

(Use this form to file a local law with the Secretary of State.)

Text of law should be given as amended. Do not include matter being eliminated and do not use italics or underlining to indicate new matter.

☑ **County** ☐ **City** ☐ **Town** ☐ **Village**
(Select one:)

of Erie

Local Law No. 2 **of the year 20**21

A local law updating and reforming Erie County's Requirements for
(Insert Title)
Lowest Responsible Bidding on County Construction Projects and
Repealing and Replacing Local Law 1-2009 in its entirety.

Be it enacted by the Erie County Legislature **of the**
(Name of Legislative Body)

☑ **County** ☐ **City** ☐ **Town** ☐ **Village**
(Select one:)

of Erie **as follows:**

Section 1. Legislative Intent.

The Erie County Legislature hereby finds, declares and determines that:

A. New York General Municipal Law Section 103 requires that all contracts entered into by the County of Erie for public work involving an expenditure of more than thirty-five thousand dollars ($35,000) shall be awarded to the lowest responsible bidder.

B. Taxpayers have a strong interest in an effective screening process to ensure that appropriate contractors be awarded public works contracts. A thorough evaluation process ensures that the taxpayers get a proper return on their investment and that qualified contractors are awarded bids.

(If additional space is needed, attach pages the same size as this sheet, and number each.)

C. General Municipal Law § 103(15)(a) recognizes the need for this process and provides that municipalities, such as the County of Erie, may establish guidelines governing the qualifications of bidders seeking to bid or enter into such contracts.

D. By enacting this Local Law, the County of Erie seeks to establish such guidelines in order to assure the prudent and economical use of public moneys for the benefit of all the inhabitants of the County.

Section 2. Short Title.

This Local Law shall be known as "the Erie County Lowest Responsible Bidder Law".

Section 3. Applicability.

This Local Law shall apply to County of Erie construction projects, defined herein, in excess of $35,000 and advertised for bids on or after the effective date of this Local Law.

Section 4. Definitions.

A. "The County of Erie" or "County" as used herein shall include the political subdivision known as the County of Erie as well as those County Departments responsible for letting public works contracts.

B. "Bidder" or "bidders" as used herein shall include individuals, companies, partnerships or other entities that respond to requests for bids issued by the County of Erie.

C. "Construction Projects" as used herein shall mean projects with a value in excess of $35,000 where the County of Erie is a direct or indirect party to the contract which includes more than an incidental amount of construction type activity intended to benefit the public, including all work which is necessary, incidental or connected with the execution of the contract which is performed by construction workers. A public entity need not be party to the construction contract. A construction contract includes: projects that the County of Erie funds directly, projects that the County of Erie funds indirectly by providing funds to a separate entity to perform the construction type activity; privately financed construction projects specifically built with the intent of leasing them to any Department of the County of Erie government; and construction projects built under the County of Erie's direction and later paid for with County of Erie funds.

D. "Commissioner" as used herein shall mean the Commissioner of the County of Erie Department that is requesting bids and/or his or her designee.

E. "Responsible" or "responsibility" as used herein means the financial ability, legal capacity, integrity, past performance of a business entity and compliance with applicable laws and regulations and as such terms have been interpreted relative to public procurements.

F. "Responsive" as used herein means a bidder meeting the minimum specifications or requirements as prescribed in the request for bids.

G. "Responsibility Questionnaire" shall mean the current the New York Vendor Responsibility Questionnaire For-Profit Construction (CCA-2), as maintained by the New York Office of the State Comptroller, and as may be amended from time to time, which requires all bidders to answer questions demonstrating their financial ability, legal capacity, integrity, past performance on municipal contracts and compliance with applicable laws and regulations. Such Questionnaire shall be affirmed by a principal of the bidder.

Section 5. Requirements.

A. By submitting bids in response to solicitations from the County of Erie, all bidders and sub-bidders (including sub-sub bidders) for construction projects funded by the County of Erie, acknowledge the terms and conditions of this Local Law and agree that they shall comply with the obligations of this Local Law.

B. In addition to the bid response, all bidders shall complete and submit a Responsibility Questionnaire as defined in Section 4 so that the County can evaluate the financial responsibility and organizational capacity of the bidder; the bidder's legal authority to do business in this County and State; the integrity of the owners, officers, principals, members and contract managers and the past performance of the bidder on prior municipal or public contracts. The completed Responsibility Questionnaire must be submitted with the bid.

C. Failure to submit the completed Responsibility Questionnaire with the bid documents shall render the bid non-responsive and the bid shall not be considered by the Commissioner.

Section 6. Procedure.

A. Bids for construction projects to which this Local Law applies shall be advertised in accordance with the requirements of the General Municipal Law and other applicable State and Local Laws. Such advertisement shall set forth the request for bids and shall set forth the deadline for submission and the time and place of the public opening of the bids.

B. The Commissioner, or his or her designee, shall distribute to all bidders a copy of this Local Law and the Responsibility Questionnaire referenced above. Distribution of the aforementioned documents shall be deemed effectuated when delivered in the same manner as the request for bids and any associated documents. The submission of a bid shall establish that the bidder received all necessary documents, including but not limited to, the Responsibility Questionnaire.

C. Only Bids accompanied by the Responsibility Questionnaire and all other necessary documentation will be considered by the Commissioner and or his or her designee.

D. All bids received shall be publicly opened and read at the time and place so specified in the advertisement for bids and the identity of all bidders shall be publicly disclosed at the time and place so specified. The apparent lowest bidder shall be announced at that time.

E. Commencing on the date of the bid opening and lasting for ten (10) calendar days thereafter, there shall be a public comment period during which members of the public may submit information relative to any such bidder to the Commissioner. The Commissioner shall acknowledge receipt of such information, and provide a written response prior to the final determination of bidder responsibility.

F. After review of the bid documents, the information collected pursuant to this and other Local Laws, New York State Law, applicable rules and regulations, consideration of the information provided in the Responsibility Questionnaire and of the financial ability, legal capacity, integrity, past performance of the bidder and compliance with applicable laws and regulations, the Commissioner shall determine if the apparent lowest bidder is responsible.

H. If the amount of the lowest responsible bidder appears disproportionately low when compared with estimates undertaken by or on behalf of the County of Erie, and/or compared to other bids submitted (10% or greater disparity), the County reserves the right to inquire further of the apparent lowest bidder to determine whether the bid contains mathematical errors, omissions and/or erroneous assumptions, and whether the apparent lowest bidder has the capability to perform and complete the contract for the bid amount.

I. If the apparent lowest bidder is deemed responsible by the Commissioner, such low bidder will be notified, as soon as is practicable.

J. At least five (5) business days prior to the award of the contract to the low bidder, the Commissioner shall post on the Erie County Website a listing of the three apparent lowest bidders for the work.

Section 7. Non-Responsibility Determination.

A. If, after review of the bid documents, the information collected pursuant to this and other Local Laws, New York State Law, applicable rules and regulations, consideration of the information provided in the Responsibility Questionnaire and of the financial ability, legal capacity, integrity, past performance of the bidder and compliance with applicable laws and regulations, the Commissioner makes a provisional determination that the apparent lowest bidder is deemed not to be responsible, the provisions of subdivisions C-E herein shall apply.

B. In the event the bidder is found to have falsified information on a submitted Responsibility Questionnaire or if the bidder fails to properly disclose information that would call into question the financial ability, legal capacity, integrity, or past performance of the business entity, the Commissioner shall make a provisional determination that the bidder is not responsible subject to the provisions of subdivisions C-E herein.

C. Not less than five (5) business days prior to any final determination that the apparent lowest bidder is not responsible, the County shall notify the affected bidder of the same, in writing, stating the reasons therefore and setting forth a time, date and place for the apparent lowest bidder to appear and be heard on the issue of non-responsibility. Mailing via first class mail to the address provided by bidder shall constitute sufficient service of the notice.

D. At the date, time and place set forth above, the bidder may appear in person, with or without counsel or via affidavit. After due consideration, the Commissioner shall make a determination with regard to responsibility. Such determination may be appealed pursuant to the CPLR.

E. If the apparent lowest bidder is deemed not to be responsible, then the next lowest bidder will be reviewed and so on until the lowest bidder is deemed responsible and selected as the lowest responsible bidder. The Commissioner reserves the right to award the contract to the bidder determined to be the lowest responsible bidder or to reject all bids and rebid the contract in accordance with the General Municipal Law.

Section 8. Ongoing Responsibility.

A. The Contractor shall at all times during the Contract term remain responsible. The Contractor agrees, if requested by the Commissioner 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.

B. Any resident of Erie County who has reason to believe that an awarded contractor is not responsible, may submit to the Commissioner evidence as to why the contractor or subcontractor is not responsible. The Commissioner shall acknowledge receipt of such evidence, and provide a written response within fifteen (15) calendar days.

C. The Commissioner may, upon receipt of such information, conduct a further investigation into whether or not the contractor is responsible and prior to making any determination of non-responsibility shall proceed in accordance with the process set forth in Section 7 above.

Section 9. Sanctions.

A. Any contractor or subcontractor, its alter ego or control group, or principal officer who has, after the opportunity to be heard as set forth above, been determined by the Commissioner to be non-responsible, shall be barred from bidding on contracts for the County of Erie for a period of six months for the first violation. In the event the bidder subsequently fails to comply with the provisions of this Local Law on future bids, it may be subject to additional penalties, including prohibition against work on County contracts for three years for the second violation, and permanently for the third violation.

Section 10. Emergency.

A. Notwithstanding the provisions of this Local Law, in the case of a public emergency arising out of an accident or any other unforeseen occurrence or condition whereby circumstances affecting public buildings, public property or the life, health, safety or property of the inhabitants of the County of Erie, which requires immediate action which cannot await competitive bidding or competitive offering, contracts for public work may be let by the appropriate officer, board or agency of the County of Erie without competitive bidding and as it otherwise deems appropriate.

Section 11. Severability.

If any clause, sentence, paragraph, subdivision, section or part of this Local Law or the application thereof, to any person, individual, corporation, firm, partnership, entity or circumstance, shall be adjudged by any court of competent jurisdiction to be invalid or unconstitutional such order of judgment shall not affect, impair, or invalidate the remainder thereof, but shall be confined in its operation to the clause, sentence, paragraph, subdivision, section or part of this Local Law or in its application to the person, individual, corporation, firm, partnership, entity, or circumstance directly involved in the controversy in which such judgment or order shall be rendered.

Section 12. Effective Date.

This Local Law shall take effect 30 days after the filing with the Secretary of State, in accordance with Section 27 of the New York State Municipal Home Rule Law.

Sponsors:

Timothy Meyers
April N.M. Baskin
Howard Johnson

(Complete the certification in the paragraph that applies to the filing of this local law and strike out that which is not applicable.)

1. (Final adoption by local legislative body only.)

I hereby certify that the local law annexed hereto, designated as local law No. _____ of 20____ of the (County)(City)(Town)(Village) of _____ was duly passed by the _____ on _____ 20____, in accordance with the applicable *(Name of Legislative Body)* provisions of law.

2. (Passage by local legislative body with approval, no disapproval or repassage after disapproval by the Elective Chief Executive Officer*.)

I hereby certify that the local law annexed hereto, designated as local law No. 2 of 20 21 of the (County) [redacted] of Erie was duly passed by the Erie County Legislature on February 4 2021, and was (approved)(~~not approved~~) *(Name of Legislative Body)*

(~~repassed after disapproval~~) by the Erie County Executive and was deemed duly adopted *(Elective Chief Executive Officer*)*

on March 1 20 2 1, in accordance w ith the applicable provisions of law.

3. (Final adoption by referendum.)

I hereby certify that the local law annexed hereto, designated as local law No. _____ of 20____ of the (County)(City)(Town)(Village) of _____ was duly passed by the _____ on _____ 20____, and was (approved)(not approved) *(Name of Legislative Body)*

(repassed after disapproval) by the _____ on _____ 20____. *(Elective Chief Executive Officer*)*

Such local law was submitted to the people by reason of a (mandatory)(permissive) referendum, and received the affirmative vote of a majority of the qualified electors voting thereon at the (general)(special)(annual) election held on _____ 20____, in accordance with the applicable provisions of law.

4. (Subject to permissive referendum and final adoption because no valid petition was filed requesting referendum.)

I hereby certify that the local law annexed hereto, designated as local law No. _____ of 20____ of the (County)(City)(Town)(Village) of _____ was duly passed by the _____ on _____ 20____, and was (approved)(not approved) *(Name of Legislative Body)*

(repassed after disapproval) by the _____ on _____ 20____. Such local *(Elective Chief Executive Officer*)*

law was subject to permissive referendum and no valid petition requesting such referendum was filed as of _____ 20____, in accordance with the applicable provisions of law.

---

* Elective Chief Executive Officer means or includes the chief executive officer of a county elected on a county-wide basis or, if there be none, the chairperson of the county legislative body, the mayor of a city or village, or the supervisor of a town where such officer is vested with the power to approve or veto local laws or ordinances.

5. (City local law concerning Charter revision proposed by petition.)
I hereby certify that the local law annexed hereto, designated as local law No. _____ of 20____ of the City of _____ having been submitted to referendum pursuant to the provisions of section (36)(37) of the Municipal Home Rule Law, and having received the affirmative vote of a majority of the qualified electors of such city voting thereon at the (special)(general) election held on _____ 20____, became operative.

6. (County local law concerning adoption of Charter.)
I hereby certify that the local law annexed hereto, designated as local law No. _____ of 20____ of the County of _____State of New York, having been submitted to the electors at the General Election of November _____ 20____, pursuant to subdivisions 5 and 7 of section 33 of the Municipal Home Rule Law, and having received the affirmative vote of a majority of the qualified electors of the cities of said county as a unit and a majority of the qualified electors of the towns of said county considered as a unit voting at said general election, became operative.

(If any other authorized form of final adoption has been followed, please provide an appropriate certification.)
I further certify that I have compared the preceding local law with the original on file in this office and that the same is a correct transcript therefrom and of the whole of such original local law, and was finally adopted in the manner indicated in paragraph 2 above.

_____
Clerk of the county legislative body, City, Town or Village Clerk or officer designated by local legislative body

(Seal)

Date: March 2, 2021

A Public Hearing was held on the foregoing **Local Law Intro. No. 7-1-2020** on **February 23, 2021** due notice thereof having been published in the official newspapers of the County of Erie designated for this purpose, and after due deliberation thereon, I, MARK C. POLONCARZ, County Executive of Erie County, do hereby APPROVE and SIGN said Local Law this 1 day of March, 2021.

Mark C. Poloncarz

A Public Hearing was held on the foregoing Local Law Intro. **No. 7-1-2020** on **February 23, 2021** due notice thereof having been published in the official newspapers of the County of Erie designated for this purpose, and after due deliberation thereon, I, MARK C. POLONCARZ, County Executive of Erie County, do hereby DISAPPROVE and VETO said Local Law this ____ day of _____, 2021.

Mark C. Poloncarz

New York State Department of State
Division of Corporations, State Records and Uniform Commercial Code
One Commerce Plaza, 99 Washington Avenue
Albany, NY 12231-0001
www.dos.ny.gov

Local Law Filing

(Use this form to file a local law with the Secretary of State.)

Text of law should be given as amended. Do not include matter being eliminated and do not use italics or underlining to indicate new matter.

☑ **County** ☐ **City** ☐ **Town** ☐ **Village**
(Select one:)

of Erie

Local Law No. 3 **of the year 20** 23

A local law *(Insert Title)* in relation to ensuring that service-disabled veterans have greater participation in Erie County contracts.

Be it enacted by the Erie County Legislature **of the**
(Name of Legislative Body)

☑ **County** ☐ **City** ☐ **Town** ☐ **Village**
(Select one:)

of Erie **as follows:**

SECTION 1. LEGISLATIVE INTENT

Erie County is home to many men and women who have faithfully served their country as members of military and national guard, some of whom became disabled during their service. It is the intent of the Erie County Legislature to honor this service and sacrifice for our nation by promoting and encouraging the continued economic development of service-disabled veteran-owned businesses by ensuring greater participation in County contracts.

(If additional space is needed, attach pages the same size as this sheet, and number each.)

SECTION 2. DEFINITIONS

The following terms shall have the meanings indicated:

1. "State-Certified Business" shall mean a business that is a certified service-disabled veteran-owned business under the New York State Service-Disabled Veteran-Owned Business Act.

2. "Departments and Offices" shall mean

   a) Any County department; or

   b) Any division, office or bureau of any County department, or Erie County Community College; or

   c) A board, a majority of whose members are appointed by the County Executive or who serve by virtue of being County officers or employees.

SECTION 3. OUTREACH

The Erie County Office of Equal Employment Opportunity (the "EEO") shall be responsible for outreach to State Certified Businesses in order to encourage participation in public contract bidding opportunities.
The EEO shall maintain a data base of all State-Certified Businesses.

SECTION 4. PARTICIPATION

All Departments and Offices of Erie County shall make good faith efforts to ensure State-Certified Businesses have greater participation in County contracts by aiming for at least a six percent participation rate of State-Certified Businesses on County contracts.

SECTION 5. RECORDS

All Departments and Offices of Erie County shall maintain documents reflecting the good faith efforts made by their Department.

SECTION 6. SEVERABILITY

If any clause, sentence, paragraph, subdivision, section or part of the Local Law or the application thereof, to any person, individual, corporation, firm, partnership, entity or circumstance, shall be adjudged by any court of competent jurisdiction to be invalid or unconstitutional such order of judgment shall not affect, impair, or invalidate the remainder thereof, but shall be confined in its operation to the clause, sentence, paragraph, subdivision, section or part of this Local Law or in its application to the

person, individual, corporation, firm, partnership, entity, or circumstance directly involved in the controversy in which such judgment or order shall be rendered.

SECTION 4. EFFECTIVE DATE

This Local Law shall take effect upon filing with the New York Secretary of State.

Sponsors:
John Gilmour

(Complete the certification in the paragraph that applies to the filing of this local law and strike out that which is not applicable.)

1. (Final adoption by local legislative body only.)

I hereby certify that the local law annexed hereto, designated as local law No. _____ of 20____ of the (County)(City)(Town)(Village) of _____ was duly passed by the _____ on _____ 20____, in accordance with the applicable *(Name of Legislative Body)*
provisions of law.

2. (Passage by local legislative body with approval, no disapproval or repassage after disapproval by the Elective Chief Executive Officer*.)

I hereby certify that the local law annexed hereto, designated as local law No. of 20 23 of the (County)(~~City~~)(~~Town~~)(~~Village~~) of Erie was duly passed by the Erie County Legislature on June 8 20 23, and was (approved)(~~not approved~~) *(Name of Legislative Body)*
(~~repassed after disapproval~~) by the Erie County Executive and was deemed duly adopted *(Elective Chief Executive Officer*)*
on June 26 20 2 3, in accordance w ith the applicable provisions of law.

3. (Final adoption by referendum.)

I hereby certify that the local law annexed hereto, designated as local law No. _____ of 20____ of the (County)(City)(Town)(Village) of _____ was duly passed by the _____ on _____ 20____, and was (approved)(not approved) *(Name of Legislative Body)*
(repassed after disapproval) by the _____ on _____ 20____. *(Elective Chief Executive Officer*)*

Such local law was submitted to the people by reason of a (mandatory)(permissive) referendum, and received the affirmative vote of a majority of the qualified electors voting thereon at the (general)(special)(annual) election held on _____ 20____, in accordance with the applicable provisions of law.

4. (Subject to permissive referendum and final adoption because no valid petition was filed requesting referendum.)

I hereby certify that the local law annexed hereto, designated as local law No. _____ of 20____ of the (County)(City)(Town)(Village) of _____ was duly passed by the _____ on _____ 20____, and was (approved)(not approved) *(Name of Legislative Body)*
(repassed after disapproval) by the _____ on _____ 20____. Such local *(Elective Chief Executive Officer*)*
law was subject to permissive referendum and no valid petition requesting such referendum was filed as of _____ 20____, in accordance with the applicable provisions of law.

* Elective Chief Executive Officer means or includes the chief executive officer of a county elected on a county-wide basis or, if there be none, the chairperson of the county legislative body, the mayor of a city or village, or the supervisor of a town where such officer is vested with the power to approve or veto local laws or ordinances.

5. (City local law concerning Charter revision proposed by petition.)
I hereby certify that the local law annexed hereto, designated as local law No._____ of 20____ of the City of _____ having been submitted to referendum pursuant to the provisions of section (36)(37) of the Municipal Home Rule Law, and having received the affirmative vote of a majority of the qualified electors of such city voting thereon at the (special)(general) election held on _____ 20____ , became operative.

6. (County local law concerning adoption of Charter.)
I hereby certify that the local law annexed hereto, designated as local law No._____ of 20____ of the County of _____State of New York, having been submitted to the electors at the General Election of November _____ 20____, pursuant to subdivisions 5 and 7 of section 33 of the Municipal Home Rule Law, and having received the affirmative vote of a majority of the qualified electors of the cities of said county as a unit and a majority of the qualified electors of the towns of said county considered as a unit voting at said general election, became operative.

(If any other authorized form of final adoption has been followed, please provide an appropriate certification.)
I further certify that I have compared the preceding local law with the original on file in this office and that the same is a correct transcript therefrom and of the whole of such original local law, and was finally adopted in the manner indicated in paragraph 2 above.

_____
Clerk of the county legislative body, City, Town or Village Clerk or officer designated by local legislative body

(Seal)

Date: _____

A Public Hearing was held on the foregoing **Local Law Intro. No. 5-1-2023** on May 31, **2023** due notice thereof having been published in the official newspapers of the County of Erie designated for this purpose, and after due deliberation thereon, I, MARK C. POLONCARZ, County Executive of Erie County, do hereby APPROVE and SIGN said Local Law this 26 day of **June, 2023**.

Mark C. Poloncarz

A Public Hearing was held on the foregoing **Local Law Intro. No. 5-1-2023** on _____, **2023** due notice thereof having been published in the official newspapers of the County of Erie designated for this purpose, and after due deliberation thereon, I, MARK C. POLONCARZ, County Executive of Erie County, do hereby DISAPPROVE and VETO said Local Law this ____ day of **June, 2023.**

Mark C. Poloncarz

NAME OF BIDDER

BID SUBMITTED BY: _____

PROPOSAL FOR:

ELECTRICAL CONSTRUCTION WORK

SUNY ECC North Campus Kittinger Hall Boiler Upgrades Project (REBID)
6205 Main Street, Williamsville NY 14221

TO: **William E. Geary,** Commissioner of Public Works
Erie County Department of Public Works
Rath Building, 95 Franklin Street, Suite 1400, Buffalo, NY 14202

Commissioner Geary:

Pursuant to and in compliance with your advertisement for Bids, the undersigned offers to furnish all materials and all plant, labor, supplies, equipment, transportation and other facilities necessary or proper for, or incidental to the construction work, as required by and in strict accord with the contract documents dated 09/08/2026 entitled: *"SUNY ECC North Campus Kittinger Hall Boiler Upgrades Project"* including all Addenda for the following sum of:

BASE BID (including allowance):

_____

/100 DOLLARS ($)

_____

Completion: We agree to complete this work within _____ calendar days from the Notice to Proceed.

CAUTION: Be advised that Erie County Local Law No. 3-2018 will be enforced. All bidders submitting bids with a value in excess of $250,000 must adhere to the provisions detailed within this Proposal and Section 10 of the General Conditions. For consideration, bidders must (1) check the appropriate box and (2) enclose the corresponding paperwork.

CAUTION: ERIE COUNTY EXECUTIVE ORDER #18: The project contemplated by these Bid Specifications may be subject to Erie County Executive Order #18 ("EO #18") which is included along with its Rules and Regulations for reference in Appendix "D" to the General Conditions of this Bid. All bids with a value that meets or exceeds $250,000 must include a verified attestation of intent to comply and statement of work force. Such attestation and statement is attached hereto. Any bids received which do not include such attestation or include an incomplete attestation will be deemed non-compliant and will not be considered for award. Should it be determined that the project is subject to EO #18, Contractor must provide county with a fully executed and verified Local and Disadvantaged Worker Compliance Certification prior to final execution of an award agreement.

CAUTION: All compliance reporting required for Erie County Local Law No. 3-2018 and Executive Order #18 shall now be completed via LCPtracker. The County will be available to assist with any reasonable training requests and support, as necessary.

NOTE: Lump-Sum Allowances are to include an Overhead and Profit (O&P) Margin. Unit-Price Allowances are NOT to include an O&P Margin. O&P for unit prices are to be included in the unit price. See Specification 012100 – Allowances for more information.

NOTE: As of April 6, 2021 the County of Erie is requiring a new experience questionnaire form. Please reference Section 5 of the Information to Bidders included within the project manual for detailed information.

SUMMARY OF WORKFORCE AND MINORITY/WOMEN BUSINESS COMMITMENT

Requirement	Applicable when Contract value meets or exceeds:	Reference
Erie County Executive Order No.18	$250,000	General Conditions Section 8.08
New York State Certified Apprenticeship Training Program	$250,000	General Conditions Section 10
Minority/ Women Business Enterprise & Disabled Veterans Business	$100,000	General Conditions Section 8.06
General Minority and Women Workforce Goals	All Contracts	General Conditions Section 8.05
Equal Pay Certification	All Contracts	General Conditions Sections 8.04 & 8.07

***Refer to Supplemental General Conditions for any modifications to the above**

ALLOWANCES

Certain work is specified in the Contract Documents by allowance. The allowances include: furnishing all materials and all plant, labor, supplies, equipment, transportation and other facilities necessary or proper for, or incidental to the work. Allowances have been established in lieu of additional requirements and to defer selection of actual materials and equipment to a later date when additional information is available for evaluation. If necessary, additional requirements will be issued by Change Order. See Allowances: Section 012100.

Electrical Construction Contingency Allowance: Contractor is to include an allowance of **$15,000.00** in the bid price for unforeseen and/or emergency conditions and general work over and above what is documented on the construction documents. The remained of the applicable specifications and notes apply to the additional work.

SUBSTITUTIONS

If awarded a contract based on the above proposal, we will use materials and equipment specified with the following exceptions:

ITEMS	MANUFACTURER'S NAME AND PRODUCT DESCRIPTION

It is understood that if any of the above proposed substitutions are not accepted by the Owner, we will furnish the product named in the specifications. Substitutions are not permitted after the award of contract.

ADDENDA:

The foregoing proposal covers the following Addenda:

(Here list, by number, each addendum issued prior to bidding.)

NON-COLLUSIVE BIDDING CERTIFICATE.

1. By submission of this bid, the bidder and each person signing on behalf of the bidder certifies, and in the case of a joint bid each party thereto certifies as to its own organization, under penalty of perjury, that to the best of his or its knowledge and belief:

   a. The prices in this bid have been arrived at independently with no 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; and
   b. Unless otherwise required by law, the prices which have been quoted in this bid have not been knowingly disclosed by the bidder and will not knowingly be disclosed by the bidder prior to opening, directly or indirectly, to any other bidder or to any competitor; and
   c. No attempt has been made or will be made by the bidder to induce any other person, partnership or corporation to submit a bid for the purpose of restricting competition; and
   d. If the bidder is a corporation, this certificate is and shall be deemed to have been authorized by the board of directors of the bidder, and such authorization is and shall be deemed to include the signing and submission of the bid and the inclusion therein of this certificate of non-collusion as the act and deed of the corporation.

2. Pursuant to 103-d, General Municipal Law, a bid shall not be considered for award nor shall any award be made where the above Non-Collusive Certificate, Paragraphs 1, (A), (B), (C), and (D) have not been complied with, unless explained, justified and legally excused in accordance with said law.

This proposal and/or contract shall be governed by New York State Law.

The undersigned agrees together into a contract for the above stated compensation, under the terms and conditions outlined, plus any other conditions mutually agreed upon.

NAME OF FIRM: Federal Tax ID No.:

AUTHORIZED SIGNATURE:

PRINTED OR TYPEWRITTEN
NAME OF SIGNATORY:

TITLE:

ADDRESS:

PHONE No.: FAX No.:

EMAIL ADDRESS:

DATE:

SEAL IF BIDDER
IS A CORPORATION

ERIE COUNTY DEPARTMENT OF PUBLIC WORKS
OFFICE OF THE COMMISSIONER

To facilitate correct drawing and execution of contract, Bidders shall supply full information concerning legal status as follows:

NAME: _____

CORPORATION CO-PARTNERSHIP AN INDIVIDUAL TRADE
(Strike out classification not applicable.)

ADDRESS OF PRINCIPAL OFFICE:

Street: _____

City: _____

State: _____

LOCAL BRANCH OFFICE ADDRESS:

_____

INCORPORATED UNDER THE LAWS OF THE STATE OF: _____

If Foreign Corporation, state if authorized to do business in the State of New York: (YES) (NO)

If Co-Partnership, Names of Partners and Addresses are:

_____ _____

_____ _____

_____ _____

_____ _____

_____ _____

If doing business under Trade Name, Assumed Name or Firm Style:

Name of Owner: _____

Certificate Filed: _____ _____

(Place) (Date)

NEW YORK STATE CERTIFIED APPRENTICESHIP TRAINING PROGRAM CERTIFICATION

Pursuant to Erie County Local Law 3-2018 the following MUST be submitted along with supporting documentation unless the Contracting Agency has otherwise determined under Section 2f of the Erie County Rules and Regulations that the New York State Certified Apprenticeship Training Program does not apply.

TO BE FILLED OUT BY BIDDER: please check that which applies on sign below.

[ ] Enclosed is a copy of the certification of approval of the New York State Certified Apprenticeship Training Program (NYSCATP) by the New York State Department of Labor which, as Bidder, will use in connection with the construction contract. Also Enclosed is a written plan demonstrating how apprentices will be utilized by the Bidder As Prime Contractor or by the Subcontractor(s) to the Bidder as Prime Contractor. Such Plan shall include at a minimum:

Please check all items i through vi to acknowledge compliance:

- [ ] i. An organized written plan in place that embodies the terms and conditions of employment, training and supervision of one or more apprentices;
- [ ] ii. A schedule of wages to be paid to the apprentices consistent with the skills required and approved by the New York State Department of Labor;
- [ ] iii. Equal employment and affirmative action plans;
- [ ] iv. Workforce development and diversification goals to ensure that the contractor will diligently work toward a minority workforce goal of 30% minority and female participation combined in project personnel including trades people, trainees, journeymen, apprentices and supervisory staff;
- [ ] v. A minimum of ten percent (10%) of the total construction workers. Trades people, trainees, journeymen, and apprentices employed at any given time on a particular project by any and all contractors or subcontractors must be consist of persons participating in a NYSCATP; and
- [ ] vi. In all cases, such Certified Apprenticeship Training Program must be specific to the type and scope of work which is being performed and must have a graduation rate of at least thirty percent (30%) as determined by the New York State Department of Labor.

[ ] Enclosed is a detailed explanatory written statement as to the inapplicability of Apprenticeship participation due to: the lack of career opportunities in NYSCATP Approved by New York State Department of Labor Commissioner; OR the magnitude of the construction contract which would make use of apprentices impracticable.

_____	_____	_____
SIGNATURE	*COMPANY NAME*	*DATE*

CONTRACTOR'S OWN WORKFORCE

(This form must be submitted with the Contractor's bid proposal)

Pursuant to Section 3.18 – Contractor's Own Workforce, of the General Conditions, the Contractor submitting a bid proposal acknowledges that they will perform a minimum of 25% of the work with their own workforce as follows:

Task	Value of Work
Total Value of Workforce	
Percentage of Total Bid	%

_____ _____ _____

SIGNATURE *COMPANY NAME* *DATE*

Erie County Equal Pay Certification

In order to comply with Executive Order 13 dated November 6, 2014, we hereby certify that we are in compliance with federal law, including the Equal Pay Act of 1963, Title VII of the Civil Rights Act of 1964, Federal Executive Order 11246 of September 24, 1965 and New York State Labor Law Section 194 (together "Equal Pay Law"). We understand that this certification is a material component of this contract. Violation of the provisions of Executive Order 13, which is attached hereto and made a part hereof, can constitute grounds for the immediate termination of this contract and may constitute grounds for determining that a bidder is not qualified to participate in future county contracts.

We have evaluated wages and benefits to ensure compliance with the Equal Pay Law. We certify that we have not been the subject of an adverse finding under the Equal Pay Law within the previous five years and, in the alternative, if we were the subject of an adverse finding under the Equal Pay Law within the previous five years, we have annexed a detailed description of the finding(s). In addition, we have annexed a detailed description of any currently pending claims under the Equal Pay Law in which we are involved.

_____
Signature

Verification

A) OWNER/PARTNERSHIP

STATE OF _____)
COUNTY OF _____) SS:

_____, being duly sworn, states he or she is the owner of (or a partner in) _____, and is making the foregoing Certification and that the statements and representations made in the Certification are true to his or her own knowledge.

Sworn to before me this _____Day of _____, 20__

_____
Notary

B) CORPORATE

STATE OF _____)
COUNTY OF _____) SS:

_____, being duly sworn, states that he or she is the
Name of Corporate Officer
_____, of_____,
Title of Corporate Officer Name of Corporation
the enterprise making the foregoing Certification, that he or she has read the Certification and knows its contents, that the statements and representations made in the Certification are true to his or her own knowledge, and that the Certification is made at the direction of the Board of Directors of the Corporation.
Sworn to before me this _____Day of _____, 20__

_____
Notary

ERIE COUNTY EXECUTIVE ORDER #18
ATTESTATION AND
STATEMENT OF WORKFORCE

We hereby attest that we have read and understand Erie County Executive Order #18 ("EO #18"). We acknowledge that the project we are bidding on may be subject to the provisions thereof. We further attest that, should we be identified as the successful bidder and should the appropriate individual or entity determine that this project is subject to EO #18, we will be in compliance with such Order, or we will have been granted a partial waiver by the Erie County Office of Equal Employment Opportunity prior to starting work on the project.

We further acknowledge that in order for Erie County to determine if the project we are bidding on is subject to EO #18, they need to analyze the workforce that we intend to use on such project. We therefore now do attest that it is our current intention to use _____#___ construction workers, which number includes any subcontracted construction workers, on this project should it be awarded to us. For purposes of this attestation we understand that construction worker shall mean a laborer, workman, or mechanic who is directly involved in the construction, reconstruction, improvement, rehabilitation, installation, alteration, renovation, demolition or otherwise providing for any building, facility, roads, highways, bridges, or physical structure of any kind, but does not include professional services employees.

_____
Signature

Verification

STATE OF NEW YORK)
COUNTY OF ERIE) SS:

A)
_____, being duly sworn, states he or she is the owner of (or partner in) _____, and is making the foregoing Attestation and Statement of Workforce and that such representations made are true to his or her own knowledge.

B)
_____, being duly sworn, states that he or she is the (Name of Corporate Officer) _____, of (Name of Corporation or Enterprise)_____, that he or she has read the Attestation and Statement of Workforce and that such representations made are true to his or her knowledge, and are made at the direction of the Board of Directors of the Corporation.

Sworn to before me this _____ _____
Day of _____. 20_____ Notary Public

ERIE COUNTY DEPARTMENT OF PUBLIC WORKS
OFFICE OF THE COMMISSIONER

ACKNOWLEDGMENT OF DRUG AND ALCOHOL TESTING COMPLIANCE

_____hereby acknowledges that a drug
(PRINT OR TYPE COMPANY NAME)
and alcohol program, which is required by Federal Department of Transportation rules (CFR, Title 49, Part 40 and 382), has been implemented by this Company. The program is administered by:

(PLEASE SELECT ONE)

( ) The Company itself - The program administrator is:

_____
(Company Administrator's Name and Telephone Number)

( ) Third - Party Administrator - The program administrator is:

_____
(Third - Party Administrator's Name)

_____
(Address)

_____
(Contact Person/Telephone)

_____
(Company's Official's Name)

_____
(Signature)

_____
(Date)

Subscribed to before me on

_____, day of _____ 20___

_____
Notary Public

Due to the safety-sensitive nature of the work which your Commercial Driver Licensed (CDL) employees may perform on this project, you are required to implement a drug and alcohol testing program which follows Federal Department of Transportation rules (CFR, Title 49, Parts 40 and 382). Further, as a condition of your contract, you must also submit proof of your compliance via this form to the Erie County Department of Public Works, office of the Commissioner.

This form must be signed and returned to the Commissioner of Public Works, 14th Floor, Rath Building, 95 Franklin Street, Buffalo, NY, no later than three (3) working days after the bid opening.

NEW YORK STATE VENDOR RESPONSIBILITY QUESTIONNAIRE
FOR-PROFIT CONSTRUCTION (CCA-2)

You have selected the For-Profit Construction questionnaire, commonly known as the "CCA-2," which may be printed and completed in this format or, **for your convenience**, **may be completed online using the New York State VendRep System.**

COMPLETION & CERTIFICATION

The person(s) completing the questionnaire must be knowledgeable about the vendor's business and operations. An owner or official must certify the questionnaire and the signature must be notarized.

NEW YORK STATE VENDOR IDENTIFICATION NUMBER (VENDOR ID)

The Vendor ID is a ten-digit identifier issued by New York State when the vendor is registered on the Statewide Vendor File. This number must now be included on the questionnaire. If the business entity has not obtained a Vendor ID, contact the IT Service Desk at ITServiceDesk@osc.state.ny.us or call 866-370-4672.

DEFINITIONS

All underlined terms are defined in the "New York State Vendor Responsibility Definitions List," found at http://www.osc.state.ny.us/vendrep/documents/questionnaire/definitions.pdf. These terms may not have their ordinary, common or traditional meanings. Each vendor is strongly encouraged to read the respective definitions for any and all underlined terms. By submitting this questionnaire, the vendor agrees to be bound by the terms as defined in the "New York State Vendor Responsibility Definitions List" existing at the time of certification.

RESPONSES

Every question must be answered. Each response must provide all relevant information which can be obtained within the limits of the law. However, information regarding a determination or finding made in error which was subsequently corrected or overturned, and/or was withdrawn by the issuing government entity, is not required. Individuals and Sole Proprietors may use a Social Security Number but are encouraged to obtain and use a federal Employer Identification Number (EIN).

NYS VENDOR ID: 000000000

NEW YORK STATE VENDOR RESPONSIBILITY QUESTIONNAIRE FOR-PROFIT CONSTRUCTION (CCA-2)

BUSINESS ENTITY INFORMATION		
Legal Business Name	EIN ____	
Address of the Principal Place of Business (street, city, state, zip code)	New York State Vendor Identification Number	
	Telephone ext.	Fax
	Website	
Authorized Contact for this Questionnaire		
Name	Telephone ext.	Fax
Title	Email	

Additional Business Entity Identities: If applicable, list any other DBA, Trade Name, Former Name, Other Identity, or EIN used in the last five (5) years, the state or county where filed and the status (active or inactive).

Type	Name	EIN	State or County where filed	Status

I. BUSINESS CHARACTERISTICS		
1.0 Business Entity Type – Check appropriate box and provide additional information:		
a) ☐ Corporation (including PC)	Date of Incorporation	
b) ☐ Limited Liability Company (LLC or PLLC)	Date Organized	
c) ☐ Limited Liability Partnership	Date of Registration	
d) ☐ Limited Partnership	Date Established	
e) ☐ General Partnership	Date Established	County (if formed in NYS)
f) ☐ Sole Proprietor	How many years in business?	
g) ☐ Other	Date Established	
If Other, explain:		
1.1 Was the Business Entity formed in New York State?		☐ Yes ☐ No
If "No," indicate jurisdiction where the Business Entity was formed:		
☐ United States	State	
☐ Other	Country	

NEW YORK STATE VENDOR RESPONSIBILITY QUESTIONNAIRE
FOR-PROFIT CONSTRUCTION (CCA-2)

I. BUSINESS CHARACTERISTICS	
1.2 Is the Legal Business Entity publicly traded?	☐ Yes ☐ No
If "Yes," provide the CIK code or Ticker Symbol:	
1.3 Is the Business Entity currently registered to do business in New York State? *Note: Select "Not Required" if the Business Entity is a Sole Proprietor or General Partnership*	☐ Yes ☐ No ☐ Not Required
If "No," explain why the Business Entity is not required to be registered to do business in New York State:	
1.4 Is the responding Business Entity a Joint Venture? Note: If the submitting Business Entity is a Joint Venture, also submit a separate questionnaire for each Business Entity comprising the Joint Venture.	☐ Yes ☐ No
1.5 If the Business Entity's Principal Place of Business is not in New York State, does the Business Entity maintain an office in New York State? *(Select "N/A" if Principal Place of Business is in New York State.)*	☐ Yes ☐ No ☐ N/A
If "Yes," provide the address and telephone number for one office located in New York State.	
1.6 Is the Business Entity a New York State certified Minority-Owned Business Enterprise, or Women-Owned Business Enterprise, or New York State Small Business, or federally certified Disadvantaged Business Enterprise?	☐ Yes ☐ No
If "Yes," check all that apply: ☐ New York State certified Minority-Owned Business Enterprise (MBE) ☐ New York State certified Women-Owned Business Enterprise (WBE) ☐ New York State Small Business ☐ Federally certified Disadvantaged Business Enterprise (DBE)	
1.7 Identify each person or business entity that is, or has been within the past five (5) years, Principal Owner of 5.0% or more of the firm's shares; a Business Entity Official; or one of the five largest shareholders, if applicable. *(Attach additional pages if necessary.)* Joint Ventures: Provide information for all firms involved.	

Name *(For each person, include middle initial)*	Title	Percentage of ownership (Enter 0%, if not applicable)	Employment status with the firm
			☐ Current ☐ Former
			☐ Current ☐ Former
			☐ Current ☐ Former
			☐ Current ☐ Former

NEW YORK STATE VENDOR RESPONSIBILITY QUESTIONNAIRE FOR-PROFIT CONSTRUCTION (CCA-2)

II. AFFILIATE and JOINT VENTURE RELATIONSHIPS

2.0 Are there any other construction-related firms in which, now or in the past five years, the submitting Business Entity or any of the individuals or business entities listed in question 1.7 either owned or owns 5.0% or more of the shares of, or was or is one of the five largest shareholders or a director, officer, partner or proprietor of said other firm? *(Attach additional pages if necessary.)*	☐ Yes ☐ No

Firm/Company Name	Firm/Company EIN (If available)	Firm/Company's Primary Business Activity

Firm/Company Address
Explain relationship with the firm and indicate percent of ownership, if applicable (enter N/A, if not applicable):

Are there any shareholders, directors, officers, owners, partners or proprietors that the submitting Business Entity has in common with this firm?	☐ Yes ☐ No

Individual's Name *(Include middle initial)*	Position/Title with Firm/Company

2.1 Does the Business Entity have any construction-related affiliates not identified in the response to question 2.0 above? *(Attach additional pages if necessary.)*	☐ Yes ☐ No

Affiliate Name	Affiliate EIN (If available)	Affiliate's Primary Business Activity

Affiliate Address
Explain relationship with the affiliate and indicate percent of ownership, if applicable *(enter N/A, if not applicable)*:

Are there any shareholders, directors, officers, owners, partners or proprietors that the submitting Business Entity has in common with this affiliate?	☐ Yes ☐ No

Individual's Name *(Include middle initial)*	Position/Title with Firm/Company

2.2 Has the Business Entity participated in any construction-related Joint Ventures within the past three (3) years? *(Attach additional pages if necessary.)*	☐ Yes ☐ No

Joint Venture Name	Joint Venture EIN (If available)	Identify parties to the Joint Venture

NEW YORK STATE VENDOR RESPONSIBILITY QUESTIONNAIRE
FOR-PROFIT CONSTRUCTION (CCA-2)

III. CONTRACT HISTORY	
3.0 Has the Business Entity completed any construction contracts?	☐ Yes ☐ No
If "Yes," list the ten most recent construction contracts the Business Entity has completed using Attachment A – Completed Construction Contracts, found at www.osc.state.ny.us/vendrep/documents/questionnaire/ac3294s.doc. *If less than ten, include most recent subcontracts on projects up to that number.*	
3.1 Does the Business Entity currently have uncompleted construction contracts?	☐ Yes ☐ No
If "Yes," list all current uncompleted construction contracts by using Attachment B – Uncompleted Construction Contracts, found at www.osc.state.ny.us/vendrep/documents/questionnaire/ac3295s.doc. *Note: Ongoing projects must be included.*	

IV. INTEGRITY – CONTRACT BIDDING ***Within the past five (5) years, has the Business Entity, an affiliate, or any predecessor company or entity:***	
4.0 Been suspended or debarred from any government contracting process or been disqualified on any government procurement?	☐ Yes ☐ No
4.1 Been subject to a denial or revocation of a government prequalification?	☐ Yes ☐ No
4.2 Had any bid rejected by a government entity for lack of qualifications, responsibility or because of the submission of an informal, non-responsive or incomplete bid?	☐ Yes ☐ No
4.3 Had a proposed subcontract rejected by a government entity for lack of qualifications, responsibility or because of the submission of an informal, non-responsive or incomplete bid?	☐ Yes ☐ No
4.4 Had a low bid rejected on a government contract for failure to make good faith efforts on any Minority-Owned Business Enterprise, Women-Owned Business Enterprise or Disadvantaged Business Enterprise goal or statutory affirmative action requirements on a previously held contract?	☐ Yes ☐ No
4.5 Agreed to a voluntary exclusion from bidding/contracting with a government entity?	☐ Yes ☐ No
4.6 Initiated a request to withdraw a bid submitted to a government entity or made any claim of an error on a bid submitted to a government entity?	☐ Yes ☐ No
For each "Yes," provide an explanation of the issue(s), the Business Entity involved, the relationship to the submitting Business Entity, the government entity involved, project(s), relevant dates, any remedial or corrective action(s) taken and the current status of the issue(s). Provide answer(s) below or attach additional sheets with numbered responses.	

V. INTEGRITY – CONTRACT AWARD ***Within the past five (5) years, has the Business Entity, an affiliate, or any predecessor company or entity:***	
5.0 Defaulted on or been suspended, cancelled or terminated for cause on any contract?	☐ Yes ☐ No
5.1 Been subject to an administrative proceeding or civil action seeking specific performance or restitution (except any disputed work proceeding) in connection with any government contract?	☐ Yes ☐ No
5.2 Entered into a formal monitoring agreement, consent decree or stipulation settlement as specified by, or agreed to with, any government entity?	☐ Yes ☐ No
5.3 Had its surety called upon to complete any contract whether government or private sector?	☐ Yes ☐ No
5.4 Forfeited all or part of a standby letter of credit in connection with any government contract?	☐ Yes ☐ No

NEW YORK STATE VENDOR RESPONSIBILITY QUESTIONNAIRE
FOR-PROFIT CONSTRUCTION (CCA-2)

V. INTEGRITY – CONTRACT AWARD

Within the past five (5) years, has the Business Entity, an affiliate, or any predecessor company or entity:

For each "Yes," provide an explanation of the issue(s), the Business Entity involved, the relationship to the submitting Business Entity, the government entity/owners involved, project(s), contract number(s), relevant dates, any remedial or corrective action(s) taken and the current status of the issue(s). Provide answer(s) below or attach additional sheets with numbered responses.

VI. CERTIFICATIONS/LICENSES

Within the past five (5) years, has the Business Entity, an affiliate, or any predecessor company or entity:

6.0	Had a revocation or suspension of any business or professional permit and/or license?	☐ Yes ☐ No
6.1	Had a denial, decertification, revocation or forfeiture of New York State certification of Minority-Owned Business Enterprise, Women-Owned Business Enterprise or a federal certification of Disadvantaged Business Enterprise status, for other than a change of ownership?	☐ Yes ☐ No

For each "Yes," provide an explanation of the issue(s), the Business Entity involved, the relationship to the submitting Business Entity, the government entity involved, relevant dates, any remedial or corrective action(s) taken and the current status of the issue(s). Provide answer(s) below or attach additional sheets with numbered responses.

VII. LEGAL PROCEEDINGS/GOVERNMENT INVESTIGATIONS

Within the past five (5) years, has the Business Entity, an affiliate, or any predecessor company or entity:

7.0	Been the subject of a criminal investigation, whether open or closed, or an indictment for any business-related conduct constituting a crime under local, state or federal law?	☐ Yes ☐ No
7.1	Been the subject of:	
	(i.) An indictment, grant of immunity, judgment or conviction (including entering into a plea bargain) for conduct constituting a crime; or	☐ Yes ☐ No
	(ii.) Any criminal investigation, felony indictment or conviction concerning the formation of, or any business association with, an allegedly false or fraudulent Minority-Owned Business Enterprise, Women-Owned Business Enterprise, or a Disadvantaged Business Enterprise?	☐ Yes ☐ No
7.2	Received any OSHA citation, which resulted in a final determination classified as serious or willful?	☐ Yes ☐ No
7.3	Had a government entity find a willful prevailing wage or supplemental payment violation?	☐ Yes ☐ No
7.4	Had a New York State Labor Law violation deemed willful?	☐ Yes ☐ No
7.5	Entered into a consent order with the New York State Department of Environmental Conservation, or a federal, state or local government enforcement determination involving a violation of federal, state or local environmental laws?	☐ Yes ☐ No

NEW YORK STATE VENDOR RESPONSIBILITY QUESTIONNAIRE
FOR-PROFIT CONSTRUCTION (CCA-2)

VII. LEGAL PROCEEDINGS/GOVERNMENT INVESTIGATIONS

Within the past five (5) years, has the Business Entity, an affiliate, or any predecessor company or entity:

7.6	Other than previously disclosed, been the subject of any citations, notices or violation orders; a pending administrative hearing, proceeding or determination of a violation of: • Federal, state or local health laws, rules or regulations; • Federal, state or local environmental laws, rules or regulations; • Unemployment insurance or workers compensation coverage or claim requirements; • Any labor law or regulation, which was deemed willful; • Employee Retirement Income Security Act (ERISA); • Federal, state or local human rights laws; • Federal, state or local security laws?	☐ Yes ☐ No

For each "Yes," provide an explanation of the issue(s), the Business Entity involved, the relationship to the submitting Business Entity, the government entity involved, relevant dates, any remedial or corrective action(s) taken and the current status of the issue(s). Provide answer(s) below or attach additional sheets with numbered responses.

Note: Information regarding a determination or finding made in error, which was subsequently corrected or overturned, and/or was withdrawn by the issuing government entity, is not required.

VIII. LEADERSHIP INTEGRITY

If the Business Entity is a Joint Venture Entity, answer "N/A - Not Applicable" to questions in this section.

Within the past five (5) years has any individual previously identified or any individual currently or formerly having the authority to sign, execute or approve bids, proposals, contracts or supporting documentation on behalf of the Business Entity with any government entity been:

8.0	Sanctioned relative to any business or professional permit and/or license?	☐ Yes ☐ No ☐ N/A
8.1	Suspended, debarred or disqualified from any government contracting process?	☐ Yes ☐ No ☐ N/A
8.2	The subject of a criminal investigation, whether open or closed, or an indictment for any business-related conduct constituting a crime under local, state or federal law?	☐ Yes ☐ No ☐ N/A
8.3	Charged with a misdemeanor or felony, indicted, granted immunity, convicted of a crime or subject to a judgment for: (i.) Any business-related activity, including but not limited to fraud, coercion, extortion, bribe or bribe-receiving, giving or accepting unlawful gratuities, immigration or tax fraud, racketeering, mail fraud, wire fraud, price-fixing or collusive bidding; or (ii.) Any crime, whether or not business-related, the underlying conduct of which related to truthfulness, including but not limited to the filing of false documents or false sworn statements, perjury or larceny	☐ Yes ☐ No ☐ N/A

For each "Yes," provide an explanation of the issue(s), the individual involved, the relationship to the submitting Business Entity, the government entity involved, relevant dates, any remedial or corrective action(s) taken and the current status of the issue(s). Provide answer(s) below or attach additional sheets with numbered responses.

NEW YORK STATE VENDOR RESPONSIBILITY QUESTIONNAIRE
FOR-PROFIT CONSTRUCTION (CCA-2)

IX. FINANCIAL AND ORGANIZATIONAL CAPACITY

9.0 Within the past five (5) years, has the Business Entity or any affiliate received any formal unsatisfactory performance assessment(s) from any government entity on any contract?	☐ Yes ☐ No
If "Yes," provide an explanation of the issue(s), the Business Entity involved, the relationship to the submitting Business Entity, the government entity involved, relevant dates, any remedial or corrective action(s) taken and the current status of the issue(s). Provide answer below or attach additional sheets with numbered responses.	
9.1 Within the past five (5) years, has the Business Entity or any affiliate had any liquidated damages assessed over $25,000?	☐ Yes ☐ No
If "Yes," provide an explanation of the issue(s), the Business Entity involved, the relationship to the submitting Business Entity, relevant dates, the contracting party involved, the amount assessed and the current status of the issue(s). Provide answer below or attach additional sheets with numbered responses.	
9.2 Within the past five (5) years, has the Business Entity or any affiliate had any liens, claims or judgments over $25,000 filed against the Business Entity which remain undischarged or were unsatisfied for more than 90 days? (*Note: Including but not limited to tax warrants or liens. Do not include UCC filings.)*	☐ Yes ☐ No
If "Yes," provide an explanation of the issue(s), the Business Entity involved, the relationship to the submitting Business Entity, relevant dates, the Lien holder or Claimants' name(s), the amount of the lien(s) and the current status of the issue(s). Provide answer below or attach additional sheets with numbered responses.	
9.3 In the last seven (7) years, has the Business Entity or any affiliate initiated or been the subject of any bankruptcy proceedings, whether or not closed, or is any bankruptcy proceeding pending?	☐ Yes ☐ No
If "Yes," provide the Business Entity involved, the relationship to the submitting Business Entity, the bankruptcy chapter number, the court name and the docket number. Indicate the current status of the proceedings as "Initiated," "Pending" or "Closed." Provide answer below or attach additional sheets with numbered responses.	

9.4 What is the Business Entity's Bonding Capacity?	
a. Single Project	b. Aggregate (All Projects)
9.5 List Business Entity's Gross Sales for the previous three (3) Fiscal Years:	

1st Year (Indicate year) Gross Sales	2nd Year (Indicate year) Gross Sales	3rd Year (Indicate year) Gross Sales
9.6 List Business Entity's Average Backlog for the previous three (3) fiscal years: (Estimated total value of uncompleted work on outstanding contracts)		
1st Year (Indicate year) Amount	2nd Year (Indicate year) Amount	3rd Year (Indicate year) Amount
9.7 Attach Business Entity's most recent annual financial statement and accompanying notes or complete Attachment C – Financial Information, found at www.osc.state.ny.us/vendrep/documents/questionnaire/ac3296s.xls. *(This information must be attached.)*		

NYS VENDOR ID: 000000000

NEW YORK STATE VENDOR RESPONSIBILITY QUESTIONNAIRE FOR-PROFIT CONSTRUCTION (CCA-2)

X. FREEDOM OF INFORMATION LAW (FOIL)	
10.0 Indicate whether any information provided herein is believed to be exempt from disclosure under the Freedom of Information Law (FOIL). *Note: A determination of whether such information is exempt from FOIL will be made at the time of any request for disclosure under FOIL. Attach additional pages if necessary.*	☐ Yes ☐ No
If "Yes," indicate the question number(s) and explain the basis for the claim.	

NEW YORK STATE VENDOR RESPONSIBILITY QUESTIONNAIRE FOR-PROFIT CONSTRUCTION (CCA-2)

Certification

The undersigned: (1) recognizes that this questionnaire is submitted for the express purpose of assisting New York State government entities (including the Office of the State Comptroller (OSC)) in making responsibility determinations regarding award or approval of a contract or subcontract and that such government entities will rely on information disclosed in the questionnaire in making responsibility determinations; (2) acknowledges that the New York State government entities and OSC may, in their discretion, by means which they may choose, verify the truth and accuracy of all statements made herein; and (3) acknowledges that intentional submission of false or misleading information may result in criminal penalties under State and/or Federal Law, as well as a finding of non-responsibility, contract suspension or contract termination.

The undersigned certifies that he/she:

- is knowledgeable about the submitting Business Entity's business and operations;
- has read and understands all of the questions contained in the questionnaire;
- has not altered the content of the questionnaire in any manner;
- has reviewed and/or supplied full and complete responses to each question;
- to the best of his/her knowledge, information and belief, confirms that the Business Entity's responses are true, accurate and complete, including all attachments, if applicable;
- understands that New York State government entities will rely on the information disclosed in the questionnaire when entering into a contract with the Business Entity; and
- is under an obligation to update the information provided herein to include any material changes to the Business Entity's responses at the time of bid/proposal submission through the contract award notification, and may be required to update the information at the request of the New York State government entities or OSC prior to the award and/or approval of a contract, or during the term of the contract.

Signature of Owner/Official _____

Printed Name of Signatory _____

Title _____

Name of Business _____

Address _____

City, State, Zip _____

Sworn to before me this _____ day of _____, 20___;

_____ Notary Public

NEW YORK STATE

VENDOR RESPONSIBILITY QUESTIONNAIRE

ATTACHMENT A – COMPLETED CONSTRUCTION CONTRACTS

Vendor Name: **NYS Vendor ID:**

Question 3.0: List the ten most recent construction contracts the Business Entity has completed. If less than ten, include most recent subcontracts on projects up to that number:					
1.	Agency/Owner		Award Date	Amount	Date Completed
	Contact Person	Telephone No.	Designer Architect and /or Design Engineer		
	Contract No. / Prime or Sub	Joint Venture (JV) Name, if applicable			EIN of JV, if applicable
2.	Agency/Owner		Award Date	Amount	Date Completed
	Contact Person	Telephone No.	Designer Architect and /or Design Engineer		
	Contract No. / Prime or Sub	Joint Venture (JV) Name, if applicable			EIN of JV, if applicable
3.	Agency/Owner		Award Date	Amount	Date Completed
	Contact Person	Telephone No.	Designer Architect and /or Design Engineer		
	Contract No. / Prime or Sub	Joint Venture (JV) Name, if applicable			EIN of JV, if applicable
4.	Agency/Owner		Award Date	Amount	Date Completed
	Contact Person	Telephone No.	Designer Architect and /or Design Engineer		
	Contract No. / Prime or Sub	Joint Venture (JV) Name, if applicable			EIN of JV, if applicable
5.	Agency/Owner		Award Date	Amount	Date Completed
	Contact Person	Telephone No.	Designer Architect and /or Design Engineer		
	Contract No. / Prime or Sub	Joint Venture (JV) Name, if applicable			EIN of JV, if applicable

NEW YORK STATE

VENDOR RESPONSIBILITY QUESTIONNAIRE

ATTACHMENT A – COMPLETED CONSTRUCTION CONTRACTS

Vendor Name: **NYS Vendor ID:**

Question 3.0: List the ten most recent construction contracts the Business Entity has completed. If less than ten, include most recent subcontracts on projects up to that number:						
6.	Agency/Owner			Award Date	Amount	Date Completed
	Contact Person		Telephone No.	Designer Architect and /or Design Engineer		
	Contract No.	Prime or Sub	Joint Venture (JV) Name, if applicable			EIN of JV, if applicable
7.	Agency/Owner			Award Date	Amount	Date Completed
	Contact Person		Telephone No.	Designer Architect and /or Design Engineer		
	Contract No.	Prime or Sub	Joint Venture (JV) Name, if applicable			EIN of JV, if applicable
8.	Agency/Owner			Award Date	Amount	Date Completed
	Contact Person		Telephone No.	Designer Architect and /or Design Engineer		
	Contract No.	Prime or Sub	Joint Venture (JV) Name, if applicable			EIN of JV, if applicable
9.	Agency/Owner			Award Date	Amount	Date Completed
	Contact Person		Telephone No.	Designer Architect and /or Design Engineer		
	Contract No.	Prime or Sub	Joint Venture (JV) Name, if applicable			EIN of JV, if applicable
10.	Agency/Owner			Award Date	Amount	Date Completed
	Contact Person		Telephone No.	Designer Architect and /or Design Engineer		
	Contract No.	Prime or Sub	Joint Venture (JV) Name, if applicable			EIN of JV, if applicable

NEW YORK STATE

VENDOR RESPONSIBILITY QUESTIONNAIRE

ATTACHMENT B – UNCOMPLETED CONSTRUCTION CONTRACTS

Vendor Name: **NYS Vendor ID:**

Question 3.1: List all current uncompleted construction contracts:

1.	Agency/Owner			Award Date	Completion Date
	Contact Person	Telephone No.	Designer Architect and /or Design Engineer		
	Contract No.	Prime or Sub	Joint Venture (JV) Name, if applicable		EIN of JV, if applicable
		Total Contract Amount	Amount Sublet to others	Uncompleted Amount	
2.	Agency/Owner			Award Date	Completion Date
	Contact Person	Telephone No.	Designer Architect and /or Design Engineer		
	Contract No.	Prime or Sub	Joint Venture (JV) Name, if applicable		EIN of JV, if applicable
		Total Contract Amount	Amount Sublet to others	Uncompleted Amount	
3.	Agency/Owner			Award Date	Completion Date
	Contact Person	Telephone No.	Designer Architect and /or Design Engineer		
	Contract No.	Prime or Sub	Joint Venture (JV) Name, if applicable		EIN of JV, if applicable
		Total Contract Amount	Amount Sublet to others	Uncompleted Amount	
4.	Agency/Owner			Award Date	Completion Date
	Contact Person	Telephone No.	Designer Architect and /or Design Engineer		
	Contract No.	Prime or Sub	Joint Venture (JV) Name, if applicable		EIN of JV, if applicable
		Total Contract Amount	Amount Sublet to others	Uncompleted Amount	

NEW YORK STATE

VENDOR RESPONSIBILITY QUESTIONNAIRE

ATTACHMENT B – UNCOMPLETED CONSTRUCTION CONTRACTS

Vendor Name: **NYS Vendor ID:**

Question 3.1: List all current uncompleted construction contracts:

5.	Agency/Owner				Award Date	Completion Date
	Contact Person		Telephone No.	Designer Architect and /or Design Engineer		
	Contract No.	Prime or Sub	Joint Venture (JV) Name, if applicable			EIN of JV, if applicable
			Total Contract Amount	Amount Sublet to others		Uncompleted Amount
6.	Agency/Owner				Award Date	Completion Date
	Contact Person		Telephone No.	Designer Architect and /or Design Engineer		
	Contract No.	Prime or Sub	Joint Venture (JV) Name, if applicable			EIN of JV, if applicable
			Total Contract Amount	Amount Sublet to others		Uncompleted Amount
7.	Agency/Owner				Award Date	Completion Date
	Contact Person		Telephone No.	Designer Architect and /or Design Engineer		
	Contract No.	Prime or Sub	Joint Venture (JV) Name, if applicable			EIN of JV, if applicable
			Total Contract Amount	Amount Sublet to others		Uncompleted Amount
8.	Agency/Owner				Award Date	Completion Date
	Contact Person		Telephone No.	Designer Architect and /or Design Engineer		
	Contract No.	Prime or Sub	Joint Venture (JV) Name, if applicable			EIN of JV, if applicable
			Total Contract Amount	Amount Sublet to others		Uncompleted Amount

NEW YORK STATE

VENDOR RESPONSIBILITY QUESTIONNAIRE

ATTACHMENT B – UNCOMPLETED CONSTRUCTION CONTRACTS

Vendor Name: **NYS Vendor ID:**

Question 3.1: List all current uncompleted construction contracts:

9.	Agency/Owner			Award Date	Completion Date
	Contact Person		Telephone No.	Designer Architect and /or Design Engineer	
	Contract No.	Prime or Sub	Joint Venture (JV) Name, if applicable		EIN of JV, if applicable
			Total Contract Amount	Amount Sublet to others	Uncompleted Amount
10.	Agency/Owner			Award Date	Completion Date
	Contact Person		Telephone No.	Designer Architect and /or Design Engineer	
	Contract No.	Prime or Sub	Joint Venture (JV) Name, if applicable		EIN of JV, if applicable
			Total Contract Amount	Amount Sublet to others	Uncompleted Amount

Grand Total All Uncompleted Contracts	**$0.00**

NEW YORK STATE VENDOR RESPONSIBILITY QUESTIONNAIRE
ATTACHMENT C - FINANCIAL INFORMATION

NYS Vendor ID: _____

As of Date: _____

ASSETS

Current Assets

1. Cash			$ -
2. Accounts receivable - less allowance for doubtful accounts	$ -		
Retainers included in accounts receivable	$ -		
Claims included in accounts receivable not yet approved or in litigation	$ -		
Total Accounts Receivable			$ -
3. Notes receivable - due within one year			$ -
4. Inventory - materials			$ -
5. Contract costs in excess of billings on uncompleted contracts			$ -
6. Accrued income receivable			
Interest	$ -		
Other (list) _____	$ -		
_____	$ -		
Total Accrued Income Receivable			$ -
7. Deposits			
Bid and Plan _____	$ -		
Other (list) _____	$ -		
_____	$ -		
Total Deposits			$ -
8. Prepaid Expenses			
Income Taxes	$ -		
Insurance	$ -		
Other (list) _____	$ -		
_____	$ -		
Total Prepaid Expenses			$ -
9. Other Current Assets			
Other (list) _____	$ -		
_____	$ -		
Total Other Current Assets			$ -
10. Total Current Assets			$ -
11. Investments			
Listed securities-present market value	$ -		
Unlisted securities-present value	$ -		
Total Investments			$ -

NEW YORK STATE VENDOR RESPONSIBILITY QUESTIONNAIRE
ATTACHMENT C - FINANCIAL INFORMATION

NYS Vendor ID: _____

12. Fixed Assets			
Land	$ -		
Building and improvements	$ -		
Leasehold improvements	$ -		
Machinery and equipment	$ -		
Automotive equipment	$ -		
Office furniture and fixtures	$ -		
Other (list) _____	$ -		
_____	$ -		
Total		$ -	
Less: Accumulated depreciation		$ -	
Total Fixed Assets - Net			$ -
13. Other Assets			
Loans receivable			
Officers	$ -		
Employees	$ -		
Shareholders	$ -		
Cash surrender value of officers' life insurance	$ -		
Organization expense – net of amortization	$ -		
Notes receivable - due after one year	$ -		
Other (list) _____	$ -		
_____	$ -		
Total Other Assets			$ -
14. TOTAL ASSETS			$ -

NEW YORK STATE VENDOR RESPONSIBILITY QUESTIONNAIRE
ATTACHMENT C - FINANCIAL INFORMATION

NYS Vendor ID: _____

LIABILITIES

Current Liabilities		
15. Accounts payable		$ -
16 a. Loans from shareholders - due within one year		$ -
16 b. Other Loans - due within one year		$ -
17. Notes payable - due within one year		$ -
18. Mortgage payable - due within one year		$ -
19. Other payables - due within one year		
Other (list) _____	$ -	
_____	$ -	
Total Other Payables - due within one year		$ -
20. Billings in excess of costs and estimated earnings		$ -
21. Accrued expenses payable		
Salaries and wages	$ -	
Payroll taxes	$ -	
Employees' benefits	$ -	
Insurance	$ -	
Other	$ -	
Total Accrued Expenses Payable		$ -
22. Dividends payable		$ -
23. Income taxes payable		
State	$ -	
Federal	$ -	
Other	$ -	
Total Income Taxes Payable		$ -
24. Total current liabilities		$ -
25. Deferred income taxes payable		
State	$ -	
Federal	$ -	
Other	$ -	
Total Deferred Income Taxes		$ -
26. Long Term Liabilities		
Loans from shareholders - due after one year	$ -	
Other Loans - due within one year		
Principle	$ -	
Interest	$ -	
Notes payable - due after one year	$ -	
Mortgage - due after one year	$ -	
Other payables - due after one year	$ -	
Other (list) _____	$ -	
_____	$ -	
Total Long Term Liabilities		$ -

NEW YORK STATE VENDOR RESPONSIBILITY QUESTIONNAIRE
ATTACHMENT C - FINANCIAL INFORMATION

NYS Vendor ID: _____

27. Other Liabilities			
Other (list) _____	$ -		
_____	$ -		
Total Other Liabilities		$ -	
28. TOTAL LIABILITIES			$ -

NET WORTH

29. Net Worth (if proprietorship or partnership)			$ -
30. Stockholders' Equity			
Common stock issued and outstanding	$ -		
Preferred stock issued and outstanding	$ -		
Retained earnings	$ -		
Total	$ -		
Less: Treasury stock	$ -		
31. TOTAL STOCKHOLDERS' EQUITY			$ -
32. TOTAL LIABILITIES AND STOCKHOLDERS' EQUITY			$ -

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COUNTY OF ERIE STANDARD INSURANCE CERTIFICATE

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EXECUTIVE ORDER NO.18 – FIRST SOURCE HIRING POLICY FOR COUNTY CONSTRUCTION PROJECTS

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FIRST SOURCE POLICY TARGETED ZIP CODES – ERIE COUNTY ZIP CODES WITH 20% POVERTY RATE OR HIGHER

GENERAL CONDITIONS OF THE CONTRACT

SECTION 1 - DEFINITIONS

1.01 CONTRACT DOCUMENTS - The Contract comprises all the documents listed in the Table of Contents of the Project Manual, including all additions, deletions and modifications incorporated therein before the execution of the Contract:

A. Legal and Procedural Documents

B. General Conditions of the Contract

C. Supplementary General Conditions

D. Application for Payment

E. Detailed Specifications

F. Drawings

1.02 ARCHITECT / ENGINEER is the Architect, Architect / Engineer or Engineer named in the Contract Documents, or the representative duly authorized in writing to act for such Architect, Architect / Engineer or Engineer.

1.03 OWNER is the County of Erie. With respect to approval of the Contract Award, Change Orders and Final Payment, as well as the appropriation of funds therefore, the County Legislature shall be the Owner's representative. For Contract execution, the County Executive shall be the Owner's representative. In legal matters, the County Attorney shall be the County's representative. In all other matters, the County's representative shall be the Commissioner of Public Works, or in his absence, his duly authorized representative.

1.04 CONTRACTOR is the Contractor named in the Contract Documents.

1.05 SUBCONTRACTOR is any person, firm or corporation who has a direct contract with the Contractor and who acts for or in behalf of the Contractor in executing any part of the Contract, but does not include one who merely furnishes material or equipment.

1.06 PROPOSAL: The offer of a Bidder to perform the work described by the Contract Documents when made out and submitted on the prescribed Proposal Form, properly signed and guaranteed.

1.07 PROPOSAL GUARANTY: The Bid Bond, which shall accompany each Proposal submitted by the Bidder, is a guarantee that the Bidder will enter into a contract with the Owner for the construction of the work if the contract is awarded to him.

1.08 PERFORMANCE LABOR AND MATERIAL PAYMENT BOND: The Owner’s standard bond document and the only approved form of security to be submitted by the contractor and his surety as a guarantee to faithfully execute the work in accordance with the terms of the contract and to pay all amounts owed by him to all laborers, tradesmen and suppliers in connection with the work covered by his contract.

1.09 SURETY is the person, firm or corporation that executes the Contractor's Performance Bond.

1.10 PROJECT MANUAL shall mean the Legal and Procedural Documents, General Conditions of the Contract, together with the modifications thereof, and the Detailed Specifications, with all addenda thereto.

1.11 DRAWINGS are those enumerated in the contract documents.

1.12 WRITTEN NOTICE shall be considered as served when delivered in person or sent by registered or certified mail to the individual, firm or corporation or to the last business address of such known to him who serves the notice.

A. Notice to Owner - All required notices to the Owner shall be delivered to the Erie County Department of Public Works – Office of the Commissioner, 14th Floor Rath Building, 95 Franklin Street, Buffalo, NY 14202.

B. Change of Address - Each party shall advise the other parties to the Contract promptly as to any change in his business address until completion of the Contract.

1.13 ACT OF GOD means an earthquake, flood, tornado or other cataclysmic phenomenon of nature. Rain, wind, flood or other natural phenomenon of normal intensity for the locality shall not be construed as an Act of God and no reparation shall be made to the Contractor for damaged to the work resulting there from.

SECTION 2 - DRAWINGS, SPECIFICATIONS AND RELATED DATA

2.01 INTENT OF DRAWINGS AND SPECIFICATIONS - The intent of the Drawings and Specifications is that the Contractor furnish all labor and materials, equipment and transportation necessary for the proper execution of the work unless specifically noted otherwise. The Contractor shall do all the work shown on the Drawings and described in the Specifications and all incidental work considered necessary to complete the work included in the contract in a substantial and acceptable manner, and to fully complete the work or improvement, ready for use, occupancy and operation by the Owner.

2.02 CONFLICT - If there is conflicting variance between the Drawings and the Specifications, the provisions of the Specifications shall control. In case of conflict between the General Conditions of the Contract or any modifications thereof and the Detailed Specification Requirements, the Detailed Specification Requirements shall control.

2.03 DISCREPANCIES IN DRAWINGS - Any discrepancies found between the Drawings and Specifications and site conditions or any errors or omissions in the Drawings or Specifications shall be immediately reported to the Architect / Engineer , who shall promptly correct such error or omission in writing. Any work done by the Contractor after his discovery of such discrepancies, errors or omissions shall be done at the Contractor's risk.

2.04 DRAWINGS AND SPECIFICATIONS - The complete requirements of the work to be performed under the Contract shall be set forth in Drawings and Specifications to be supplied through the Architect / Engineer or by the Architect / Engineer as consultant to the Owner.

2.05 ADDITIONAL INSTRUCTIONS - Further instructions may be issued by the Architect / Engineer during the progress of the work by means of Drawings or otherwise to make more clear or specific the Drawings and Specifications or as may be necessary to explain or illustrate changes in the work to be done.

2.06 COPIES OF DRAWINGS AND SPECIFICATIONS FURNISHED - Except as provided for otherwise, all required copies of Drawings and Specifications necessary for the execution of the work shall be furnished to the Contractor without charge.

2.07 DRAWINGS AND SPECIFICATIONS AT JOB SITE - One complete set of all Drawings and Specifications shall be maintained at the job site and shall be available to the Architect / Engineer at all times.

2.08 OWNERSHIP OF DRAWINGS AND SPECIFICATIONS - Except as otherwise provided in the Owner's Contract with the Architect / Engineer, all original or duplicated Drawings and Specifications and other data prepared by the Architect / Engineer shall remain the property of the Owner and/or Architect / Engineer, and they shall not be reused on other work, but shall be returned upon completion of the work.

2.09 DIMENSIONS - Figured dimensions on the plans will be used in preference to scaling the Drawings. Where the work of the Contractor is affected by finish dimensions, these shall be determined by the Contractor at the site, and he shall assume the responsibility therefore.

2.10 MODELS - All models prepared for this work shall become the property of the Owner at the completion of the work.

2.11 SAMPLES - All samples called for in the Specifications or required by the Architect / Engineer shall be furnished by the Contractor and shall be submitted to the Architect / Engineer for his approval. Samples shall be furnished so as not to delay fabrication, allowing the Architect / Engineer reasonable time for the consideration of the samples submitted.

A. Samples of Tests - Contractor shall furnish such samples of material as may be required for examination and test. All materials and workmanship shall be in accordance with approved samples. All samples of materials for tests shall be taken according to methods provided in the Specifications.

2.12 SHOP DRAWINGS – A schedule of shop drawings, setting data, and other manufacturer's data shall be submitted by the Contractor for approval of the Architect/Engineer. This schedule shall be coordinated with the project construction schedule and shall be submitted within 30 days after award of contracts.

A. The shop drawings schedule should list the following information:

1. Description of items for which shop drawings and data shall be submitted.

2. Approximate date for first submittal.

3. Approximate number of calendar days required for fabrication and delivery after final approval.

4. Number of copies each item for preliminary and final submittals.

B. The Contractor shall be responsible for the accuracy, completeness, and suitability of the information furnished or shop drawings prepared by the subcontractors and vendors. The Contractor shall check and approve all shop drawings before they are submitted to the Architect/Engineer. Such approval shall be understood to indicate the Contractor's assurances that the items proposed by the drawings and data sheets are in accordance with the contract. Shop drawings shall include setting drawings, schedules, catalogs, brochures, manufacturer's data and other information required to evaluate and install.

C. Shop drawings may be disapproved by the Architect/Engineer for the following reasons:

1. Drawing has not been approved by the Contractor.

2. Drawings have been prepared without due regard for information and requirements called for or logically implied by the Contract Documents.

3. The information is not sufficiently complete or accurate to verify that that the work represented is in accordance with the Contract Documents.

D. Shop drawings and submitted data shall be graded by the Architect/Engineer as follows:

1. Reviewed

   a. There shall be no correction marks on drawings.

   b. The work may be fabricated.

2. Make Noted Corrections

   a. Corrections shall be of a minor nature.

   b. The work may be fabricated at the Contractor's option, except where otherwise noted.

   c. Corrected copies shall be submitted within a reasonable time for final approval.

   d. Not Approved

3. Rejected

   a. Drawings are not acceptable.

4. Revise and Re-submit

   a. Drawings are basically correct, but due to the nature and/or extent of the corrections and/or revisions required, work shall not be fabricated.

5. Submit Item Specified

   a. Contractor shall submit item as specified in the specifications.

6. The Architect / Engineer shall, within fourteen (14) days of the submittal of any shop drawings, return one copy to the contractor marked with all corrections and changes.

E. The Architect/Engineer's approval of shop drawings is subject to the following conditions:

1. Approval does not authorize changes to contract requirements unless so stated in a separate letter or change order.

2. The Contractor shall verify all dimensions.

3. Checking and approval of shop drawings shall be only for conformance with the design concept of the project and compliance with the information given in the Contract Documents. Contractor shall be responsible for the dimensions to be confirmed and correlated at the jobsite; for all quantities, for information that pertains solely to the fabrication processes or to techniques or construction, and for coordination of the work of all trades.

F. Shop drawings should generally provide the following information:

1. Job Title and Shop Drawing Number.
2. Date of Drawing and Revisions.
3. Certification that drawing has been checked by Contractor and is in compliance with the Contract Documents.
4. Details of Fabrication, Assembly and Erection.
5. Materials Used.
6. Required Dimensions.
7. Details of connections of related work.
8. Designation of the other subcontractor, trade or Contractor who provides related work shown on drawings. If not shown, this information should be provided by the Contractor before the first submittal is transmitted to the Architect / Engineer.
9. Information relating to the capacities, controls and other specification data for items or equipment.
10. Schedule, where pertinent, information on finishes or protective coating, including color samples as required.

G. Distribution Procedure:

1. In general, all shop drawings and submittals shall be received by the Architect / Engineer under a covering transmittal memorandum from the Contractor.
2. Unless otherwise indicated, initial and subsequent submissions, except final submissions shall consist of one (1) reproducible transparency and two (2) prints. The two (2) prints will be retained by the Architect /Engineer and the reproducible transparency will be returned to the Contractor.
3. Submission of catalogs, brochures and other data, where reproducible transparencies are not feasible, shall consist of a minimum of four (4) copies, two (2) of which shall be retained and two (2) returned to the Contractor. Final submittal shall include extra copies as maybe be required by the Contractor.
4. The Contractor shall make all necessary corrections to conform to the corrections and changes requested by the Architect / Engineer.
5. When shop drawings are “approved “and so stamped, the Contractor shall then submit an additional three (3) copies to the Architect/ Engineer which will be retained.
6. The Contractor shall make a minimum distribution of “approved” copies as follows:
7. One or more copies to the fabricator and /or manufacturer’s representative.
8. One copy in the contractor’s office.

9. One copy to file and keep in good condition at the site.

2.13 QUALITY OF EQUIPMENT AND MATERIALS - In order to establish standard of quality, the Architect / Engineer may, in the Detailed Specifications, refer to certain products by name and catalog number. This procedure is not to be construed as eliminating from competition other products of equal or better quality by other manufacturers where fully suitable for performance, capacity and design.

A. The Contractor shall furnish the complete list of proposed desired substitutions at the time of bidding, in the space provided on the Proposal Form, together with such engineering and catalog data as the Architect / Engineer may require.

B. Substitutions

1. Requests for substitutions will be considered under the following time limitations and situations:

    a. Not less than ten (10) calendar days before bids are due.
    b. Work or equipment specified becomes unavailable through unforeseen events such as strikes, loss of manufacturers' plant through fire, flood or bankruptcy.

2. Requested substitutions will be reviewed and adjudged. Failure of the Owner to raise objection shall not constitute a waiver of any of the requirements of the Contract Documents.

3. Request for substitutions shall include complete data with drawings and samples as required, including the following:

    a. Quality Comparison – Proposed substitution versus the specified product.
    b. Changes required in other work because of the substitution.
    c. Effect on the construction schedule.
    d. Cost Data – Resulting from the proposed substitution versus the specified product. The Contractor shall certify that the cost data presented is complete and includes all related costs under this Contract.

4. When proposing a substitution, the Contractor represents that:

    a. They have investigated the proposed substitution and have determined that it is equal to or better than the product specified.
    b. They will guarantee the substitution in the same manner as the product specified.
    c. They will coordinate and make other changes as required in the work as a result of the substitution.
    d. They waive all claims for additional costs as a result of the substitution, with the exception of those identified above under "cost data".

5. The Owner will be sole judge of the acceptability of the proposed substitution.

6. The Owner will have authority to approve or reject substitutions or to change the specified standards of quality. However, neither this authority to act under this provision nor any decision made in good faith, either to exercise or not to exercise this authority, shall give rise to any duty or responsibility of the Owner to the Contractor, any Subcontractor, any Sub-Subcontractor, any of their agents or employees, or any other persons performing the work or offering to perform the work.

C. The Contractor shall abide by the Architect / Engineer's judgment when proposed substitute materials or items of equipment are judged to be unacceptable and shall furnish the specified material or item of equipment in such case. All proposals for substitutions shall be submitted in writing by the Contractor and not by sub-contractors, individual trades or material suppliers. The Architect / Engineer will approve or disapprove proposed substitutions in writing. No substitute materials or equipment shall be used unless approved in writing.

2.14 EQUIPMENT APPROVAL DATA - The Contractor shall furnish one copy of complete catalog data for every manufactured item of equipment and all components to be used in the work, including specific performance data, material description, rating, capacity, working pressure, material gage or thickness, brand name, catalog number and general type.

A. This submission shall be compiled by the Contractor and approved by the Architect / Engineer before any of the equipment is ordered.

B. Each data sheet or catalog in the submission shall be indexed according to specification section and paragraph for easy reference.

C. After written approval, this submission shall become a part of the Contract, and may not be deviated from except upon written approval of the Architect / Engineer and Owner.

D. Catalog data for equipment approved by the Architect / Engineer does not in any case supersede the Architect / Engineer's Contract Documents. The approval of the Architect / Engineer shall not relieve the Contractor from responsibility for deviations from Drawings or Specifications, unless he has in writing called the Architect / Engineer's attention to such deviations at the time of submission, nor shall it relieve him from responsibility for errors of any sort in the items submitted. The Contractor shall check the work described by the catalog data with the Architect / Engineer's Contract Documents for deviations and errors.

E. It shall be the responsibility of the Contractor to insure that items to be furnished fit the space available. He shall make necessary field measurements to ascertain space requirements, including those for connections, and shall order such sizes and shapes of equipment that the final installation shall suit the true intent and meaning of the Drawings and Specifications.

F. Where equipment requiring different arrangement of connections from those shown is approved, it shall be the responsibility of the Contractor to install the equipment to operate properly, and in harmony with the intent of the Drawings and Specifications, and to make all changes in the work required by the different arrangement of connections without extra cost to the Owner.

2.15 SURVEYS - Unless otherwise specified, the Owner shall establish all base lines for the location of the principal component parts of the work together with a suitable number of bench marks adjacent to the work. Based upon the information provided by the Owner, the Contractor shall develop and make all detail surveys necessary for construction, including slope stakes, batterboards, stakes for pile locations and other working points, lines and elevations. The Contractor shall have the responsibility to carefully preserve bench marks, reference points and stakes, and, in the case of destruction thereof by the Contractor or resulting from his negligence, the Contractor shall be charged with the expense and damage resulting there from and shall be responsible for any mistakes that may be caused by the unnecessary loss or disturbance of such bench marks, reference points and stakes.

2.16 RECORD DOCUMENT SUBMITTALS

A. Record Drawings: Prior to acceptance by the Owner of all work covered by the contract each contractor shall furnish to the Architect/ Engineer project record documents as required under Division 1.

B. Operation and Maintenance Manuals: Prior to acceptance by the Owner of all work covered by the contract each contractor shall furnish to the Architect/ Engineer operation and maintenance manuals as required under Division 1.

SECTION 3 - RELATIONS AMONG OWNER, CONTRACTOR AND ARCHITECT / ENGINEER

3.01 ARCHITECT / ENGINEER 'S RESPONSIBILITY AND AUTHORITY - All work shall be done under the general administration of the Architect / Engineer. The Architect / Engineer shall decide any and all questions which may arise as to the quality and acceptability of materials furnished, work performed, rate or progress of work, interpretation of Drawings and Specifications and all questions, other than legal questions, as to the acceptable fulfillment of the Contract on the part of the Contractor.

3.02 ARCHITECT / ENGINEER'S DECISIONS - All decisions of the Architect / Engineer concerning the intent of the drawings and specifications shall be final. No changes may be made in the drawings or specifications involving more or less quantities of materials, changes in the quality of materials or workmanship, or changes in design or in the amount of labor or machine time involved, regardless of whether or not a change in contract price is sought, until a request in writing has been submitted to the Owner for his approval and such approval has been granted.

3.03 SUSPENSION OF WORK - The Owner's representative and/or the Architect / Engineer shall have the authority to suspend the work, wholly or in part, for such periods as he may deem necessary due to unsuitable weather or such other conditions as are considered unfavorable for prosecution of the work, or failure on the part of the Contractor to carry out the provisions of the Contract or to supply materials meeting the requirements of the Specifications. The Contractor shall not suspend operation without the Owner's representative and/or the Architect / Engineer's permission.

3.04 INSPECTION OF WORK - All materials and each part or detail of the work shall be subject at all times to inspection by the Owner's representative and/or the Architect / Engineer, and the Contractor will be held strictly to the true intent of the Specifications in regard to quality of materials, workmanship, and the diligent execution of the Contract. Such inspection may include mill, plant, or shop inspection, and any material furnished under these Specifications is subject to such inspection. The Owner's representative and/or the Architect / Engineer shall be allowed access to all parts of the work and shall be furnished with such information and assistance by the Contractor as is required to make a complete and detailed inspection.

3.05 EXAMINATION OF COMPLETE WORK - If the Architect / Engineer requests it, the Contractor at any time before acceptance of the work shall remove or uncover such portions of the finished work as maybe directed. After examination, the Contractor shall restore said portions of the work to the standard required by the Specifications. Should the work thus exposed or examined prove acceptable, the uncovering or removing, and the replacing of the covering or making good of the parts removed shall be paid for as Extra Work, but should the work so exposed or examined prove unacceptable, the uncovering, removing and replacing shall be at the Contractor's expense.

3.06 CONTRACTOR'S SUPERINTENDENCE - The Contractor shall designate a qualified superintendent, acceptable to the Owner's representative and the Architect / Engineer, who shall be maintained on the project and give efficient supervision to the work until its completion. The superintendent shall have full authority to act in behalf of the Contractor, and all directions given to the superintendent shall be considered given to the Contractor. In general, the Architect / Engineer's instructions shall be confirmed in writing and always upon written request from the Contractor. The Contractor's superintendent or other authorized managerial level representative shall be required to attend all scheduled job meetings.

1. Delays caused by the contractor due to lack of attendance at a scheduled job meeting and/or lack of coordination will be at the contractor's expense. This would be inclusive of all costs related to the delayed work caused by a given prime contractor and/or its subcontractors affecting any contractor (prime or sub) on the Project.

3.07 LANDS BY OWNER - The Owner shall provide the lands shown on the Drawings upon which the work under the Contract is to be performed and to be used for rights-of-way for access. Any unreasonable delay in furnishing these lands by the Owner shall be deemed proper cause for adjustment in the Contract Amount and/or in the time of completion.

3.08 LANDS BY CONTRACTOR - Any additional land and access thereto, not shown on the Drawings, that may be required for temporary construction facilities or for storage of materials shall be provided by the Contractor with no liability to the Owner. The Contractor shall confine his apparatus and storage of materials and operation of his workmen to those areas described in the Drawings and Specifications and such additional areas which he may provide as approved by the Owner's representative and the Architect / Engineer.

3.09 PRIVATE PROPERTY - The Contractor shall not enter upon private property for any purpose without obtaining permission, and he shall be responsible for the preservation of all public property, trees, monuments, etc. along and adjacent to the street and/or right-of-way, and shall use every precaution necessary to prevent damage or injury thereto. He shall use suitable precautions to prevent damage to pipes, conduits, and other underground structures, and shall protect carefully from disturbance or damage all monuments and property marks until an authorized agent has witnessed or otherwise referenced their location and shall not remove them until directed.

3.10 ASSIGNMENT OF CONTRACT - The Contractor shall be bound by Section 109 of the General Municipal Law relating to the assignment of Public Contracts. The following extracts are directed to the attention of bidders:

A. "Prohibiting any contractor, to whom any contract shall be let, granted or awarded, as required by law, from assigning, transferring, conveying, subletting or otherwise disposing of the same, or of his right, title or interest therein, or his power to execute such contract, to any other person or corporation without the previous consent in writing of the officer, board or agency awarding the contract."

B. "If any contractor, to whom any contract is let, granted or awarded, as required by law, by any officer, board or agency of a political subdivision, or of any district therein, shall without the previous written consent specified in subdivision one of this section, assign, transfer, convey, sublet or otherwise dispose of such contract, or his right, title or interest therein, or his power to execute such contract, to any other person or corporation, the officer, board or agency which let, made, granted or awarded such contract shall revoke and annul such contract, and the political subdivision or district therein, as the case maybe, and such officer, board or agency shall be relieved and discharged from any and all liability and obligations growing out of such contract to such contractor, and to the person or corporation to which such contract shall have been assigned, transferred, conveyed, sublet or otherwise disposed of, and such contractor, and his assignees, transferees or sub lessees shall forfeit and lose all moneys, theretofore earned under such contract, except so much as may be required to pay his employees. The provisions of this section shall not hinder, prevent or affect any assignment by any such contractor for the benefit of his creditors made pursuant to the laws of this state."

3.11 REMOVAL OF CONSTRUCTION EQUIPMENT, TOOLS AND SUPPLIES - At the termination of this Contract, before acceptance of the work by the Architect / Engineer , the Contractor shall remove all of his equipment, tools and supplies from the property of the Owner. Should the Contractor fail to remove such equipment, tools and supplies, the Owner shall have the right to remove them.

3.12 SUSPENSION OF WORK BY OWNER - The work or any portion thereof may be suspended at any time by the Owner provided that he give the Contractor five (5) days' written notice of suspension, which shall set forth the date on which work is to be resumed.

3.13 OWNER'S RIGHT TO CORRECT DEFICIENCIES - Upon failure of the Contractor to perform the work in accordance with the Contract Documents, including any requirements with respect to the Schedule of Completion, and after five (5) day's written notice to the Contractor and receipt of written approval from the Architect / Engineer, the Owner may, without prejudice to any other remedy he may have, correct such deficiencies.

3.14 OWNER'S RIGHT TO TERMINATE CONTRACT AND COMPLETE THE WORK - The Owner shall have the right to terminate the employment of the Contractor after giving ten (10) days' written notice of termination to the Contractor in the event of any default by the Contractor and upon receiving written notice from the Architect / Engineer certifying cause for such action. In the event of such termination, the Owner may take possession of the work and of all materials, tools and equipment thereon and may finish the work by whatever method and means he may select. It shall be considered a default by the Contractor whenever he shall:

A. Declare bankruptcy, become insolvent, or assign his assets for the benefit of his creditors.

B. Disregard or violate important provisions of the Contract Documents or Architect / Engineer's Instructions, or fail to prosecute the work according to the agreed progress schedule, including extensions thereof.

C. Fail to provide a qualified superintendent, competent workmen or sub-contractors, or proper materials, or fail to make prompt payment therefore.

3.15 CONTRACTOR'S RIGHT TO SUSPEND WORK OR TERMINATE CONTRACT - The Contractor may suspend work or terminate Contract upon ten (10) days' written notice to the Owner and the Architect / Engineer, if an order of any court, or other public authority causes the work to be stopped or suspended for a period of ninety (90) days through no act or fault of the Contractor or his employees.

3.16 RIGHTS OF VARIOUS INTERESTS - Wherever work being done by the Owner's forces or by other contractors is contiguous to work covered by this Contract, the respective rights of the various interests involved shall be established by the Architect / Engineer to secure the completion of the various portions of the work in general harmony.

3.17 SEPARATE CONTRACTS - The Owner may let other contracts in connection with the work of the Contractor. The Contractor shall cooperate with other Contractors with regard to storage of materials and execution of their work. It shall be the Contractor's responsibility to inspect all work by other Contractors affecting their work and to report to the Architect / Engineer any irregularities which will not permit them to complete their work in a satisfactory manner. Their failure to notify the Architect / Engineer of such irregularities shall indicate the work of other Contractors has been satisfactorily completed to receive their work. The Contractor shall not be responsible for defects of which he could not have known, which develop in the work of others after the work is completed. It shall be the responsibility of the Contractor to measure the completed work in place and report to the Architect / Engineer immediately any difference between completed work by others and the Drawings.

It is the responsibility of each Prime Contractor under separate contracts associated with the same project to coordinate the activities of their respective subcontractors and the work between other prime contracts that affects their scope of work in a cooperative manner to prevent delays and/ or additional costs to the extent practical. It will be the responsibility of the Architect/ Engineer in conjunction with the Owner to evaluate delays and/or additional costs should they arise. Owner reserves the right to withhold payment per Section 7.05 as deemed necessary.

3.18 CONTRACTORS OWN WORKFORCE – The Contractor shall perform with their own workforce contract work amounting to not less that 25 percent of the original total contract price, except those items designated by the County as "Specialty Items" so performed shall be deducted from the original total contract price before computing the amount of work required to be performed by the Contractor with their own workforce.

A. "Their own workforce" shall be construed to include only worker's employed and paid directly by the Contractor and equipment owned or rented by the Contractor, with or without operators.

B. "Specialty Items" shall be construed to be limited to work that requires specialized knowledge, craftsmanship or equipment not ordinarily available in contracting organizations qualified to bid on the contract as a whole and, in general, are to be limited to minor components of the overall contract.

The following list of "Specialty Items" are work items which require special skills and comprise work which is not relevant to the general type of construction contained in this contract:

NONE

CONTRACTOR'S OWN WORKFORCE
(This form must be submitted with the Contractor's bid proposal)

Pursuant to Section 3.18 – Contractor's Own Workforce, of the General Conditions, the Contractor submitting a bid proposal acknowledges that they will perform a minimum of 25% of the work with their own workforce as follows:

Task	Value of Work
Total Value of Workforce	
Percentage of Total Bid	%

3.19 SUBCONTRACTS - Within 48 hours (not counting Saturdays, Sundays or holidays) after the time of bidding, the Contractor shall submit in writing to the Owner for approval by the Architect / Engineer the names of the sub-contractors proposed for the work. After such approval, sub-contractors may not be changed except at the request of, or with the approval of the Architect / Engineer. The Contractor is responsible to the Owner for the acts and omissions of his sub-contractors, and of their direct and indirect employees, to the same extent as he is responsible for the acts and omissions of his employees. The Contract Documents shall not be construed as creating any contractual relation between any sub-contractor and the Owner. The Contractor shall bind every sub-contractor by the terms of the Contract Documents.

A. For convenience of reference and to facilitate the letting of Contracts and sub-contracts, the Specifications are separated into titled sections. Such separations shall not, however, operate to make the Architect / Engineer an arbiter to establish limits to the contracts between Contractor and sub-contractors.

3.20 WORK DURING AN EMERGENCY - The Contractor shall perform any work and shall furnish and install any materials and equipment necessary during an emergency endangering life or property. In all cases he shall notify the Architect / Engineer of the emergency as soon as practicable, but he shall not wait for instructions before proceeding to properly protect both life and property.

3.21 ORAL AGREEMENTS - No oral order, objection, claim or notice by any party to the others shall affect or modify any of the terms or obligations contained in any of the Contract Documents, and none of the provisions of the Contract Documents shall be held to be waived or modified by reason of any act whatsoever, other than a definitely agreed waiver or modification thereof in writing, and no evidence shall be introduced in any proceeding of any other waiver or modification.

SECTION 4 - MATERIALS AND WORKMANSHIP

4.01 MATERIALS FURNISHED BY THE CONTRACTOR - All materials sold to the Owner and/or used in the work shall meet the requirements of the respective Specifications, and no material shall be used until it has been approved by the Architect / Engineer. All materials not otherwise specifically indicated shall be furnished by the Contractor.

4.02 MATERIALS FURNISHED BY THE OWNER - Materials specifically indicated shall be furnished by the Owner. The fact that the Owner is to furnish material is conclusive evidence of its acceptability for the purpose intended, and the Contractor may continue to use it until otherwise directed. If the Contractor discovers any defect in material furnished by the Owner, he shall notify the Architect / Engineer. Unless otherwise noted or specifically stated, materials furnished by the Owner, which are not of local occurrence, are considered to be f.o.b. the nearest railroad station. The Contractor shall be prepared to unload and properly protect all such material from damage or loss. The Contractor shall be responsible for material loss or damage after receipt of material at the point of delivery.

4.03 STORAGE OF MATERIALS - Materials shall be so stored as to insure the preservation of their quality and fitness for the work. When considered necessary, they shall be placed on wooden platforms or other hard, clean surfaces, and not on the ground, and/or they shall be placed under cover. Stored materials shall be located so as to facilitate prompt inspection. Request for payment of offsite storage shall be in accordance with Section 7.02.c.

4.04 CHARACTER OF WORKMEN - The Contractor shall at all times be responsible for the conduct and discipline of his employees and/or any sub-contractor or persons employed by sub-contractors. All workmen must have sufficient knowledge, skill, and experience to perform properly the work assigned to them. Any foreman or workman employed by the Contractor or sub-contractor who, in the opinion of the Architect / Engineer, does not perform his work in a skillful manner, or appears to be incompetent or to act in a disorderly or intemperate manner shall, at the written request of the Architect / Engineer, be discharged immediately and shall not be employed again in any portion of the work without the approval of the Architect / Engineer.

4.05 REJECTED WORK AND MATERIALS - All materials which do not conform to the requirements of the Contract Documents, are not equal to samples approved by the Architect / Engineer, or are in any way unsatisfactory or unsuited to the purposes for which they are intended, shall be rejected. Any defective work whether the result of poor workmanship, use of defective materials, damaged through carelessness or any other cause shall be removed within ten (10) days after written notice is given by the Architect / Engineer, and the work shall be re-executed by the Contractor. The fact that the Architect / Engineer may have previously overlooked such defective work shall not constitute an acceptance of any part of it.

A. Should the Contractor fail to remove rejected work or materials within ten (10) days after written notice to do so, the Owner may remove them and may store the materials.

B. Correction of Faulty Work after Final Payment shall be in accordance with Paragraph 7.18.

4.06 MANUFACTURER'S DIRECTIONS - Manufactured articles, material and equipment shall be applied, installed, connected, erected, used, cleaned and conditioned as directed by the manufacturer unless herein specified to the contrary.

4.07 CUTTING AND PATCHING - The Contractor shall do all necessary cutting and patching of the work that may be required to properly receive the work of the various trades or as required by the Drawings and Specifications to complete the structure. He shall restore all such cut or patched work as directed by the Architect / Engineer. Cutting of existing structure that shall endanger the work, adjacent property, workmen or the public, shall not be done unless approved by the Architect / Engineer and under his direction.

4.08 CLEANING UP - The Contractor shall remove from the Owner's property, and from all public and private property, all temporary structures, rubbish and waste materials resulting from his operation or caused by his employees, and shall remove all surplus materials leaving the site smooth, clean and true to line and grade. If all materials described above related to a contractor’s scope of work are not removed in a timely manner, the contractor will be issued a written notice of unsatisfactory demobilization / cleanup which shall be addressed within 24 hours. If satisfactory corrective action is not completed within 24 hours the County shall have the situation remedied as deemed necessary by the County and the contractor shall be responsible for the costs through a withhold of retention and/or invoice to the contractor equaling the cost to clean up the construction site.

4.09 GUARANTY PERIOD - The Contractor shall warrant all materials and equipment furnished and all work performed by him for a period of two (2) years, or for such longer period as may be specified in the Detailed Specifications, from the date of written acceptance of the work or "Notice of Substantial Completion". (Note: The warranty period, in regard to any facilities or portions thereof which are essentially completed and have been accepted for use and occupancy by the Owner shall commence with the date of the "Notice of Substantial Completion".)

A. Correction of Faulty Work after Final Payment shall be as provided in Paragraph 7.18, except that where a period longer than two years is specified in the Detailed Specifications, such longer period shall apply.

B. As a condition precedent to final payment, the Contractor shall execute a guaranty in the form provided by the Architect / Engineer warranting the work under his contract free from defects of materials and workmanship and agreeing to replace at his expense any materials or equipment found defective within the two years after final acceptance by the Owner, and to replace any other work found unsatisfactory because of settlement or displacement within such longer period as may be specified in the Detailed Specifications, and to do such replacing or corrective work at such times and in such manner as not to interfere with the Owner's use of the premises.

SECTION 5 - INSURANCE, BONDS, SAFETY, ETC.

5.01 INSURANCES REQUIRED - Insurance shall be procured by the successful bidder before commencing work, no later than seven (7) days after notice of an award and maintained without interruption for the duration of the contract, in the kinds and amounts specified below.

	Each Occurrence	Aggregate
A. Commercial General Liability Premises and Operations	$1,000,000	$2,000,000
▪ Products and Completed Operations	$2,000,000	
▪ Independent Contractors	Not Excluded or Limited	
▪ Contractual	Not Excluded or Limited	
▪ Broad Form Property Damage	Not Excluded or Limited	
▪ X,C,U	Not Excluded or Limited	
B. Automobile Liability, including	$1,000,000 CSL	
▪ Owner		
▪ Hired		
▪ Non-Owned		
C. Excess Umbrella Liability		$5,000,000
D. Worker's Compensation	Statutory (IC-1, Section IX)	
E. New York Disability	Statutory (IC-1, Section IX)	

F. Builders' Risk-All Risk. The policy is required. The Prime Contractors shall procure and maintain Insurance against loss by fire, extended coverage, vandalism and malicious mischief upon all work in place and all materials and equipment stored on and off the building site. This insurance shall be in an amount equal to the full insurable value at all times and shall be for the benefit of the Owner and each Prime Contractor, as their interest might appear. The Policy must carry the County of Erie as the named insured.

5.02 CERTIFICATES OF INSURANCE

A. Shall be made to the "County of Erie"

B. Coverage must comply with all requirements of “Instructions for County of Erie Standard Insurance Certificate” page IC-1 of this Project Manual.

C. Executed by an insurance company and/or agency or broker which is licensed by the Insurance Department of the State of New York. If executed by a broker, notarized copy of authorization to bind or certify coverage must be attached.

D. All policies in which the County of Erie is named as an additional insured shall provide that:

E. "The insurance company or companies issuing the policies shall have no recourse against the County of Erie for payment of any premiums or for assessments under any form of policy."

F. "The insurance shall apply separately to each insured (except with respect to the limit of liability)."

G. During the term of this Agreement, the Contractor agrees to maintain insurance coverage consistent with the insurance requirements attached hereto. Contractor agrees to name the “County of Erie” as an additional insured on all such insurance policies, and to provide to the County Attorney certificate(s) of insurance evidencing such insurance coverage prior to the commencement of any work on the Project. All insurance certificates shall be subject to approval by the office of the County Attorney.

5.03 PERFORMANCE, LABOR AND MATERIAL PAYMENT BOND - The Contractor shall furnish, as required elsewhere in the General Conditions. A Performance, Labor and Material Payment Bond in a sum equal to the Contract amount, including change order values. The form of such bond shall be the Owner’s Standard Performance, Labor and Material Payment Bond which is exhibited elsewhere in the Project Manual. The bond shall be written with a Surety Company licensed or otherwise authorized to do business in the State of New York.

The Performance Bond shall be submitted by the successor bidder no later than 7 days after notice of an award.

5.04 PATENTS AND ROYALTIES - If any design, device, material or process covered by letters, patent or copyright is used by the Contractor, he shall provide for such use by legal agreement with the Owner of the patent or a duly authorized licensee of such owner, and shall save harmless the Owner from any and all loss or expense on account thereof, including its use by the Owner.

5.05 PERMITS - All permits and licenses necessary for the prosecution of the work shall be secured by the Contractor as required and/or as directed by the Architect/ Engineer as described within the Project Documents.

The Contractor shall apply for and obtain a Building Permit from the Department of Public Works prior to the start of the work. The Contractor shall also submit proof of NYS Worker’s Compensation and NYS Disability Benefit’s Insurance on forms as prescribed by NYS. No work shall be started until the County has issued a valid Building Permit to the Contractor. Building in violation of a valid Building Permit is cause for the County to issue a Stop Work Order. The Contractor will not be required to submit stamped drawings as part of the application process. Building Permit Forms are included in Appendix B.

5.06 LAWS TO BE OBSERVED - The Contractor shall give all notices and comply with all Federal, State and Local Laws, Ordinances and Regulations in any manner affecting the conduct of the work, and all such order and decrees as exist, or may be enacted by bodies or tribunals having any jurisdiction or authority over the work, and shall indemnify and save harmless the Owner against any claim or liability arising from or based on, the violation of any such law, ordinance, regulation, order or decree, whether by himself or his employees.

5.07 PROTECTION OF PROJECT AND PUBLIC - The Contractor shall provide adequate signs, barricades, flashing and/or red lights and take all necessary precautions for the safety of the public and the protection of the work against loss or damage. All barricades and obstructions shall be protected at night by signal lights which shall be kept burning or flashing from sunset to sunrise. Barricades shall be of substantial construction and shall be so painted or coated as to increase their visibility at night. Suitable warning signs shall be so placed and illuminated at night as to show in advance where construction, barricades or detours exist. The Contractor shall inform himself as to conditions likely to be applicable to the site and shall, in any case, provide such watchmen, guards, watchdogs or other services as appear necessary to protect the work and workmen from damage or injury from vandalism, malicious mischief or other hazard.

5.08 TRAFFIC SAFETY AND CONVENIENCE - The Contractor shall at all times so conduct his work as to insure the least possible obstruction to traffic and to minimize inconvenience to the general public and the residents in the vicinity of the work, and to insure the protection of persons and property in a manner satisfactory to the Architect/Engineer. No road or street shall be closed to the public except with the permission of the Architect/Engineer and proper governmental authority. Fire hydrants on or adjacent to the work shall be kept accessible to firefighting equipment at all times. Temporary provisions shall be made by the Contractor to insure the use of sidewalks and the proper functioning of all gutters, sewer inlets, drainage ditches and irrigation ditches, which shall not be obstructed except as approved by the Architect/Engineer under conditions assuring satisfactory detour and/or by-pass facilities.

5.09 CROSSING UTILITIES - When new construction crosses highways, railroads, streets or utilities under the jurisdiction of State, County, City or other public agency, public utility or private entity, the Contractor shall secure written permission from the proper authority before executing such new construction. A copy of this written permission must be filed with the Owner before any work is done. The Contractor will be required to furnish a release from the proper authority before final acceptance of the work.

5.10 SANITARY PROVISIONS - The Contractor shall provide and maintain such sanitary accommodations for the use of his employees and those of his subcontractors as may be necessary to comply with the requirements and regulations of the local and State departments of health and as directed by the Architect/Engineer.

SECTION 6 - PROGRESS AND COMPLETION OF WORK

6.01 NOTICE TO PROCEED - Following authorization of the Contract by the Owner, written Notice to Proceed with the work shall be given to the Contractor. The Contractor shall begin and shall prosecute the work regularly and uninterruptedly thereafter (unless otherwise directed in writing by the Owner) with such labor force as to secure the completion of the work within the time stated in the Proposal.

6.02 LAYING OUT WORK

A. The Contractor shall, immediately upon entering the project site for the purpose of beginning work, locate all general reference points and take such action as is necessary to prevent their destruction. He shall lay out his own work and be responsible for all lines, elevations and measurements of structures, grading, paving, utilities and other work executed by him under the Contract. He must exercise proper precaution to verify figures shown on drawings before laying out work and will be held responsible for any error resulting from his failure to exercise such precaution.

B. The Contractor shall be responsible for correlation of all work.

6.03 METHODS OF MATERIALS

A. If alternate methods or materials from those specified are accepted and approved by the Owner, the Contractor shall be responsible for the equivalent operation and performance, and the proper installation in the space designated of the substituted material or system.

B. When job conditions require reasonable changes in indicated locations and arrangements, such changes shall be made without extra cost to the Owner.

6.04 CONTRACT TIME - The Contractor shall complete, in an acceptable manner, all of the work contracted for in the time stated in the Agreement, commencing with the date of Notice to Proceed.

6.05 PROGRESS SCHEDULE

A. The Contractor shall prepare a progress schedule to indicate the proposed progress of work. The progress schedule shall be in the form of a bar graph or other approved method.

B. The progress schedule shall be submitted to the Owner for application of work sequencing approval within fourteen (14) days of Notice to Proceed.

6.06 CHANGES IN THE WORK - The Owner may, as the need arises, order changes in the work through additions, deletions, or modifications without invalidating the Contract. Compensation and time of completion affected by the change shall be adjusted at the time of ordering such change, and shall be specified in a written Change Order approved by the Owner on recommendation by the Architect / Engineer.

6.07 EXTRA WORK - New and unforeseen items of work found to be necessary and which cannot be covered by any item or combination of items for which there is a Contract price shall be classed as Extra Work. The Contractor shall do such Extra Work and furnish such materials as may be required for the proper completion or construction of the whole work contemplated upon written Change Order by the Owner on recommendation by the Architect / Engineer. Materials to be incorporated into the project shall be sold to the Owner separately and apart from the furnishing of work, labor and other items required for the construction of the project in the same manner and with the same effect as if specified in the Bid Documents. In the absence of such written order, no claim for Extra Work shall be considered. Extra Work shall be performed in accordance with these Specifications where applicable and work not covered by the Specifications or special provisions shall be done in accordance with the best practice as approved by the Architect / Engineer. Extra Work required in an emergency to protect life and property shall be performed by the Contractor as required.

6.08 EXTENSION OF CONTRACT TIME - A delay beyond the Contractor's control occasioned by an Act of God, or act or omission on the part of the Owner by strikes, lockouts, fire, etc. may entitle the Contractor to an extension of time in which to complete the work as determined by the Architect / Engineer, provided, however, that the Contractor shall immediately give written notice to the Architect / Engineer of the cause of such delay. If an extension of time is granted, the approved Progress Schedule shall be updated and a change order issued covering the extension of time. The Contractor's signature on the change order shall signify the Contractor's acceptance of the updated Progress Schedule.

6.09 USE OF COMPLETED PORTIONS - The Owner shall have the right to take possession of and use any completed or partially completed portions of the work, notwithstanding that the time for completing the entire work or such portions may not have expired; but such taking possession and use shall not be deemed an acceptance of any work not completed in accordance with the Contract Documents. If such prior use increases the cost of or delays the completion of uncompleted work or causes refinishing of completed work, the Contractor shall be entitled to such extra compensation, or extension of time or both, as the Owner and Contractor may agree.

6.10 EXISTING UTILITIES - The operation of existing active utilities, including gas, water, sewer, electric and telephone lines, shall not be disturbed except as required to connect new utilities thereto.

6.11 SITE CONDITIONS - The Contractor shall maintain the site so as to avoid unhealthful, hazardous and noisome conditions. He shall maintain excavations free of the accumulation of excess water.

6.12 PREVENTION OF DELAY - The Contractor agrees that there will be no interruption in the performance of the work under this agreement due to labor strife or unrest. The Contractor and his subcontractors will not employ on the work, any labor, materials or means whose employment or utilization during the course of this contract may tend to or in any way cause or result in strikes, work stoppages, delays, suspension of work or similar troubles by workmen employed by the Contractor or his subcontractors or by any of the trades working in or about the buildings and premises where work is being performed under this contract, or by other contractors or their subcontractors pursuant to other contracts, or on any other building or premises owned or operated by the County of Erie. Any violation by the Contractor of this requirement will be considered proper and sufficient cause for the County, through the Department of Public Works – Office of the Commissioner to consider such interruption a breach of the agreement and to cancel the contract without any penalty to the County, and to recover any damages from the Contractor that may have been caused by labor strife and unrest.

SECTION 7 - MEASUREMENT AND PAYMENT

7.01 DETAILED BREAKDOWN OF CONTRACT AMOUNT - Except in cases where unit prices form the basis for payment under the Contract, the Contractor shall within ten (10) days of receipt of Notice to Proceed submit a complete breakdown of the Contract Amount showing the value assigned to the materials sold to the Owner for, and separately, the labor and other costs assigned to each part of the work, including any allowances as part of the base bid. Upon approval of the breakdown of the Contract Amount by the Architect / Engineer, it shall be used as the basis for all Requests for Payment.

Allowances and any future approved change orders shall be shown on the request for payment worksheets as separate line items. Request for payment worksheet can be found in specification Section 011500 – Application For Payment.

7.02 REQUESTS FOR PAYMENT

A. The Contractor may submit periodically, but not more than once a month, a Request for Payment for work done. The Contractor shall furnish the Architect / Engineer all reasonable facilities required for obtaining the necessary information relative to the progress and execution of the work. Each Request for Payment shall be computed on all items listed in the Detailed Breakdown of Contract Amount, less 5% to be retained until substantial completion and acceptance of the work and less previous payments. See Specification Section 011500 'Application for Payment' for additional information

B. Upon the issuance of a letter of substantial completion by the Owner, the Contractor shall prepare a detailed listing of all items of work or corrections yet to be performed on the project with monetary value assigned to each. He shall forward said list to the Architect/Engineer and the Owner, who may modify such list at their discretion. The Owner reserves the sole right to reduce the retention previously withheld to any amount equal to two times the value of the outstanding work items and corrections yet to be performed with monetary values assigned to each as determined by the Owner, 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 Owner shall promptly pay, upon receipt of a requisition, for these items less amount necessary to satisfy any claims, liens or judgments against the Contractor which have not been suitably discharged. Where unit prices are specified, the Request for Payment shall be based on the quantities expended.

C. For purposes of monitoring the payment progress, the Contractor shall submit a detailed breakdown on a proper County form indicating items of work and separately listing labor and material cost for each item.

D. The Owner will make payments for stored materials at off-site locations provided said materials are suitably stored (a) in public warehouses, or (b) at the contractor's place of business or other location approved by the Owner, in which case the materials shall be segregated and have affixed to them in prominent locations placards stating "this material is the property of the County of Erie". All materials to be considered for payment shall be stored within a 100 mile radius of the County of Erie. The materials shall be completely covered by insurance. The required insurance shall be an all-risk policy, in an amount equal to the full insurable value at all times and shall be for the benefit of the County of Erie (named insured). In addition to the necessary insurance, a notarized affidavit shall be provided at the time of request for payment, indicating the location of the stored material. The Owner shall have the right of access to inspect the material at any time during normal working hours. All other appropriate insurance requirements and procedures as stipulated in Section 5 of the Erie County General Conditions shall apply.

7.03 ARCHITECT / ENGINEER'S ACTION ON A REQUEST FOR PAYMENT - Within ten (10) days of submission of any Request for Payment by the Contractor, the Architect / Engineer shall:

A. Approve the Request for Payment as submitted; or

B. Approve such other amount as he shall decide is due the Contractor, informing the Contractor in writing for his reasons for approving the amended amount; or

C. Withhold the Request for Payment, informing the Contractor in writing of his reasons for withholding it.

7.04 OWNER'S ACTION ON AN APPROVED REQUEST FOR PAYMENT - Within forty-five days (45) from the date of approval of a Request for Payment by the Architect / Engineer, the Owner shall:

A. Pay the Request for Payment as approved, or

B. Pay such other amount in accordance with Paragraph 7.05 as he shall decide is due the Contractor, informing the Contractor and the Architect / Engineer in writing of his reasons for paying the amended amount; or

C. Withhold payment in accordance with paragraph 7.05, informing the Contractor and the Architect / Engineer of his reasons for withholding payment.

7.05 OWNER'S RIGHT TO WITHHOLD PAYMENT OF AN APPROVED REQUEST FOR PAYMENT - The Owner may withhold payment in whole or in part on an approved Request for Payment to the extent necessary to protect himself from loss on account of any of the following causes discovered subsequent to approval of a Request for Payment by the Architect / Engineer :

A. Defective work.

B. Evidence indicating the probable filing of claims by other parties against the Contractor.

C. Failure of the Contractor to make payments to sub-contractors, material suppliers and suppliers of labor.

D. Damage to another contractor.

E. Lack of progress of work for by a contractor that affects the progress of work of other contractors under a separate contract related to the same project. The County reserves the right to withhold payment until work has progressed to a satisfactory manner and/or to compensate other contractors under separate contracts related to any project delays. This would include but not be limited to; labor, materials and equipment associated with any necessary rework, compensation for extended completion of work duration, extended schedule of work, mobilization/ remobilization of other prime contractors.

The above does not include unforeseen work and/or unforeseen conditions that add time and/or costs to the project that is unavoidable by contractors.

7.06 RESPONSIBILITY OF THE CONTRACTOR - Unless specifically noted otherwise, the Contractor shall furnish and pay for all materials and services and perform all the work described by the Contract Documents, or shall have all materials and services furnished and all the work, performed at his expense. It shall also be the Contractor's responsibility to pay for:

A. Replacement of survey benchmarks, reference points and stakes provided by the Owner under Paragraph 2.15.

B. Lands by Contractor provided in accordance with Paragraph 3.08.

C. Insurance obtained in accordance with Paragraph 5.01.

D. Fire Insurance obtained in accordance with Paragraph 5.01.

E. Performance Labor and Material Payment Bond obtained in accordance with Paragraph 5.04.

F. Royalties required under Paragraph 5.05.

G. Permits and Licenses required of the Contractor and all subcontractors.

H. All applicable taxes and fees, including sales and compensating use taxes except sales and compensating use taxes of the State of New York and of cities and counties of the State, on all materials sold to the Owner under this Contract.

7.07 PAYMENT FOR UNCORRECTED WORK - Should the Architect / Engineer direct the Contractor not to correct work that has been damaged or that was not performed in accordance with the Contract Documents, an equitable deduction from the Contract Amount shall be made to compensate the Owner for the uncorrected work.

7.08 PAYMENT FOR REJECTED WORK AND MATERIALS - The removal of work and materials rejected under Paragraph 4.05 and the re-execution of acceptable work by the Contractor shall be at the expense of the Contractor, and he shall pay the cost of the replacement of work of other contractors destroyed or damaged by the removal of the rejected work or materials and the subsequent replacement of acceptable work.

A. Removal of rejected work or materials and storage of materials by the Owner in accordance with Paragraph 4.05 shall be paid by the Contractor within thirty (30) days after written notice to pay is given by the Owner. If the Contractor does not pay the expenses of such removal and after ten (10) days' written notice being given by the Owner of his intent to sell the materials, the Owner may sell the materials at auction or at private sale and shall pay to the Contractor the net proceeds there from after deducting all the costs and expenses that should have been borne by the Contractor.

7.09 PAYMENT FOR EXTRA OR OMITTED WORK - The Contractor after receiving instructions to submit a proposal for Extra Work or for the Omission of Work shall within ten (10) days, except in an emergency endangering life and/or property, furnish the Architect / Engineer with a Change Order Proposal for transmittal to the Owner. The Contractor shall also submit to the Architect / Engineer an itemized sheet or sheets showing the labor, and separately, the materials to be sold to the Owner involved in the Change Order, together with (1) a maximum mark-up for overhead and profit of 15% on the sum of the aforementioned where the work is to be performed solely by the Contractor, or (2) a maximum mark-up for overhead and profit of 10% by a sub-contractor where the work is to be performed by the sub-contractor with a 5% maximum mark-up by the contractor on the total sub-contractor cost proposal. The Architect / Engineer shall promptly review the change order proposal and forward it to the Owner, together with his recommendations. The addition to or deduction form the contract amount shall be a sum for the materials sold to the Owner and a separate sum for labor and other costs, based on the Contractor's proposal, approved by the Architect / Engineer and accepted by the Owner.

The County is due a credit or a reduction in the total contract amount for omitted work that was originally included in the scope of work; whether it was included in the base bid or by an increase contract amendment (change order). The work previously agreed upon that is not performed by the contractor will result in a decrease contract amendment (credit change order) at a negotiated price between the design consultant (if applicable), The County and contractor.

If the decrease contract amendment is in relation to a previously approved change order, the Overhead and Profit percentages as described above will still apply to the portion of said change order that is being credited. If the credit change order is related to work removed from the original base scope of work associated with the Project at the direction of the Owner, a reasonable Overhead and Profit (O&P) percentage is to be included as part of the change order. It is understood that the Contractor submits bid proposal price at their discretion and therefore the O&P percentage will be proposed by the Contractor and negotiated or approved by the Owner and/or Architect/ Engineer.

7.10 PAYMENT FOR WORK SUSPENDED BY THE OWNER - If the work or any part thereof shall be suspended by the Owner, the Contractor will then be entitled to payment for the cost of all work done on the portions so abandoned, but such payment shall not exceed the value of such portion of the work as established under Paragraph 7.01.

7.11 PAYMENT FOR WORK BY THE OWNER - The cost of the work performed by the Owner in removing construction equipment, tools and supplies in accordance with Paragraph 3.11 and in correcting deficiencies in accordance with Paragraph 3.13 shall be paid by the Contractor.

7.12 PAYMENT FOR WORK BY THE OWNER FOLLOWING HIS TERMINATION OF THE CONTRACT - Upon termination of the Contract by the Owner in accordance with Paragraph 3.14, no further payments shall be due the Contractor until the work is completed. If the unpaid balance of the Contract Amount shall exceed the cost of completing the work, including all overhead cost, the excess shall be paid to the Contractor. If the cost of completing the work shall exceed the unpaid balance, the Contractor shall pay be difference to the Owner. The cost incurred by the Owner, as herein provided, and the damage incurred through the Contractor's default, shall be certified by the Owner, and approved by the Architect / Engineer.

7.13 PAYMENT FOR WORK TERMINATED- Upon suspension of the work or termination of the Contract by the Owner, the Contractor shall recover payment from the Owner for the work performed as negotiated with the owner. See Section 7.09 above for additional information.

7.14 PAYMENT FOR SAMPLES AND TESTING OF MATERIALS - Samples furnished in accordance with Paragraph 2.11 shall be furnished by the Contractor at his expense.

A. Testing of samples and materials furnished in accordance with Paragraph 2.11 shall be arranged and paid for by the Owner unless otherwise specified in the detailed specifications.

7.15 RELEASE OF LIENS - The Contractor shall deliver to the Owner a complete release of all liens arising out of this Contract before the retained percentage or before the final Request for Payment is paid.

7.16 ACCEPTANCE AND FINAL PAYMENT - When the Contractor shall have completed the work in accordance with the terms of the Contract Documents, the Architect / Engineer shall certify his acceptance to the Owner and his approval of the Contractor's final Request for Payment, which shall be the Contract Amount plus all approved additions less all approved deductions and less previous payments made. The Contractor shall furnish evidence that he has fully paid all debts for labor, materials, and equipment incurred in connection with the work, following which the Owner shall accept the work and release the Contractor except as to the conditions of the Performance Bond, any legal rights of the Owner, required guarantees, and Correction of Faulty Work after Final Payment, and shall authorize payment of the Contractor's final Request for Payment. The Contractor must allow sufficient time between the time of completion of the work and approval of the final Request for Payment for the Architect / Engineer to assemble and check the necessary data.

7.17 TERMINATION OF CONTRACTOR'S RESPONSIBILITY - The Contract will be considered complete when all work has been finished, the final inspection made by the Architect / Engineer, and the project accepted in writing by the Owner. The Contractor's responsibility shall then cease, except as set forth in his Performance Bond, as required by the Guaranty Period in accordance with Paragraph 4.09, and as provided in Paragraph 7.18.

7.18 CORRECTION OF FAULTY WORK AFTER FINAL PAYMENT - The approval of the final Request for Payment by the Architect / Engineer and the making of the final payment by the Owner to the Contractor shall not relieve the Contractor of responsibility for faulty materials or workmanship. The Owner shall promptly give notice of faulty materials or workmanship and the Contractor shall promptly replace any such defects discovered within two years from the date of written acceptance of the work, or within such longer period as may be incorporated in the Detailed Specification Requirements. The Architect / Engineer shall decide all questions arising under this paragraph.

SECTION 8 - WAGES AND LABOR CONDITIONS

8.01 WORKING HOURS - No laborer, workman or mechanic in the employ of the Contractor, subcontractor or other person doing or contracting to do the whole or a part of the work contemplated by this contract shall be permitted or required to work more than eight hours in any one calendar day or more than five days in any one week, except in the emergencies set forth in the Labor Law.

8.02 WAGE RATES AND SUPPLEMENTS - Each laborer, workman or mechanic, employed by the Contractor, subcontractor or other person about or upon such public work, shall be paid not less than the prevailing rates of wages and shall be provided supplements not less than the prevailing supplements, as determined by the Industrial Commissioner of the State of New York (see "Information for Bidders").

8.03 DISCRIMINATION

A. In the hiring of employees for the performance of work under this contract or any subcontract hereunder, no Contractor, subcontractor nor any person acting on behalf of such Contractor or subcontractor, shall by reason of race, creed, color 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;

B. No contractor, subcontractor, nor any person on his behalf shall, in any manner, discriminate against or intimidate any employee hired for the performance of work under this contract on account of race, creed, color or national origin;

C. There may be deducted from the amount payable to the Contractor by the County of Erie under this contract a penalty of five dollars for each person for each calendar day during which such person was discriminated against or intimidated in violation of the provisions of the contract;

D. This contract may be cancelled or terminated by the County of Erie and all moneys due or to become due hereunder may be forfeited, for a second or any subsequent violation of the terms or conditions of this section of the contract; and

E. The aforesaid provisions of this section covering every contract for or on behalf of the County of Erie for the manufacture, sale or distribution of materials, equipment or supplies shall be limited to operations performed within the territorial limits of the State of New York.

F. General Regulation No. 1 as issued by the State Commission Against Discrimination states: "It is hereby agreed by and between the parties hereto that every contractor and subcontractor engaged in the public work described in this contract shall post and maintain at each of his establishments and at all places at which the public work described hereunder is being conducted, the Notice of the State Commission Against Discrimination indicating the substantive provision of the Law Against Discrimination, where complaints may be filed, and other pertinent information. Such Notice shall be posted in easily accessible and well lighted places customarily frequented by employees and applicants for employment."

G. Provision of the State Law Against Discrimination also prohibits discrimination in employment because of age.

8.04 EQUAL EMPLOYMENT OPPORTUNITY

In the performance of work under Erie County Contracts or any subcontract, no Contractor, subcontractor, nor any person acting on behalf of such Contractor, or subcontractor, in their employment practices, shall by reason of race, color, national origin, sex, age, religion, marital status, or disability discriminate against any citizen of the State of New York who is qualified and available to perform the work to which the employment relates. Reference Title VI of the Civil Rights Act of 1964 (42 USC 200d).

Executive Order 11245, 30 Federal Regulation 12319 (1965) (Equal Opportunity Clause)

During the performance of Erie County contracts, the Contractor agrees:

A. The Contractor will not discriminate against any employee or applicant for employment because of race, color, national origin, sex, age, religion, marital status, or disability. The Contractor will take affirmative action to ensure the applicants are employed and employees are treated during employment, without regard to their race, color, national origin, sex, age, religion, marital status, or disability. Such action shall include, but not be limited to the following: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship.

B. The Contractor agrees to appoint an Equal Employment Opportunity (EEO) officer whose function will be to assure that said Contractor participates fully and effectively in the County of Erie Affirmative Action Program in compliance with the requirements of the County of Erie Contract.

C. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided by the EEO officer setting forth the provisions of this non-discrimination clause.

D. The Contractor will, in all solicitations or advertisements for employees placed by or on behalf of the Contractor; state that all qualified applicants will receive consideration for employment without regard to race, color, national origin, sex, age, religion, marital status, or disability.

E. The Contractor will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice to be provided by the organization EEO officer, advising the labor union or workers' representative of the Contractor's commitment under Executive Order No. 11246 on September 24, 1965 and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

F. The Contractor will file, by the fifteenth day of each month with the EEO office and the Contracting Agency, a monthly manpower utilization report of his work force on the Erie County project for the preceding month, broken down by racial groups, craft status, and job classification and including (a) the number of minority workers he has secured and (b) the type of On-the-Job Training he has provided on the Erie County project, the classification of said minority participants (apprentices, journeymen, and trainees), the specific crafts in which they have received training, and the number of hours they have worked.

G. The Monthly Manpower Utilization Report shall be attached to every Request for Payment Application. Payment Requests will not be reviewed unless the manpower utilization report is attached.

H. The Contractor will comply with all provisions of Executive Order No. 11246 of September 24, 1965 and all relevant rules, regulations, and orders of an Erie County Contract and the Erie County Affirmative Action Program.

I. In the event of the Contractor's non-compliance with the nondiscrimination clauses of an Erie County Contract or with any such rules, regulations, or orders that contract may be cancelled, terminated, or suspended in whole or in part and the Contractor may be declared ineligible for further Erie County contracts in accordance with the procedures authorized in Executive Order No. 11246 or as otherwise provided by law.

J. The Contractor will include the provisions of paragraphs a. through i. in every subcontract or purchase order unless specifically exempted by the rules, regulations, or orders, of an Erie County contractual agreement, so that such provisions will be binding upon each subcontractor or vendor. The Contractor will take such action with respect to any subcontractor or purchase order as the Contracting Agency may direct as a means of enforcing such provisions including sanctions for non-compliance; provided, however, that in the event the Contractor becomes involved in, or is threatened with litigation with any subcontractor or vendor as a result of such direction by the Contracting Agency, the Contractor may request the County of Erie to enter into such litigations to protect the interests of the County of Erie.

8.05 MONITORING

A. The EEO Office has the responsibility of administering the Monitoring Program for the County of Erie and its Affirmative Action Program. During the monitoring of an organization, the EEO Office shall receive the full cooperation of the Contracting Agency in dealing with organizations needing remedial actions.

B. The objective of the County of Erie's Monitoring Program is a systematic review, by the EEO Office, of the Contractor's performance in meeting the goals of minority utilization at each level of his work force. There will be two basic results from the County of Erie's monitoring process:

C. Acceptable achievement or progress, according to the program for construction contracts on County of Erie projects, toward the County of Erie's goal of 13.2% minority manpower utilization, and in addition, the County of Erie's goal for the utilization of women in the area of construction shall be in accordance with the U.S. Department of Labor's goal of 6.9%.

1. Insufficient progress toward goals according to the program; if an organization is found to be unwilling to correct deficiencies after a recommended non-compliance investigation, the County of Erie may:

   a. Summon the Contractor to a hearing

   b. Withhold progress payments in part or in full

   c. Cancel the Contract

   d. Bar the award of future contracts until the Contractor can demonstrate that he will comply

D. The County of Erie's Monitoring Program will consist of both Off-Site and On-site monitoring.

E. Off-Site monitoring program shall consist of Monthly Employment Utilization reports submitted via LCPtracker. Due to the regular turnover of the work force of a construction Contractor and because of Federal Compliance reporting requirements, all Contractors and subcontractors must submit these monthly reports to the Erie County EEO Office and the Contracting Agency. These reports will state an employee's EEO identification trade, classification, hours worked, and the percentage of completion for each County of Erie project for each reporting month.

F. On-Site monitoring, for the purpose of verifying these monthly reports, will be dependent on but not limited to:

1. The compliance status of each Contractor for each County of Erie construction project.

2. Length of the contract, subcontract, or grant and its percentage of completion.

3. Size of the labor force of the organization.

4. Degree of employment opportunity the County of Erie contract, subcontract, or grant will offer to minority workers.

5. Past record of affirmative action achievement of the organization.

6. Past record of affirmative action compliance performance under the EEO Office.

G. The EEO Office will have an ongoing Master File, dealing with each Contractor or subcontractor for each County of Erie construction project participated in for reference of the past performance of each Contractor.

H. In the event any deficiencies are found during an Off-Site or On-Site analysis, organization officials shall receive a summary of these deficiencies and the audits made for each reporting month. Any violations found will be fully explained and discussed with the Contractor or subcontractor. During discussions with the EEO Office and the Contracting Agency, alternative solutions to particular problems will be explored. At this time, attempts will be made to obtain the Contractor's agreement to take action by specified dates and a duplicate copy of the agreement will be sent to the Contractor or subcontractor.

8.06 COUNTY OF ERIE MINORITY AND WOMEN'S BUSINESS ENTERPRISE COMMITMENT
Minority/Women's Business & Service-Disabled Veteran Owned Business Utilization Commitment:

A. Erie County's Minority and Women's Business Utilization Local Law. No. 6, 1987 requires all prime contractors awarded construction contracts let by the County of Erie to exemplify Affirmative Action and subcontract to minority and women's business enterprises MBE/WBE.

1. For the purpose of these regulations, the term "Minority Business Enterprise" refers to a business at least fifty-one percent (51%) of which is owned and controlled by minority group members. Minority group members are citizens of the United States who are Blacks, Hispanics, Asian Americans, American Indians, Eskimos and Aleuts. MBE's must be certified by the Erie County and/or the Erie County City of Buffalo Joint Certification Committee.

2. For the purpose of these regulations the term "Women's Business Enterprise" refers to a business at least fifty-one percent (51%) of which is owned and controlled by women. WBE's must be certified by Erie County and/or the Erie County/City of Buffalo Joint Certification Committee.

3. For the purpose of these regulations, the term "Service-Disabled Veteran Owned Business" (SDVOB) refers to a business that is a certified service-disabled veteran-owned business under the New York State Service-Disabled Veteran-Owned Business Act.

4. Be it further understood that in order for a Minority and/or Women's Business to be certified as such by Erie County and/or the Erie County City of Buffalo Joint Certification Committee and the proposed business is incorporated, that the MBE/WBE must own and control 51% of the stock authorized to be issued by the corporation. Such authorization is made in the Certificate of Incorporation.

5. The County of Erie has determined that a goal of six percent (6%) of the total contract value represents a fair share of SDVOB utilization, six percent (6%) of the total contract value represents a fair share of minority business utilization and five percent (5%) of the total contract value represents a fair share of women's business utilization on each construction contract awarded.

6. This local law requires that positive efforts be made by recipients of Erie County construction contracts to utilize service-disabled veteran owned business as well as minority and women owned business sources for supplies, services and professional services, allowing these sources the maximum feasible opportunity to compete for contracts, subcontracts and third-tier contracts to be performed.

7. All prime contractors awarded Erie County contracts estimated to exceed $100,000 are to take positive steps "to afford fair opportunities to SDVOB, MBE's and WBE's". Positive steps shall include but not be limited to:

a. Utilizing a source list of bona fide service-disabled veteran owned business, minority and women's business enterprises.

b. Solicitations of bids from SDVOB's, MBE's and WBE's particularly of those located in Erie, Niagara, Cattaraugus and Chautauqua Counties.

c. Giving service-disabled, minority and women firms' sufficient time to submit proposals in response to solicitations.

d. Maintaining records showing minority and women's business enterprises and specific efforts to identify and award contracts to these companies.

e. Each contractor bidding on a County of Erie Contract is to contact SDVOB's, MBE's and WBE's and solicit bids for various aspects of each project. The contractor is to supply the County MBE/WBE office with information regarding contracts for services and products with minority and women's business enterprises and the dollar amount of each contract on the Minority Business Utilization Report.

8. Where the SDVOB, MBE or WBE is a supplier, a credit of one hundred percent (100%) of the dollar value of the subcontract between the SDVOB, MBE or WBE and the Contractor shall be awarded toward the fulfillment of the appropriate goal.

9. For purposes of this Section, a SDVOB, MBE or a WBE will be considered a supplier when it:

   a. Assumes actual and contractual responsibility to furnish supplies and/or materials and is the manufacturer of those supplies and/or materials; or

   b. Is recognized by the manufacturer involved as a distributor of its supplies and/or materials; and

   c. Owns or leases a warehouse, yard, building or other facility which is necessary and customary to carry out the purported function of the business; and

   d. Distributes, delivers and services the supplies and/or materials with its' own staff.

10. Where an SDVOB, MBE or WBE performs a sales function, which is customarily performed as a distinct and necessary part of the supply process, a credit of twenty-five percent (25%) of the dollar value of the subcontract between the MBE or WBE, the Contractor will be awarded toward the fulfillment of the appropriate goal.

11. Where the SDVOB, MBE or WBE performs a function or service which is commercially unnecessary, such as acting as a passive conduit in the supply process of duplicating a service provided by others in the same chain of supply from manufacturer to purchaser, no credit will be granted toward the appropriate goal.

12. The qualifications set forth in subsections, above of this Action shall be certified by the Erie County Equal Employment Opportunity Office.

13. All bidders shall submit a properly executed SDVOB/Minority/Women Business Enterprise Utilization Report Part A with their bid proposal at the time of bid.

14. In the event of a joint venture participating in this SDVOB and/or MBE/WBE Program, the Joint Venture Disclosure Affidavit must be submitted with the Minority/Women Business Enterprise Utilization - Prime Contractor Affidavit. Only to the extent that a minority and/or women's business enterprise contributes to and is paid for its participation in a Joint Venture will that dollar amount be credited towards the 6% and/or 5% respectively goal of minority/women's participation in the County of Erie MBE/WBE Program.

15. SDVOB's, MBE's and WBE's must be certified before their participation may be credited toward the respective 6%, 6% and 5% goal. Where the proposed MBE and/or WBE are not certified by Erie County or the Erie County/City of Buffalo Joint Certification Committee, the appropriate Certification Disclosure Affidavit must be filed with the appropriate Erie County/City of Buffalo Department. Forms and lists of certified MBE's/WBE's may be obtained by calling 858-7542.

16. Should a bidder conclude that they would be unable to satisfy the SDVOB and/ or the MBE/WBE goal, the bidder shall submit a properly executed applicable Waiver Request Form with their bid proposal. Waivers shall be granted only where the availability of SDVOB's, MBE's and/or WBE's in the market area of the project is less than the respective 6%, 6% and 5% goals.

17. Sufficient information must be provided on the SDVOB, Minority and/or Women's Business Enterprise Utilization Waiver Request to ascertain whether a waiver should be approved, conditionally approved or rejected by the Department of Public Works on the advice of the EEO Office.

18. A waiver approval limits the contractor's obligation to solicit SDVOB's, MBE's and/or WBE's for a particular project only. It does not relieve the contractor of MBE/WBE utilization for any other County of Erie project on which he submits a bid.

19. Conditional approval of the waiver request makes it necessary for the contractor to continue soliciting SDVOB's, MBE's and/or WBE's for contracting purposes, after he has been declared the low bidder.

20. A MBE/WBE Utilization Waiver Request will be rejected if the contractor:

    a. Fails to provide information on the SDVOB, Minority and/or Women's Business Enterprise Utilization Report at the time of the Bid opening.

    b. Provides fraudulent information on the SDVOB or MBE/WBE reports.

    c. Fails to make an honest good faith effort to recruit a contractor with SDVOB or MBE's/WBE's.

    or

    d. Takes any other action which is contrary to the spirit and intent of the law.

21. The information provided on the SDVOB/MBE/WBE Waiver Request and the SDVOB/MBE/WBE Utilization Report will be considered concurrently to determine if a waiver should be approved, conditionally approved or rejected.

22. The successful low bidder shall submit to the Erie County SDVOB/MBE/WBE Office within 15 business days of the bid opening, a schedule for service-disabled veteran owned business and minority/women's business enterprise participation as applicable, listing the business enterprise with whom the contractor intends to subcontract, specifying the agreed price to be paid for such work, and identifying in detail the contract item(s) or parts to be performed by each business enterprise.

23. A letter of intent to enter into a subcontract or purchase agreement, contingent upon contract award, indicating the agreed upon price and scope of work, shall be provided, signed by both the contractor and the SDVOB/MBE/WBE business enterprise. The prime contractor shall not substitute or delete the listed service-disabled veteran owned business minority and/or women's business enterprise without the written consent of Erie County.

24. In the event that the SDVOB/MBE/WBE goal for the contract is not met, the contractor shall provide sufficient documentation to establish that every positive effort was made to identify, solicit and negotiate with SDVOB, MBE's and WBE's in pursuit of the goal. Such documentation includes, but is not limited to advertisement in minority-focus media, written contact with minority contractors' associations and community groups and copies of direct solicitation of individual minority businesses indicating sufficient time to prepare quotations. Where an SDVOB/MBE/WBE is rejected due to price, the contractor shall provide documentation of the successful bidder's price along with evidence showing the work to be performed in the same, and not a reduced portion thereof.

25. The contractor shall provide to the Erie County EEO Office copies of all subcontracts and/or purchase agreements with minority/women's business enterprise within 15 days of contract award. A Notice to Proceed with construction shall not be issued until acceptable documentation is received.

26. Upon completion of the work, the contractor shall provide a properly executed SDVOB/Minority/Women Business Enterprise Utilization Report – Part A-Part D, certifying the total dollar amounts expended to the MBE's & WBE's subcontracted with. This report and all cancelled checks necessary to verify certification are to be submitted to the Erie County EEO Office, prior to final payment request.

27. In the event a contractor fails to comply with these provisions, Erie County may:

    a. Summon the contractor to a hearing.

    b. Withhold progress payments in part or in full.

    c. Cancel the contract.

    d. Bar award of future contracts until the contractor can demonstrate that he will comply.

28. It is, hereby, the County of Erie's commitment to assure that on all contracts awarded, prime contractors expend a fair share of the contract with bona fide Minority and Women Owned business enterprises in accordance with the goals set forth in the Minority Business Utilization Local Law, No. 1, 1987.

29. It is, hereby, the County of Erie's commitment to assure that on all contracts awarded, prime contractors expend a fair share of the contract with bona fide Service-Disabled Veteran Owned Business enterprises in accordance with the goals set forth in the fide Service-Disabled Veteran Owned Business Utilization Local Law, No. 3, 2023.

30. Failure to comply with the provisions of the law shall constitute a break of contract subject to all remedies available to Erie County.

31. The Prime Contractor and all Service-Disabled Veteran Owned Business, Minority and Women Owned Business subcontractors are bound by all requirements as put forth in the County of Erie Standard General Conditions and all modifications thereto contained in these Contract Specifications.

8.07 COUNTY OF ERIE EXECUTIVE ORDER #13 "PAY EQUITY CERTIFICATION ON COUNTY CONTRACTS"

A. During the term of this Contract, the agency shall comply with Executive Order 13 (2014), and the Agency shall make such records available, upon request, to the County's Division of Equal Employment Opportunity for review. The County shall have the right, upon reasonable notice and at reasonable times, to inspect the books and records of the agency, its offices and facilities, for the purpose of verifying information supplies in the Erie County Equal Pay Certification and for any other purpose reasonably related to confirming the Agency's compliance with Erie County Executive Order No. 13 (2014). Violation of the provisions of Executive Order 13 (2014) which is attached hereto and made a part hereof, can constitute grounds for the immediate termination of this contract and may constitute grounds for determining that a bidder is not qualified to participate in future county contracts.

1. Refer to Appendix C for the Erie County Executive Order #13 and Equal Pay Certification Form.

2. The Equal Pay Certification Form shall be submitted with the bid proposal.

8.08 COUNTY OF ERIE EXECUTIVE ORDER #18 "FIRST SOURCE HIRING POLICY FOR COUNTY CONSTRUCTION PROJECTS"

A. During the term of this Contract, Erie County Executive Order No. 18 (2017) may apply. Violation of the provisions of Executive Order 13 (2014) which is attached hereto and made a part hereof, can constitute grounds for the immediate termination of this contract and may constitute grounds for determining that a bidder is not qualified to participate in future county contracts.

1. Refer to Appendix D of the General Conditions for the Erie County Executive Order #18, Rules and Regulations, Erie County Local and Disadvantaged Worker Compliance Certification, County of Erie Executive Order #18 Monitoring and Reports, and First Source Policy Targeted Zip Codes.

    a. First Source Policy Targeted Zip Codes are provided for information only and subject to change.

    b. Be advised that the Contractor will be required to provide monthly reports demonstrating good faith effort to meet the required work force goals using LCPtracker web-based software.

2. The Erie County Executive Order #18 Attestation and Statement of Workforce shall be submitted with the bid proposal.

B. Requirements of Executive Order No.18 are as shown in Appendix D of the General Conditions and are summarized below. It should be noted that Executive Order No. 18 does not apply to work hours performed by individuals residing outside of New York State per the language of the Executive Order.

a. 100% of the workforce must be from New York State's 8 Western Counties.
b. 70% of the workforce must be from County of Erie.
c. 30% of the workforce must be from the identified zip codes included in Appendix D and/or one of the following qualifying disadvantaged status as described below
    i. Area Medium Income
    ii. Released from prison in last 10 years
    iii. Participated in Temporary Assistance for Needy Families Program
    iv. Participated in Supplemental Nutritional Assistance Program
    v. Was unemployed for a least 12 consecutive months.

SECTION 9 – ACCOUNTABILITY

9.01 The Contractor shall be fully accountable for his performance under this contract and agrees to answer under oath all questions relevant to the performance thereof and to any transaction, act, or omission had, done or omitted in connection therewith if called before any Judicial, County or State Officer or agency empowered to investigate the Contract or its performance.

9.02 It shall be the contractor's responsibility for providing and maintaining daily sign-in books for all persons on the project site including; employees, visitors or otherwise at all times during the duration of the project until the project has been completed. Copies of the sign in books are to be provided to the Owner if requested.

9.03 The Electrical Contractor (or General Contractor when there is no associated Electrical Contract associated with a given Project) will be responsible to replace all existing smoke detectors within the construction work area with heat detectors, when applicable, at the direction of the Owner.

9.04 It is the Contractor's responsibility to perform all work in accordance with the Occupational Safety and Health Administration (OSHA) rules and requirements. All contractors are to ensure that all employees assigned to the Project as defined within the Project Documents, have been OSHA 10 certified. Proof of certification to be uploaded to the LCPtracker software system.

9.05 Contractor to ensure that at least one (1) approved fire extinguisher device is on the contraction site at all times. Additional fire extinguishers to be provided at the locations, as applicable, as follows:

- At each stairway on all floor levels where combustible materials have accumulated.
- In every storage and construction shed.
- Additional portable fire extinguishers shall be provided where special hazards exist, such as the storage and use of flammable and combustible liquids

SECTION 10 - THE ERIE COUNTY WORKFORCE DEVELOPMENT AND DIVERSIFICATION NEW YORK STATE CERTIFIED WORKER TRAINING PROGRAM

10.01 County of Erie Local Law No. 3-2018

COUNTY OF ERIE
LOCAL LAW INTRO NO. 3 - 2018

A LOCAL LAW in relation to a requirement for New York State Certified Worker Training Programs by contractors and subcontractors under construction contracts, as defined herein, with the County of Erie.

BE IT ENACTED BY THE ERIE COUNTY LEGISLATURE AS FOLLOWS:

Section 1. Legislative Intent.

The Erie County Legislature hereby finds, declares and determines that:

A. New York Labor Law Section 816-b specifically authorizes this Local Law.

B. There has been a long and productive history of partnership between labor and management in the training of workers in New York State.

C. New York State Certified Worker Training Programs are valuable educational and training tools for the local workforce by reducing reliance on out-of-area labor for construction projects.

D. New York State Certified Worker Training Programs provide opportunities to residents in this area through training and education for skilled jobs.

E. These skilled jobs allow us to reinvest our taxpayer dollars spent on local construction projects so that local workers and local tax dollars remain within the local community.

F. It would be valuable to encourage labor and business/industry to participate in New York State Certified Worker Training Programs to meet the increased need for trade persons while providing residents the means to earn a better living and fostering the local and regional economies.

G. It is valuable for local government to encourage broad participation in such New York State Certified Worker Training Programs by the residents of Erie County and to foster the equal opportunity of men and women of all races and backgrounds to participate in order to enhance workforce development and diversification, and to prevent exclusionary practices which have historically excluded women and minorities.

H. The New York State Department of Labor sets objective standards and provides oversight for New York State Certified Worker Training Programs. These Programs are important because they require on-the-job training and classroom training, and provide objective industry standards. In effect these programs lead to a standardized, cost effective and skilled local workforce.

I. Nothing in this Local Law should be read to abrogate the duty of Erie County with respect to its MBE/WBE requirements.

Section 2. Short Title.

This Local Law shall be known as "The Erie County Workforce Development and Diversification New York State Certified Worker Training Program."

Section 3. Definitions.

A. "New York State Certified Worker Training Program" shall mean: a state registered and regulated apprenticeship program through the New York State Department of Labor that has been approved by the New York State Commissioner of Labor in accordance with Article 23 of the New York Labor Law, that includes the following standards:

   i. An organized, written plan in place that embodies the terms and conditions of employment, and the training and supervision of one or more workers;

   ii. A schedule of wages to be paid to the worker consistent with the skills required and approved by the New York State Department of Labor;

   iii. Equal opportunity and affirmative action plans;

   iv. Workforce development and diversification goals to ensure that the contractor will diligently work toward a minority workforce goal of 30% minority and female participation combined in project personnel including trades people, trainees, journeymen, apprentices and supervisory staff;

   v. A minimum of ten percent (10%) of the total construction workers. Trades people, trainees, journeymen, and apprentices employed at any given time on a particular project by any and all contractors or subcontractors must be consist of persons participating in a New York State Certified Worker Training Program.

vi. In all cases, such Certified Apprenticeship Training Program must be specific to the type and scope of work which is being performed and must have a graduation rate of at least thirty percent (30%) as determined by the New York State Department of Labor.

B. "Commissioner" shall mean the Commissioner of the Erie County Department of Public Works.

C. "Construction contract" shall mean projects with a value in excess of $250,000 where Erie County is a direct or indirect party to the contract which includes more than an incidental amount of construction type activity intended to benefit the public, including all work which is necessary, incidental or connected with the execution of the contract which is performed by construction workers. A public entity need not be party to the construction contract. A construction contract includes: projects that Erie County funds directly, projects that Erie County funds indirectly by providing funds to a separate entity to perform the construction type activity; privately financed construction projects specifically built with the intent of leasing them to any Department of Erie County government; and construction projects built under Erie County's direction and later paid for with Erie County funds.

D. "Construction subcontract" shall mean any subcontract between a contractor who has a construction contract as defined in Section 3, subdivision C above.

E. "Contractor" or "subcontractor" shall mean a contractor or subcontractor that directly employs construction workers, as defined below, under a construction contract or construction subcontract, as defined herein, for which a New York State Certified Worker Training Program is required.

F. "Construction worker" shall mean an individual directly involved in the construction, reconstruction, improvement, rehabilitation, installation, alteration, renovation, demolition or otherwise providing for any building, facility, roads, highways, bridges, or physical structure of any kind, but does not include professional services employees or those construction workers for which a New York State Certified Worker Training Program does not exist.

Section 4. Requirements.

A. Any contractor, prior to entering into a construction contract as set forth in section 3 (C) above, or any subcontractor entering into a construction subcontract with a contractor who has a construction contract with the County of Erie is required to have in place and provide written proof of same at the time of bid a New York State Certified Worker Training Program, either internally to the contractor or subcontractor and/or through an organization servicing several contractors or subcontractors, appropriate for the type and scope of work to be performed.

B. Any contractor or subcontractor, as defined herein, shall strive to meet the minimum workforce development and diversification goals set forth in section 3(A) (iv) above. Such contractors and/or subcontractors shall provide the Commissioner or designated compliance officer with the following:

i. A monthly workforce census and such other employment and/or payroll records necessary to verify an attempt to achieve the workforce development and diversification goals set forth in Section 3(A)(iv) above.

ii. Access to and cooperation with the project compliance officer to review records on-site and/or at worksite premises to validate attempts to achieve the workforce development and diversification goals set forth in Section 3(A)(iv) above.

iii. With bid submission, a statement committing to providing apprenticeship training opportunities to workers, as well as details of workforce diversification recruiting program directed at attracting candidates to fill positions to meet the minimum workforce development and diversification goals set forth in Section 3(A)(iv) above.

Section 5. Rules & Regulations.

As of the date this Local Law becomes effective, the Commissioner of the Erie County Department of Public Works shall promulgate such rules and regulations that are lawful, necessary and appropriate to implement, enforce or otherwise carry out the purposes of this Local Law, provided that the Legislature, by simple majority, has not voted to disapprove such rule or regulation within sixty (60) days from the Commissioner's written notice to the Legislature that such rule or regulation has been promulgated.

Section 6. Equal Employment Monitoring.

There shall be an Independent Monitor to report on the compliance of each County contractor and subcontractor with this Local Law's workforce development and diversification goals. The Commissioner of DPW shall develop regulations that provide for the compensation of the Independent Monitor.

The Monitor shall monitor and review every facet of construction to report what percentage of the goals that are established for minority and female participation are met or exceeded. The Monitor shall report to the Equal Employment Opportunity Office on the compliance of each contractor and subcontractor with the workforce development and diversification goals.

The Monitor shall file monthly reports with the Equal Employment Opportunity Office regarding the actual workforce development and diversification goals, including reporting all instances of non-compliance; make appropriate recommendations to the Equal Employment Opportunity Office when non-compliance is evident with supportive documentation; develop a database of the workforce of each contractor and subcontractor to provide a visual format of each contractor's workforce, both monthly and year-to-date cumulative totals on each construction contract.

Section 7. Compliance.

The Director of Erie County Division of Equal Employment shall ensure that all contractors and subcontractors entering into a construction contract as it is defined herein, maintain records which prove that each construction worker as it is defined herein, signs in and out at the beginning and end of each day, listing next to his or her name his or her craft, and status as journeyman or apprentice, if applicable.

Section 8. Penalties.

Violation of any provision of this Local Law shall constitute cause, grounds or other legal justification for termination of any contractual agreement with any contractor or subcontractor engaged in a construction contract or construction subcontract with the County, in accordance with County and state laws, rules and regulations governing the termination of such contractual agreements.

Section 9. Severability.

If any clause, sentence, paragraph, subdivision, section or part of this Local Law or the application thereof, to any person, individual, corporation, firm, partnership, entity or circumstance, shall be adjudged by any court of competent jurisdiction to be invalid or unconstitutional such order of judgment shall not affect, impair, or invalidate the remainder thereof, but shall be confined in its operation to the clause, sentence, paragraph, subdivision, section or part of this Local Law or in its application to the person, individual, corporation, firm, partnership, entity, or circumstance directly involved in the controversy in which such judgment or order shall be rendered.

Section 10. Applicability.

This Local Law shall apply to construction contracts advertised for bids on or after the effective date with the following condition:

Apprenticeship agreements currently in place as of the effective date of this Local Law which are still in probationary status or apprenticeship agreements which were in probationary status during the period preceding the specific trade's program length as set forth in the New York State Prevailing Wage Schedule, shall be exempt from the 30% apprenticeship graduation requirement specified in Section 3 (A) (vi) for the period measured from the date the apprenticeship program is registered with the New York State Department of Labor plus the specific trade's program length plus two years.

Section 11. Effective Dates.

This Local Law shall take effect 30 days after the filing with the Secretary of State, in accordance with Section 27 of the New York State Municipal Home Rule Law.

SPONSORS: PATRICK BURKE
APRIL N.M. BASKIN
JOHN BRUSSO

10.02 Rules and Regulations Adopted by the Erie County Commissioner of Public Works Regarding Local Law No. 3-2018

RULES AND REGULATIONS ADOPTED BY THE ERIE COUNTY COMMISSIONER OF PUBLIC WORKS REGARDING: COUNTY OF ERIE LOCAL LAW NO. 3-2018

A LOCAL LAW in relation to a requirement for New York State Certified Worker Training Programs by contractors and subcontractors under construction contracts, as defined herein, with the County of Erie.

Pursuant to Section 5 of Erie County Local Law No. 3-2018, "the Commissioner of the Erie County Department of Public Works shall promulgate such rules and regulations that are lawful, necessary and appropriate to implement, enforce or otherwise carry out the purposes of this Local Law..." Such rules and regulations are as follows:

1. Definitions.

“Bidders” – an individual or entity which submits a formal Bid for a Construction Contract, as hereinafter defined.

“Bids” – formal bids submitted for a Construction Contract, as hereinafter defined, in accordance with New York General Municipal Law.

“Commissioner” – Erie County Commissioner of Public Works

“Construction Contract” – a contract for a Project which includes more than an incidental amount of construction-type activity performed by persons in trades or careers for which there exists an NYSCATP, as hereinafter defined.

“Contracting Agency” – a department, division, board, agency or office of the County, an entity undertaking a Project that Erie County funds indirectly, or an entity undertaking a Project with the specific intent of leasing the completed Project to the County, which solicits and receives Bids for a Construction Contract.

“Local Law” – Erie County Local Law 3-2018

“Monitoring Agency” – the Erie County Equal Employment Opportunity Office

“New York State Certified Apprentice Training Program” or “NYSCATP” - a state registered and regulated apprenticeship program(s) approved by the Commissioner of the New York State Department of Labor in accordance with Article 23 of the Labor Law and the Rules and Regulations thereto.

“Prime Contractor” – the party with whom the Contracting Agency contracts with on a Project.

“Project” – the construction, reconstruction, improvement, rehabilitation, installation, alteration, renovation, demolition or otherwise of any building, facility, roads, highways, bridges, or physical structure of any kind, estimated by the Contracting Agency as having a cost to complete in excess of $250,000, for which the County is a direct or indirect party to a Construction Contract. Projects include those: that Erie County funds directly, either in whole or in part; that Erie County funds indirectly, either in whole or in part, by providing funds to a separate entity to perform the construction-type activity; privately financed construction projects specifically built with the intent of leasing the completed project to Erie County; and construction projects built under Erie County’s direction and later paid for with Erie County funds.

"Rules" – these rules and regulations promulgated by the Commissioner pursuant to the Local Law.

"Subcontractor" – A subcontractor to a Prime Contractor.

"Workforce" – the total worker hours anticipated on the Construction Contract to be undertaken by workers in careers or trades for which there exists an NYSCATP.

2. Rules and Regulations.

A. Each Contracting Agency shall include in its bid specifications provisions for the implementation of the Local Law and these Rules. Bids shall demonstrate a Bidder's ability to comply with the Local Law and these Rules and in the event that Bidder is a successful Prime Contractor on a Construction Contract.

B. Bidder shall submit as part of the Bid a copy of the certification of approval of the NYSCATP by the New York State Department of Labor which will be used by the Bidder in connection with the Construction Contract. Such NYSCATP shall be a NYSCATP registered by the NYS Commissioner of Labor which will be utilized by the Bidder on the Construction Contract by the Bidder as a Prime Contractor or by the Bidder's Subcontractor(s).

C. As part of its' Bid, Bidder shall provide a written plan demonstrating how apprentices will be utilized by the Bidder as Prime Contractor or by Subcontractor(s) to the Bidder as Prime Contractor. Such plan shall include at a minimum, but not be limited to the following:

   i. An organized, written plan in place that embodies the terms and conditions of employment, training and supervision of one or more apprentices;

   ii. A schedule of wages to be paid to the apprentices consistent with the skills required and approved by the New York State Department of Labor;

   iii. Equal employment opportunity and affirmative action plans.

   iv. Demonstration that ten percent (10%) of the Workforce of the Prime Contractor (inclusive of the workforce utilized by any Subcontractor(s) to the Bidder) shall consist of persons participating in New York State Certified Apprentice Training Programs.

D. In the alternative Bidder may provide a statement as to the inapplicability of apprenticeship participation on the Prime Contract and the related subcontracts due to the lack of career opportunities in NYSCATP approved by New York State Department of Labor Commissioner or that the magnitude of the Construction Contract would make use of apprentices impracticable. In the event that Bidder provides a statement that there is a lack of such career opportunities or the use of apprentices on the Construction Contract is impracticable, said Bidder may not be deemed non-responsive by virtue of the submission of such a statement, as determined by the Monitoring Agency. Applicability of this section will be viewed within the total Workforce of each Prime Contract and not as a function of each subcontract of the Construction Contract as a whole.

E. As part of its' Bid, Bidder shall provide affirmation of its commitment toward acceptable achievement or progress towards the County of Erie workforce development and diversification goal in all construction contracts of thirty percent (30%) minority and female participation combined in project personnel including trades people, trainees, journeymen, apprentices and supervisory staff.

F. Contracting Agency may determine prior to the advertisement of bids for the Project or prior to the award of Bids that the nature of the Construction Contract does not provide an adequate opportunity for the use of NYSCATP for such reasons including, but not limited to, that:

i. 75% or more of the value of the Construction Contract involves material, equipment and/or supplies; or

ii. There is a lack of NYSCATP approved by the Department of Labor for at least 75% of the work hours anticipated to be spent on construction-type activity involved in the Construction Contract; or

iii. The Construction Contract is in response to an emergency condition; or

iv. The Project is estimated to cost less than $250,000 or the Bid amount is less than $250,000; or

v. None of the bids received were from Bidders who had an NYSTACP.

G. All Bids shall be reviewed by the Monitoring Agency within 10 business days of delivery of the Bids by the Contracting Agency to the Monitoring Agency. A Contracting Agency shall not reject any Bid as being non-responsive to the requirements of the Local Law and these Rules, unless the Monitoring Agency, within 10 business days of receipt of Bids from the Contracting Agency, provides the Contracting Agency with a written report recommending non-responsiveness of the Bidder and the reasons therefore. Determination of a Bidder's compliance with the Local Law and these Rules shall be the responsibility of the Monitoring Agency.

H. The Contracting Agency is permitted to require within the Bid specifications for a Project, a reasonable fee for the Prime Contractor to hire an independent monitor to review and report on the diversification gals of the Local Law

3. Effect

These Rules and Regulations shall become effective immediately. No Rule or Regulation promulgated herein shall be disapproved by the Erie County Legislature unless and until such time as the public, following 10 days advertised notice, is given the opportunity to comment upon such rule or regulation.

APPENDIX "A"
EQUAL EMPLOYMENT OPPORTUNITY FORMS

COUNTY OF ERIE DEPARTMENT OF PUBLIC WORKS
OFFICE OF THE COMMISSIONER

BID DATE: _____

TODAY'S DATE: _____

ERIE COUNTY MINORITY/WOMEN BUSINESS ENTERPRISE & SERVICE-DISABLED VETERAN-OWNED BUSINESS UTILIZATION REPORT- PART A

COMPANY: _____

AUTHORIZED REPRESENTATIVE: _____

ADDRESS: _____

TELEPHONE NUMBER: _____

PROJECT NAME: _____

PROJECT NUMBER: _____

I. List actions taken to identify, solicit, and contact Minority Business Enterprise (MBE), Women Business Enterprise (WBE) & Service-Disabled Veteran-Owned Business (SDVOB) to bid on subcontracts for this project.

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____

II. List all bona-fide Minority/Women Business Enterprise & Service-Disabled Veteran-Owned Businesses, sub-contractors, suppliers, professional personnel, solicited, contracted, or presently negotiating a contract in accordance with the minority business utilization goal set forth by the County of Erie.

MBE/WMB/SDVOB OWNED FIRMS	SUPPLY/ SERVICE	AMOUNT OF PROPOSAL	PRIOR CERTIFICATION	CONTRACT EXECUTED	REASON IF CONTRACT NOT AWARDED
NAME: _____ ADDRESS: _____ CITY, STATE: _____ TELEPHONE: _____ IRS #: _____				YES NO	

MBE/WMB/SDVOB OWNED FIRMS	SUPPLY/ SERVICE	AMOUNT OF PROPOSAL	PRIOR CERTIFICATION	CONTRACT EXECUTED	REASON IF CONTRACT NOT AWARDED

NAME: _____ YES

ADDRESS: _____

CITY, STATE: _____

TELEPHONE: _____ NO

IRS #: _____

MBE/WMB/SDVOB OWNED FIRMS	SUPPLY/ SERVICE	AMOUNT OF PROPOSAL	PRIOR CERTIFICATION	CONTRACT EXECUTED	REASON IF CONTRACT NOT AWARDED

NAME: _____ YES

ADDRESS: _____

CITY, STATE: _____

TELEPHONE: _____ NO

IRS #: _____

MBE/WMB/SDVOB OWNED FIRMS	SUPPLY/ SERVICE	AMOUNT OF PROPOSAL	PRIOR CERTIFICATION	CONTRACT EXECUTED	REASON IF CONTRACT NOT AWARDED

NAME: _____ YES

ADDRESS: _____

CITY, STATE: _____

TELEPHONE: _____ NO

IRS #: _____

MBE/WMB/SDVOB OWNED FIRMS	SUPPLY/ SERVICE	AMOUNT OF PROPOSAL	PRIOR CERTIFICATION	CONTRACT EXECUTED	REASON IF CONTRACT NOT AWARDED

NAME: _____ YES

ADDRESS: _____

CITY, STATE: _____

TELEPHONE: _____ NO

IRS #: _____

III. Assistance offered by contractor to MBE's/WBE's/SDVOB's as to bonding, union requirements obtaining work capital, etc.

1._____

2._____

3._____

4._____

5._____

6._____

IV. Total Dollar Amount to be subcontracted to:

Minority Business Enterprise(s). $_____

Women Business Enterprise(s). (if applicable) $_____

Service-Disabled Veteran-Owned Business(s). $_____

V. Total Amount of Bid $_____

VI. MBE Percent (%) of project bid: (EC goal is 17%) _____%

WBE Percent (%) of project bid: (EC goal is 13%) _____%

SDVOB Percent (%) of project bid: (EC goal is 6%) _____%

VII. YOU MUST ATTACH COPIES OF RELEVANT CORRESPONDENCE AND DOCUMENTS, INCLUDING RETURN RECEIPTS UPON LOW BIDDER STATUS TO EEO.

_____ _____
SIGNATURE OF AUTHORIZED REPRESENTATIVE DATE

VIII. CONTRACTOR'S DESIGNATED EQUAL OPPORTUNITY OFFICER (EEO)

_____ _____
NAME DATE

COUNTY OF ERIE MINORITY/WOMEN BUSINESS ENTERPRISE
& SERVICE-DISABLED VETERAN-OWNED BUSINESS UTILIZATION REPORT PART – B

Certificate of Expenditures at 30% Completion of Project

Contractor: _____ Contractor Name: _____

I. List all bona-fide minority/women business enterprises & Service-Disabled Veteran-Owned Business, subcontractors, suppliers, professional personnel, or joint venture firms, with whom you have entered into a binding agreement in accordance with the MWBE/SDVOB Business Utilization Goal set forth by the County of Erie. Include (minority trucking) firms that will be utilized and include an estimated dollar amount. The information must be submitted to the County of Erie when the project is 30% complete.

MBE/WBE/SDVOB OWNED FIRMS (SEE REVERSE SIDE IF MORE SPACE IS NEEDED)	TYPE OF WORK	DATE CONTRACT EXECUTED	TOTAL EXPENDED TO DATE	ESTIMATED AMOUNT REMAINING

NAME: _____

ADDRESS: _____

CITY, STATE: _____

TELEPHONE: _____

IRS #: _____

MBE/WBE/SDVOB OWNED FIRMS (SEE REVERSE SIDE IF MORE SPACE IS NEEDED)	TYPE OF WORK	DATE CONTRACT EXECUTED	TOTAL EXPENDED TO DATE	ESTIMATED AMOUNT REMAINING

NAME: _____

ADDRESS: _____

CITY, STATE: _____

TELEPHONE: _____

IRS #: _____

Erie County reserves the right to require documentation including, but not limited to, cancelled checks to verify these amounts.

II. Total Dollar Amount To Be Subcontracted To:

Minority Business Enterprise(s). $_____

Women Business Enterprise(s). (if applicable) $_____

Service-Disabled Veteran-Owned Business(s). $_____

III. Total Amount Expended To Date: $_____

IV. Total Amount of Bid: $_____

V. MBE Percent (%) of project bid: _____%

WBE Percent (%) of project bid: _____%

SDVOB Percent (%) of project bid: _____%

I, _____

As an official representative of _____

do hereby certify that the information listed above is correct and complete.

_____ _____

NAME DATE

_____

TITLE

MINORITY/WOMEN BUSINESS ENTERPRISE & SERVICE-DISABLED VETERAN-OWNED BUSINESS UTILIZATION REPORT – PART C CERTIFICATION OF EXPENDITURES TO MBEs/WBEs

(To Be Completed by the Prime Contractor and submitted at the 75% payment level.)

Contractor: _____ Contractor Name: _____

MBE / WBE	PART B CONTRACT AMOUNT OR ESTIMATE	TOTAL EXPENDED TO DATE	ESTIMATED AMOUNT REMAINING
MBE's			
WBE's			
SDVOB's			

Erie County Reserves the right to require documentation, including, but not limited to, cancelled checks to verify these amounts.

I, _____

As an official representative of _____

do hereby certify that the information listed above is correct and complete.

_____ _____
NAME DATE

_____
TITLE

MINORITY BUSINESS ENTERPRISE UTILIZATION REPORT-PART D
FINAL CERTIFICATION OF EXPENDITURE TO MBE's/WBE's/SDVOB's

(To be completed by the prime contractor and submitted when contract is complete)

Erie County reserves the right to require documentation, including, but not limited to, cancelled checks to verify these amounts.

Contractor: _____ Contractor Name: _____

MBE	**TOTAL AMOUNT EXPENDED**
WBE	**TOTAL AMOUNT EXPENDED**
SDVOB	**TOTAL AMOUNT EXPENDED**

TOTAL OF ALL MBE SUBCONTRACTS $_____

TOTAL OF ALL WOMEN SUBCONTRACTS (if applicable) $_____

TOTAL OF ALL SDVOB SUBCONTRACTS $_____

FINAL MBE PERCENTAGE _____%

FINAL WBE PERCENTAGE (if applicable) _____%

FINAL SDVOB PERCENTAGE _____%

I, _____

As an official representative of _____

do hereby certify that the information listed above is correct and complete.

_____ _____

NAME DATE

_____

TITLE

*Sworn to before me

This _____ day of _____, 2023”

_____

Notary Public / Commissioner of Deeds

County of Erie
Division of Equal Employment Opportunity
Andrew McLaren
Director

M/WBE & SDVOB WAIVER PACKET

Instructions for Prime Contractors:

The utilization of certified M/WBE & SDVOB for non-commercially useful functions may not be counted towards utilization of certified M/WBE & SDVOB in the Utilization Plan.

M/WBE & SDVOB firms must be certified by Erie County's Division of Equal Employment Opportunity ("DEEO") or by New York State ("NYS") in order to be counted towards satisfaction of M/WBE & Office of General Services ("OGS") SDVOB participation goals.

See the Bid Packet or consult the DEEO for further guidance.

Erie County Division of Equal Employment Opportunity
Minority- & Women- Owned Business Enterprise (M/WBE) & SDVOB Utilization Waiver Checklist

The following checklist is for the Project Manager to use when reviewing the M/WBE & SDVOB Utilization Waiver Request. Once the Project Manager is satisfied, they should forward the Waiver Request forms, along with this signed checked list, to Erie County's Division of Equal Employment Opportunity ("DEEO") for final review and approval/denial.

M/WBE & SDVOB Waiver Request Form

There are two types of requests: Full Waiver from meeting the M/WBE & SDVOB Goals or a Partial Waiver from meeting the full M/WBE and/or SDVOB Goals. The Waiver Request Form contains examples of Good Faith Effort documentation (GFE). However, the following checklist contains items that are required before submission to the DEEO.

☐ Letter of Explanation for Waiver Request

☐ Copies of advertisements for M/WBE & SDVOB Participation, if applicable

☐ Screenshots of search results (by business type) from the DEEO's, NYS M/WBE & OGS SDVOB Directories: https://www3.erie.gov/eeo/mbe-wbe-resource-list, https://ny.newnycontracts.com/FrontEnd/SearchCertifiedDirectory.asp?XID=8140&TN=ny, https://sdves.ogs.ny.gov/business-search

☐ A completed Solicitation Log (See Attachment A). The log shall be broken out into separate areas for each task that is solicited (e.g. electrician, plumbing, drywall, painting, etc.). The log shall show: (1) each M/WBE & SDVOB firm was contacted at least twice, by two (2) different methods (e.g. phone, e-mail, fax, etc.), and (3) with whom the Requesting Firm spoke with at the potential M/WBE firm.

The following items are optional, depending on the type of request:

☐ Quotes from M/WBE & SDVOB and non-M/WBE & SDVOB to show the lowest responsible bidder

☐ Documentation of any negotiations Prime Contractor has/had with M/WBE & SDVOB

☐ Any other documentation to show GFE, such as: e-mail correspondence, sign in sheet from any pre-bid meetings, etc.

Acknowledgment and Signature

☐ By checking this box and signing below, you affirm that all of the information requested is included in this package, and that all information is honest, true, and accurate to the best of your knowledge.

_____	_____	_____
Prime Contractor – Print Name	Prime Contractor Signature	Date

Erie County Division of Equal Employment Opportunity
Solicitation Log (Examples Included)
Attachment A

Company Name	MBE WBE SDVOB	Work Type	Location	Contact 1 - Date	Contact 1 - Type	Result	Contact 2 - Date	Contact 2 - Type	Result	Overall Result/Reason Chosen or Not/Comments
ABC	MBE	Doors and Windows	Rochester	12-Apr	Fax	Went thru, No response	14-Apr	Phone	Left VM	No response
XYZ	MBE	Doors and Windows	Syracuse	12-Apr	Fax	Went thru, May bid	21-Apr	Phone	Spoke with Kathy.	Declined to bid.
123	WBE	Doors and Windows	Albany	12-Apr	Fax	Went thru, No response	14-Apr	Phone	Spoke with Bob.	Don't offer the items.
Tough guy	MWBE	masonry	Liverpool	12-Apr	Email	Undeliverable	12-Apr	Fax	Went thru, No response	No response
Quality	WBE	masonry	Plattsburgh	12-Apr	Fax	Went thru, will respond	16-Apr	Phone	Left VM	Received quote, too high
GENERAL CON	NA	masonry	Plattsburgh	12-Apr	Email	Responded low bidder	X	X	X	See quote comparison

SECTION 3: SUPPORTING DOCUMENTATION

To be considered, the Request for Waiver Form **must be accompanied by the documentation requested in items 1 – 9,** as listed below. Copies of the following information and all relevant supporting documentation must be submitted along with the request. Please contact the DEEO for assistance.

1. A letter of explanation setting forth your basis for requesting a partial or total waiver and detailing the good faith efforts that were made.

2. Copies of advertisements in any general circulation, trade association, and Minority- and Women-Owned publications in which you solicited M/WBE & SDVOB for the purposes of complying with your participation goals, with the dates of publication.

3. Screenshots of search results (by business description or commodity code) from Erie County's Equal Employment Opportunity M/WBE Directory of all certified M/WBE & OGS SDVOB Business Directory that were solicited for purposes of complying with your M/WBE & SDVOB participation goals.

4. Copies of faxes, letters, or e-mails sent to M/WBE & SDVOB firms to solicit participation and their responses.

5. A log of solicitation results, consisting of the list of M/WBE & SDVOB firms solicited for the contract and the outcome of the solicitations. The log should be broken out into separate areas for each task that is solicited (e.g., trucking, materials, electricians) and clearly provide a rationale for firms included on the completed Utilization Plan as well as for those not chosen. The log should show: that each M/WBE & SDVOB firm was contacted twice by two different methods (e.g., fax and phone); who was spoken to; what was said; and the final outcome of the solicitation.

6. A description of any contract documents, plans, or specifications made available to M/WBE and SDVOB for purposes of soliciting their bids and the date and manner in which these documents were made available. Specifically, include information on the scope of work in the contract and a breakout of tasks or equipment, such as a schedule of values for a construction contract or a proposal or excerpt from a professional services agreement.

7. Documentation of any negotiations between you, the Contractor, the M/WBE and SDVOB undertaken for purposes of complying with your M/WBE & SDVOB participation goals.

8. Any other information you deem relevant which may help us in evaluating your request for a waiver. Examples may include sign-in sheets from any pre-bid meetings where M/WBE & SDVOB firms were invited, attendance at M/WBE forums, SDVOB forums etc.

9. The Project Manager and/or the DEEO reserve the right to request additional information and/or documentation.

Note: Unless a Total Waiver has been granted, Firms will be required to submit all reports and documents pursuant to the provisions set forth in the procurement and/or contract, as deemed appropriate by Erie County, to determine M/WBE & SDVOB compliance. In cases where Erie County accepts a full or partial waiver of M/WBE and/or SDVOB participation goals, the waiver request approval will be added to your file.

SIGNATURE	
Prime Contractor Acknowledgment: ☐ I certify that the information submitted herein is true, accurate and complete to the best of my knowledge and that all M/WBE and SDVOB subcontractors will perform a commercially useful function. **Prime Contractor/Contractor's Authorized Representative's Name (Please Type):**	**Date:**

Prime Contractor/Contractor's Authorized Representative's Signature:	

SECTION 4: DIVISION OF EQUAL EMPLOYMENT OPPORTUNITY INFORMATION (FOR THE DEEO USE ONLY)		
DEEO Director:	**Email:**	**Phone #:**
Signature DEEO Director:	**Date:**	
DEEO Director Acknowledgment: ☐ I certify that the information submitted herein is true, accurate and complete to the best of my knowledge and belief.		
Complete if applicable:		
Department Authorized Rep.:	**Title:**	
Email:	**Phone #:**	
Signature of DEEO Representative:	**Date:**	
DEEO Representative Acknowledgment: ☐ I certify that the information submitted herein is true, accurate and complete to the best of my knowledge and belief.		
Comments:		

APPENDIX "B"

COUNTY OF ERIE – DEPARTMENT OF PUBLIC WORKS BUILDING PERMIT APPLICATION AND INSURANCE REQUIREMENTS

Exhibit 1B – Building Permit Application

Exhibit 2B – Contractor Insurance Requirements

MARK C. POLONCARZ
COUNTY EXECUTIVE

WILLIAM E. GEARY
COMMISSIONER OF PUBLIC WORKS

Building Permit Application

ECDPW Building Permit No.

Part I: General Information

1. Project Location and Information

Project Name:
Name and Address:
Building Name:

2. Architect/Engineer (Prime)

Name:
Address:
City, State, Zip: Phone Number:

3. Contractor

Name:
Address:
City, State, Zip: Phone Number:

4. Type of Construction or Improvement

☐New Building: Proposed use is		
☐Conversion:	Current use is	Proposed use is

☐Addition	☐Alteration	☐Repair/Replacement	☐Relocation
☐Demolition	☐Sign	☐Fence	☐Equipment
☐Other (Describe)			

NOTE: AN INCOMPETE APPLICATION MAY DELAY THE TIMELY ISSUANCE OF YOUR PERMIT; PLEASE ENTER N/A IF A SECTION IS NOT APPLICABLE

5. Use and Occupancy Classification

☐ Assembly Group **A**	☐ Business Group **B**	☐ Education Group **E**	☐ Factory Group **F**
☐ High-Hazard Group **H**	☐ Institutional Group **I**	☐ Mercantile Group **M**	☐ Residential Group **R**
☐ Storage Group **S**	☐ Utility Group **U**		

If Assembly, Factory, High-Hazard, Institutional, Residential or Storage indicate Group subcategory type (e.g. Assembly A4) and Describe:

6. Special Inspections Required (3Rd Party) ☐ N/A

☐ Electrical	☐ Mechanical	☐ Plumbing	☐ Geotechnical
☐ Foundations	☐ Compaction	☐ Steel	☐ Equipment
☐ Asbestos	☐ Hazardous Materials	☐ Medical Specialties	☐ Other:
☐ Chapter 17 – Structural Tests and Special Inspections			

7. Dimensions of **EXISTING** Buildings**:**

Description:	Width:	Length:	Height:	No. of Stories:

8. Dimensions of **NEW** Buildings:

Description:	Width:	Length:	Height:	No. of Stories:

9. Lot Dimensions:

Description:	Width:	Length:	Height:	No. of Stories:

NOTE: AN INCOMPETE APPLICATION MAY DELAY THE TIMELY ISSUANCE OF YOUR PERMIT; PLEASE ENTER N/A IF A SECTION IS NOT APPLICABLE

10. Description of Project: (If need additional space please attach sheets to application). For any mixed occupancy, specify in detail the nature and extent of each use.

11. Estimated Project Cost

Cost of the work to be performed, **excluding** land costs:

CONTINUE TO PART TWO: ***DO NOT WRITE BELOW THIS LINE – OFFICIAL USE ONLY***

Date Received:	Received by:	Forwarded to (for review):
Additional Approvals needed:		
☐Historic Preservation	☐Environmental Impact Statement	☐Engineering:
☐Attorney:	☐Other (explain):	☐None

Part II: Not Used

Part III: Project Location and Details

1. This application must be accompanied by two complete sets of plans and specifications. Depicting the scope of the work to be performed.

2. Location of the proposed structure or addition showing the number of stories and all exterior dimensions.

3. The distance of the proposal from all lot lines and any structure including neighboring structures.

4. The depth of the proposed foundation or footers.

5. The maximum percentage of the lot to be covered by building(s).

6. The Water Supply is: ☐Municipal Water ☐Existing Well ☐New Well

7. Site is: ☐Within Flood Plain ☐**Not** within Flood Plain
   ☐Designated as a Wetland ☐**Not** Designated as a Wetland

NOTE: AN INCOMPETE APPLICATION MAY DELAY THE TIMELY ISSUANCE OF YOUR PERMIT; PLEASE ENTER N/A IF A SECTION IS NOT APPLICABLE

8. A drawing showing the existing conditions surrounding the project area. The drawing must include but not limited to adjacent: locations, exiting requirements, fire separations and functional areas, etc. Indicate with sufficient clarity and detail the nature and extent of the work proposed and its context. Failure to do so will interrupt the approval process until all the pertinent information is received.

9. Architectural and/or Engineered drawings are required. Drawings need to be prepared by a New York registered Architect or Licensed Professional Engineer. When the project floor area exceeds fifteen hundred (1,500) square feet and/or the project costs twenty thousand ($20,000) dollars or more.

Part IV: Notices (Read before signing):

1. Work conducted pursuant to a building permit must be visually inspected by the Code Enforcement Official and must conform to the New York State Uniform Fire Prevention and Building Code, and all applicable local, County of Erie, state and federal: laws, codes, rules and regulations.

2. In the event that there are changes to the scope of work that has been approved on the building permit, the Erie County Department of Public Works, Office of the Commissioner **must be notified immediately** of the same.

3. Prior to the start of Demolition activities the potential for exposure to asbestos and any other hazardous materials must be identified. Accordingly, an abatement plan that complies with New York State Department of Labor rules must be implemented.

4. It is the owner's responsibility to contact the Erie County Department of Public Works, Office of the Commissioner at (716) 858-8301 (Monday through Friday from 8am to 4pm) at least **72** hours before the owner and/or contractor wishes to have an inspection conducted. Inspections will be performed by appointment only. More than one inspection may be necessary. This is especially true for "internal work" which will eventually be covered from visual inspection by additional work (i.e. electrical work later to be covered by a wall).

Part V: Inspections (Read before signing):

1. **PROVISIONS SHALL BE MADE FOR INSPECTION OF THE FOLLOWING ELEMENTS OF THE CONSTRUCTION PROCESS, WHERE APPLICABLE:**
    a. Work site prior to the issuance of a permit
    b. Fire rated construction
    c. Footing and foundations
    d. Fire rated penetrations
    e. Preparation for concrete slab
    f. Solid fuel burning heating appliances, chimneys, flues or gas vents
    g. Framing
    h. Energy code compliance

i. Rough-in of all building systems, including but not limited to: Electrical, Plumbing, Gas or Fuel Piping, Security, HVAC, Temperature Controls, etc.

j. A final inspection after all work authorized by the building permit has been completed

2. DO NOT PROCEED TO THE NEXT STEP OF CONSTRUCTION IF SUCH "INTERNAL WORK" HAS NOT BEEN INSPECTED. Otherwise, work may need to be removed at the contractor's expense to conduct the interior inspection. Close coordination with the Erie County Department of Public Works, Office of the Commissioner will greatly reduce this possibility.

3. All permitted electrical work to be performed will be inspected by a certified independent third party having the prior approval of the Department of Public Works. Such inspections shall be paid for by the Contractor.

4. Owner herby agrees to allow the Erie County Department of Public Works, Office of the Commissioner to inspect the sufficiency of the work being done pursuant to this permit, provided however, that such inspection(s) is (are) limited to the work being conducted pursuant to this permit and any other non work related violations which are readily discernible from such inspection(s).

5. New York State law requires contractors to maintain Worker's compensation and Disability Insurance for their employees. The contractor, as part of their Building Permit Application, shall submit copies of their NYS Workmen's Compensation and NYS Worker's Disability Insurance Certificates on the prescribed New York State forms. The County also requires Certificates of Insurance as limited on the attached Schedule for Contractors performing work on County property whether contracted by the County or third party. Please use the attached Standard Insurance Certificate with the "County of Erie, 95 Franklin St, Buffalo, NY 14202" listed as Certificate Holder.

6. All drawings and specifications submitted with a Building Permit Application for a Building Permit shall bear the seal and signature of a NYS Registered Design Professional per the requirements of NYS law. Building Permit Applications submitted without the seal and signature of a registered NYS Design Professional will be returned as incomplete.

7. If a Certificate of Occupancy is required, the structure shall not be occupied until said certificate has been issued.

8. Work undertaken pursuant to this permit is conditioned upon and subject to any State and Federal regulations relating to Asbestos Material and any other Hazardous Material.

9. This permit does not include any privilege of encroachment in, over, under, or upon any city street or right-of-way.

10. The building permit card must be displayed so as to be visible from the street nearest to the site of the work being conducted.

I,_____, the above named applicant, hereby attest that I am the contractor for the above referenced project and affirm under the penalty of perjury that all statements made by me on this application are true.

(Contractor Signature) Date:

Please Return Completed Application to:

Erie County
Department of Public Works
95 Franklin Street, Room 1400
Buffalo, NY 14202

DO NOT WRITE BELOW THIS LINE – OFFICIAL USE ONLY

☐ Application Approved	Date:	Permit Number:
☐ Permit issued by:		Date:
CERTIFICATE OF OCCUPANCY OR COMPLIANCE MUST BE OBTAINED BEFORE OCCUPANCY USE.		
☐ Certificate of Occupancy or Use by:		Date:
☐ Application Denied by:		Date:

NOTE: AN INCOMPETE APPLICATION MAY DELAY THE TIMELY ISSUANCE OF YOUR PERMIT; PLEASE ENTER N/A IF A SECTION IS NOT APPLICABLE

INSTRUCTIONS FOR COUNTY OF ERIE STANDARD INSURANCE CERTIFICATE

I. Insurance shall be procured and certificates delivered before commencement of work or delivery of merchandise or equipment.

II. CERTIFICATES OF INSURANCE

A. Shall be made to the "County of Erie, 95 Franklin St, Buffalo NY, 14202"

B. Coverage must comply with all specifications of the contract.

C. Must be executed by an insurance company, agency or broker, which is licensed by the NYS Department of Financial Services.
If executed by a broker, notarized copy of authorization to bind or certify coverage must be attached.

III. Forward the completed certificate to: County of Erie, (Department or Division) responsible for entering into the agreement for construction, purchase, lease or service.

IV. Minimum coverage with limits are as follows:

Vendor Classification	A Construction and Maintenance	B Purchase or Lease of Merchandise or Equipment	C Professional Services	D Property Leased To Others Or Use Of Facilities or Grounds	E Concessionaires Services	F Livery Services	G All Purposes Public Entity Contracts
Commercial Gen. Liab.	$1,000,000 per occ.	$1,000,000 CSL	$1,000,000 CSL	$1,000,000	$1,000,000 CSL	$1,000,000	$1,000,000 CSL
General Aggregate	$2,000,000	$2,000,000	$2,000,000	$2,000,000	$2,000,000	$2,000,000	$2,000,000
Products Completed Operations Liability	$2,000,000	$2,000,000	$2,000,000	$2,000,000	$2,000,000	$2,000,000	$2,000,000
Blanket Broad Form Contractual Liability	INCLUDE						
Contractual Liability		INCLUDE	INCLUDE	INCLUDE	INCLUDE	INCLUDE	INCLUDE
Broad Form P.D.	INCLUDE						
X.C.U. (explosion, collapse, Underground)	INCLUDE						
Liquor Law				INCLUDE	INCLUDE		
Auto Liab.	$1,000,000 CSL		$1,000,000 CSL	$1,000,000 CSL	$1,000,000 CSL	$1,000,000 CSL	$1,000,000 CSL
Owned	INCLUDE		INCLUDE	INCLUDE	INCLUDE	INCLUDE	INCLUDE
Hired	INCLUDE		INCLUDE	INCLUDE	INCLUDE	INCLUDE	INCLUDE
Non-Owned	INCLUDE		INCLUDE	INCLUDE	INCLUDE	INCLUDE	INCLUDE
Excess/Umbrella Liab.	$5,000,000	$1,000,000	$1,000,000	$1,000,000	$1,000,000	$5,000,000	$1,000,000
Worker's Compensation	STATUTORY	STATUTORY	STATUTORY	STATUTORY	STATUTORY	STATUTORY	STATUTORY
& Employer's Liability							
Disability Benefits	STATUTORY	STATUTORY	STATUTORY	STATUTORY	STATUTORY	STATUTORY	STATUTORY
Professional Liability			$5,000,000				
Cyber Liability	$1,000,000	N/A	$5,000,000	N/A	N/A	N/A	$1,000,000
Erie County, To Be Named Add'l Insd.	Gen. Liab., Auto Liab., & Excess	Broad Form Vendors May Be Required	Gen. Liab., Auto Liab., & Excess	Gen. Liab., Auto Liab., & Excess	Gen. Liab., Auto Liab., & Excess	Gen. Liab., Auto Liab., & Excess	Gen. Liab., Auto Liab., & Excess

V. Construction contracts require excess Umbrella Liability limits of $5,000,000.

VI. Coverage must be provided on a primary noncontributory basis.

VII. Designated Construction Project General Aggregate Limit Per Project Endorsement CG 25 03 is required

VIII. In the event the concessionaire is required to have a N.Y.S. license to dispense alcoholic beverages an endorsement for liquor liability is required.

IX. Waiver of Subrogation: Required on all lines unless noted

X Transportation of people in buses, vans or station wagons requires $5,000,000 excess liability.

XI. Workers Compensation: State Workers' Compensation / Disability Benefits Law.

USE APPLICABLE CERTIFICATES BELOW:

Workers Compensation Forms

CE-200	Exemption
C105.2	Commercial Insurer
SI-12	Self-Insurer
GSI-105.2	Group Self Insured
U-26.3	New York State Insurance Fund

DBL (Disability Benefits Law) Forms

CE-200	Exemption
DB-120.1	Insurers
DB-155	Self-Insured

XII. The "ACORD" form certificate may be used in place of the County of Erie Standard Insurance Certificate, provided that all of the above referenced requirements are incorporated into the "ACORD" form certificate.

XIII Cyber Liability coverage must be provided in instances where vendors/contractors have access to the County's IT network and/or any personal and confidential information.

XIV Pollution/Environmental Liability coverage required for projects involving the remediation, handling, transporting and/or disposal of hazardous waste Including but not limited to asbestos, lead and any other substance determined to be a Pollutant or Contaminant by the (DEC).

XV Endorsement CG2038 (Additional Insured) or equivalent should be used in construction contracts where there is no direct contract between the Contractor performing services and ECC/Erie County.

County of Erie Standard Insurance Certificate

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER	CONTACT NAME	
	PHONE (A/C No, Ext)	FAX A/C No:
	EMAIL ADDRESS	
	PRODUCER CUSTOMER ID #:	
	INSURER(S) AFFORDING COVERAGE	**NAIC #**
INSURED	INSURER A:	
	INSURER B:	
	INSURER C:	
	INSURER D:	
	INSURER E:	
	INSURER F:	

COVERAGES **CERTIFICATE NUMBER:** **REVISION NUMBER:**

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO T E INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY T E POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	ADDL INSR	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP MM/DD/YYYY)	LIMITS	
	GENERAL LIABILITY						EACH OCCURRENCE	$
	☐ COMMERCIAL GENERAL LIABILITY						DAMAGE TO RENTED PREMISES (Ea occurrence)	$
	☐☐ CLAIMS-MADE ☐ OCCUR						MED EXP (Any one person)	$
	☐						PERSONAL & ADV INJURY	$
	☐						GENERAL AGGREGATE	$
	GEN'L AGGREGATE LIMIT APPLIES PER:						PRODUCTS COMP/OP AGG	$
	☐ POLICY ☐ PRO-JECT ☐ LOC							$
	AUTOMOBILE LIABILITY						COMBINED SINGLE LIMIT (Ea accident)	$
	☐ ANY AUTO						BODILY INJURY (Per person)	$
	☐ ALL OWNED AUTOS						BODILY INJURY (Per accident)	$
	☐ SCHEDULED AUTOS						PROPERTY DAMAGE (Per accident)	$
	☐ HIRED AUTOS							$
	☐ NON-OWNED AUTOS							$
	☐							
	☐ UMBRELLA LIAB ☐ OCCUR						EACH OCCURRENCE	$
	☐ EXCESS LIAB ☐ CLAIMS-MADE						AGGREGATE	$
	☐ DEDUCTIBLE							$
	☐ RETENTION $							$
	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY Y/N						☐ WC STATU TORY LIMITS- ☐ OTH ER-	$
	ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICE/MEMBER EXCLUDED? ☐ **(Mandatory in NH)**	N/A					E.L. EACH ACCIDENT	$
	If yes describe under DESCRIPTION OF OPERATIONS below						E.L. DISEASE - EA EMPLOYEE	$
							E.L.DISEASE - POLICY LIMIT	$

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (Attach ACORD 101, Additional Remarks Schedule, if more space is required)

CERTIFICATE HOLDER	**CANCELLATION**
County of Erie 95 Franklin St Buffalo NY, 14202	SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS. AUTHORIZED REPRESENTATIVE

X. FOR COUNTY USE ONLY:

Name of County Dept. Requesting Certificate: DPW OFFICE OF THE COMMISSIONER

Purchase Order or Contact Number: _____

Vendor Insurance Classification: _____

(Rev 3/11)

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B. Coverage must comply with all specifications of the contract.

C. Must be executed by an insurance company, agency or broker, which is licensed by the NYS Department of Financial Services.
If executed by a broker, notarized copy of authorization to bind or certify coverage must be attached.

III. Forward the completed certificate to: County of Erie, (Department or Division) responsible for entering into the agreement for construction, purchase, lease or service.

IV. Minimum coverage with limits are as follows:

Vendor Classification	A Construction and Maintenance	B Purchase or Lease of Merchandise or Equipment	C Professional Services	D Property Leased To Others Or Use Of Facilities or Grounds	E Concessionaires Services	F Livery Services	G All Purposes Public Entity Contracts
Commercial Gen. Liab.	$1,000,000 per occ.	$1,000,000 CSL	$1,000,000 CSL	$1,000,000	$1,000,000 CSL	$1,000,000	$1,000,000 CSL
General Aggregate	$2,000,000	$2,000,000	$2,000,000	$2,000,000	$2,000,000	$2,000,000	$2,000,000
Products Completed Operations Liability	$2,000,000	$2,000,000	$2,000,000	$2,000,000	$2,000,000	$2,000,000	$2,000,000
Blanket Broad Form Contractual Liability	INCLUDE						
Contractual Liability		INCLUDE	INCLUDE	INCLUDE	INCLUDE	INCLUDE	INCLUDE
Broad Form P.D.	INCLUDE						
X.C.U. (explosion, collapse, Underground)	INCLUDE						
Liquor Law				INCLUDE	INCLUDE		
Auto Liab.	$1,000,000 CSL		$1,000,000 CSL	$1,000,000 CSL	$1,000,000 CSL	$1,000,000 CSL	$1,000,000 CSL
Owned	INCLUDE		INCLUDE	INCLUDE	INCLUDE	INCLUDE	INCLUDE
Hired	INCLUDE		INCLUDE	INCLUDE	INCLUDE	INCLUDE	INCLUDE
Non-Owned	INCLUDE		INCLUDE	INCLUDE	INCLUDE	INCLUDE	INCLUDE
Excess/Umbrella Liab.	$5,000,000	$1,000,000	$1,000,000	$1,000,000	$1,000,000	$5,000,000	$1,000,000
Worker's Compensation	STATUTORY	STATUTORY	STATUTORY	STATUTORY	STATUTORY	STATUTORY	STATUTORY
& Employer's Liability							
Disability Benefits	STATUTORY	STATUTORY	STATUTORY	STATUTORY	STATUTORY	STATUTORY	STATUTORY
Professional Liability			$5,000,000				
Cyber Liability	$1,000,000	N/A	$5,000,000	N/A	N/A	N/A	$1,000,000
Erie County, To Be Named Add'l Insd.	Gen. Liab., Auto Liab., & Excess	Broad Form Vendors May Be Required	Gen. Liab., Auto Liab., & Excess	Gen. Liab., Auto Liab., & Excess	Gen. Liab., Auto Liab., & Excess	Gen. Liab., Auto Liab., & Excess	Gen. Liab., Auto Liab., & Excess

V. Construction contracts require excess Umbrella Liability limits of $5,000,000.

VI. Coverage must be provided on a primary noncontributory basis.

VII. Designated Construction Project General Aggregate Limit Per Project Endorsement CG 25 03 is required

VIII. In the event the concessionaire is required to have a N.Y.S. license to dispense alcoholic beverages an endorsement for liquor liability is required.

IX. Waiver of Subrogation: Required on all lines unless noted

X Transportation of people in buses, vans or station wagons requires $5,000,000 excess liability.

XI. Workers Compensation: State Workers' Compensation / Disability Benefits Law.

USE APPLICABLE CERTIFICATES BELOW:

Workers Compensation Forms

CE-200	Exemption
C105.2	Commercial Insurer
SI-12	Self-Insurer
GSI-105.2	Group Self Insured
U-26.3	New York State Insurance Fund

DBL (Disability Benefits Law) Forms

CE-200	Exemption
DB-120.1	Insurers
DB-155	Self-Insured

XII. The "ACORD" form certificate may be used in place of the County of Erie Standard Insurance Certificate, provided that all of the above referenced requirements are incorporated into the "ACORD" form certificate.

XIII Cyber Liability coverage must be provided in instances where vendors/contractors have access to the County's IT network and/or any personal and confidential information.

XIV Pollution/Environmental Liability coverage required for projects involving the remediation, handling, transporting and/or disposal of hazardous waste Including but not limited to asbestos, lead and any other substance determined to be a Pollutant or Contaminant by the (DEC).

XV Endorsement CG2038 (Additional Insured) or equivalent should be used in construction contracts where there is no direct contract between the Contractor performing services and ECC/Erie County.

APPENDIX "C"

COUNTY OF ERIE – EXECUTIVE ORDER NO.13 – PAY EQUITY CERTIFICATION ON COUNTY CONTRACTS

Pay Equity Certification on County Contracts

During the term of this Contract, the Awardee shall comply with Executive Order 13 (2014), and the Awardee shall make such records available, upon request, to the County's Division of Equal Employment Opportunity for review. The County shall have the right, upon reasonable notice and at reasonable times, to inspect the books and records of the Awardee, its offices and facilities, for the purpose of verifying information supplied in the Erie County Equal Pay Certification and for any other purpose reasonably related to confirming the Awardee's compliance with Erie County Executive Order No. 13 (2014). Violation of the provisions of Executive Order 13 (2014), which is attached hereto and made a part hereof, can constitute grounds for the immediate termination of this contract and may constitute grounds for determining that a bidder is not qualified to participate in future county contracts.

Executive Order #013

Pay Equity Certification on County Contracts

WHEREAS, federal law, including the Equal Pay Act of 1963, Title VII of the Civil Rights Act of 1964 and Federal Executive Order 11246 of September 24, 1965 (Equal Employment Opportunity) (together "Federal Equal Pay Law"), requires that men and women in the same workplace be given equal pay for equal work; and

WHEREAS, Section 194 of New York State Labor Law ("NYS Equal Pay Law") prohibits compensating men and women differently for the same work; and

WHEREAS, on average, a full-time working woman in New York State earns just 85 cents for every dollar that a man earns and the pay gap is even greater for African-American and Latina women; and

WHEREAS, females make up nearly fifty-two percent of Erie County's population; and

WHEREAS, women make up nearly half of the U.S. labor force and are a growing number of breadwinners in their families; and

WHEREAS, this pay differential shortchanges women and their families by thousands of dollars a year, and potentially hundreds of thousands of dollars over a lifetime, presenting a lifelong threat to those families' economic security and reducing their earnings through Social Security and other post retirement plans; and

WHEREAS, poverty is recognized as a leading cause of or contributing factor to many social problems, including but not limited to substance abuse, domestic violence, child abuse, improper nutrition, obesity, improper health care and criminal conduct; and

WHEREAS, the impact of pay differentials is exacerbated as workers age, causing underpaid workers to disproportionally rely upon various forms of public support in their retirement years; and

WHEREAS, pay inequity can significantly impact the County, necessitating the provision of various public subsidies for low income residents and leading to the lack of receipt of income by women residents which would be spent in our local economy; and

WHEREAS, through the enforcement of current state and federal laws that ban unequal pay for equal work, Erie County can help ameliorate the many negative consequences of pay inequality, thereby improving the lives of those who might otherwise be underpaid, strengthening families and protecting children, and

reducing the demand for public services, all positively impacting county, state and federal budgets.

NOW, THEREFORE, I MARK C. POLONCARZ, Erie County Executive, by virtue of the authority vested in me by the Erie County Charter § 302, do hereby order as follows:

1. It is ordered that on and after January 1, 2015, all Erie County offices, departments and administrative units, including but not limited to the Division of Purchase, fully implement a requirement in all bids, requests for proposals and other contract solicitations that the contractor submit an Erie County Equal Pay Certification which certifies the contractor's compliance with Federal Equal Pay Law and New York State Equal Pay Law (together, the "Equal Pay Laws"). Such certification shall be required prior to execution of the contract; and it is,

2. Further ordered that such certification shall include a representation by the contractor that it has not been the subject of an adverse finding under the Equal Pay Laws within the previous five years and shall include disclosure of any currently pending claims against the contractor; and it is,

3. Further ordered that violation of any provision of the Equal Pay Laws during the effective period of such a contract or the filing of a false or misleading Erie County Equal Pay Certificate may constitute grounds for immediate termination of such a contract; and it is,

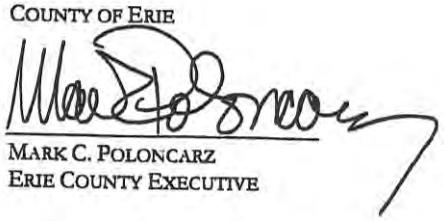
4. Further ordered that violation of any provision of the Equal Pay Laws during the effective period of such a contract or the filing of a false or misleading Erie County Equal Pay Certificate may constitute grounds for determining a bidder or responder is not qualified to participate in future County contracts; and it is,

5. Further ordered that the Law Department prepare an Erie County Equal Pay Certification for use by Erie County offices, departments and administrative units and assure compliance with this Executive Order in the contract approval process; and it is,

6. Further ordered that the County Division of Equal Employment Opportunity ("EEO") establish a procedure for compliance monitoring and periodic auditing of certification records; and it is,

GIVEN, under my hand and the Privy Seal of the County of Erie in the City of Buffalo this 28th day of October, in the year two thousand fourteen.

COUNTY OF ERIE

BY: 

MARK C. POLONCARZ
ERIE COUNTY EXECUTIVE

APPENDIX "D"

COUNTY OF ERIE – EXECUTIVE ORDER NO. 18 – FIRST SOURCE HIRING POLICY FOR COUNTY CONSTRUCTION PROJECTS

Exhibit 1 - Executive Order # 18 Policy

Exhibit 2 - Executive Order # 18 Rules and Regulations

Exhibit 3 – Executive Order # 18 Monitoring and Reporting Requirements

Exhibit 4 – List of First Source Zip Codes

Executive Order #018
Erie County Construction Project Bid Documents Shall Include
Local and Disadvantaged Worker Requirements

Whereas, Erie County annually appropriates over $25,000,000 in tax dollars for expenditures related to public works construction projects;

Whereas, Erie County awards contracts to private firms to provide the construction services associated with budgeted projects;

Whereas, while unemployment in Erie County as a whole is comparable to other metropolitan regions in the United States, the unemployment rate within certain zip codes located in Erie County is as high as 21.7% and the poverty rate as high as 44.7%;

Whereas, there are 182,200 working age individuals in the region who are either unemployed or underemployed and seeking work;

Whereas, low-income or otherwise disadvantaged individuals residing in Erie County experience higher rates of unemployment compared to other individuals;

Whereas, the purpose of this order is to foster construction employment opportunities for qualified local residents, underemployed individuals or otherwise disadvantaged workers on those construction projects located within the geographic boundaries of Erie County which are bid by the County of Erie ("Erie County construction project(s)").

Now, Therefore, I, Mark C. Poloncarz, Erie County Executive, by virtue of the authority vested in me by Erie County's Charter Sections 301 and 302, do hereby order as follows:

1. It is ordered that on and after April 30, 2018, all bids for Erie County construction projects initiating out of the Erie County Department of Environment and Planning Division of Sewerage Management and on and after October 1, 2017, all other bids for Erie County construction projects wherever so initiated, and all associated contracts involving an expenditure of $250,000 or greater which utilize not less than three workers to complete the project shall require that:

   a) Entirely 100% of work hours performed by residents of New York State on an Erie County construction project will be worked by residents of the Local Labor Area (Erie County, Niagara County, Chautauqua County, Cattaraugus County, Allegany County, Wyoming County, Genesee County, Orleans County).

   b) At least 70% of total work hours performed by residents of New York State on an Erie County construction project will be worked by residents of the County of Erie.

   c) For the remainder of the calendar year subsequent to the effective date of this Order as specified above in Section 1, and for the entirety of the calendar year that follows, at least 20% of total work hours performed by residents of New York State, which percentage may be wholly or partly included within the hourly requirement contained in sub-section (b) above, used on an Erie County construction project will be worked by residents of Erie County who reside in zip codes with a poverty rate of 20% or higher, and/or, in any ratio, disadvantaged workers who

reside in Erie County. A disadvantaged worker is a resident who has a household income below 50% of the Area Median Income ("AMI"); or has been released from prison within the last 10 years; or participates in the Temporary Assistance for Needy Families program; or participates in the Supplemental Nutrition Assistance Program; or has been unemployed for at least 12 consecutive months.

d) On the first day of the second full calendar year from such effective date and continuing thereafter, the applicable percentage of total work hours performed referenced in this subsection above will move upward from 20% to 30%. The applicable zip codes as referenced above will be determined annually by the ErieCounty Division of Equal Employment Opportunity and will be provided to potential contractors in all request for bids documents; and

2. It is further ordered that work hours performed by individuals residing outside of New York State will not be included in the requirements set forth above; and

3. It is further ordered that where an Erie County construction project is funded in whole or in part with Federal Highway Administration monies, those projects are exempt from the requirements specified above to avoid conflict with federal law or regulation; and

4. It is further ordered that failure to adhere to the requirements herein, as further delineated in all formal construction contracts and any rules and regulations promulgated pursuant to Section 5 below, will constitute grounds for immediate termination of the underlying contract and will further result in the Contractor being deemed a non-responsible bidder for a period of twelve months. Once grounds for immediate termination are established, actual contract termination will be at the discretion of Erie County; and

5. It is further ordered that the Erie County Department of Law must promulgate, and update annually where necessary, separate formal rules and regulations with respect to implementation of the requirements contained herein as applied respectively and distinctly to Erie County construction projects initiating out of the Erie County Department of Environment and Planning Division of Sewerage Management and to Erie County construction projects wherever else so initiated. The Erie County Department of Law must also assure compliance with this Executive Order within the contract approval process; and

6. It is further ordered that the Erie County Division of Equal Employment Opportunity establish a procedure for compliance monitoring and periodic auditing of construction contractor hiring rates.

Given, under my hand and the Privy Seal of the County of Erie in the City of Buffalo this twenty seventh day of September, in the year two thousand seventeen.

COUNTY OF ERIE

BY: _____

MARK C. POLONCARZ
ERIE COUNTY EXECUTIVE

RULES AND REGULATIONS IMPLEMENTING
ERIE COUNTY EXECUTIVE MARK C. POLONCARZ ORDER #18

PURPOSE

The Erie County Attorney's Office promulgates these Rules and Regulations pursuant to Section 5 of Erie County Executive Mark C. Poloncarz Order #18 dated September 27, 2017 ("EO #18"). These Rules and Regulations are intended to articulate guidelines for implementing the provisions of EO #18 as they relate to those Erie County construction projects.

DEFINITIONS

1. **ERIE COUNTY CONSTRUCTION PROJECT** shall mean construction projects bid by Erie County and located within the geographic boundaries of Erie County which involve an expenditure of $250,000 or more and which utilize not less than three construction workers to complete the project.

2. **CONSTRUCTION SUBCONTRACT** shall mean any subcontract entered into by a contractor working on an Erie County Construction Project which, by its terms, engages such subcontractor to provide work hours on an Erie County Construction Project.

3. **CONTRACTOR OR SUBCONTRACTOR** shall mean a contractor or subcontractor that directly employs construction workers who provide work hours on an Erie County Construction Project.

4. **CONSTRUCTION WORKER** shall mean a laborer, workman or mechanic who resides in the local labor area (Erie County, Niagara County, Chautauqua County, Cattaraugus County, Allegany County, Wyoming County, Genesee County, Orleans County) and is directly involved in the construction, reconstruction, improvement, rehabilitation, installation, alteration, renovation, demolition or otherwise providing for any building, facility, roads, highways, bridges, or physical structure of any kind, but does not include professional services employees.

APPLICATION

All Erie County Construction Projects ("Project" or "Projects") as defined above are subject to the provisions of EO #18. The Commissioner or his/her Designee or the Division Head or his/her Designee of the Erie County Department or Division who solicits a bid for an Erie County Construction project ("the Commissioner") must, with the aid of the County Attorney when necessary, determine on a case by case basis the applicability of EO #18 to a given project. In order for a project to be subject to EO #18, the Commissioner must make the following findings:

1. **Location**: The Commissioner must find that work on a project will take place solely within the geographic boundaries of Erie County.

2. **Monetary Threshold**: The Commissioner must find that the cost of a project meets or exceeds $250,000. In determining whether a project meets the expenditure threshold of $250,000, the Commissioner shall calculate the total cost of the project based on the successful bidder's final bid submission. A project previously exempt because it did not meet the monetary threshold of $250,000 may become subject to EO #18 because an amendment, modification, renewal, or extension increases the total cost of the project. In that case, the Commissioner will have the authority to unilaterally amend the project contract(s) to include the standard EO #18 contract language and certification specifically delineated below.

3. **Work Force Threshold**: The Commissioner must find that no less than three construction workers will be utilized by contractor and/or subcontractor for the completion of the project. In determining whether a project utilizes at least three construction workers to complete the Project, the Commissioner shall rely on the statement of work force contained within the attestation required by the mandatory request for bid language specifically delineated below. A project previously exempt because it did not meet the work force threshold may become subject to EO #18 because of an increase in work force during the course of work on the project. In that case, the Commissioner shall have the authority to unilaterally amend the project contract(s) to include the standard EO #18 contract language and certification specifically delineated below.

REQUEST FOR BID LANGUAGE

The Commissioner shall include the following language in all construction project Requests for Bids.

ERIE COUNTY EXECUTIVE ORDER #18: The project contemplated by this Request for Bids may be subject to Erie County Executive Order #18 which is attached hereto along with its Rules and Regulations for reference as Exhibit _____. The Erie County Department or Division letting the contract will advise the successful bidder if it must comply with Executive Order #18 at the time of award. All bids must include a verified attestation of intent to comply and statement of work force. Such attestation and statement is attached hereto as Exhibit _____. Any bids received which do not include such attestation or include an incomplete attestation will be deemed non-compliant and will not be considered for award. Be advised that the Contractor will be required to provide monthly reports demonstrating good faith efforts to meet the work force requirements using LCPtracker software.

CONTRACT LANGUAGE

The Commissioner shall include the following language in all award contracts for construction projects determined to be subject to EO #18.

ERIE COUNTY EXECUTIVE ORDER #18: The Commissioner or Division Director of the Erie County Department or Division letting the contract has determined that the project

contemplated herein is subject to the provisions of Erie County Executive Order #18 which is attached hereto for reference as Exhibit _____. Prior to the final execution of this Agreement, Contractor shall furnish to the County a fully executed and verified Local and Disadvantaged Worker Compliance Certification. A fillable Certification is attached hereto as Exhibit _____. Contractor will be required to provide monthly reports demonstrating good faith efforts to meet the work force requirements using LCPtracker software. Contractor shall make such records as deemed necessary available upon request to the Erie County Division of Equal Employment Opportunity for review. The County shall have the right, upon reasonable notice and at reasonable times, to inspect the books and records of the Contractor, for the purpose of verifying information supplied in the Local and Disadvantaged Worker Compliance Certification and for any other purpose reasonably related to confirming Contractor compliance with Erie County Executive Order #18. Notwithstanding any other termination provisions contained herein, violations of the provisions of Executive Order #18 will constitute grounds for immediate termination of the underlying contract and shall further result in the Contractor being deemed a non-responsible bidder for a period of twelve months. Once grounds for immediate termination are established, actual contract termination will be at the discretion of Erie County.

WAIVER PROCESS

When a Commissioner determines that a project is subject to the provisions of EO #18, he/she shall notify the successful bidder of such determination at the time of award. The successful bidder shall then have the opportunity to submit a partial waiver request to the Erie County Division of Equal Employment Opportunity for consideration. Waiver requests shall be made in writing and directed to the Erie County Division of Equal Employment Opportunity at 95 Franklin Street, Room 625, Buffalo, NY 14202 "Attention Director". In order to prevent undue project delays, any such request shall be made as soon as the successful bidder is aware that it cannot meet the full requirements of EO #18. Should a partial waiver be requested such request shall state which EO #18 requirement(s) cannot be met and shall further indicate how the successful bidder intends to partially comply. All waiver requests shall contain a narrative of the efforts employed by the successful bidder in attempting to comply with EO #18 by recruiting construction workers to work on the subject project and the reasons why such efforts were only partially successful. At a minimum, these efforts must include and the narrative must state the following:

1) Where a successful bidder has, through collective bargaining agreements or other legally binding agreements, any exclusive hiring arrangements with local unions such successful bidder must attempt to meet the mandates of EO #18 by following the hiring process outlined in their respective exclusivity agreements. The narrative provided in connection with any waiver request will describe the process followed and the results of those efforts. Where a successful bidder has no exclusive hiring agreements in place or where a successful bidder is unable to comply with EO #18 after following their exclusive hire process, such successful bidder must proceed to follow steps 2 through 4 below.

2) Posting the job opening(s) for construction worker(s) on or with each of the following:

A) The New York State Department of Labor Database used by the Buffalo and Erie County Workforce System (www.jobzone.ny.gov)

B) The People United for Sustainable Housing located at 271 Grant Street, Buffalo, NY 14213

C) At least one private staffing firm to aid Contractor in locating qualified candidates

D) Any other staffing organization or web site if so directed by the Erie County Commissioner of Public Works

3) All job opening(s) posted pursuant to Section one above must be posted for a period of at least ten (10) consecutive calendar days. Proof of publication must be included in all waiver requests.

4) The narrative provided with a waiver request shall state the number of candidates found via the job postings that would aid Contractor in meeting the requirements of EO #18, the number of those candidates that were subsequently interviewed for the opening(s), and if such candidates were not hired, the narrative shall include the reason(s) why the candidates were found to be unsuitable for the position(s).

5) A copy of the waiver request shall be sent to the Project Manager/Point of Contact in the Erie County Department of Public Works located at 95 Franklin Street, 14th Floor, Buffalo, NY 14202

If the Erie County Division of Equal Employment Opportunity determines that a successful bidder has demonstrated a good faith effort to comply in whole with the provisions of EO #18, and yet for reasons delineated in its request still cannot do so, a partial waiver shall be granted to the successful bidder.

SPECIALIZED WORK EXEMPTION

Certain Erie County Construction Projects require the use of workers who possess specialized skills, training, or formal certification/licensing in order to complete the contemplated work. When a Commissioner or Director of an Erie County Department or Division believes that there are an insufficient number of construction workers that meet EO#18 requirements and possess the unique qualifications necessary to complete such specialized work, he/she may request a specialized work exemption from the Erie County Division of Equal Employment Opportunity. Where granted, a specialized work exemption removes the mandates of EO #18 in whole or in part for a given project.

A request for a specialized work exemption shall be made in writing by the commissioner or director bidding the subject project. The request shall be directed to the Erie County Division of Equal Employment Opportunity at 95 Franklin Street, Room 625, Buffalo, NY 14202 “Attention Director” and must include a narrative describing what the specialized work involves, what portion of the project such specialized work is needed for, the particular skills, training, or formal

certification/licensing needed to perform the work, and the steps taken to determine if workers meeting EO #18 requirements have the necessary expertise. Upon receipt of a specialized work exemption request, the Equal Employment Opportunity Director shall form an ad hoc committee, and select its members, in order to review the request and either grant or deny the specialized work exemption.

The specialized work exemption committee shall consist of four members to include the commissioner or director of the department or division biding the project, the involved project manager, and one respective representative from the Erie County Department of Law and the Erie County Division of Equal Employment Opportunity. The committee shall convene as soon as practicable to consider the specialized work exemption request. In making a determination, the committee shall consider all information presented to it and shall solicit further information from any source available in order to aid in its deliberations. A determination as to whether or not to grant the specialized work exemption shall be made within a reasonable time so as not to frustrate the bidding process for the contemplated project. The committee's determination shall be memorialized in writing and shall include its specific findings and the information upon which such findings were made.

Where the committee finds that a specialized work exemption is warranted, a notice to bidders shall be included in the project bid specifications which shall clearly indicate what portion of the project is exempt from the provisions of EO #18 and shall further indicate that the remaining work, if any, may still be subject to EO #18. Where there is work remaining outside of the granted exemption, the attestation of work force must be completed to include that portion of work which falls outside of the exemption.

COMPLIANCE

The Director of the Erie County Division of Equal Employment Opportunity shall ensure that all contractors and subcontractors working on a Project as defined herein are in compliance with EO #18 or are in compliance with the provisions of any duly granted partial waiver or have been granted a full waiver.

PENALTY FOR NONCOMPLIANCE

Any failure to adhere to Erie County Executive Order #18 or the Rules and Regulations contained herein shall cause Contractor to be deemed noncompliant. Such noncompliance shall constitute grounds for immediate termination of the underlying contract and shall further result in the Contractor being deemed a non-responsible bidder for a period of twelve months. Once grounds for immediate termination are established, actual contract termination will be at the discretion of Erie County.

County of Erie Executive Order No. 18
Monitoring and Reports

All EMPLOYER/EMPLOYEE information reviewed or gathered, including Social Security Numbers, as a result of ERIE COUNTY'S Division of Equal Employment Opportunity (DEEO) monitoring and enforcement activities will be held confidential in accordance with all County, State and Federal confidentiality and privacy laws and used only for the purposes that it was reviewed or gathered.

A. The Division of Equal Employment Opportunity (DEEO) shall monitor all Projects as authorized by Executive Order No. 18. The DEEO will require the following:
   1. CONTRACTOR and Subcontractor whose projects are subject to ERIE COUNTY Executive Order No. 18 are to utilize their Certified Payroll Records when reporting their workforce compliance. That of the total work hours performed by residents of New York State on an Erie County construction project 100% are worked by residents of the Local Labor Area and 70% are worked by residents of the County of Erie.
   2. Monthly LCPTracker Reports to determine if the CONTRACTOR and/or Subcontractor's workforce is in compliance with the submitted Agreement and that Monthly Compliance Reports identify residents of Erie County who reside in zip codes with a poverty rate of 30% or higher, and/or, in any ratio, disadvantaged workers who reside in Erie County. (***A disadvantaged worker is*** *(1).* ***a resident who has a household income below 50% of the Area Median Income (AMI); or*** *(2)* ***has been released from prison within the last 10 years, or*** *(3)* ***participates in the Temporary Assistance for Needy Families Program; or*** *(4)* ***participates in the Supplemental Nutrition Assistance Program; or*** *(5)* ***has been unemployed for at least 12 consecutive months.***)
   3. Receive *LCPTracker* Reports; inspect certified payroll, personnel records and any other records or information necessary to ensure the required workforce utilization is in compliance with the EC Executive Order No. 18.
   4. Conduct desk reviews of Monthly Compliance Reports.
   5. Monitor and complete statistical reports that identify the overall project, contractor, and subcontractors' hiring or hours worked percentages in accordance with meeting Executive Order No. 18 stated requirements.
   6. Provide formal notification of non-compliance with the required workforce percentages or any alleged breach of Executive Oder No. 18 to all contracting agencies, and stakeholders.

B. PENALTIES

Willful breach of the Executive Order No. 18 by the CONTRACTOR, failure to submit the Contract Compliance Reports via LCPTracker, deliberate submission of falsified data, or failure to reach specific hiring or hours worked requirements may result in:

1. Erie County immediate termination of the underlying contract.
2. The CONTRACTOR being deemed a non-responsible bidder for a period of twelve months.

EO #18 - EXHIBIT # 4

First Source Policy Targeted Zip Codes – Erie County Zip Codes with 20% Poverty Rate or Higher:

Zip Code	Area
14201	Buffalo – Peace Bridge to Chippewa
14203	Buffalo – Downtown and the Outer Harbor
14204	Buffalo – Fruit Belt to the Old First Ward
14206	Cheektowaga
14207	Buffalo
14208	Buffalo
14209	Buffalo
14210	Buffalo
14211	Buffalo, Cheektowaga and Sloan – Kensington and Bailey
14212	Buffalo and Cheektowaga – Central Terminal and Broadway
14213	Buffalo – Peace Bridge to Buffalo State
14214	Buffalo – Delaware Park to UB (East Side)
14215	Buffalo and Cheektowaga – Intersection of Bailey Ave. and Route 33
14218	City of Lackawanna
14061	Farnham
14169	Wales Center

APPENDIX “E”

COUNTY OF ERIE – CONTRACT REFERENCE DOCUMENTS

Exhibit 1 – Example Agreement

Exhibit 2 – Example Performance and Labor Bond

COUNTY OF ERIE
DEPARTMENT OF PUBLIC WORKS
OFFICE OF THE COMMISSIONER

DPW PROJECT # **YEAR-LOCATION-#**
VENDOR #

AGREEMENT

This Agreement made as of the _____ day of _____, 2020 by and between the County of Erie, a municipal corporation of the State of New York, having its principal place of business at The Edward A. Rath, County Office Building, 95 Franklin Street, Buffalo New York 14202, hereinafter called "County" and **AWARDEE (VENDOR)** having its principal office at **VENDOR ADDRESS, CITY, STATE, ZIP** hereinafter called the "Contractor".

All notices or other communications including service under this contract shall be deemed to have been properly given when sent, first class, postage prepaid, return receipt requested to the addresses set forth below:

For the County:
Erie County Department of Public Works
95 Franklin Street, Suite 1400
Buffalo, New York 14202

For the Contractor:
VENDOR NAME
VENDOR ADDRESS
CITY, STATE ZIP

WITNESSETH That whereas the County intends to do **DISCIPLINE** construction work in connection with the **PROJECT NAME**, located at **PROJECT ADDRESS** hereinafter called the "Project" in accordance with the Contract Documents prepared by **AE DESIGN FIRM**, having its principal offices at **AE ADDRESS**.

NOW, THEREFORE, The County and the Contractor for the consideration hereinafter set forth, agree as follows:

The Contractor agrees to furnish all necessary labor, materials, equipment, tools and services necessary to perform and complete in a workman - like manner all work required for the construction of the PROJECT, in strict compliance with the Contract Documents herein mentioned, which are hereby made a part of the Contract, including the following Addenda:

Addendum # 1 DATE
Addendum # 2 DATE

COMPLETION TIME: Work shall commence immediately upon receipt of written Notice to Proceed and shall progress pursuant to the provisions set forth in the agreement. The Contractor hereby agrees substantially complete with the work of this agreement **within 000 calendar days** from the date of issuance of the Notice to Proceed.

SUB-CONTRACTORS: The Contractor agrees to bind every sub-Contractor by the terms of the Contract Documents. The Contract Documents shall not be construed as creating any contractual relation between any sub-Contractor and the County.

AGREEMENT AMOUNT: The County agrees to pay and the Contractor agrees to accept, in full payment for the performance of this Agreement, the total amount of: **AMOUNT LONG WRITTEN Dollars ($00.00).** And be funded from **SAP Account(s) X.00000.**

a. Progress Payments will be made in accordance with the General Conditions of the Contract.

CONTRACT DOCUMENTS: the Contract is comprised of the documents listed in paragraph 1.01 of the General Conditions of the Contract. In the event that any provision of one Contract Document, conflicts with the provision of another Contract Document, the provision in that Contract Document first listed below shall govern, except as otherwise specifically stated:

a. Agreement (This Instrument)
b. Addenda to Contract Documents
c. Legal and Procedural documents other than Bonds
    1. Proposal which is attached hereto as "Appendix A".
    2. Information for Bidders
    3. Advertisements
    4. Form of Affidavit for Final Payment
    5. Form of Guarantee
d. Detailed Specifications Requirements
e. Drawings
f. General Conditions of the Contract (Sections 1 through 9, inclusive)
g. Supplementary General Conditions
h. Bonds
    1. Performance, Labor and Material Payment Bond
    2. Proposal Guaranty

AUTHORITY AND RESPONSIBILTY OF THE ARCHITECT - ENGINEERS: All work shall be done under the general administration of the Architect - Engineer. The Architect - Engineer shall decide any and all questions which may arise as to quality and acceptability of materials furnished, work performed, rate of progress of the work, interpretation of drawings and specifications, and all questions as to the acceptable fulfillment of the contract on the part of the Contractor.

SUCCESSORS AND ASSIGNS: This agreement and all of the covenants hereof shall inure to the benefit of and be binding upon the County and the Contractor respectively and his partners, successors, assigns and legal representatives. Neither the County nor the Contractor shall have the right to assign, transfer or sublet his interests or obligations hereunder without written consent of the other party.

INDEMNIFICATION: To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the County of Erie, its agents, officers and employees, from any and all liability, damage, claims, demands, costs, judgments, fees, attorney's fees or loss arising out of, directly or indirectly, or relating in any way to the performance or failure to perform under this Agreement by the Contractor or third parties under the direction or control of the Contractor, including but not limited to personal injuries. The Contractor shall defend the County, at its sole expense, against any and all claims, demands or causes of action directly or indirectly arising out of this Agreement and to bear all other costs and expenses related thereto.

EXECUTIVE ORDER No. 13 (2014): The Contractor shall comply with Erie County Executive Order 13 (2014) and agrees to complete the Certificate collectively attached hereto **as Appendix "C**" and made a part hereof. The Contractor shall make such records available, upon request, to the County's Division of Equal Employment Opportunity for review. The County shall have the right, upon reasonable notice and at reasonable times, to inspect the books and records of the Contractor, its offices and facilities, for the purpose of verifying information supplied in the Erie County Equal Pay Certification and for any other purpose reasonably related to confirming the Contractors' compliance with Erie County Executive Order 13 (2014). Notwithstanding the termination provisions contained herein, violation of the provisions of Executive Order 13 (2014) , may constitute grounds for the immediate termination of this Agreement and may constitute grounds for determining that the Contractor is not qualified to participate in future County contracts.

EXECUTIVE ORDER No. 18 (2017): The Commissioner or Division Director of the Erie County Department or Division letting the contract has determined that the project contemplated herein is subject to the provisions of Erie County Executive Order #18. Prior to the final execution of this Agreement, Contractor shall furnish to the County a fully executed and verified *Local and Disadvantaged Worker Compliance Certification*. A fillable Certification is included in **Appendix "D"**. Contractor shall make such records as deemed necessary available upon request to the Erie County Division of Equal Employment Opportunity for review. The County shall have the right, upon reasonable notice and at reasonable times, to inspect the books and records of the Contractor, for the purpose of verifying information supplied in the Local and Disadvantaged Worker Compliance Certification and for any other purpose reasonably related to confirming Contractor compliance with Erie County Executive Order #18. Notwithstanding any other termination provisions contained herein, violations of the provisions of Executive Order #18 will constitute grounds for immediate termination of the underlying contract and shall further result in the Contractor being deemed a non-responsible bidder for a period of twelve months. Once grounds for immediate termination are established, actual contract termination will be at the discretion of Erie County.

EXECUTORY: This Contract is executory only to the extent of funds appropriated and made available to the County, therefore, and no liability shall be incurred by the County beyond such available funds.

a. The Contractor agrees not to submit a Request for Payment until the Contractor receives an executed copy of this Agreement from the County.

COUNTY'S RIGHT TO TERMINATE:

a. The County, upon ten (10) days' notice to the Contractor, may terminate this Agreement in whole or in part when the County deems it to be in its best interest. In such event, the Contractor shall be compensated and the County shall be liable only for payment for services already rendered under this Agreement prior to the effective date of termination at the values established under the approved Schedule of Values. Upon receipt of notice that the County is terminating this Agreement in its best interests, the Contractor shall stop work immediately and incur no further costs in furtherance of this Agreement without the express approval of the Commissioner of Public Works, and the Contractor shall direct any approved sub-contractor to do the same. In the event of a dispute as to the value of the Work rendered by the Contractor prior to the date of termination, it is understood and agreed that the Commissioner shall determine the value of such Work rendered by the Contractor. The Contractor shall accept such reasonable and good faith determination as final.

b. In the event the County determines that there has been a material breach by the Contractor of any of the terms of the Agreement and such breach remains uncured for forty-eight (48) hours after service on the Contractor of written notice thereof, the County, in addition to any other right or remedy it might have, may terminate this Agreement and the County shall have the right, power and authority to complete the Work provided for in this Agreement, or contract for its completion, and any additional expense or cost of such completion shall be charged to and paid by the Contractor. Without limiting the foregoing, upon written notice to the Contractor, repeated breaches by the Contractor of duties or obligations under this Agreement shall be deemed a material breach of this Agreement justifying termination for cause hereunder without requirement for further opportunity to cure.

SPECIAL PROVISIONS: The County and the Contractor mutually agree that this Agreement shall be subject to the following Special Provision:

The Contractor agrees that he will hold all of the Alternate and/or Unit Prices appearing in the PROJECT PROPOSAL, "Appendix A", for the duration of the Agreement with Owner. All materials and workmanship shall be in strict accordance with specifications and drawings. The Owner, reserves the right to either accept or reject any or all of the Alternate and/or Unit Prices in the PROJECT PROPOSAL, "Appendix A". The total amount of the contract as heretofore states, shall be accordingly increased or decreased, as the case may be.

INSURANCE: During the term of this Agreement, the Contractor agrees to maintain insurance coverage consistent with the insurance requirements attached hereto and incorporated herein as **Schedule B.** Contractor agrees to name the "County of Erie" as an additional insured on all such insurance policies, and to provide to the County Attorney certificate(s) of insurance evidencing such insurance coverage prior to the commencement of any work on the Project. All insurance certificates shall be subject to approval by the office of the County Attorney.

CONFIDENTIALITY: The County agrees to assist the Contractor with the scope of work described in the Contractor's Contract by providing applicable drawing files that may include but not be limited to; drawings, specifications, approved submittals and any other reasonable information necessary to perform the Contractor's scope of work. Any and all information provided to the Contractor by The County or the Design Consultant, shall be defined as "Confidential Information".

Contractor hereby agrees to maintain any Confidential Information received or learned in preparation of the underlying scope of work, (a) in confidence to the same extent the Contractor maintains its own proprietary industrial information of similar kind and value (but at a minimum the Consultant shall use commercially reasonable efforts); (b) the Contractor agrees not to disclose such Confidential Information to any Third Party without prior consent of the County; and (c) not use such Confidential Information for any purpose except those permitted by this Agreement.

RESOLUTION: This Agreement is made and executed pursuant to resolutions of **the Erie County Legislature adopted on the 00 day of MONTH, YEAR being Communication Number 00E-00**, copy(ies) of which are annexed hereto.

COUNTY OF ERIE
DEPARTMENT OF PUBLIC WORKS
OFFICE OF THE COMMISSIONER

This Agreement document, together with the Contract Documents listed on page A2 of the Agreement constitutes the sole and complete agreement and understanding between the Parties.

County of Erie

_____
Mark Poloncarz/Lisa Chimera
County Executive/Deputy County Executive
Dated: _____

95 Franklin Street
BUSINESS ADDRESS

Buffalo NY 14202
CITY STATE ZIP

VENDOR NAME

_____
Print Name:
Title:
Date:

VENDOR ADDRESS
BUSINESS ADDRESS

CITY **STATE** **ZIP**
CITY STATE ZIP

APPROVED AS TO CONTENT
Electronically Signed

.
COMMISSIONER 0F PUBLIC WORKS
COUNTY OF ERIE, STATE OF NEW YORK

APPROVED AS TO FORM
Electronically Signed

Document No._____
ASSISTANT ERIE COUNTY ATTORNEY
COUNTY OF ERIE, STATE OF NEW YORK

CORPORATE ACKNOWLEDGEMENT

State of New York)
County of)

On the ____day of _____, 2020, before me personally came_____, to me known who, being by me duly sworn, did depose and say that he reside(s) in _____ _____; that he is the_____of_____, the corporation described in and which executed the above instrument; that he knows the seal of said corporation; that the seal affixed to said instrument is such corporate seal; that it was so affixed by authority of the board of directors of said corporation, and that he signed his name thereto by like authority.

_____
Notary Public

Re: PROJECT I.D.

COUNTY OF ERIE
DEPARTMENT OF PUBLIC WORKS
OFFICE OF THE COMMISSIONER

PERFORMANCE AND LABOR AND MATERIAL PAYMENT BOND

PROJECT No. _____

KNOW ALL MEN BY THESE PRESENTS, That we, _____

of_____(hereinafter called Principal) and the

_____a corporation of the State of _____

having its principal office in the City of _____and authorized to do business in the State of New York (hereinafter called Surety) and held and firmly bound unto the County of Erie, State of New York (hereinafter called Obligee), in the amount of _____

($_____) Dollars, lawful money of the United States of America, for the payment of which the Principal and the Surety hereby bind themselves, their heirs, executors, administrators, successors and assigns jointly and severally, firmly by these presents.

WHEREAS, the above bounden Principal has by written agreement dated_____20____ entered into a contract with the Obligee for $_____which contract and documents included therein by reference made a part hereof (hereinafter called Contract), covering the following project, _____

NOW, THEREFORE, the condition of this obligation is such that if the Principal shall:

1. Well and truly perform and fulfill all the undertakings, covenants, terms, conditions, and agreements of said Contract during the original term of said Contract and any extensions thereof that may be granted by the Obligee, with or without notice to the Surety, and during the life of any guarantee required under the Contract, and shall also well and truly perform and fulfill all the undertakings, covenants, terms, conditions and agreements of any and all modifications of said Contract that may hereafter be made, with or without notice to the Surety.

2. Promptly make payment to all persons having a direct contract with the Principal or with a subcontractor of the Principal supplying labor and material in the prosecution of the work provided for in said Contract and any and all modifications of said Contract that may hereinafter be made, notice of which modifications to the Surety being hereby waived; then this obligation shall be void, otherwise to remain in full force and effect.

PROVIDED, HOWEVER, and this bond is executed and accepted upon the following express conditions.

1. That all persons who have supplied labor and material as aforesaid shall have a direct right of action hereunder against the Principal and the Surety subject, however, to the prior right of the Obligee to recover hereunder on account of any loss or damage caused to it by the failure of the Principal to perform the Contract as aforesaid.

2. The Surety for value received hereby stipulates and agrees, if requested to do so by the Obligee, to fully perform and complete the work and furnish the materials mentioned and described in said contract pursuant to terms, conditions, and covenants thereof, if for any cause said principal fails or neglects to so fully perform said work; the said Surety further agrees to commence said work of completion twenty (20) days after notice thereof from the Obligee.

3. That the Obligee shall notify the Surety by registered letter, addressed and mailed to its Home Office, of any breach of said-Contract within sixty (60) days after such breach shall have come to the knowledge of the Obligee (Owner)

4. That the Surety shall not be liable hereunder for any damage or compensation recoverable under any Workmen's Compensation or Employer's Liability Statute.

5. That no suit, action or proceedings, for loss or damage caused by a breach of any of the conditions of this bond shall be brought against the Surety by the Obligee after one (1) year from the day of final acceptance of the work by the Owner.

6. That no suit, action or proceedings for loss caused by the failure of the Principal to pay all persons supplying labor and material in the prosecution of the work under said Contract shall be brought against the Surety after six (6) months from the day on which final payment of the Contract is made.

Signed, sealed and dated this _____day of_____20_____

_____ (seal)
(Principal)

_____ (seal)
(Principal)

By
_____ (seal)
President, Vice President, Secretary-Treasurer
(Surety)

SUPPLEMENTARY GENERAL CONDITIONS

The following supplements modify the "GENERAL CONDITIONS OF THE CONTRACT". Where a portion of the General Conditions is modified or deleted by these Supplementary General Conditions, the unaltered portions of the General Conditions shall remain in effect.

Item -1: SECTION 3 – RELATIONS AMONG OWNERS, CONTRACTOR AND ARCHITECT/ ENGINEER

3.14 Delete and replace with the following: "3.14 OWNER'S RIGHT TO TERMINATE CONTRACT AND COMPLETE THE WORK

A. The County, upon ten (10) days notice to the Contractor, may terminate this Agreement in whole or in part when the County deems it to be in its best interest. In such event, the Contractor shall be compensated and the County shall be liable only for payment for services already rendered under this Agreement prior to the effective date of termination at the values established under the approved Schedule of Values. Upon receipt of notice that the County is terminating this Agreement in its best interests, the Contractor shall stop work immediately and incur no further costs in furtherance of this Agreement without the express approval of the Commissioner of Public Works, and the Contractor shall direct any approved sub contractor to do the same.

In the event of a dispute as to the value of the Work rendered by the Contractor prior to the date of termination, it is understood and agreed that the Commissioner shall determine the value of such work rendered by the contractor. The Contractor shall accept such reasonable and good faith determination as final.

B. In the event the County determines that there has been a material breach by the Contractor of any of the terms of the Agreement and such breach remains uncured for forty-eight (48) hours after service on the Contractor of written notice thereof, the County, in addition to any other right or remedy it might have, may terminate this Agreement and the County shall have the right, power and authority to complete the Work provided for in this Agreement, or contract for its completion, and any additional expense or cost of such completion shall be charged to and paid by the Contractor. Without limiting the foregoing, upon written notice to the Contractor, repeated breaches by the Contractor of duties or obligations under this Agreement shall be deemed a material breach of this Agreement justifying termination for cause hereunder without requirement for further opportunity to cure."

Item-2: SECTION 8 – WAGES AND LABOR CONDITIONS

8.05. C. 1. Delete and replace with the following: "1. The U.S. Department of Labor – Office of Federal Contract Compliance has established a 6.9% goal for women in the area of construction."

8.06. A. 5. Delete and replace with the following: "5. The County of Erie has determined that a goal of six percent (6%) of the total contract value represents a fair share of SDVOB utilization. In addition, the State University of New York Minority/Women's Business Enterprise and Equal Employment Opportunity (MWBE-EEO) Goals for State Contracts apply to this project. Goals for the project shall be as follows:

A. Service-Disable Veteran Owned Business (SDVOB) goal: 6%
B. Minority and Women Owned Business Enterprise (MWBE) goals
   a. Minority Owned Business Enterprises: 17%.
   b. Women Owned Business Enterprises: 13%.

c. MWBE Participation: 30%.

C. Equal Employment Opportunity (EEO) Goals

a. Minority Workforce Participation: 10%.

b. Female Workforce Participation: 10%."

8.06. A. 14. Delete and replace with the following: "14. In the event of a joint venture participating in this SDVOB and/or MBE/WBE Program, the Joint Venture Disclosure Affidavit must be submitted with the SDVOB and Minority/Women Business Enterprise Utilization – Prime Contractor Affidavit. Only to the extent that a SDVOB, minority and/or women's business enterprise contributes to and is paid for its participation in a Joint Venture will that dollar amount be credited towards the 6%, 17% and/or 13% respectively goal of SDVOB/minority/women's participation in the State University of New York MWBE-EEO program."

8.06. A. 15. Delete and replace with the following: "15. SDVOB's, MBE's and WBE's must be certified before their participation may be credited toward the respective 6%, 17% and 13% goal. Where the proposed MWB and/or WBE are not certified by State University of New York, the appropriate Certification Disclosure Affidavit must be filed with the appropriate Department. Forms and lists of certified MBE's/WBE's may be obtained at www.suny.edu/meansbusiness/mwbe/."

8.06. A. 16. Delete and replace with the following: "16. Should a bidder conclude that they would be unable to satisfy the SDVOB and/or MBE/WBE goal, the bidder shall submit a properly executed applicable Waiver Request Form with their bid proposal. Waivers shall be granted only where the availability of SDVOB's, MBE's and/or WBE's in the market area of the project is less than the respective 6%, 17% and 13% goal."

SUNY ERIE COMMUNITY COLLEGE NORTH CAMPUS
KITTINGER HALL BOILER ROOM UPGRADES
DIVISION 01
GENERAL REQUIREMENTS SPECIFICATIONS
PAGE 1

SECTION	DESCRIPTION
011000	SUMMARY
011200	MULTIPLE CONTRACT SUMMARY
011500	APPLICATION FOR PAYMENT
012100	ALLOWANCES
012600	CONTRACT MODIFICATION PROCEDURES
013100	PROJECT MANAGEMENT AND COORDINATION
013200	CONSTRUCTION PROGRESS DOCUMENTATION
013300	SUBMITTAL PROCEDURES
014100	QUALITY REQUIREMENTS
015000	TEMPORARY FACILITIES AND CONTROLS
016000	PRODUCT REQUIREMENTS
017300	EXECUTION
017700	CLOSEOUT PROCEDURES
017823	OPERATIONS AND MAINTENANCE DATA
017839	PROJECT RECORD DOCUMENTS
019113	GENERAL COMMISSIONING REQUIREMENTS

SECTION 011000 - SUMMARY

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Project information.
2. Work covered by Contract Documents.
3. Phased construction.
4. Work under Owner's separate contracts.
5. Contractor's use of site and premises.
6. Coordination with occupants.
7. Work restrictions.
8. Specification and Drawing conventions.
9. Miscellaneous provisions.

B. Related Requirements:

1. Section 011200 “Multiple Contract Summary” for summary of multiple contracts, including responsibilities for coordination and temporary facilities and controls.
2. Section 015000 "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

1.3 PROJECT INFORMATION

A. Project Identification: SUNY Erie Community College North Campus Kittinger Hall Boiler Room Upgrades, ECDPW PROJECT #: 2025-956-02

1. Project Location: 6205 Main Street, Williamsville, New York, 14221.

B. Owner: Erie County Department of Public Works, 95 Franklin Street, 14th Floor, Buffalo, New York 14202.

1. Owner's Representative: Natalie Tan, RA, ECDPW Assistant Architect.

C. Engineer:

IBC Engineering, P.C.
2495 Main Street, Suite 318
Buffalo, NY 14214
Contact: Rob Eimer
Email: reimer@ibceng.com
Phone: (716) 836-2315 ext 234

D. Engineer's Consultants: Engineer has retained the following design professionals, who have prepared designated portions of the Contract Documents:

1. Architect: KCB Architecture, North Tonawanda, NY.

    a. Representative: Kelley Culp-Burton

2. Structural Engineer: Nussbaumer & Clarke Inc., Buffalo, NY.

    a. Representative: Michael Murphy

E. Other Owner Consultants: Owner has retained the following design professionals who have prepared designated portions of the Contract Documents:

1. Hazardous Materials Abatement Design: Watts AE, 95 Perry St #300, Buffalo, NY.

    a. Hazardous Materials Abatement Design Representative: Mark Beyer.
    b. Scope of Service: Abatement Design and Construction Phase Services.

F. Project Coordinator for Multiple Contracts: Each prime contractor is responsible for coordination of their work with the work of other prime contractors and shall cooperate to accomplish coordination of construction operations among contractors and entities to ensure efficient and orderly installation of each part of the Work. The Owner’s representative shall facilitate coordination by the prime contractors.

G. Web-Based Project Software: Project Information Sharing software (Procore) will be used for purposes of managing communication and documents during the construction stage.

1. See Section 013100 "Project Management and Coordination." for requirements for using web-based Project software.

1.4 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of Project is defined by the Contract Documents and includes, but is not limited to, the following:

1. Mechanical and Plumbing Construction Work, including but not limited to;

   a. Replace hot water boiler heating plant including boilers, pumps, air separator, expansion tanks, boiler flue, and all associated ductwork and piping.
   b. Replace existing domestic water heater and associated flue.
   c. Providing mechanical combustion air unit and associated ductwork and controls.
   d. All roof patching and repair required as indicated on the contract drawings to replace boiler and domestic flue venting, and relocation of gas piping. Roofing work shall meet existing roof warranties.
   e. All cutting, patching, refinishing for mechanical and plumbing work, including boiler room hole infill, patching, and painting of mechanical room walls and ceiling, and floor resealing.
   f. Boiler room curtain wall removal/re-installation for new louver.
   g. Abatement of hazardous material.
   h. Exterior wall opening, including providing new exterior door, structural framing and supports, new staircase and associated supports.
   i. Concrete housekeeping pad demolition and new installation.
   j. New second floor chase construction for piping and flue up to roof.

2. Electrical Construction Work, including but not limited to;

   a. Power, wiring, distribution, cutting, patching, replacement, and refinishing for electrical work in support of mechanical/plumbing scope of work.
   b. Replacement of existing lighting with new.
   c. Relocation of existing electrical equipment and switch gear as indicated on the contract drawings to accommodate new mechanical equipment

B. Type of Contract:

1. Project will be constructed under coordinated, concurrent multiple contracts. See Section 011200 "Multiple Contract Summary" for a list of multiple contracts, a description of work included under each of the multiple contracts.

1.5 PHASED CONSTRUCTION

A. Construct the Work in phases as required, to be coordinated with the SUNY Erie academic calendar.

   a. Construction activities on-site shall begin no sooner than April 2027. The project is anticipated to be a six-month maximum project Abatement work must be completed between May 20, 2027 through July 31, 2027.
   b. Substantial completion date for this project is no later than October 1, 2027 or the start of heating season, whichever is earlier.
   c. Work hours may be second or third shift and can include weekends.
   d. Owner will not pay additional labor costs for contractors to meet this schedule.

2. The MC is required to submit a phasing plan. Prior to the MC and EC work in the boiler room, the abatement contractor will abate the room completely per the abatement project scope of work.

B. Before commencing Work of each phase, submit an updated copy of Contractor's construction schedule, showing the sequence, commencement, and completion dates for all phases of the Work.

1.6 WORK UNDER OWNER'S SEPARATE CONTRACTS

A. Work with Separate Contractors: Cooperate fully with Owner's separate contractors, so work on those contracts may be carried out smoothly, without interfering with or delaying Work under this Contract or other contracts. Coordinate the Work of this Contract with work performed under Owner's separate contracts.

1.7 CONTRACTOR'S USE OF SITE AND PREMISES

A. Restricted Use of Site: Each Contractor shall have limited use of Project site for construction operations as indicated on Drawings by the Contract limits and as indicated by requirements of this Section.

B. Limits on Use of Site: Limit use of Project Buildings and Site to Work in areas within the Contract limits indicated. Do not disturb portions of Project Site or Buildings beyond areas in which the Work is indicated.

1. Limits on Use of Site: Confine construction operations to areas in which the Work is indicated, unless otherwise authorized by the Owner.
2. Driveways, Walkways and Entrances: Keep driveways loading areas, and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or for storage of materials.

    a. Schedule deliveries to minimize use of driveways and entrances by construction operations.
    b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

C. Condition of Existing Building: Maintain portions of existing building affected by construction operations in a weathertight condition throughout construction period. Repair damage caused by construction operations.

D. Condition of Existing Grounds: Maintain portions of existing grounds, landscaping, and hardscaping affected by construction operations throughout construction period. Repair damage caused by construction operations.

1.8 COORDINATION WITH OCCUPANTS

A. Owner Occupancy: Owner will occupy the project site and existing building(s) during entire construction period. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's day-to-day operations. Maintain existing exits unless otherwise indicated.

1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and authorities having jurisdiction.
2. Provide not less than 72 hours' notice to Owner of activities that will affect Owner's operations.

1.9 WORK RESTRICTIONS

A. Comply with restrictions on construction operations.

B. Comply with limitations on use of public streets, work on public streets, rights of way, and other requirements of authorities having jurisdiction.School Dates of Full-Occupancy: The school will be fully occupied and the building will be in full use except as follows:

1. May 19th, 2027: Last day of full occupancy of the building; school is out of session.

2. September 3rd, 2027: Full occupancy of building resumes; school is back in session.

C. On-Site Work Hours: Limit work to between 7:00 a.m. to 11:00 p.m.,Monday through Friday, unless otherwise indicated. Work hours may be modified to meet Project requirements if approved by Owner and authorities having jurisdiction.

1. Weekend Hours: available on request, with Owner’s written authorization.
2. Early Morning Hours: available on request, with Owner’s written authorization.

D. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging for temporary utility services according to requirements indicated:

1. Notify Owner not less than two days in advance of proposed utility interruptions.
2. Obtain Owner's written permission before proceeding with utility interruptions.

E. Noise, Vibration, Dust, and Odors: Coordinate operations that may result in high levels of noise and vibration, dust, odors, or other disruption to Owner occupancy with Owner.

1. Notify Owner not less than two days in advance of proposed disruptive operations.
2. Obtain Owner's written permission before proceeding with disruptive operations.

F. Smoking and Controlled Substance Restrictions: Use of tobacco products, alcoholic beverages, and other controlled substances within the existing building or on Project site is not permitted.

1.10 SPECIFICATION AND DRAWING CONVENTIONS

A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
2. Text Color: Text used in the Specifications, including units of measure, manufacturer and product names, and other text may appear in multiple colors or underlined as part of a hyperlink; no emphasis is implied by text with these characteristics.
3. Hypertext: Text used in the Specifications may contain hyperlinks. Hyperlinks may allow for access to linked information that is not residing in the Specifications. Unless otherwise indicated, linked information is not part of the Contract Documents.
4. Specification requirements are to be performed by Contractor unless specifically stated otherwise.

B. Division 00 Contracting Requirements: General provisions of the Contract, including General and Supplementary Conditions, apply to all Sections of the Specifications.

C. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.

D. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:

1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
2. Abbreviations: Materials and products are identified by abbreviations scheduled on Drawings.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 011200 - MULTIPLE CONTRACT SUMMARY

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes a summary of each contract, including responsibilities for coordination and temporary facilities and controls.

B. Specific requirements for Work of each contract are also indicated in individual Specification Sections and on Drawings.

C. Related Requirements:

1. Section 011000 "Summary" for the Work covered by the Contract Documents, restrictions on use of Project site, phased construction, coordination with occupants, and work restrictions.
2. Section 013100 "Project Management and Coordination" for general coordination requirements.
3. Section 015000 "Temporary Facilities and Controls" for temporary utilities for other trades' construction activities.

1.3 PROJECT COORDINATOR

A. Project Coordinator for Multiple Contracts: Each prime contractor is responsible for

coordination of their work with the work of other prime contractors and shall cooperate to accomplish coordination of construction operations among contractors and entities to ensure efficient and orderly installation of each part of the Work. The Owner’s representative shall facilitate coordination by the prime contractors.

1.4 PROJECT COORDINATOR RESPONSIBILITIES

A. Project coordinator shall perform Project coordination activities for the multiple contracts, including, but not limited to, the following:

1. Attend the Contractor’s Coordination Meetings to facilitate communication among separate prime contractors.
2. Coordinate shared access to workspaces.
3. Provide overall coordination of temporary facilities and controls provided by the Contractors.
4. Coordinate, schedule, and approve interruptions of permanent and temporary utilities, including those necessary to make connections for temporary services.

1.5 GENERAL REQUIREMENTS OF CONTRACTS

A. Extent of Contract: Unless the Agreement contains a more specific description of the Work of each Contract, requirements indicated on Drawings and in Specification Sections determine which contract includes a specific element of Project.

1. Unless otherwise indicated, the work described in this Section for each contract shall be complete systems and assemblies, including products, components, accessories, and installation required by the Contract Documents.
2. Blocking, backing panels, sleeves, and metal fabrication supports for the work of each contract shall be the work of each contract for its own work.
3. Removal of ceilings and replacement of ceilings shall be the work of the Mechanical/Plumbing (MP) Contractor.
4. The window wall system removal and reinstallation, including louver work, shall be the work of the MP Contract.
5. Preparation of new wall openings or existing openings shall be the work of the MP Contractor.
6. Concrete equipment pads shall be the work of the MP Contractor.
7. Roof-mounted equipment curbs and support rails for the work of the MP contract shall be the work of the MP Contractor.
8. Painting for the work of each contract shall be the work of each contract for its own work.
9. Cutting and Patching: Provided under each contract for its own work.
10. Through-penetration firestopping for the work of each contract shall be provided by each contract for its own work. Separate contractors shall make every effort to coordinate and comply with Section 078400 requirement for single source for firestopping products.
11. All electrical work shall be the work of the electrical contractor.

B. Temporary Facilities and Controls: In addition to specific responsibilities for temporary facilities and controls indicated in this Section and in Section 015000 "Temporary Facilities and Controls," each contractor is responsible for the following:

1. Installation, operation, maintenance, and removal of each temporary facility necessary for its own normal construction activity, and costs and use charges associated with each facility, except as otherwise provided for in this Section.
2. Plug-in electric power cords and extension cords, supplementary plug-in task lighting, and special lighting necessary exclusively for its own activities.
3. Its own field office, utilities, and telephone service.
4. Its own storage and fabrication sheds.
5. Temporary enclosures for its own construction activities.
6. Staging and scaffolding for its own construction activities.
7. General hoisting facilities for its own construction activities, up to 2 tons.
8. Waste disposal facilities, including collection and legal disposal of its own hazardous, dangerous, unsanitary, or other harmful waste materials.
9. Progress cleaning of work areas affected by its operations on a daily basis.
10. Secure lockup of its own tools, materials, and equipment.
11. Construction aids and miscellaneous services and facilities necessary exclusively for its own construction activities.

1.6 Mechanical/Plumbing (MP) CONSTRUCTION CONTRACT

A. Work of the MP Construction Contract includes, but is not limited to, the following:

1. Remaining work not identified as work under other contracts.
2. Selective demolition.
3. Where specification sections indicate testing or inspection is required for concrete testing, inspection of concrete reinforcing and forms; it is the MP Construction Contractor's responsibility to notify the Owner's testing agency when work is scheduled that requires testing or inspection.
4. Abatement of hazardous materials and related demolition.
5. Interior and exterior construction, including all treatment and preparation for louver openings and roof openings.
6. Exterior wall opening and preparation for new egress door.
7. Removal, replacement, and installation of existing and new ceilings where indicated.
8. Concrete equipment pads.
9. Interior finishes including finishes after installation of Unit Ventilators, CUH, and convectors.
10. HVAC systems and equipment, including installation of new boiler plant, new boiler flue, combustion air ductwork, roof penetrations and associated flashing by a qualified roofing contractor, per roof manufacturer's requirements to maintain existing warranties.
11. HVAC instrumentation and controls.
12. HVAC testing, adjusting, and balancing.
13. Domestic water heater and storage tank replacement.
14. Hot and domestic water piping.
15. Natural gas piping.
16. Boiler room store front removal and reinstallation by experienced contractor.
17. Commissioning.

B. Temporary facilities and controls in the MP Contract include, but are not limited to, the following:

1. Temporary facilities and controls that are not otherwise specifically assigned to the MP Contract or Electrical Contract.
2. Special or unusual hoisting requirements for construction activities, including hoisting loads in excess of 2 tons, hoisting material or equipment into spaces below grade, and hoisting requirements outside building enclosure.
3. Project identification and temporary signs.
4. General waste disposal facilities.
5. Pest control.
6. Temporary stairs.
7. Temporary fire-protection facilities.
8. Barricades, warning signs, and lights.
9. Site enclosure fence.
10. Security enclosure and lockup.
11. Environmental protection.
12. Maintenance and restoration of Owner's existing facilities used as temporary facilities.
13. Temporary heat to the entire building in the event heating season starts before boiler project is completed.

1.7 ELECTRICAL CONTRACT

A. Work of the Electrical Contract includes, but is not limited to, the following:

1. Electrical power, distribution, switchgear and transformer relocation.
2. Interior lighting.
3. Electrical connections to equipment furnished by the MP Construction Contract.
4. Providing a detailed phasing plan for switch gear relocation including temporary building shutdowns and coordination with ECC scheduling.
5. Generator shut-down and start-up, and testing.

B. Temporary facilities and controls in the Electrical Contract include, but are not limited to, the following:

1. Electric power service and distribution.
2. Lighting, including site lighting.
3. Electrical connections to existing systems and temporary facilities and controls furnished by the MP Contractor.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 011500 - APPLICATION FOR PAYMENT

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor for this work shall be held to have read: all of the Bidding Requirements, all of the County of Erie General Conditions, the Supplementary General Conditions, Information for Bidders, Division 1 and Contract Proposal Forms before submitting a tender for the proposed work, and in the execution of the work, he will be bound by all of the conditions and requirements therein.

B. Drawings and general provisions of the Contract, Division 01 Specification Sections, apply to this Section. All work shall comply with the New York State Uniform Fire Prevention and Building Code, latest edition.

1.2 GENERAL REQUIREMENTS

A. The Contractor shall submit an Application for Payment in accordance with the requirements stated in the General Conditions of the Contract Specifications and as indicated below.

B. During Construction, Monthly Applications for Payment will be approved only at the scheduled bi-weekly Project Construction Meetings.

C. All copies must have original signatures.

1.3 REVIEW PROCEDURE

A. The Contractor, Architect/Engineer, Construction Inspector, and Construction Manager (when applicable) must review all Preliminary Requests for Payment (Pencil Copies) prior to submission of the Monthly Application for Payment.

B. After the Pencil Copies are approved, the Contractor shall forward their Monthly Application for Payment with all the required documents to the Architect/Engineer.

C. The Architect/Engineer must review the Applications for Payment to ensure that they are mathematically accurate and that all the required documents are included.

D. If any of the required documentation is missing or inaccurate, the Application for Payment shall be rejected and returned to the Contractor. Such action will be recorded in the minutes of the Project Meeting. Rejected Applications for Payment must be corrected and re-submitted to the Architect/Engineer and will not be reviewed until the next Project Meeting.

E. If the required documentation is complete and accurate the Monthly Application for Payment will be approved and signed, by all parties, at the Project Meeting.

F. The Department of Public Works, Office of the Commissioner will receive and log-in the approved Monthly Application for Payment when received.

1.4 REQUIRED DOCUMENTS

A. The Contractor's Monthly Application for Payment **must include** one (1) set of originals by the prime contractor and subcontractor(s) as noted comprised of the following:

1. Invoice: Printed on the Contractor's own Letterhead.
2. Certificate for Payment: Signature sheet for payment certification and approval.
3. Request for Payment Worksheets: Labor and material costs itemized by Specification Division of Work and/or separated by scope of work of subcontractors.
4. Certified Payroll Records, from each Prime Contractor and from each Sub- Contractor. Certified Payroll Records are to be submitted via LCPtracker per the General Conditions included as part of this project manual.
5. Contractor's Payment Certification: To be completed by Prime Contractor and ALL associated subcontractors.
6. Minority MBE/WBE Utilization Forms, one (1) copy of: part B - at 30% completion and Part C - at 75% completion. To be completed by Prime Contractor

    a. MBE/WBE Utilization Forms as required are included within the General Conditions – Appendix A

7. Certification for Stored Materials, one (1) copy, when applicable.

B. The Contractor's **FINAL** Application for Payment including **retention only must include** one (1) set of originals comprised of the following:

1. Invoice: Printed on the Contractor's own Letterhead.
2. Certificate for Payment: Signature sheet for payment certification and approval.
3. Request for Payment Worksheets: Labor and material costs itemized by Division of Work.

4. Final Waiver of Lien and Claim: Affix with Notary Stamp. To be completed by Prime Contractor and ALL associated subcontractors.
5. Form of Guarantee, To be completed by Prime Contractor
6. Form of Affidavit For Final Payment, To be completed by Prime Contractor
7. Public Improvement Contractor Certification: Prime Contractor
8. Public Improvement Contractor Certification: Subcontractor (if applicable)
9. Minority MBE/WBE Utilization Form Part D - at 100% completion from the Prime Contractor only.
10. Executive Order 18 Workers Compliance Certification; To be completed by Prime Contractor
11. Apprenticeship Utilization Certification, if applicable. To be completed by Prime Contractor

ALL SIGNATURES ON ALL FORMS NOTED ABOVE MUST BE ORIGINAL SIGNATURES

1.5 DISTRIBUTION

A. In addition to including MWBE forms with the payment application, the Prime Contractor must mail separately, one (1) copy of the Minority MBE/WBE Utilization forms Part B, Part C, and Part D forms at 30% completion, 75% completion, and 100% completion respectively to the Erie County Division of Equal Employment Opportunity, 95 Franklin St., Buffalo, New York, 14202.

B. If deemed applicable to the underlying project, the Prime Contractor and all subcontractors shall provide monthly reports demonstrating good faith efforts to meet the requireements outlined in Executive Order #18 dated September 27, 2017 and Local Law 3-2018 via LCPtracker.

1.6 STANDARD FORMS

A. The Erie County Department of Public Works' **standard forms** must be used in all applications for payment. **AIA (American Institute of Architects) forms or any other forms will not be accepted in lieu of the above.** The standard forms are annexed hereto for contractor's reference and use.**CONTRACTOR PAYMENT CHECKLIST**

PROJECT NAME: PAYMENT NO.:
DPW PROJECT NO.:
CONTRACTOR NAME: DATE:

*Prime/Sub-Contractor Name	Invoice	Certificate For Payment	Request for Payment Worksheet	CP 1	MBE/WBE Utilization Part B-30%	MBE/WBE Utilization Part C-75%	Certified Payroll Records	Certification for Stored Materials	*Subs Included in this Pay App.	Comments

*Prime Contractor shall list all sub-contractors included in their scope of work and shall make a check mark (Subs included column) for those sub-contractors covered under this payment application. Refer to Section 011500 - Application for Payment for additional payment information, requirements and procedures for Reduction in Retention and Final Payment.

SAMPLE INVOICE

(ON YOUR OWN LETTERHEAD)

X.Y.Z. CO., INC.

499 Elm Avenue
P.O. BOX 9-C Buffalo, NY 14000 Telephone: (716) 666-8888

Date: January 1, 2019 Payment No.:
To: COUNTY OF ERIE
DEPARTMENT OF PUBLIC WORKS – OFFICE OF THE COMMISSIONER 14TH FLOOR
95 FRANKLIN STREET, ROOM 1408
BUFFALO, NY 14202

Re: PROJECT NAME: _____
DPW PROJECT NO.: 2019-XXX-01

BILLING PERIOD: From: to: ____

ORIGINAL CONTRACT AMOUNT:		$	0.00
CHANGE ORDER:	NO.:	$	0.00
	NO.:	$	0.00
	NO.:	$	0.00
CONTRACT SUM TO DATE:		$	0.00

Total Complete to Date:	$	0.00
Less 5% Retainage	$	0.00
Total Earned less Retainage	$	0.00
Less Previous Payments	$	0.00
Current Amount Due:	$	0.00

VENDOR NO: _____
CE/PO NUMBER: _____
CONTRACT DOC NO: XX-XXX-PW
SAP WBS NO: _____

CERTIFICATE FOR PAYMENT

PROJECT NAME:

CONTRACTOR NAME:

DPW PROJECT NO.: PAYMENT NO.:

In accordance with the Contract Documents, based on on-site observations and the data comprising this application, the Undersigned certifies to the Owner that to the best of their knowledge, information and belief the Work has progressed as indicated, the quality of the Work is in accordance with the Contract Documents, and the Contractor is entitled to payment of the Amount Certified.

AMOUNT CERTIFIED ..... $__

Contractor Company Name	Contractor Representative's Name	Signature	Date
Architect/Engineer Firm Name	Architect/Engineer Representative's Name	Signature	Date
Erie County DPW			
Construction Inspector (Owner)	Construction Inspector (Owner) Name	Signature	Date
Erie County DPW			
Project Manager (Owner)	Project Manager (Owner) Name	Signature	Date

This Certificate is not negotiable. The **AMOUNT CERTIFIED** is payable only to the Contractor named herein. Issuance, payment and acceptance of payment are without prejudice to any rights of the Owner or Contractor under this Contract.

REQUEST FOR PAYMENT – WORKSHEETS

PROJECT NAME: _____ **SHEET #:** _____ **OF**

CONTRACTOR NAME: _____ **DPW PROJECT NO.:** _____ _____ **PAYMENT**

ARCHITECT/ENGINEER NAME: _____ **CONTRACTOR FOR:** _____ **NO.:**

ITEM NO.	ITEM	ITEM PRICE		PERCENT COMPLETE		AMOUNT COMPLETE TO DATE		AMOUNT PREVIOUSLY BILLED		AMOUNT THIS BILLING		AMOUNT UNBILLED	
		L	M	L	M	L	M	L	M	L	M	L	M
PREVIOUS SUBTOTAL (If Applicable)													
SHEET SUBTOTAL													

ITEM NO.	ITEM	ITEM PRICE		PERCENT COMPLETE		AMOUNT COMPLETE TO DATE		AMOUNT PREVIOUSLY BILLED		AMOUNT THIS BILLING		AMOUNT UNBILLED	
		L	M	L	M	L	M	L	M	L	M	L	M
PREVIOUS SUBTOTAL (If Applicable)													
				.									
	Record Drawings.												
	Oper. & Maint. Man.												
CONTRACT TOTAL													
NO.	**APPLIED CHANGE ORDERS**												
ADJUSTED TOTAL													

SECTION 012100 - ALLOWANCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements governing allowances.

1. Certain items are specified in the Contract Documents by allowances. Allowances have been established in lieu of additional requirements and to defer selection of actual materials and equipment to a later date when direction will be provided to the Contractor. If necessary, additional requirements will be issued by Change Order.

B. Types of allowances include the following:
1. Unit Cost allowances.
2. Contingency allowances.

1.3 SELECTION AND PURCHASE

A. At the earliest practical date after award of the Contract, advise Architect of the date when final selection and purchase of each product or system described by an allowance must be completed to avoid delaying the Work.

B. At Architect's request, obtain proposals for each allowance for use in making final selections. Include recommendations that are relevant to performing the Work.

C. Purchase products and systems selected by Architect from the designated supplier as approved through the submittal process.

1.4 ACTION SUBMITTALS

A. Submit proposals for purchase of products or systems included in allowances, in the form specified for Change Orders.

1.5 INFORMATIONAL SUBMITTALS

A. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.

B. Submit time sheets and other documentation to show labor time and cost for installation of allowance items that include installation as part of the allowance.

C. Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

1.6 COORDINATION

A. Coordinate allowance items with other portions of the Work. Furnish templates as required to coordinate installation.

B. See Sections 1.7 and 1.8 within this specification below for permitted markups to Unit Cost and Contingency Allowances, respectively.

1.7 UNIT-COST ALLOWANCES

A. Allowance shall include cost to Contractor of specific products and materials ordered by Owner or selected by Architect under allowance and shall include freight and delivery to Project site.

B. Unless otherwise indicated, Contractor's costs for receiving and handling at Project site, labor, installation, overhead and profit, and similar costs related to products and materials selected by Architect under allowance shall be included as part of the Contract Sum and not part of the allowance.

C. Unused Materials: Return unused materials purchased under an allowance to manufacturer or supplier for credit to Owner, after installation has been completed and accepted.

1.8 CONTINGENCY ALLOWANCES

A. Use the contingency allowance only as directed by Architect for Owner's purposes and only by Change Orders that indicate amounts to be charged to the allowance.

B. Contractor's related costs for products and equipment ordered by Owner under the contingency allowance are included in the allowance and are not part of the Contract Sum. These costs include delivery, installation, insurance, equipment rental, and similar costs.

C. Change Orders authorizing use of funds from the contingency allowance will include Contractor's related costs and reasonable overhead and profit margins.

D. At Project closeout, credit unused amounts remaining in the contingency allowance to Owner by Change Order.

1.9 ADJUSTMENT OF ALLOWANCES

A. Allowance Adjustment: To adjust allowance amounts, prepare a Change Order proposal based on the difference between purchase amount and the allowance, multiplied by final measurement of work-in-place where applicable. If applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, and similar margins.
   1. Include installation costs in purchase amount only where indicated as part of the allowance.
   2. If requested, prepare explanation and documentation to substantiate distribution of overhead costs and other margins claimed.
   3. Submit substantiation of a change in scope of work, if any, claimed in Change Orders related to unit-cost allowances.
   4. Owner reserves the right to establish the quantity of work-in-place by independent quantity survey, measure, or count.

B. Submit claims for increased costs because of a change in scope or nature of the allowance described in the Contract Documents, whether for the purchase order amount or Contractor's handling, labor, installation, overhead, and profit.
   1. Do not include Contractor's or subcontractor's indirect expense in the Change Order cost amount unless it is clearly shown that the nature or extent of work has changed from what could have been foreseen from information in the Contract Documents.
   2. No change to Contractor's indirect expense is permitted for selection of higher- or lower-priced materials or systems of the same scope and nature as originally indicated.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine products covered by an allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

3.2 PREPARATION

A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.

3.3 SCHEDULE OF ALLOWANCES

A. Mechanical/Plumbing Construction Contingency Allowance: Include a contingency allowance of **Fifty Thousand Dollars ($50,000.00)** for unforeseen and/or emergency conditions and mechanical/plumbing construction work over and above what is documented on the construction documents. The remainder of the applicable specifications and notes apply to the additional work.
   1. This allowance includes material cost and receiving, handling, and installation, and Contractor overhead and profit.

B. Electrical Construction Contingency Allowance: Include a contingency allowance of **Fifteen Thousand Dollars ($15,000.00)** for unforeseen and/or emergency conditions and electrical construction work over and above what is documented on the construction documents. The remainder of the applicable specifications and notes apply to the additional work.
   1. This allowance includes material cost and receiving, handling, and installation, and Contractor overhead and profit.

END OF SECTION

SECTION 012600 - CONTRACT MODIFICATION PROCEDURES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for handling and processing Contract modifications.

B. Related Requirements:

1. Section 012500 "Substitution Procedures" for administrative procedures for handling requests for substitutions made after the Contract award.
2. Section 013100 "Project Management and Coordination" for requirements for forms for contract modifications provided as part of web-based Project management software.

1.3 MINOR CHANGES IN THE WORK

A. Architect will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on form acceptable to the Owner.

1.4 PROPOSAL REQUESTS

A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.

1. Work Change Proposal Requests issued by Architect are not instructions either to stop work in progress or to execute the proposed change.
2. Within time specified in Proposal Request or 20 days, when not otherwise specified, after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.

    a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
    b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
    c. Include costs of labor and supervision directly attributable to the change.

d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
e. Quotation Form: Use forms acceptable to Architect.

B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Architect.

1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Include costs of labor and supervision directly attributable to the change.
5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
6. Comply with requirements in Section 012500 "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.
7. Proposal Request Form: Use form acceptable to Architect.

1.5 ADMINISTRATIVE CHANGE ORDERS

A. Allowance Adjustment: See Section 012100 "Allowances" for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect actual costs of allowances.

B. Unit-Price Adjustment: See Section 012200 "Unit Prices" for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect measured scope of unit-price work.

1.6 CHANGE ORDER PROCEDURES

A. On Owner's approval of a Work Change Proposal Request, Architect will issue a Change Order for signatures of Owner and Contractor on form acceptable to the Owner.

1.7 CONSTRUCTION CHANGE DIRECTIVE

A. Construction Change Directive: Architect may issue a Construction Change Directive on form acceptable to the Owner. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.

1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.

B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.

1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative provisions for coordinating construction operations on Project, including, but not limited to, the following:

1. General coordination procedures.
2. RFIs.
3. Digital project management procedures.
4. Web-based Project Information Sharing software package.
5. Project meetings.

B. Each Prime Contractor is responsible for coordination of their work with the work of other Prime Contractors and shall participate in coordination requirements. Certain areas of responsibility are assigned to a specific contractor.

C. Related Requirements:

1. Section 011200 "Multiple Contract Summary" for a description of the division of work among separate contracts and responsibility for coordination activities not in this Section.
2. Section 013200 "Construction Progress Documentation" for preparing and submitting Contractor's construction schedule.
3. Section 017300 "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
4. Section 017700 "Closeout Procedures" for coordinating closeout of the Contract.

1.3 DEFINITIONS

A. BIM: Building Information Modeling.

B. RFI: Request for Information. Request from Owner, Architect, or Contractor seeking information required by or clarifications of the Contract Documents.

1.4 INFORMATIONAL SUBMITTALS

A. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities, list addresses, cellular telephone numbers, and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.

1. Post copies of list in Project meeting room. Keep list current at all times.

1.5 GENERAL COORDINATION PROCEDURES

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations included in different Sections that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain the best results, where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.

B. Coordination of Multiple Contracts: Each prime contractor is responsible for coordination of their work with the work of other prime contractors and shall cooperate to facilitate coordination of construction operations among contractors and entities to ensure efficient and orderly installation of each part of the Work. Each contractor shall coordinate its own operations with operations included in different Sections that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain the best results, where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components with other contractors to ensure maximum performance and accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.

C. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.

D. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and scheduled activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Contractor's construction schedule.
2. Preparation of the schedule of values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Preinstallation conferences.
7. Project closeout activities.
8. Startup and adjustment of systems.

1.6 REQUEST FOR INFORMATION (RFI)

A. General: Immediately on discovery of the need for additional information, clarification, or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.

1. Architect will return without response those RFIs submitted to Architect by other entities controlled by Contractor.
2. Coordinate and submit RFIs in a prompt manner to avoid delays in Contractor's work or work of subcontractors.

B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:

1. Project name.
2. Owner name.
3. Owner's Project number.
4. Name of Architect.
5. Date.
6. Name of Contractor.
7. RFI number, numbered sequentially.
8. RFI subject.
9. Specification Section number and title and related paragraphs, as appropriate.
10. Drawing number and detail references, as appropriate.
11. Field dimensions and conditions, as appropriate.
12. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
13. Contractor's signature.
14. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.

    a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.

C. RFI Forms: Software-generated form with substantially the same content as indicated above, acceptable to Architect.

1. Attachments shall be electronic files in PDF format.

D. Engineer's Action: Engineer will review each RFI, determine action required, and respond. Allow seven days for Engineer's response for each RFI. RFIs received by Engineer after 1:00 p.m. will be considered as received the following working day.

1. The following Contractor-generated RFIs will be returned without action:

    a. Requests for approval of submittals.
    b. Requests for approval of substitutions.
    c. Requests for approval of Contractor's means and methods.
    d. Requests for coordination information already indicated in the Contract Documents.
    e. Requests for adjustments in the Contract Time or the Contract Sum.
    f. Requests for interpretation of Engineer's actions on submittals.
    g. Incomplete RFIs or inaccurately prepared RFIs.

2. Engineer's action may include a request for additional information, in which case Engineer's time for response will date from time of receipt by Engineer of additional information.
3. Engineer's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Section 012600 "Contract Modification Procedures."

    a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 5 days of receipt of the RFI response.

E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log biweekly. Include the following:

1. Project name.
2. Name and address of Contractor.
3. Name and address of Architect.
4. RFI number, including RFIs that were returned without action or withdrawn.
5. RFI description.
6. Date the RFI was submitted.
7. Date Engineer's response was received.
8. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.

F. On receipt of Engineer's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Engineer within three days if Contractor disagrees with response.

1.7 DIGITAL PROJECT MANAGEMENT PROCEDURES

A. Use of Architect's Digital Data Files: Digital data files of Engineer's BIM model will be provided by Engineer for Contractor's use during construction.

1. Digital data files may be used by Contractor in preparing coordination drawings, Shop Drawings, and Project Record Drawings.
2. Engineer makes no representations as to the accuracy or completeness of digital data files as they relate to Contract Drawings.
3. Digital Drawing Software Program: Contract Drawings are available in Revit 2017.
4. Contractor shall execute a data licensing agreement in the form of AIA Document C106 Digital Data Licensing Agreement.

    a. Subcontractors and other parties granted access by Contractor to Architect's digital data files shall execute a data licensing agreement in the form of AIA Document C106 Agreement included in this Project Manual.

5. The following digital data files will be furnished for each appropriate discipline:

    a. Floor plans.
    b. Reflected ceiling plans.

B. Web-Based Project Information Sharing Software Package: Use Architect's web-based Project management software package (Master Library) for purposes of hosting and managing Project communication and documentation until Final Completion. Access to project information in Master Library will be provided to each Prime Contractor at no cost.

1. Web-based Project Information Sharing software includes, at a minimum, the following features:

    a. Compilation of Project data, including Contractor, subcontractors, Architect, Architect's consultants, Owner, and other entities involved in Project.
    b. Access control for each entity for each workflow process, to determine entity's digital rights to create, modify, view, and print documents.
    c. Creation, logging, tracking, and notification for Project communications required in other Specification Sections, including, but not limited to, RFIs, submittals, Minor Changes in the Work, Construction Change Directives, and Change Orders.
    d. Processing and tracking of contract modifications. Note: all contract modification records will be kept using ECDPW standard forms.
    e. Creating and distributing meeting minutes.

C. PDF Document Preparation: Where PDFs are required to be submitted to Architect, prepare as follows:

1. Assemble complete submittal package into a single indexed file, incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
2. Name file with submittal number or other unique identifier, including revision identifier.

3. Certifications: Where digitally submitted certificates and certifications are required, provide a digital signature with digital certificate on where indicated.

1.8 PROJECT MEETINGS

A. General: Schedule and conduct meetings and conferences at Project site unless otherwise indicated.

1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times a minimum of seven days prior to meeting.
2. Agenda: prepare the meeting agenda. Distribute the agenda to all invited attendees.
3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner, prime contractors, and Architect.

B. Preconstruction Conference: Architect will schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement.

1. Attendees: Authorized representatives of Owner Architect, and their consultants; Contractors and their superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Discuss items of significance that could affect progress, including the following:

    a. Tentative construction schedule and Project Phasing.
    b. Critical work sequencing and long lead items.
    c. Designation of key personnel and their duties.
    d. Lines of communications.
    e. Use of web-based Project software.
    f. Procedures for processing field decisions and Change Orders.
    g. Procedures for RFIs.
    h. Procedures for testing and inspecting.
    i. Procedures for processing Applications for Payment.
    j. Submittal procedures.
    k. Preparation of Record Documents.
    l. Use of the premises and existing buildings.
    m. Work restrictions and working hours.
    n. Owner's occupancy requirements.
    o. Responsibility for temporary facilities and controls.
    p. Procedures for moisture and mold control.
    q. Procedures for disruptions and shutdowns.
    r. Parking availability.
    s. Office, work, and storage areas.
    t. Equipment deliveries and priorities.
    u. Security.
    v. Daily progress cleaning.

3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.

C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity when required by other Sections and when required for coordination with other construction.

1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.
2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:

    a. Related RFIs.
    b. Related Change Orders.
    c. Submittals.
    d. Possible conflicts.
    e. Compatibility requirements.
    f. Time schedules.
    g. Manufacturer's written instructions.
    h. Warranty requirements.
    i. Compatibility of materials.
    j. Acceptability of substrates.
    k. Temporary facilities and controls.
    l. Space and access limitations.
    m. Regulations of authorities having jurisdiction.
    n. Testing and inspecting requirements.
    o. Installation procedures.
    p. Coordination with other work.
    q. Required performance results.
    r. Protection of adjacent work.
    s. Protection of construction and personnel.

3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

D. Project Closeout Conference: Schedule and conduct a project closeout conference, at a time convenient to Owner and Architect, but no later than 30 days prior to the scheduled date of Substantial Completion.

1. Conduct the conference to review requirements and responsibilities related to Project closeout.

2. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:

    a. Preparation of Record Documents.
    b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
    c. Submittal of written warranties.
    d. Requirements for preparing operations and maintenance data.
    e. Requirements for delivery of material samples, attic stock, and spare parts.
    f. Requirements for demonstration and training.
    g. Preparation of Contractor's punch list.
    h. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
    i. Coordination of separate contracts.
    j. Owner's partial occupancy requirements.
    k. Responsibility for removing temporary facilities and controls.

4. Minutes: Entity conducting meeting will record and distribute meeting minutes.

E. Progress Meetings: Architect will Conduct progress meetings at biweekly intervals.

1. Coordinate dates of meetings with preparation of payment requests.
2. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

    a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

        1) Review schedule for next period.

    b. Review present and future needs of each entity present, including the following:

        1) Sequence of operations.
        2) Status of submittals.
        3) Deliveries.

4) Temporary facilities and controls.
5) Daily Progress cleaning.
6) Quality and work standards.
7) Status of correction of deficient items.
8) Status of RFIs.
9) Status of Proposal Requests.
10) Pending changes.
11) Status of Change Orders.

4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.

a. Schedule Updating: General Contractor shall revise and update the Combined Contractor's Construction Schedule after each progress meeting, where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

F. Coordination Meetings: General Contractor shall Conduct Project coordination meetings at biweekly intervals. All Prime Contractors are responsible for coordination of their work with the work of other Prime Contractors and are required to attend coordination meetings and cooperate with other Primes to coordinate the Work. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.

1. Attendees: In addition to representatives of Owner and each prime contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meetings shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Review and correct or approve minutes of the previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

a. Combined Contractor's Construction Schedule: Review progress since the last coordination meeting. Determine whether each contract is on time, ahead of schedule, or behind schedule, in relation to combined Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
b. Schedule Updating: Revise combined Contractor's construction schedule after each coordination meeting, where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.
c. Review present and future needs of each contractor present, including the following:

1) Interface requirements.
2) Sequence of operations.
3) Resolution of BIM component conflicts.

4) Status of submittals.
5) Deliveries.
6) Site use.
7) Temporary facilities and controls.
8) Work hours.
9) Progress cleaning.
10) Quality and work standards.
11) Status of RFIs.
12) Proposal Requests.
13) Change Orders.

3. Reporting: Record meeting results and distribute copies to everyone in attendance, the Architect and to others affected by decisions or actions resulting from each meeting.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 013200 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:

1. Startup construction schedule.
2. Contractor's Construction Schedule.
3. Construction schedule updating reports.

B. Related Requirements:

1. Section 011200 "Multiple Contract Summary" for summary of each contract, including prime contractor responsibilities.
2. Section 013300 "Submittal Procedures" for submitting schedules and reports.
3. Section 014000 "Quality Requirements" for schedule of tests and inspections.

1.3 DEFINITIONS

A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction Project. Activities included in a construction schedule consume time and resources.

1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
2. Predecessor Activity: An activity that precedes another activity in the network.
3. Successor Activity: An activity that follows another activity in the network.

B. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine the critical path of Project and when activities can be performed.

C. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.

D. Event: The starting or ending point of an activity.

E. Float: The measure of leeway in starting and completing an activity.

1.4 INFORMATIONAL SUBMITTALS

A. Format for Submittals: Submit required submittals in the following format:

1. PDF file.

B. Startup construction schedule.

C. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.

D. Construction Schedule Updating Reports: Submit with Applications for Payment.

1.5 COORDINATION

A. General Construction Contractor shall coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.

B. Coordinate Contractor's Construction Schedule with the schedule of values, submittal schedule, progress reports, payment requests, and other required schedules and reports.

1. Secure time commitments for performing critical elements of the Work from entities involved, including multiple prime contractors.
2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

1.6 STARTUP CONSTRUCTION SCHEDULE

A. Gantt-Chart Schedule: Submit startup, horizontal, Gantt-chart-type construction schedule within seven days of date established for the Notice to Proceed.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first 60 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

1.7 GANTT-CHART SCHEDULE REQUIREMENTS

A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal, Gantt- chart-type, Contractor's Construction Schedule within 30 days of date established for the Notice to Proceed.

1. Base schedule on the startup construction schedule and additional information received since the start of Project.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.

1. For construction activities that require three months or longer to complete, indicate an estimated completion percentage in 10 percent increments within time bar.

1.8 CONTRACTOR'S CONSTRUCTION SCHEDULE (GANTT CHART)

A. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules.

B. Time Frame: Extend schedule from date established for the Notice to Proceed to date of Substantial Completion and Final Completion.

1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

C. Activities: Treat each building, floor, or separate area as a separate numbered activity for each main element of the Work. Comply with the following:

1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Architect.
2. Temporary Facilities: Indicate start and completion dates for the following as applicable:

    a. Temporary facilities.
    b. Owner interfaces and furnishing of items.
    c. Punch list.

3. Procurement Activities: Include procurement process activities for long lead-time items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
4. Submittal Review Time: Include review and resubmittal times indicated in Section 013300 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with submittal schedule.
5. Startup and Testing Time: Include no fewer than 7 days for startup and testing.
6. Punch List and Final Completion: Include not more than 30 days for completion of punch list items and Final Completion.

D. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule and show how the sequence of the Work is affected.

1. Phasing: Arrange list of activities on schedule by phase.
2. Work under More Than One Contract: Include a separate activity for each contract.
3. Owner-Furnished Products: Include a separate activity for each product.
4. Work Restrictions: Show the effect of the following items on the schedule:

    a. Limitations of continued occupancies.
    b. Uninterruptible services.

c. Partial occupancy before Substantial Completion.
d. Use-of-premises restrictions.

5. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:

a. Submittals.
b. Deliveries.
c. Installation.

6. Construction Areas: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:

a. Abatement of hazardous materials.
b. Completion of toilet room renovations, by phase and by building.
c. Completion of mechanical installation.
d. Completion of electrical installation.
e. Site work and site lighting.
f. Substantial Completion.

E. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and Final Completion.

F. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:

1. Unresolved issues.
2. Unanswered Requests for Information.
3. Status of submittals.
4. Pending modifications affecting the Work and the Contract Time.

G. Contractor's Construction Schedule Updating: At biweekly intervals, update schedule to reflect actual construction progress and activities. Issue updated schedule at each regularly scheduled progress meeting.

H. Recovery Schedule: When periodic update indicates the Work is 14 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, equipment required to achieve compliance, and date by which recovery will be accomplished.

I. Distribution: Distribute copies of approved schedule to Architect Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 013300 - SUBMITTAL PROCEDURES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Submittal schedule requirements.
2. Administrative and procedural requirements for submittals.

B. Related Requirements:

1. Section 013100 "Project Management and Coordination" for submitting subcontract list and for requirements for project meetings and web-based Project software.
2. Section 013200 "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.
3. Section 014000 "Quality Requirements" for submitting test and inspection reports, and schedule of tests and inspections.
4. Section 017700 "Closeout Procedures" for submitting closeout submittals and maintenance material submittals.
5. Section 017823 "Operation and Maintenance Data" for submitting operation and maintenance manuals.
6. Section 017839 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.

1.3 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."

B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."

1.4 SUBMITTAL SCHEDULE

A. Submittal Schedule: Submit, as an action submittal, a list of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Architect and additional time for handling and reviewing submittals required by those corrections.

1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
2. Initial Submittal Schedule: Submit within 14 days of date established for commencement of the Work. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
3. Final Submittal Schedule: Submit concurrently with the first complete submittal of Contractor's construction schedule.

    a. Submit revised submittal schedule as required to reflect changes in current status and timing for submittals.

4. Format: Arrange the following information in a tabular format:

    a. Scheduled date for first submittal.
    b. Specification Section number and title.
    c. Submittal Category: Action; informational.
    d. Name of subcontractor.
    e. Description of the Work covered.
    f. Scheduled date for Architect's final release or approval.
    g. Scheduled dates for purchasing.
    h. Scheduled date of fabrication.
    i. Scheduled dates for installation.

1.5 SUBMITTAL FORMATS

A. Submittal Information: Include the following information in each submittal:

1. Project name.
2. Date.
3. Name of Architect.
4. Name of Contractor.
5. Name of firm or entity that prepared submittal.
6. Names of subcontractor, manufacturer, and supplier.
7. Unique submittal number, including revision identifier. Include Specification Section number with sequential alphanumeric identifier and alphanumeric suffix for resubmittals.
8. Category and type of submittal.
9. Submittal purpose and description.
10. Number and title of Specification Section, with paragraph number and generic name for each of multiple items.
11. Drawing number and detail references, as appropriate.
12. Indication of full or partial submittal.

13. Location(s) where product is to be installed, as appropriate.
14. Remarks.
15. Signature of transmitter.

B. Options: Identify options requiring selection by Architect.

C. Deviations and Additional Information: On each submittal, clearly indicate deviations from requirements in the Contract Documents, including minor variations and limitations; include relevant additional information and revisions, other than those requested by Architect on previous submittals. Indicate by highlighting on each submittal or noting on attached separate sheet.

D. Electronic Submittals: Prepare submittals as PDF package, incorporating complete information into each PDF file. Name PDF file with submittal number.

1.6 SUBMITTAL PROCEDURES

A. Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.

1. Web-Based Project Information Sharing Software: Prepare submittals in PDF form, and upload to web-based Project Information Sharing software website (Master Library). Enter required data in web-based software site to fully identify submittal.

B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
4. Coordinate transmittal of submittals for related parts of the Work specified in different Sections, so processing will not be delayed because of need to review submittals concurrently for coordination.

    a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.

1. Initial Review: Allow 14 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.

2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
3. Resubmittal Review: Allow 14 days for review of each resubmittal.
4. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow 14 days for initial review of each submittal.

D. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.

1. Note date and content of previous submittal.
2. Note date and content of revision in label or title block, and clearly indicate extent of revision.
3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.

E. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

F. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's action stamp.

1.7 SUBMITTAL REQUIREMENTS

A. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. If information must be specially prepared for submittal because standard published data are unsuitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:

    a. Manufacturer's catalog cuts.
    b. Standard color charts.
    c. Statement of compliance with specified referenced standards.
    d. Testing by recognized testing agency.
    e. Notation of coordination requirements.

4. For equipment, include the following in addition to the above, as applicable:

    a. Wiring diagrams that show factory-installed wiring.
    b. Clearances required to other construction, if not indicated on accompanying Shop Drawings.

5. Submit Product Data before Shop Drawings, and before or concurrently with Samples.

B. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data unless submittal based on Architect's digital data drawing files is otherwise permitted.

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:

    a. Identification of products.
    b. Schedules.
    c. Compliance with specified standards.
    d. Notation of coordination requirements.
    e. Notation of dimensions established by field measurement.
    f. Relationship and attachment to adjoining construction clearly indicated.
    g. Seal and signature of professional engineer if specified.

C. Samples: Submit Samples for review of type, color, pattern, and texture for a check of these characteristics with other materials.

1. Transmit Samples that contain multiple, related components, such as accessories together in one submittal package.
2. Identification: Permanently attach label on unexposed side of Samples that includes the following:

    a. Project name and submittal number.
    b. Generic description of Sample.
    c. Product name and name of manufacturer.
    d. Sample source.
    e. Number and title of applicable Specification Section.
    f. Specification paragraph number and generic name of each item.

3. Web-Based Project Information Sharing Software: Prepare submittals in PDF form, and upload to web-based Project software website. Enter required data in web-based software site to fully identify submittal.
4. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.

    a. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.

5. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units, showing the full range of colors, textures, and patterns available.

    a. Number of Samples: Submit one full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.

6. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.

    a. Number of Samples: Submit two sets of Samples. Architect will retain one Sample set; remainder will be returned.

        1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
        2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.

D. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:

1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
2. Manufacturer and product name, and model number if applicable.
3. Number and name of room or space.
4. Location within room or space.

E. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.

F. Design Data: Prepare and submit written and graphic information indicating compliance with indicated performance and design criteria in individual Specification Sections. Include list of assumptions and summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Number each page of submittal.

G. Certificates:

1. Certificates and Certifications Submittals: Submit a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity. Provide a notarized signature where indicated.
2. Material Certificates: Submit written statements on manufacturer's letterhead, certifying that material complies with requirements in the Contract Documents.
3. Product Certificates: Submit written statements on manufacturer's letterhead, certifying that product complies with requirements in the Contract Documents.

1.8 DELEGATED-DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are insufficient to perform services or certification required, submit a written request for additional information to Architect.

B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF file, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

1.9 CONTRACTOR'S REVIEW

A. Action Submittals and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.

B. Contractor's Approval: Indicate Contractor's approval for each submittal with indication in web-based Project management software. Include name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

1. Architect will not review submittals received from Contractor that do not have Contractor's review and approval.

1.10 ARCHITECT'S REVIEW

A. Action Submittals: Architect will review each submittal, indicate corrections or revisions required, and return.

1. PDF Submittals: Architect will indicate, via markup on each submittal, the appropriate action.
2. Submittals by Web-Based Project Information Sharing Software: Architect will upload PDF submittals to Project Information Sharing software website, indicating the appropriate action.

a. Actions indicated on PDF submittals uploaded to Project Information Sharing software website have the following meanings:

1) Stamped Reviewed: "No Exceptions Taken": No corrections or resubmission required; fabrication may proceed.

2) Stamped Reviewed: "Make Corrections Noted":

   a) If contractor complies with noted corrections, fabrication may proceed and resubmission is not required, unless otherwise noted for a specific item.
   b) If for any reason the contractor cannot comply with the noted corrections, fabrications shall not proceed and contractor shall resubmit, following procedures outlined hereinafter.

3) Stamped Reviewed: "Revise and Resubmit": Contractor shall revise and resubmit for review. Fabrication shall not proceed.
4) Stamped: "Rejected: Submittal is not in compliance with the Contract Documents and is not acceptable. Resubmit contract compliant material.
5) Stamped: "For Record Only": Submittal has been received and will be retained for record keeping purposes. No action taken.

B. Informational Submittals: Architect will review each submittal and will not return it or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.

C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.

D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.

E. Architect will return without review submittals received from sources other than Contractor.

F. Submittals not required by the Contract Documents will be returned by Architect without action.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 014000 - QUALITY REQUIREMENTS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspection services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

1. Specific quality-assurance and quality-control requirements for individual work results are specified in their respective Specification Sections. Requirements in individual Sections may also cover production of standard products.
2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and quality-control procedures that facilitate compliance with the Contract Document requirements.

1.3 DEFINITIONS

A. Experienced: When used with an entity or individual, "experienced," unless otherwise further described, means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

B. Field Quality-Control Tests and Inspections: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

C. Product Tests: Tests and inspections that are performed by a nationally recognized testing laboratory (NRTL) according to 29 CFR 1910.7, by a testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program (NVLAP), or by a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.

D. Source Quality-Control Tests and Inspections: Tests and inspections that are performed at the source (e.g., plant, mill, factory, or shop).

E. Testing Agency: An entity engaged to perform specific tests, inspections, or both. The term "testing laboratory" has the same meaning as the term "testing agency."

F. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work, to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

G. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work, to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Contractor's quality- control services do not include contract administration activities performed by Architect.

1.4 DELEGATED DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

B. Delegated Design Services Statement: Submit a statement signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional, indicating that the products and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.

1.5 CONFLICTING REQUIREMENTS

A. Conflicting Standards and Other Requirements: If compliance with two or more standards or requirements is specified and the standards or requirements establish different or conflicting requirements for minimum quantities or quality levels, inform the Architect regarding the conflict and obtain clarification prior to proceeding with the Work. Refer conflicting requirements that are different, but apparently equal, to Architect for clarification before proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified is the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.6 INFORMATIONAL SUBMITTALS

A. Schedule of Tests and Inspections: Prepare in tabular form and include the following:

1. Specification Section number and title.
2. Entity responsible for performing tests and inspections.
3. Description of test and inspection.
4. Identification of applicable standards.
5. Identification of test and inspection methods.

6. Number of tests and inspections required.
7. Time schedule or time span for tests and inspections.
8. Requirements for obtaining samples.
9. Unique characteristics of each quality-control service.

B. Reports: Prepare and submit certified written reports and documents as specified.

C. Permits, Licenses, and Certificates: For Owner's record, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents established for compliance with standards and regulations bearing on performance of the Work.

1.7 REPORTS AND DOCUMENTS

A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:

1. Date of issue.
2. Project title and number.
3. Name, address, telephone number, and email address of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample-taking and testing and inspection.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and reinspecting.

1.8 QUALITY ASSURANCE

A. Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units. As applicable, procure products from manufacturers able to meet qualification requirements, warranty requirements, and technical or factory-authorized service representative requirements.

C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

D. Installer Qualifications: A firm or individual experienced in installing, erecting, applying, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that is similar in material, design, and extent to those indicated for this Project.

F. Testing and Inspecting Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspection indicated, as documented in accordance with ASTM E329, and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.

1.9 QUALITY CONTROL

A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.

1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspection they are engaged to perform.
2. Costs for retesting and reinspecting construction that replaces or is necessitated by Work that failed to comply with the Contract Documents will be charged to Contractor.

B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities, whether specified or not, to verify and document that the Work complies with requirements.

1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
2. Engage a qualified testing agency to perform quality-control services.
3. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspection will be performed.
4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
5. Testing and inspection requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

C. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.

2. Determine the locations from which test samples will be taken and in which in- situ tests are conducted.
3. Conduct and interpret tests and inspections, and state in each report whether tested and inspected Work complies with or deviates from requirements.
4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
6. Do not perform duties of Contractor.

D. Coordination: Coordinate sequence of activities to accommodate required quality- assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspection.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.

1.10 SPECIAL TESTS AND INSPECTIONS

A. Special Tests and Inspections: Owner will engage a qualified special inspector to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner, and as follows:

1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviewing the completeness and adequacy of those procedures to perform the Work.
2. Notifying Architect and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
3. Submitting a certified written report of each test, inspection, and similar quality- control service to Architect with copy to Contractor and to authorities having jurisdiction.
4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
5. Interpreting tests and inspections and stating in each report whether tested and inspected Work complies with or deviates from the Contract Documents.
6. Retesting and reinspecting corrected Work.

PART 2 - PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 TEST AND INSPECTION LOG

A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:

1. Date test or inspection was conducted.
2. Description of the Work tested or inspected.
3. Date test or inspection results were transmitted to Architect.
4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Architect's and authorities' having jurisdiction reference during normal working hours.

1. Submit log at Project closeout as part of Project Record Documents.

3.2 REPAIR AND PROTECTION

A. General: On completion of testing, inspection, sample-taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 017300 "Execution."

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION

SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

B. Related Requirements:

1. Section 011000 "Summary" for work restrictions and limitations on utility interruptions.
2. Section 011200 "Multiple Contract Summary" for responsibilities for temporary facilities and controls for projects utilizing multiple contracts.
3. Section 311000 "Site Clearing" for temporary site enclosure / protection zone construction fencing requirements.

1.3 PROJECT CONDITIONS

A. Temporary Use of Permanent Facilities: Engage Installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Dust-Control Adhesive-Surface Walk-Off Mats: Provide mats, minimum 36 by 60 inches.

2.2 TEMPORARY FACILITIES

A. Field Offices: Owner will provide conditioned interior space for construction progress and construction coordination meetings, for use by all prime contractors, for duration of Project.

2.3 EQUIPMENT

A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

PART 3 – EXECUTION

3.1 INSTALLATION, GENERAL

A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.

1. Locate facilities to limit site disturbance as specified in Section 011000 "Summary."

B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

C. Isolation of Work Areas in Occupied Facilities: Prevent dust, fumes, and odors from entering occupied areas.

1. **All access to the existing boiler room shall be limited to the new egress door location only. All interior traffic to be minimized. MP contractor to provide wall opening at start of construction to facilitate abatement and demolition activities.**
2. Prior to commencing work, isolate the HVAC system in area where work is to be performed.
3. Maintain dust partitions during the Work. Use vacuum collection attachments on dust-producing equipment. Isolate limited work within occupied areas using portable dust-containment devices.
4. Perform daily construction cleanup and final cleanup using approved, HEPA-filter-equipped vacuum equipment.

3.2 TEMPORARY UTILITY INSTALLATION

A. General: Install temporary service or connect to existing service.

1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.

B. Temporary Power Installation: Provide temporary power as required to maintain life safety equipment, and provide power for other trades' construction activity. This temporary power shall be provided during the time period the 5 kv transformer and 1,600 Amp switchboard in the boiler room is without power.

1. Refer to specification 263200 Packaged Generator Assemblies for additional requirements.

C. Sanitary Facilities: Provide temporary toilets, wash facilities, safety shower and eyewash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.

1. Use of Permanent Toilets: Use of Owner's existing or new toilet facilities is not permitted.

D. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.

1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.

E. Heating: Provide temporary heating (rental boiler(s)) with a sufficient capacity to heat the entire building in the event the heating season starts before boiler project is completed.

3.3 SUPPORT FACILITIES INSTALLATION

A. Comply with the following:

1. Utilize designated area within existing building for temporary construction meeting space.
2. Maintain support facilities until Architect schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.

B. Temporary Use of Planned Permanent Roads and Paved Areas: use of existing paved areas will be permitted only as designated and authorized by the Owner, within construction limits indicated, as necessary for construction operations. Existing paved areas used for construction purposes shall be restored to as new condition prior to Final Completion.

C. Parking: Use designated areas of Owner's existing parking areas for construction personnel.

D. Storage and Staging: Use designated areas of Project site for storage and staging needs.

E. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with progress cleaning requirements in Section 017300 "Execution."

F. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.

1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

G. Existing Elevator Use: Use of Owner's existing elevators will be permitted, provided elevators are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore elevators to condition existing before initial use, including replacing worn cables, guide shoes, and similar items of limited life.

1. Do not load elevators beyond their rated weight capacity.
2. Provide protective coverings, barriers, devices, signs, or other procedures to protect elevator car and entrance doors and frame. If, despite such protection, elevators become damaged, engage elevator Installer to restore damaged work, so no evidence remains of correction work. Return items that cannot be refinished in field to the shop, make required repairs and refinish entire unit, or provide new units as required.

H. Existing Stair Usage: Use of Owner's existing stairs will be permitted, provided stairs are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore stairs to condition existing before initial use.

1. Provide protective coverings, barriers, devices, signs, or other procedures to protect stairs and to maintain means of egress. If stairs become damaged, restore damaged areas, so no evidence remains of correction work.

I. Temporary Use of Permanent Stairs: Use of new stairs for construction traffic will be permitted, provided stairs are protected and finishes restored to new condition at time of Substantial Completion.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.

1. Where access to adjacent properties is required in order to affect protection of existing facilities, obtain written permission from adjacent property owner to access property for that purpose.

B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.

1. Comply with work restrictions specified in Section 011000 "Summary."

C. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.

D. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.

E. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals, so Project will be free of pests and their residues at Substantial Completion. Perform control operations lawfully, using materials approved by authorities having jurisdiction.

F. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each workday.

G. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.

H. Temporary Egress: Provide temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction. Provide signage directing occupants to temporary egress.

I. Temporary Partitions: Provide floor-to-ceiling dustproof partitions to limit dust and dirt migration and to separate areas occupied by Owner and tenants from fumes and noise.

1. Construct dustproof partitions with two layers of 6-mil polyethylene sheet on each side. Cover floor with two layers of 6-mil polyethylene sheet, extending sheets 18 inches up the sidewalls. Overlap and tape full length of joints. Cover floor with fire- retardant-treated plywood.

    a. Construct vestibule and airlock at each entrance through temporary partition with not less than 48 inches between doors. Maintain water-dampened foot mats in vestibule.

2. Seal joints and perimeter. Equip partitions with gasketed dustproof doors and security locks where openings are required.
3. Protect air-handling equipment.
4. Provide walk-off mats at each entrance through temporary partition.

3.5 MOISTURE AND MOLD CONTROL

A. Moisture and Mold Protection: Protect stored materials and installed Work from Moisture and Mold.

B. Controlled Construction Period: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:

1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
2. Use temporary or permanent HVAC system to control humidity within ranges specified for installed and stored materials.
3. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.

    a. Hygroscopic materials that may support mold growth, including wood and gypsum-based products, that become wet during the course of construction and remain wet for 24 hours are considered defective and require replacing.
    b. Remove and replace materials that cannot be completely restored to their manufactured moisture level within 24 hours.

3.6 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.

B. Maintenance: Maintain facilities in good operating condition until removal.

1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.

C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.

D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
2. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 017700 "Closeout Procedures."

END OF SECTION

SECTION 016000 - PRODUCT REQUIREMENTS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.

B. Related Requirements:

1. Section 011000 "Summary" for Contractor requirements related to Owner- furnished products.
2. Section 012100 "Allowances" for products selected under an allowance.
3. Section 012300 "Alternates" for products selected under an alternate.
4. Section 017700 "Closeout Procedures" for submitting warranties.

1.3 DEFINITIONS

A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
2. New Products: Items that have not previously been incorporated into another project or facility. Salvaged items or items reused from other projects are not considered new products. Items that are manufactured or fabricated to include recycled content materials are considered new products, unless indicated otherwise.
3. Comparable Product: Product by named manufacturer that is demonstrated and approved through the comparable product submittal process described in Part 2 "Comparable Products" Article, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

B. Basis-of-Design Product Specification: A specification in which a single manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation. Published attributes and characteristics of basis-of-design product establish salient characteristics of products.

1. Evaluation of Comparable Products: In addition to the basis-of-design product description, product attributes and characteristics may be listed to establish the significant qualities related to type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other special features and requirements for purposes of evaluating comparable products of additional manufacturers named in the specification. Manufacturer's published attributes and characteristics of basis-of-design product also establish salient characteristics of products for purposes of evaluating comparable products.

C. Subject to Compliance with Requirements: Where the phrase "Subject to compliance with requirements" introduces a product selection procedure in an individual Specification Section, provide products qualified under the specified product procedure. In the event that a named product or product by a named manufacturer does not meet the other requirements of the specifications, select another named product or product from another named manufacturer that does meet the requirements of the specifications; submit a comparable product request or substitution request, if applicable.

D. Comparable Product Request Submittal: An action submittal requesting consideration of a comparable product, including the following information:

1. Identification of basis-of-design product or fabrication or installation method to be replaced, including Specification Section number and title, and Drawing numbers and titles.
2. Data indicating compliance with the requirements specified in Part 2 “Comparable Products" Article.

E. Basis-of-Design Product Specification Submittal: An action submittal complying with requirements in Section 013300 "Submittal Procedures."

1.4 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.

1. Resolution of Compatibility Disputes between Multiple Contractors:

a. Contractors are responsible for providing products and construction methods compatible with products and construction methods of other contractors.

1.5 COORDINATION

A. Modify or adjust affected work as necessary to integrate work of approved comparable products and approved substitutions.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products, using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.

B. Delivery and Handling:

1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to determine compliance with the Contract Documents and that products are undamaged and properly protected.

C. Storage:

1. Provide a secure location and enclosure at Project site for storage of materials and equipment.
2. Store products to allow for inspection and measurement of quantity or counting of units.
3. Store materials in a manner that will not endanger Project structure.
4. Store products that are subject to damage by the elements under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation and with adequate protection from wind.
5. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
6. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
7. Protect stored products from damage and liquids from freezing.

1.7 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

1. Manufacturer's Warranty: Written standard warranty form furnished by individual manufacturer for a particular product and issued in the name of the Owner or endorsed by manufacturer to Owner.
2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner and issued in the name of the Owner or endorsed by manufacturer to Owner.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.

1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.

C. Submittal Time: Comply with requirements in Section 017700 "Closeout Procedures."

PART 2 – PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.

1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. Owner reserves the right to limit selection to products with warranties meeting requirements of the Contract Documents.
4. Where products are accompanied by the term "as selected," Architect will make selection.
5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
6. Or Equal: For products specified by name and accompanied by the term "or equal," "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.

    a. Submit additional documentation required by Architect in order to establish equivalency of proposed products. Unless otherwise indicated, evaluation of "or equal" product status is by the Architect, whose determination is final.

B. Product Selection Procedures:

1. Limited List of Manufacturers: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will be considered.

    a. Limited list of manufacturers is indicated by the phrase "Subject to compliance with requirements, provide products by one of the following."

2. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications may additionally indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.

    a. For approval of products by unnamed manufacturers, comply with requirements in Section 012500 "Substitution Procedures" for substitutions for convenience.

2.2 COMPARABLE PRODUCTS

A. Conditions for Consideration of Comparable Products: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with the following requirements:

1. Evidence that proposed product does not require revisions to the Contract Documents, is consistent with the Contract Documents, will produce the indicated results, and is compatible with other portions of the Work.
2. Detailed comparison of significant qualities of proposed product with those of the named basis-of-design product. Significant product qualities include attributes, such as type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other specific features and requirements.
3. Evidence that proposed product provides specified warranty.
4. List of similar installations for completed projects, with project names and addresses and names and addresses of architects and owners, if requested.
5. Samples, if requested.

B. Engineer/Architect's Action on Comparable Products Submittal: If necessary, Engineer/Architect will request additional information or documentation for evaluation, as specified in Section 013300 "Submittal Procedures."

1. Form of Approval of Submittal: As specified in Section 013300 "Submittal Procedures."
2. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.

C. Submittal Requirements, Two-Step Process: Approval by the Engineer/Architect of Contractor's request for use of comparable product is not intended to satisfy other submittal requirements. Comply with specified submittal requirements.

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 017300 – EXECUTION

PART 1 – GENERAL

1.1 SUMMARY

A. Section includes general administrative and procedural requirements governing execution of the Work, including, but not limited to, the following:

1. Construction layout.
2. Installation of the Work.
3. Cutting and patching.
4. Coordination of Owner-installed products.
5. Progress cleaning.
6. Starting and adjusting.
7. Protection of installed construction.
8. Correction of the Work.

B. Related Requirements:

1. Section 011000 "Summary" for coordination of Owner-furnished products, Owner's separate contracts, and limits on use of Project site.
2. Section 013300 "Submittal Procedures" for submitting surveys.
3. Section 017700 "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, replacing defective work, and final cleaning.
4. Section 024119 "Selective Demolition" for demolition and removal of selected portions of the building.
5. Section 078400 "Firestopping" for patching penetrations in fire-rated construction.

1.2 DEFINITIONS

A. Cutting: Removal of in-place construction necessary to permit installation or performance of subsequent work.

B. Patching: Fitting and repair work required to restore construction to original conditions after installation of subsequent work.

1.3 QUALITY ASSURANCE

A. Professional Engineer Qualifications: Refer to Section 014000 "Quality Requirements."

B. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.

1. Structural Elements: When cutting and patching structural elements, or when encountering the need for cutting and patching of elements whose structural function is not known, notify Architect of locations and details of cutting and await directions from Architect before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection.
2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operational elements include the following:

    a. Primary operational systems and equipment.
    b. Fire separation assemblies.
    c. Plumbing piping systems.
    d. Mechanical systems piping and ducts.
    e. Control systems.
    f. Communication systems.
    g. Fire-detection and -alarm systems.
    h. Conveying systems.
    i. Electrical wiring systems.
    j. Operating systems of special construction.

3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety. Other construction elements include but are not limited to the following:

    a. Water, moisture, or vapor barriers.
    b. Membranes and flashings.
    c. Exterior curtain-wall construction.
    d. Equipment supports.
    e. Piping, ductwork, vessels, and equipment.
    f. Noise- and vibration-control elements and systems.

4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

C. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of specified products and equipment.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Comply with requirements specified in other Sections.

B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials. Use materials that are not considered hazardous.

C. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.

1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, gas service piping, and water-service piping; underground electrical services; and other utilities.
2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

C. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

B. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

C. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Architect in accordance with requirements in Section 013100 "Project Management and Coordination."

3.3 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks and existing conditions. If discrepancies are discovered, notify Architect promptly.

B. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.

C. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect.

3.4 INSTALLATION

A. Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

1. Make vertical work plumb and make horizontal work level.
2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
4. Maintain minimum headroom clearance of 96 inches in occupied spaces and 96 inches in unoccupied spaces, unless otherwise indicated on Drawings.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure satisfactory results as judged by Architect. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations, so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy of type expected for Project.

E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on-site and placement in permanent locations.

F. Tools and Equipment: Select tools or equipment that minimize production of excessive noise levels.

G. Templates: Obtain and distribute to the parties involved templates for Work specified to be factory prepared and field installed. Check Shop Drawings of other portions of the Work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions with manufacturer.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
2. Allow for building movement, including thermal expansion and contraction.
3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

I. Joints: Make joints of uniform width. Where joint locations in exposed Work are not indicated, arrange joints for the best visual effect, as judged by Architect. Fit exposed connections together to form hairline joints.

3.5 CUTTING AND PATCHING

A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.

C. Temporary Support: Provide temporary support of Work to be cut.

D. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

E. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching in accordance with requirements in Section 011000 "Summary."

F. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to minimize interruption to occupied areas.

G. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering, and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
6. Proceed with patching after construction operations requiring cutting are complete.

H. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as practicable, as judged by Architect. Provide materials and comply with installation requirements specified in other Sections, where applicable.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.

    a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
    b. Restore damaged pipe covering to its original condition.

3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.

    a. Where patching occurs in a painted surface, prepare substrate, and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch, corner to corner of wall and edge to edge of ceiling. Provide additional coats until patch blends with adjacent surfaces.

4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.

I. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.6 PROGRESS CLEANING

A. Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.

1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F.
3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

    a. Use containers intended for holding waste materials of type to be stored.

4. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where Work is in progress to the level of cleanliness necessary for proper execution of the Work.

1. Remove liquid spills promptly.
2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section 015000 "Temporary Facilities and Controls."

H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

3.7 STARTING AND ADJUSTING

A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

B. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.

C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Manufacturer's Field Service: Comply with qualification requirements in Section 014000 "Quality Requirements."

3.8 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Protection of Existing Items: Provide protection and ensure that existing items to remain undisturbed by construction are maintained in condition that existed at commencement of the Work.

C. Comply with manufacturer's written instructions for temperature and relative humidity.

3.9 CORRECTION OF THE WORK

A. Repair or remove and replace damaged, defective, or nonconforming Work. Restore damaged substrates and finishes.

1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.

B. Repair Work previously completed and subsequently damaged during construction period. Repair to like-new condition.

C. Restore permanent facilities used during construction to their specified condition.

D. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

E. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

F. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION

SECTION 017700 – CLOSEOUT PROCEDURES

PART I – GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:

1. Substantial Completion procedures.
2. Final completion procedures.
3. Warranties.
4. Final cleaning.

B. Related Section:

1. Division 1 Section "Project Record Documents: for submitting Record Drawings, Record Specifications, and Record Product Data.
2. Division 1 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
3. All Divisions for "Demonstration and Training" for requirements for instructing Owner's personnel.
4. All Divisions for specific closeout and special cleaning requirements for the Work in those Sections.

1.2 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete with request.

1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
2. Advise Owner of pending insurance changeover requirements.
3. Submit specific warranties, workmanship bonds. Maintenance service agreements, final certifications, and similar documents.
4. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
5. Prepare and submit Project Record Documents, operation and maintenance manual, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.
6. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
7. Make final changeover

8. Complete startup testing of systems.
9. Submit test/adjust/balance records.
10. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
11. Advise Owner of changeover in hear and other utilities.
12. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
13. Complete final cleaning requirements, including touchup painting.
14. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issues.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for final completion.

1.3 FINAL COMPLETION

A. Preliminary Procedures: Before requesting final inspection for determining final completion, complete the following:

1. Submit a final Application for Payment according to Division 1 Section "Payment Procedures."
2. Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
4. Submit pest-control final inspection report and warranty.
5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.

B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.4 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding form lowest floor to highest floor.
2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
3. Submit list of incomplete items in the following format:
   a. One electronic copy in Portable Data File (PDF) format provided to the Owner and Architect/ Engineer.

1.5 WARRANTIES

A. Submittal Time: Submit written warranties per General Conditions of the Contract, specifically Section 4.09, on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.

B. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.

1. Bind two sets of warranties and bonds in heavy-duty, 3-ring, vinyl-covered, lose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8 ½ - 11 inch paper.
2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
3. Identify each binder on the front and spine with the typed or printed title “WARRANTIES”, Project name, and name of contractor.
4. Provide one CD or USB flash drive to contain all scanned warranties and bonds. Assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide table of contents at beginning of document.

C. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

1. Use cleaning products that meet Green Seal GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

PART 3 – EXECUTION

3.1 FINAL CLEANING

A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with General Conditions of the Contract, specifically Section 4.08, all local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:

a. Clean Project sire, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
d. Remove tools, construction equipment, machinery, and surplus material from Project site.
e. Remove snow and ice to provide safe access to building.
f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.

g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
h. Sweep concrete floors broom clean in unoccupied spaces.
i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
k. Remove labels that are not permanent.
l. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.

    1. Do not paint over "URL" and other required labels and identification, including mechanical and electrical nameplates

m. Wipe surfaces of mechanical and electrical equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
n. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
o. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
p. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.

q. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
r. Leave Project clean and ready for occupancy.

C. Pest Control: Engage an experienced, licensed exterminator to make a final inspection and rid Project of rodents, insects, and other pests. Prepare a report.

END OF SECTION

SECTION 017823 – OPERATIONS AND MAINTENANCE DATA

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawing and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:

1. Operation and Maintenance manuals for systems, subsystems, and equipment.
2. Maintenance manuals for the care and maintenance of products, materials, and finishes.

B. Related Sections include the following:

1. Division 1 Section “Submittal Procedures” for submitting copies of submittals for operation and maintenance manuals.
2. Division 1 Section “Closeout Procedures” for submitting operation and maintenance manuals.
3. All Divisions Sections for specific operation and maintenance manual requirements for products in those Sections.

1.3 DEFINITIONS

A. System: An organized collection of parts, equipment, or subsystems united by regular interaction

B. Subsystem: a portion of a system with characteristics similar to a system.

1.4 SUBMITTALS

A. Final Submittal: Submit each manual in electronic portable data file (pdf) format at least 15 days before final inspection to Architect/ Engineer of Record. Architect/ Engineer will return copy with comments within 15 days after final inspection.

1. Correct or modify each manual to comply with comments provided by Architect/ Engineer. Submit one (1) hard copy and one (1) electronic copy in Portable Data File (pdf) format of the corrected Operation & Maintenance Manual within 15 days of receipt of Architect’s comments for submission to the Owner.

1.5 COORDINATION

A. Where operation and maintenance documentation includes information on installations by more than one factory-authorized service representative, assemble and coordinate information furnished by representatives and prepare manuals.

PART 2 – PRODUCTS

2.1 MANUAL, GENERAL

A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following material, in the order listed:

1. Title Page
2. Table of Contents
3. Manual Contents

B. Title Page: Enclose title page in transparent plastic sleeve. Include the following information:

1. Subject matter included in manual
2. Name and address of Project
3. Name and address of Owner
4. Date of submittal
5. Name, address, and telephone number of Contractor
6. Name and address of Architect
7. Cross-reference to related systems in other operation and maintenance manuals.

C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the column, and cross-referenced to Specification Section number in Project Manual.

1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive Table of Contents for all volumes in each volume of the set.

D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystem, equipment, and components of one system into a single binder.

1. Binders: Heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2- by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.

a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENACE MANUAL," Project title or name, and subject matter of contents. Indicate volume number for multiple-volume sets.

2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software diskettes for computerized electronic equipment.
4. Supplementary Text: Prepared on 8-1/2-by-11-inch, 20-lb/sq.ft. white bond paper.
5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text

a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.2 OPERATION AND MAINTENACE MANUALS

A. Content: In addition to requirements in this Section, include operation and maintenance data required in individual Specification Sections and the following information:

1. System, subsystem, and equipment descriptions
2. Performance and design criteria if Contractor is delegated design responsibility
3. Operating standards
4. Operating procedures
5. Wiring diagrams
6. Control diagrams
7. Piped system diagrams
8. Precautions against improper use
9. License requirements including inspection and renewal dates
10. Warranty information

B. Descriptions: Include the following:

1. Product name and model number
2. Manufacturer's name
3. Equipment identification with serial number of each component
4. Equipment function
5. Operating characteristics
6. Limiting conditions
7. Performance curves
8. Engineering data and tests
9. Complete nomenclature and number of replacement parts

C. Operating Procedures: Include the following, as applicable:

1. Start-up procedures
2. Equipment or system break-in procedures
3. Routine and normal operating instructions
4. Regulation and control procedures
5. Instructions on stopping
6. Normal shutdown instructions
7. Seasonal and weekend operating instructions
8. Required sequences for electric or electronic systems
9. Special operating instructions and procedures

D. Systems and Equipment Controls: Describe the sequence of operations, and diagram controls as installed.

E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

F. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:

1. Standard printed maintenance instructions and bulletins
2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly
3. Identification and nomenclature of parts and components
4. List of items recommended to be stocked as spare parts

G. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:

1. Test and inspection instructions

2. Troubleshooting guide
3. Precautions against improper maintenance
4. Disassembly; component removal, repair, and replacement; and reassembly instructions
5. Aligning, adjusting, and checking instructions
6. Demonstration and training videotape, if available

H. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.

1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies
2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance

I. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

J. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.

K. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

L. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include instructions and procedures for each type of emergency, and responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.

1. Include the following, as applicable:

a. Instructions on stopping
b. Shutdown instructions for each type of emergency
c. Operating instructions for conditions outside normal operating limits
d. Required sequences for electric or electronic systems
e. Special operating instructions and procedures

2.3 PRODUCT MAINTENANCE MANUAL

A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

B. Source Information: List each product included in manual identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.

C. Product Information: Include the following, as applicable:

1. Product name and model number
2. Manufacturer's name
3. Color, pattern, and texture
4. Material and chemical composition
5. Reordering information for specially manufactured products

D. Maintenance Procedures: Include manufacturer's written recommendations and the following:

1. Inspection procedures
2. Types of cleaning agents to be used and methods of cleaning
3. List of cleaning agents and methods of cleaning detrimental to product
4. Schedule for routine cleaning and maintenance
5. Repair instructions

E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

3.1 MANUAL PREPARATION

A. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.

1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

B. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

C. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.

1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.

D. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in Record Drawings to ensure correct illustration of completed installation.

1. Do not use original Project Record Documents as part of operation and maintenance manuals.

E. Comply with Division 1 Section "Closeout Procedures" for the schedule for submitting operation and maintenance documentation.

END OF SECTION

SECTION 017839 – PROJECT RECORD DOCUMENTS

PART I – GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for project record documents, including the following:

1. Record Drawings
2. Record Specifications
3. Record Product Date

B. Related Sections:

1. Division 1 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
2. All Divisions for specific requirements for project record documents of the Work in those Sections.

1.2 CLOSEOUT SUBMITTALS

A. Record Drawings: Comply with the following:

1. Number of Copies: Submit record drawings as follows:

a. Initial Submittal: Submit one set of marked-up (red-lined) record prints in electronic portable data file (PDF) format inclusive of all addendum, sketches, work change directives, change orders and field revisions to Architect for review. Architect will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.
b. Final Submittal: Submit one set of marked-up (red-lined) record prints in electronic portable data file (PDF) format and one set hard paper copy incorporating Architect's comments to Architect and Owner. Provide each drawing, whether or not changes were applicable to any given specific drawing/ sheet.

B. Record Specifications: Submit one hard paper copy and electronic portable data file (PDF) format of the Project's Specifications, including addenda and contract modifications to the Owner and Architect.

PART 2 – PRODUCTS

2.1 RECORD DRAWINGS

A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings.

1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record date, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.

    a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
    b. Record data as soon as possible after obtaining it.
    c. Record and check the markup before enclosing concealed installations.

2. Mark the Contract Drawings and Shop Drawings completely and accurately. Utilize personnel proficient at recording graphic information in production of marked-up record prints.
3. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same locations.
4. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

B. Record Digital Data Files: Immediately before inspection for Certificate of Substantial Completion and in accordance with Section 1.2 of this specification, review marked-up record prints with Architect and/or Construction Manager. When authorized, prepare a full set of corrected red-lines, as follows:

1. Copies: One (1) electronic copy provided on a CD or USB flash drive in portable data file (PDF) format.
2. Format: Same digital data software program, version, and operating system as the original Contract Drawings.
3. Format: Annotated PDF electronic file with comment function enabled.
4. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
5. Refer instances of uncertainty to Architect for resolution.
6. Architect will furnish Contractor one set of digital data files of the Contract Drawings for use in recording information.

C. Format: Identify and date each record Drawing; include the designation “PROJECT RECORD DRAWING” in a prominent location.

1. Record Prints: Organize record prints and newly prepared record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
2. Format: Annotated PDF electronic file with comment function enabled.
3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.

4. Identification: As follows:

    a. Project Name
    b. Date
    c. Designation “PROJECT RECORD DRAWINGS”
    d. Name of Architect
    e. Name of Contractor

2.2 RECORD SPECIFICATIONS

A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from the indicated in Specifications, addenda, and contract modifications.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
4. Note related Change Orders and record Drawings where applicable.

B. Format: submit record Specifications as PDF electronic file.

2.3 RECORD PRODUCT DATE

A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Include significant changes in the product delivered to Project site and changes in manufacturer’s written instructions for installation.
3. Note related Change Orders, and record Drawings where applicable.

B. Format: Submit record Product Data as paper copy within the Operation and Maintenance Manual and one electronic copy in portable data file (pdf) format. .

2.4 MISCELLANEOUS RECORD SUBMITTALS

A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

B. Format; Submit record submittals as paper copy.

PART 3-EXECUTION

3.1 RECORDING AND MAINTENANCE

A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and modifications to project record documents as they occur; do not wait until the end of Project.

B. Maintenance of Record Documents and Samples: Store record documents and Samples in the field office apart from the Contract Documents used for construction. Do not use project record documents for contraction purposes. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to project record documents for Architect's and Construction Manager's reference during normal working hours.

END OF SECTION

SECTION 019113 – COMMISSIONING REQUIREMENTS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Commissioning. Commissioning (Cx) is a systematic process of ensuring that all building systems perform interactively according to the design intent and the Owner's operational needs. The commissioning process shall coordinate components of the traditionally separate functions of system documentation, equipment startup, control system calibration, testing and balancing, performance testing and training.

B. The intent of the commissioning on this project is to fulfill the commissioning requirements of C408 of the 2020 Energy Conservation Construction Code of New York State (ECCCNYS). This overview is provided to outline those requirements and detail the responsibilities of all parties.

C. The commissioning process does not take away from or reduce the responsibility of the system designers or installing Contractors to provide a finished and fully functioning product.

1.2 RELATED SECTIONS

A. All work under this section is subject to the Contract Documents and this Contractor shall be responsible for and governed by all the requirements therein.

B. This Contractor shall reference the entirety of Divisions 22, 23 and 26 as they apply to this work, with specific attention to the following sections:

1. Section 230593 – Testing and Balancing
2. Section 230923 – Temperature Controls
3. Refer to Section 230010 for additional requirements related to Operation and Maintenance Manuals.
4. Refer to section 230593 for additional testing and balancing requirements.

1.3 ABBREVIATIONS

ABBREVIATIONS. The following are common abbreviations used in these Specifications.

A/E-	Architect and Design Engineer	FT-	Functional Performance Test
BACS-	Building Automation Control System	CM-	Construction Manager
CA-	Commissioning Authority	TAB-	Test and Balance
Cx-	Commissioning		
Cx Plan-	Commissioning Plan		

1.4 COORDINATION

A. Commissioning Team.

1. The commissioning team members shall include Commissioning Authority, the Owner's Construction Manager/Project Manager (CM), the Architect and Design Engineers, and the various construction contractors on the project with work associated with the systems to be commissioned ("contractor"). This generally includes, but may not be limited to representatives from the General Contractor (GC), the Mechanical (HVAC) Contractor(s) (MC), the Plumbing Contractor (PC), the Testing and Balancing Contractor (TAB), the Controls Contractor (CC), the Electrical Contractor (EC) and any other installing Subcontractors or suppliers of equipment. The Owner may designate facilities staff as members of the commissioning team.
2. The contents of these specifications describe the roles and responsibilities for each of the traditional commissioning team members. In the event that individuals serve multiple roles, the responsibilities shall equally apply.

B. Management.

1. The CA shall be provided directly by the Owner. The CA directs and coordinates the commissioning activities and reports to the CM and Owner. All members work together to fulfill their contracted responsibilities and meet the objectives of the Contract Documents.

C. Scheduling.

1. The CA shall work with the CM according to established protocols to schedule commissioning activities. The CA shall provide sufficient notice to the CM for scheduling commissioning activities. The CM shall regularly update the CA regarding construction progress, changes to commissioned systems, and expected completion. The CM shall inform the CA a minimum of 14 days in advance when initial start-up appointments are scheduled for commissioned systems. The CM shall integrate all commissioning activities into the master schedule and shall maintain an adequate window of time for each required activity. All parties shall address scheduling problems and make necessary notifications in a timely manner in order to expedite the commissioning process.

1.5 COMMISSIONING PROCESS

A. Commissioning Plan. The Commissioning Plan provides guidance in the execution of the commissioning process.

1. The CA shall distribute a draft Commissioning Plan in an industry standard format to the Commissioning Team as early as practical in the construction process.
2. Based on construction observations, changes in project scope or at the discretion of the CA, the commissioning plan may be updated throughout the construction process and during actual testing procedures as necessary to adequately validate the operation of systems being commissioned.

3. The commissioning plan shall contain, as a minimum:

    a. A narrative description of the activities that will be accomplished during each phase of commissioning, including the personnel intended to accomplish each of the activities.
    b. A listing of the specific equipment, appliances or systems to be tested and a description of the tests to be performed.
    c. Functions to be tested, including, but not limited to, calibrations and economizer controls.
    d. Conditions under which the test will be performed. Testing shall affirm winter and summer design conditions and full outside air conditions.
    e. Measurable criteria for performance.

B. Commissioning Process. The following provides a brief overview of typical construction phase commissioning tasks and the general order in which they occur.

1. Commissioning during construction begins with the ongoing development of the Commissioning Plan by the CA. This includes formalizing testing procedures and processes.
2. A Pre-Commissioning meeting may be conducted by the CA. The commissioning testing procedures are reviewed at this time and opened for comment by additional team members.
3. Additional meetings may be required during construction to plan, coordinate, schedule future activities, and resolve issues. The additional meetings will be scheduled through the CM with necessary parties attending.
4. Appropriate documentation and communication paths (project dependent) are developed with all team members.
5. The CA will perform (two) progress compliance inspections to determine deviations from contract documents, construction issues which may adversely affect the ability to commission the systems, and / or make recommendations to improve project outcome. In the event that observations require clarification from other members of the Commissioning Team, these requests for information shall be placed in writing and become part of the commissioning record.
6. Detailed equipment start-up procedures for major equipment shall be submitted to the CA for review and comment. Depending on project complexity, the CA may attend selected equipment startups, and shall be notified a minimum of 14 days prior to their scheduled date.
7. The CA develops specific equipment and system Functional Performance Test procedures and forms. These shall be presented within the Commissioning Plan or separate associated document package.
8. The Functional Performance Tests are executed by the Contractors under the direction of the CA. The CA documents functional performance test results.
9. Items of contract non-compliance in material, installation or setup are documented by the CA and forwarded in appropriate report format for correction at the Contractor’s expense. Non-compliance issue resolutions shall be documented in a Commissioning Issues Log (or other acceptable format) by the CA. This log shall be maintained throughout the project, and include items noted during site inspections and functional performance testing.

10. Prepare a preliminary report of commissioning test procedures and results. Report is to be certified as a complete summary of findings and shall be forwarded to the Engineer for review and comment prior to being provided to the building Owner or Owner's Representative. Failure to provide this report in a timely manner may delay building occupancy. The report shall contain the following:

    a. Clearly labeled as "Preliminary Commissioning Report".
    b. Organized with mechanical and service hot water findings in separate sections to allow independent review.
    c. Itemization of deficiencies found during testing that have not been corrected at the time of report preparation.
    d. Deferred tests that cannot be performed at the time of report preparation because of climatic conditions.
    e. Climatic conditions required for the performance of deferred tests.

11. Seasonal or other deferred testing may be required to optimally test the systems and shall be conducted as required for system performance verification. These tests, and participation by all commissioning team members, shall be provided at no additional costs to the Owner.
12. The CA prepares a final report to document the results of the commissioning process. The final report shall be provided to the Owner or Owner's Representative within 90 days of receipt of the certificate of occupancy.

1.6 RESPONSIBILITIES

A. The general roles and responsibilities of the primary Cx team members toward the Cx process are outlined in this section. Other various additional startup activities related to the Cx process reside in the specific sections for equipment (boilers, chillers, etc), systems (Temperature controls), or activities (testing and balancing).

B. Architect (of A/E)

1. Construction and Acceptance Phase:

    a. Attend any pre-commissioning scoping meeting and selected commissioning team meetings.
    b. Perform usual and customary submittal review and construction observation.
    c. Provide design narrative documentation requested by the CA necessary to clarify design intent.
    d. Coordinate resolution of system deficiencies identified during commissioning, according to the Contract Documents.
    e. Review and approve the O&M Manuals

C. Mechanical, Plumbing and Electrical Designers/Engineers (of the A/E)

1. Construction and Acceptance Phase:

    a. Attend commissioning scoping meetings and other selected commissioning team meetings.
    b. Perform usual and customary submittal review and construction observation.

c. Review TAB Strategies and Procedures Plan submittal, forward approved copy to Commissioning Agent for their use.
d. Provide design narrative and sequence documentation requested by the CA. The designers shall assist (along with the Contractors) in clarifying the operation and control of commissioned equipment in areas where the specifications, control drawings or equipment documentation is not sufficient for writing detailed testing procedures.
e. Participate in the resolution of system deficiencies identified during commissioning, according to the Contract Documents.
f. Review the Pre-Commissioning Report as provided by the Temperature Controls contractor.
g. Review the Preliminary Commissioning Report, append any necessary comments, and transmit document to the Owner for record. Failure to review and transmit this manual to the Owner in a timely manner may delay final inspections and occupancy.
h. Review and approve the MEP/FP component of the O&M Manuals.
i. Approve air and water systems balancing reports.
j. Review Temperature Controls Training Agenda and Documentation.
k. Provide technical review and assistance to the Owner and Architect regarding CA comments reflecting upon the Commissioning Activities.

D. Commissioning Authority (CA)

1. Construction and Acceptance Phase:

a. Coordinate and direct the commissioning activities in a logical, sequential, and efficient manner using technical expertise, consistent protocols and forms, centralized documentation, clear and regular communications/consultation with all necessary parties, and frequently updated timelines/schedules.
b. Coordinate the commissioning work and, with the CM, ensure that commissioning activities are being scheduled into the master schedule.
c. Develop the Commissioning Plan document that describes construction phase commissioning activities.
d. Plan and conduct a pre-commissioning meeting and other commissioning meetings as needed.
e. Review and comment upon approved TAB Strategies and Procedures Plan. Where ambiguities exist, request clarifications from the Engineer.
f. Where project complexity indicates, attend the Testing and Balancing Conference.
g. Before startup, review the current control sequences and interlocks and work with Contractors and design engineers until sufficient clarity has been obtained, in writing, to be able to write detailed testing procedures.
h. Perform (2) site visits to observe component and system installations. Attend selected planning and job-site meetings to obtain information on construction progress. Review construction meeting minutes for revisions/substitutions relating to the commissioning process. Assist in resolving any discrepancies.
i. Write the Functional Performance Test procedures and develop test forms for equipment and systems.
j. Analyze any functional performance trend logs and monitored data to verify performance.

k. Supervise manual Functional Performance Tests with installing Contractors. Coordinate retesting as necessary until satisfactory performance is achieved.
l. Maintain a master Commissioning Issues Log and testing records. Communicate test results and non-compliance issues to the CM. Recommend actions to resolve non-compliance issues.
m. Compile and maintain the Commissioning Record Manual.
n. Review, spot validate, and certify the accuracy and completeness of the lighting controls testing performed by the Electrical Contractor (see section 260923 and paragraphs C408.3 through C408.3.2 of the 2020 Energy Conservation Construction Code of New York State for testing and documentation requirements).
o. Provide a final Commissioning Report providing the following information:

1) Organized with mechanical and service hot water findings in separate sections to allow independent review.
2) Disposition of deficiencies found during testing, including details of corrective measures used or proposed.
3) Outcome of deferred tests that could not be performed at the time of preliminary report preparation because of climatic conditions, and the conditions under which the tests were performed.
4) Functional performance test procedures used during the commissioning process, including measurable criteria for test acceptance (provided in report for repeatability).

2. Warranty Period:

a. Coordinate and supervise required seasonal or deferred testing and deficiency corrections.

E. Construction Manager - Owner's Project Manager (CM)

1. Construction and Acceptance Phase:

a. Facilitate the coordination of the commissioning work by the CA. Maintain commissioning activity in the master schedule. For successful commissioning it is critical that the master schedule clearly denote adequate time frames for each of the following work segments:

1) Completion and startup of all mechanical equipment
2) Completion and pre-commissioning of temperature control systems (reference 230923.1.11
3) Completion of Testing and Balancing of HVAC Systems
4) Functional Testing of HVAC and remediation of Issues Log findings. **Functional testing shall not commence until the CA has received complete confirmation of and / or startup reports for all HVAC equipment from the Mechanical contractor and completed pre-commissioning forms from the Temperature Controls Contractor. The CA may, at their discretion, proceed with functional testing prior to receipt of a fully certified testing and balancing report, approved by the Engineer of Record.**

b. Review the final Construction Phase Commissioning Plan.
c. Coordinate and attend a pre-commissioning meeting and other commissioning team meetings.
d. When requested by the CA, observe startup and functional testing of selected equipment.
e. Coordinate the resolution of non-compliance and design deficiencies.
f. Review Commissioning Issues Log and follow up Contractors to achieve resolution of non-compliance issues.
g. Furnish a copy of all Contract Documents, as-built documents, addenda, change orders, approved submittals, and shop drawings related to commissioned equipment to the CA.

2. Warranty Period:

a. Assist the CA as necessary in the seasonal or deferred testing and
b. Ensure that any seasonal or deferred testing and any deficiency issues are addressed.

F. Contractors

1. Construction and Acceptance Phase:

a. The Contractors shall provide all tools or the use of tools to start, check-out, and functionally test equipment and systems.
b. Execute commissioning responsibilities according to the Contract Documents and schedule.
c. A representative shall attend a pre-commissioning meeting and other necessary meetings scheduled by the CM and CA to facilitate the Cx process.
d. Provide to the CA detailed start-up procedures, all requested submittal data, and specific Owner responsibilities required to keep warranties in force.
e. Execute Functional Performance Tests under the direction of the CA. The CA documents the Functional Performance Test process and results.
f. Correct non-compliance issues.
g. Prepare O&M Manuals according to the Contract Documents; clarify and update the original control sequences to as-built conditions.

2. Warranty Period:

a. Execute seasonal or deferred Functional Performance Testing, witnessed by the CA, according to the specifications.
b. Correct non-compliance issues and document resolutions in the Commissioning Issues Log and make necessary adjustments to O&M Manuals and as-built drawings for applicable issues identified in any seasonal testing.

G. Equipment Suppliers

1. Provide all requested submittal data, including detailed start-up procedures and specific responsibilities of the Owner to keep warranties in force.
2. Assist in equipment testing per agreements with Contractors.

3. Include all special tools and instruments (e.g., tools only available from vendor or specific to a piece of equipment) required for testing equipment according to these Contract Documents.
4. Provide information requested by CA regarding equipment control sequences and testing procedures.
5. Review test procedures for equipment installed by factory representatives.

H. Owner (or Owner's Authorized Representative)

1. Construction and Acceptance Phase:

a. A representative shall attend a pre-commissioning meeting and other necessary meetings scheduled by the CM and CA to facilitate the Cx process.
b. Assist to the extent necessary with access and scheduling for testing of mechanical and service hot water systems.
c. Provide transmittal to the Code Official that acknowledges receipt of the Preliminary Commissioning Report. Failure to provide transmittal may delay final inspection and occupancy of the project. On request by the Code Official, release a copy of the Preliminary Commissioning Report for Code Official review, or authorize the CA to do so on behalf of the Owner.

1.7 SYSTEMS TO BE COMMISSIONED

Option 1 Example:

A. All energy consuming equipment as schedule on drawing K H600

B. All newly installed or modified / existing HVAC Control Systems as described on drawing K H700 and H502 and within Specification Section 230923.

C. Lighting System Controls shall be tested by the contractors as described under section 260923 paragraph 3.9, Lighting System Functional Testing. The testing reports shall be provided to the commissioning authority upon completion for spot verification and inclusion in the project Commissioning Report.

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 Division Contractor for the equipment being tested. For example, the mechanical (HVAC) Contractor of Division 23 shall ultimately be responsible for all standard testing equipment for the HVAC system and controls system in Division 23, except for equipment specific to and used by TAB in their commissioning responsibilities.

B. All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified in the Specifications. If not otherwise noted, the following minimum requirements apply: Temperature sensors and digital thermometers shall have a certified calibration within the past year to an accuracy of 0.5°F and a resolution of + or - 0.1°F. Pressure and humidity sensors shall have an accuracy of + or - 2.0% of the value being measured (not full range of meter) and have been calibrated within the last year. 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.**

PART 3 - EXECUTION

3.1 MEETINGS

A. Commissioning Scoping Meeting. The CA (through the CM) shall schedule, plan and conduct a commissioning scoping meeting with the entire commissioning team in attendance.

B. Miscellaneous Meetings. Other meetings will be planned and conducted by the CA (through the CM) as construction progresses. These meetings will cover coordination, deficiency resolution and planning issues with particular Contractors. The CA will plan these meetings and will minimize unnecessary time being spent by the Contractors.

3.2 REPORTING

A. The CA will coordinate commissioning meetings and activities through the CM. The CA will develop and maintain the Commissioning Issues Log to document non-compliance issues and deficiencies noted throughout the Cx process. The CA will regularly submit the Commissioning Issues Log to the CM who is responsible for communicating deficiencies to the responsible Contractors and coordinating resolution to issues. The CM and all Contractors are responsible for detailing the resolution of issues in the Commissioning Issues Log and returning it regularly to the CA as issues become resolved.

B. A preliminary commissioning report shall be generated meeting the requirements of paragraph 1.5.B.10.

C. A final commissioning report shall be generated meeting the requirements of paragraph 1.6.D.1.m.

3.3 START-UP AND INITIAL CHECKOUT

A. The Contractor responsible for the purchase of the equipment shall attach completed manufacturer's detailed start-up and checkout procedures and the Contractor's normally used field checkout sheets.

B. Sensor and Actuator Calibration. In lieu of specifications to the contrary, all field-installed control components and sensors (e.g., temperature, relative humidity, CO_2, pressure) and all actuators (e.g., dampers and valves) on all equipment shall be pre-commissioned as described within section 230923.1.11. The following general format shall be used by the contractor for recording all calibration results. Alternate methods and recording formats may be used if approved by the A/E and CA. All test instruments shall have had a certified calibration within the preceding 12 months.

Temperature Controls Pre-Commissioning Checklist					
Project Name:					
IBC Project #:					
SED Project #:					
Analog Inputs					
Equipment	Point Name	Sensor Range	Reference Reading	Sensor Reading	Testing Method
Analog Outputs					
Equipment	Point Name	Output Range	Visual Verification	Upstream Temp	Downstream Temp
Binary Inputs					
Equipment	Point Name	Verified Closed Status	Verified Open Status	Associated Binary Output	
Binary Outputs					
Equipment	Point Name	Enable/Disable Verified	Associated Binary Input	Hard Wire Interlocks Tested	

C. Pre-Commissioning shall include completion of the following additional items. The Controls Contractor, via the Construction Manager, shall provide a notice to the Commissioning Authority certifying that the following have been completed and are ready for testing.

1. Communication Network Startup – All controllers and integration with factory controllers shall be completed.
2. Graphical User interface – the GUI shall be completed and ready for review for compliance with section 230923.
3. Software – The contractor shall certify that the software meets the requirements of the contract documents and is ready for functional testing.

D. Functional testing shall not proceed until pre-commissioning as described under this paragraph, including the notice of certification to the Commissioning Authority are complete, reviewed and accepted by both the CA and the A/E.

3.4 FUNCTIONAL PERFORMANCE TESTING

A. The commissioning activities described in the Functional Performance Tests as contained in the commissioning plan shall be performed by the contractor under the direction of the CA. Each task shall be assigned to the appropriate trade, generally the specific contractor providing the equipment. Only skilled tradesmen knowledgeable in the operation of the equipment and systems shall be perform the each of the FT requirements.

B. Objectives and Scope. The objective of Functional Performance Testing is to demonstrate that each system is operating according to the documented Design Intent and Contract Documents. Functional Performance Testing facilitates bringing systems from a state of substantial completion to full dynamic operation. During the testing process, areas of deficient performance are identified and corrected, improving the operation and functioning of the systems.

C. In general, each system will be operated through all critical modes of operation (e.g., seasonal, occupied, unoccupied, warm-up, cool-down, part- and full-load) where there is a specified system response. Verify each action and response documented in control sequences. Proper responses to such modes and conditions as power failure, freeze condition, low oil pressure, no flow, equipment failure, etc. may also be tested.

D. Test Methods.

1. Functional Performance Testing and verification may be achieved through a combination of manual testing (manual manipulation of the equipment and observation performance), monitoring field performance data and analyzing the results using the control system's trend log capabilities or by stand-alone dataloggers.
2. Setup. Each function and test shall be performed under conditions that simulate actual conditions as closely as is practicable. The tradesmen executing the test 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. Upon completion of the test, the Contractor shall return all affected building equipment and systems to their pre-test condition. In the event that commissioning leads to changes in the baseline control setpoints and / or parameters, these shall be closely documented by the CA and forwarded to the Owner and A/E team for technical evaluation.

3. Coordination and Scheduling. The Contractors via the CM shall provide sufficient notice to the CA regarding their completion schedule for the Pre-Commissioning activities and startup of all equipment and systems.

    a. In general, functional testing is conducted after control system Pre-Commissioning and startup and Testing and Balancing have been satisfactorily completed. The control system is to be sufficiently tested before it is used for TAB or to verify performance of other components or systems. The air balancing and water balancing to be is completed and debugged before functional testing of air-related or water-related equipment or systems

4. Problem Solving. The CA may recommend solutions to problems found, however the burden of responsibility to solve, correct and retest problems is with the CM, GC, Contractors and A/E.

3.5 DOCUMENTATION, NON-COMPLIANCE AND APPROVAL OF TESTS

A. Documentation. The CA shall witness and document the results of all Functional Performance Tests using the specific procedural forms developed for that purpose.

B. Lighting control systems shall be tested by the Division 26 contractor as described in Section 260923 and documented on the forms provided therein. The completed test forms shall be provided to the CA for field verification (on a spot-check basis) and inclusion in the project commissioning record.

C. Non-Compliance.

1. The CA shall record the results of the Functional Test on the test form. All deficiencies or non-compliance issues shall be noted and reported to the CM via a Commissioning Issues Log, developed by the CA.
2. Minor deficiencies identified during testing may be corrected during testing at the discretion of the CA. In such cases the deficiency and resolution will be documented on the Commissioning Issues Log.
3. Every effort will be made to expedite the testing process without compromising the integrity of the test procedures. However, the CA shall not be pressured into overlooking deficiencies or loosening acceptance criteria to satisfy scheduling or cost issues unless the Owner provides a written request to do so.
4. Each deficiency identified during testing shall be recorded on the Commissioning Issues Log. The CM shall coordinate resolution of any deficiencies. Any disputes regarding the validity of or responsibility for correcting a deficiency shall follow these guidelines:

    a. Resolutions are made at the lowest management level possible. Other parties are brought into the discussions as needed. Final interpretive authority is with the A/E. Final acceptance authority is with the Owner.
    b. Once the interpretation and resolution have been decided, the appropriate party corrects the deficiency. The CA reschedules the test and the test is repeated until satisfactory performance is achieved.

5. Cost of Retesting.

    a. The cost for the CA to retest / re-verify a Functional Test, after a second round of testing on a piece of equipment shall be provided by the party responsible for the defect or deficiency. In the event that multiple parties are responsible for test failures, any cost recovery for retesting shall be negotiated with the CM and subsequently assigned to the responsible parties.

6. Any required retesting by any Contractor shall not be considered a justified reason for a claim of delay or for a time extension by the Contractor.
7. Failure Due to Manufacturer Defect. If 10% or three, whichever is greater, of identical pieces (size alone does not constitute a difference) of equipment fail to perform to the Contract Documents (mechanically or substantively) due to manufacturing defect, all identical units may be considered unacceptable by the CA. In such case, the Contractor shall provide the Owner with the following:

    a. Within one week of notification from the CA, the Contractor or manufacturer's representative shall examine all other identical units making a record of the findings. The findings shall be provided to the CM within two weeks of the original notice.
    b. Within two weeks of the original notification, the Contractor or manufacturer shall provide a signed and dated, written explanation of the problem, cause of failures, etc. and all proposed solutions which shall include full equipment submittals. The proposed solutions shall not significantly exceed the specification requirements of the original installation.
    c. The CM shall determine whether a replacement of all identical units or a repair is acceptable.
    d. Two examples of the proposed solution shall be installed by the Contractor and the A/E and CA shall be allowed to test the installations for up to one week, where after the A/E, taking into account information provided by the CA shall decide whether to accept the solution.
    e. Upon acceptance, the Contractor and/or manufacturer shall replace or repair all identical items, at their expense and extend the warranty accordingly, if the original equipment warranty had begun. The replacement/repair work shall proceed with reasonable speed beginning within one week from when parts can be obtained.

3.6 DEFERRED TESTING

A. Seasonal / Deferred Testing: During the warranty period, seasonal testing (tests delayed until weather conditions are closer to the system's design conditions) shall be completed as part of this contract. The CA shall note in the final commissioning report where environmental conditions did not allow for definitive results, or where testing could not be completed, and a description of requirements to complete the functional testing with a plan for implementation. The Owner and CM shall coordinate this activity with the Contractors. The results of this testing shall be forwarded to the CA to update the Commissioning Report. Any final adjustments to the O&M Manuals and as-built drawings due to the testing shall be made by the contractors.

END OF SECTION

SUNY ERIE COMMUNITY COLLEGE NORTH CAMPUS
KITTINGER HALL BOILER ROOM UPGRADES
DIVISION 02
EXISTING CONDITIONS SPECIFICATIONS
PAGE 1

SECTION	DESCRIPTION
028213	ASBESTOS ABATEMENT
028313	WORKING WITH LEAD CONTAINING MATERIALS
	APPENDIX A: HAZARDOUS MATERIALS REPORT: ACM

SECTION 028213 – ASBESTOS ABATEMENT

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including but not limited to General and Supplementary Conditions, and other Specification Sections, apply to this Section.

B. "Pre-Renovation Environmental Survey for Asbestos-Containing Materials, Lead-Based Paint, Polychlorinated Biphenyls in Caulk/Sealants, Universal Waste and Miscellaneous Hazardous Materials for the Kittinger Hall Boiler Room Upgrades Project".

1.2 SUMMARY

A. This project includes the removal of asbestos-containing materials (ACM) from SUNY Erie North Campus, Kittinger Hall in Williamsville, NY.

1.3 SCOPE OF WORK

A. The scope of work for asbestos abatement for this project is depicted on contract drawing KHM-101. Refer to the contract documents for additional information regarding the asbestos abatement scope of work. The scope of asbestos abatement includes the following:

1. Properly remove and dispose of all layers of flooring down to and from concrete substrate as required for mechanical chase installation. Several layers of flooring are present. Bottom layer of floor tile and associated mastic is asbestos-containing. Leave straight lines at the limits of required removal. Chemical mastic removers shall not be used as they are likely to compromise adherence of adjacent flooring to remain. Approximately 15 square feet of flooring removal will be required.

2. Properly remove and dispose of tape style pipe insulation wrap (non-friable) on domestic plumbing line. Approximately 10 linear feet of insulation removal will be required.

3. Properly remove and dispose of holding tank. The mastic adhering the foam insulation to the tank is asbestos-containing. Coordinate work with associated trade. Approximately 100 square feet of mastic removal will be required.

1.4 CODES AND REGULATIONS

A. General Applicability of Codes and Regulations and Standards: Except to the extent that more explicit or more stringent requirements are written directly into the Contract Documents, all applicable codes, regulations and standards have the same force and effect (and are made a part of the Contract Documents by reference) as if copied directly into the Contract Documents, or as if published copies are bound herewith.

B. Contractor Responsibility: The Contractor shall assume full responsibility and liability for the compliance with all applicable Federal, State and local regulations pertaining to work practices, hauling, disposal, and protection of workers, visitors to the site and persons occupying areas adjacent to the site. The Contractor is responsible for providing medical examinations and maintaining medical records of personnel as required by the applicable Federal, State and local regulations. The Contractor shall hold the Owner and Owner's Representative harmless for failure to comply with any applicable work, hauling, disposal, safety, health or other regulation on the part of himself, his employees or his subcontractors.

C. Federal requirements that govern asbestos abatement work or hauling and disposal of asbestos waste materials include but are not limited to the following:

1. OSHA: U.S. Department of Labor, Occupational Safety and Health Administration (OSHA), including but not limited to:

   a. Occupational Exposure to Asbestos, Tremolite, Anthophyllite, and Actinolite; Final Rules: Title 29, Part 1926, Section 1101 of the Code of Federal Regulations

   b. Respiratory Protection: Title 29, Part 1910, Section 134 of the Code of Federal Regulations

   c. Access to Employee Exposure and Medical Records: Title 29, Part 1910, Section 2 of the Code of Federal Regulations

   d. Hazard Communication: Title 29, Part 1910, Section 1200 of the Code of Federal Regulations

   e. Specifications for Accident Prevention Signs and Tags: Title 29, Part 1910, Section 145 of the Code of Federal Regulations

2. DOT: U.S. Department of Transportation, including but not limited to:

   a. Hazardous Substances: Title 49, Part 171 and 172 of the Code of Federal Regulations

3. EPA: U.S. Environmental Protection Agency (EPA), including but not limited to:

   a. Training Requirements of (AHERA) Regulations - Asbestos-Containing Material in Schools Final Rule & Notice: Title 40, Part 763, Subpart E, amended Appendix C of the Code of Federal Regulations dated April 4, 1994

   b. National Emission Standard for Hazardous Air Pollutants (NESHAP) National Emission Standard for Asbestos: Title 40, Part 61, Subpart A, and revised Subpart M (Revised Subpart B) of the Code of Federal Regulations dated November 20, 1990

D. State requirements that govern asbestos abatement work or hauling and disposal of asbestos waste materials include but are not limited to the following:

1. New York State Department of Labor (NYSDOL):

a. Part 56 of Title 12 of the Official Compilation of Codes, Rules and Regulations of the State of New York (12 NYCRR Part 56) - Industrial Code Rule 56 (Code Rule)

2. New York State Department of Environmental Conservation (DEC) Regulations regarding waste collector registration:

a. Title 6, Part 364 of the New York State Official compilation of Codes, Rules and Regulations. An annual "Industrial Waste Hauler Permit" specifically for asbestos-containing materials is required for transportation of asbestos-containing waste to the disposal site.

b. New York State Department of Health (NYS DOH):
Title 10, Part 73: Asbestos Safety Program Requirements

E. Local Requirements: Abide by all local requirements that govern asbestos abatement work or hauling and disposal of asbestos waste materials.

1.5 STANDARDS

A. General Applicability of Standards: Except to the extent that more explicit or more stringent requirements are written directly into the Contract Documents, all applicable standards have the same force and effect (and are made a part of the Contract Documents by reference) as if copied directly into the Contract Documents, or as if published copies are bound herewith.

B. Contractor Responsibility: The Contractor shall assume full responsibility and liability for the compliance with all standards pertaining to work practices, hauling, disposal, and protection of workers, visitors to the site and persons occupying areas adjacent to the site. The Contractor shall hold the Owner and Owner's Representative harmless for failure to comply with any applicable standard on the part of himself, his employees or his subcontractors.

C. Standards: These standards apply to asbestos abatement work or hauling and disposal of asbestos waste materials and include but are not limited to the following:

1. American National Standards Institute (ANSI)
1430 Broadway
New York, NY 10018
(212) 354-3300

2. Practices for Respiratory Protection Publication Z88.2-80

3. American Society for Testing and Materials (ASTM)
1916 Race Street
Philadelphia, PA 19103
(215) 299-5400

4. Safety and Health Requirements Relating to Occupational Exposure to Asbestos E 849-82

1.6 SUBMITTALS

NOTE: Submittals will not be considered acceptable for review unless they are submitted as a complete package including all specified information. All information shall be submitted in the order listed in this specification section. An electronic copy of the submittals must be provided. Include title pages to identify the information included in the distinct sections. If any of the specified information is not included, contractor shall include a page acknowledging the specified information, and an explanation as to why the information is not included. Pre-work submittals shall be submitted at least ten (10) business days prior to the commencement of work.

A. At least ten (10) business days before the start of the project, legible copies of the following items must be submitted to the Owner or the Owner's Representative:

1. NYSDOL Contractor's License (DOH-432).
2. A statement signed by an authorized representative of the company stating that a Respiratory Protection Program that meets the requirements of OSHA Title 29, Part 1910, Section 134 will be in effect and followed during the project.
3. Project Notifications: As required by Federal and State regulatory agencies together with proof of transmittal (i.e. certified mail return receipt).
4. Provide a statement signed by an authorized representative of the company stating that the Building Occupants/Other Trades notification required by ICR 56 will be or has been posted at least 10 days prior to the start of the project. Provide a copy of the proposed Building Occupant Notification that will be posted at the job site.
5. Information regarding the type(s) of respiratory protection planned for use for each type of abatement activity.
6. Site-specific variance(s) proposed for use on the project, if applicable. Note: Any variance petition initiated by the contractor must be submitted to the Owner and/or Owner's Representative for review and approval prior to submission to NYSDOL.
7. Information (i.e. product data sheet) on the surfactant to be used. Note: Product must be specified for use on asbestos abatement projects.
8. Waste Hauler's Permit.
9. Landfill permit.
10. Name, address and phone number of air sampling firm and laboratory to be used on the project for OSHA personal samples. Include the accreditation of the analytical laboratory (ELAP certificates) of the air monitoring firm.
11. Site-Specific Work Plan that includes the following:
    a. A schedule for the completion of the work.
    b. Work procedures.
    c. Types of equipment to be used.
    d. Anticipated location for water and electrical hookups.
    e. Anticipated location of decontamination enclosures.
    f. Anticipated location(s) of negative air exhaust.
    g. Estimated crew size, shift times and durations.

h. Emergency procedures for fire and medical emergencies and for failure of containment barriers.

Marked-up drawings must be provided with the work plan to clearly indicate proposed work plan and work area layout (i.e. locations of decontamination units, negative air exhaust areas, locations of restricted areas to be established, estimated duration of abatement activities per work area, worker/waste pathways, dumpster locations, utility connections, etc.).

B. During the project, legible copies of the following items must be submitted to the Owner or Owner's Representative:

1. NYSDOL Asbestos Handling Certifications (DOH 442) for all persons employed on the project. (Likeness on photographs must be clear) *****
2. Proof of current (within the last 12 months) physical examination for all persons to be employed on the project. *****
3. Proof of current (within the last 12 months) respirator fit test for all persons to be employed on the project. *****
4. Project Log Book Entries.
5. Daily Sign-in Log.
6. Work Area Entry/Exit Log.
7. Any and all changes to the Contract should any occur.
8. Personal sampling results within 24 hours of sampling.

***** If this information is not provided at the time each worker arrives on site, they will be prohibited from working until the information is provided and reviewed.

C. During the project, legible copies of the following items must be maintained at the job site, and available for review:

1. The company's standard operating procedures manual.
2. The company's respiratory protection program.
3. Safety Data Sheets for all substances to be used on the project.

D. Upon completion of the project, legible copies of the following items must be submitted to the Owner or Owner's Representative:

1. Personal air sampling records including chain-of-custody forms and laboratory results. These records must also include the accreditation of the analytical laboratory (ELAP certificates).
2. Waste manifest(s), shipment records and landfill receipts signed by the landfill operator within 30 days after the waste leaves the site. A percentage of the final payment will be withheld until the waste shipment record is received by the Owner or Owner's Representative.
3. Project log book.

1.7 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with the referenced regulations and standards.

B. Pre-work Conference: Before the work of this section is scheduled to commence, a conference will be held at the site for the purpose of reviewing the Contract Documents, discussing requirements for the work and site-specific procedures, reviewing the Contractor's approved Site-Specific Work Plan, and abatement procedures. The asbestos abatement contractor shall attend.

1.8 SPECIAL CONDITIONS

A. Locations and quantities of all materials to be removed by the abatement contractor must be field verified. Information given on contract drawings and specification sections is for general orientation and information only.

B. The Contractor shall have at least one English-speaking supervisor on the job site at all times while the project is in progress. The supervisor must be able to communicate fluently with all employees.

PART 2 – PRODUCTS AND RESPIRATORS

2.1 PRODUCTS

A. WETTING MATERIALS: For wetting prior to disturbance of asbestos-containing materials, use amended water:

1. Amended Water: Water to which a surfactant has been added. Use a mixture of surfactant and water which results in wetting of the asbestos-containing material and retardation of fiber release during disturbance of the material equal to or greater than that provided by the use of one ounce of a surfactant consisting of 50% polyoxyethylene ester and 50% polyoxyethylene ether mixed with five gallons of water.

B. POLYETHYLENE SHEET: Fire retardant polyethylene film in the largest sheet size possible to minimize seams, 6-mil thick as indicated, clear, frosted or black as indicated.

C. DUCT TAPE: Provide duct tape in 2" or 3" widths as indicated, with an adhesive which is formulated to stick aggressively to sheet polyethylene.

D. SPRAY CEMENT: Provide spray adhesive in aerosol cans which is specifically formulated to stick tenaciously to sheet polyethylene.

E. DISPOSAL BAGS: Provide 6-mil thick leak-tight polyethylene bags labeled as described in the standards referenced in Part 1 of this section.

F. GARDEN SPRAYER: Provide a hand pump type pressure-can garden sprayer fabricated out of either metal or plastic, equipped with a metal wand at the end of a hose that can deliver a stream or spray of liquid under pressure.

2.2 RESPIRATORS

A. Select respirators from those approved by the National Institute for Occupational Safety and Health (NIOSH), Department of Health and Human Services.

B. Respirators shall be fit-tested to personnel by an industrial hygienist or other competent person. Fit-tested respirators shall be permanently marked to identify the individual fitted, and use shall be limited to that individual.

C. In accordance with 29 CFR 1926.1101(h)(3)(iv), at a minimum, all employees will be required to use full face, powered air purifying HEPA-filtered respirators when they are in a regulated area where OSHA Class I work is being performed until a negative exposure assessment is obtained in accordance with 1926.1101 (f)(2)(iii).

D. No respirators shall be issued to personnel without such personnel participating in a respirator training program.

E. High Efficiency Particulate Air (HEPA) respirator filters shall be approved by NIOSH and have the NIOSH P100 designation. The respirator filters shall also conform to the OSHA requirements in 29 CFR 1910.134 and 29 CFR 1926.1101.

F. A storage area for respirators shall be provided by the Contractor on the clean room side of any established decontamination chamber where they will be kept in a clean environment.

G. The Contractor shall provide and make available a sufficient quantity of respirator filters so that filter changes can be made as necessary during the work day. Filters will be removed and discarded during the decontamination process. Filters cannot be reused. Filters must be changed if breathing becomes difficult.

H. Filters shall not be used any longer than one eight (8) hour work day.

I. Respirator filters shall be stored at the project site in the clean room of each work area personnel decontamination unit.

J. Where not in violation of NIOSH and OSHA requirements the Contractor shall provide at least the following minimum respiratory protection to the maximum use concentrations indicated below:

OSHA/NIOSH Approved Respiratory Protection	**Maximum use Concentrations (fibers/cm^3) (f/cc)**
Half Face Mask Air Purifying, HEPA Filtered	1.0
Full Face Piece Air Purifying, HEPA Filtered, Qualitative Fit Test	5.0

OSHA/NIOSH Approved Respiratory Protection	Maximum use Concentrations (fibers/cm^3) (f/cc)
Powered Air Purifying (PAPR), Full Face Piece, HEPA Filtered	10.0
Supplied Air - Continuous Flow, Full Face Piece, HEPA Filtered	10.0
Supplied Air - Full Face Piece, Pressure Demand	100.0
Supplied Air - Full Face Piece, Pressure Demand with Auxiliary SCBA Pressure Demand or Continuous Flow	100.0

* A qualitative fit-tested tight fitting negative pressure air-purifying respirator can only be used in an atmosphere less than or equal to 10 times the PEL. In order to achieve the full protection factor, quantitative fit testing must be performed.

PART 3 – EXECUTION

3.1 ASBESTOS-CONTAINING MATERIAL HANDLING AND REMOVAL PROCEDURES

A. Perform work under this contract in accordance with the standards referenced in Part 1 of this Section. The provisions of any site-specific variance to New York State Department of Labor (NYSDOL) Industrial Code Rule 56 (ICR 56) obtained for this project may not be implemented until approval is given by the Owner or Owner's Representative.

B. Work resulting in disturbance of asbestos-containing materials shall be performed by a licensed asbestos abatement contractor employing certified workers in accordance with all applicable standards referenced herein.

3.2 CLEAN-UP PROCEDURES

A. Comply with the standards referenced in Part 1 of this Section.

3.3 AIR SAMPLING AND ANALYSIS

A. The Owner shall be responsible for hiring an independent third-party firm to perform any/all required area air sampling and analysis in accordance with ICR 56 and AHERA.

B. The Contractor is required to ensure cooperation of its personnel with the Air Sampling Technician (AST) for general air sampling, and clearance testing of each work area after completion of asbestos work prior to removal of containment barriers.

C. Air samples shall be analyzed using Phase Contrast Microscopy (PCM) and/or Transmission Electron Microscopy (TEM) in accordance with applicable NYSDOL Industrial Code Rule 56 and AHERA requirements.

D. Standard turn-around time for laboratory analysis of area air samples shall not exceed twenty-four (24) hours. The Owner may request an expedited turn-around time for some or all air samples. Copies of all area air monitoring results shall be maintained by the

Project Monitor/Air Sampling Technician and included with the project monitoring closeout report.

E. For clearance air sampling: PCM air samples, taken utilizing an aggressive sampling technique must show airborne concentrations of total fibers below 0.01 fibers per cubic centimeter (f/cc). TEM results must show less than (<) an average of 70 structures per square millimeter, and/or be deemed satisfactory in accordance with the Z-test methodology as prescribed by AHERA.

F. If the clearance criteria are not met, then the abatement/decontamination is incomplete. The cleaning procedures shall be repeated and retesting conducted until such time clearance criteria are successfully achieved. The Contractor shall bear the cost of any additional re-testing required due to failure to achieve final clearance criteria.

3.4 PERSONAL AIR SAMPLING

A. The Contractor shall conduct daily personal monitoring that is representative of the exposure of each employee who is assigned to work within a regulated area who is performing OSHA Class I or II work, unless the employer has obtained a negative exposure assessment for the entire operation in accordance with OSHA 1926.1101 (f)(2)(iii). Periodic personal monitoring shall be performed in accordance with 1926.1101(f)(3). If the provisions of 1926.1101(f)(4)(i) are met and monitoring is discontinued, the Contractor shall resume the periodic personal monitoring whenever there has been a change in process, control equipment, personnel or work practices that may result in new or additional exposures above the permissible exposure limits or when the Contractor has any reason to suspect that a change may result in new or additional exposures above the permissible exposure limits. This resumption of personal monitoring is required regardless of whether a "negative exposure assessment" was previously produced for the specific work area.

B. All personal samples shall be analyzed within 48 hours upon being collected at the site. The analysis of personal air samples shall be conducted by an ELAP approved laboratory, subject to approval of the Owner or the Owner’s Representative.

C. The Contractor shall notify affected employees of the personal monitoring results that represent that employee's exposure as soon as possible following receipt of monitoring results. The Contractor shall notify affected employees of the results of monitoring representing the employee's exposure in writing either individually or by posting at a centrally located place that is accessible to affected employees.

3.5 PROJECT MONITORING

A. The Owner shall retain the services of a New York State Department of Labor licensed and certified Project Monitor to provide periodic, as needed site inspections, documentation review, and general consulting services. ICR 56 requires a Project Monitor perform a visual inspection at the completion of the asbestos abatement work to verify the completeness of the abatement and the cleanup. The Contractor shall cooperate fully with the Project Monitor(s) during the course of work. Failure to cooperate fully may lead to the issuance of a Stop Work Order. Any liquidated damages incurred as a result of any stop work order issued shall be the responsibility of the Contractor.

3.6 DISPOSAL OF ASBESTOS-CONTAINING MATERIAL AND RELATED DEBRIS

A. Transport the asbestos-containing waste and related debris to the approved disposal site. Comply with the standards referenced in Part 1 of this Section. All asbestos waste removed from the project site shall be transported directly to the disposal site without any additional waste being added to the container during transport.

B. The Contractor's Hauler and Disposal Site shall be approved by the Owner.

C. The Contractor shall give twenty-four (24) hour notification prior to removing any waste from the site. Waste shall be removed from the site only during normal working hours unless otherwise specified. Unless otherwise specified, no waste may be taken from the site unless the Contractor and Environmental Consultant are present, and the Environmental Consultant authorizes the release of the waste.

D. The Contractor and the Environmental Consultant shall inspect the material in the transport container prior to the waste transporter taking possession of the waste.

E. All waste generated as part of the asbestos project shall be removed from the site within ten (10) calendar days after successful completion of all asbestos abatement work.

3.7 RESTORATION

A. Remove temporary decontamination facilities and restore area designated for these facilities to its original condition or better.

END OF SECTION 028213

SECTION 028313 – WORKING WITH LEAD-CONTAINING MATERIALS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 specification sections, apply to this section.

B. ON MARCH 31, 2008 EPA ISSUED A RULE REQUIRING THE USE OF LEAD-SAFE PRACTICES AND OTHER ACTIONS AIMED AT PREVENTING LEAD POISONING. UNDER THE RULE, CALLED THE EPA'S LEAD-BASED PAINT RENOVATION, REPAIR AND PAINTING PROGRAM (LEAD-BASED PAINT RRP), BEGINNING IN APRIL 2010, CONTRACTORS PERFORMING RENOVATION, REPAIR AND PAINTING PROJECTS THAT DISTURB LEAD-BASED PAINT IN HOMES, CHILD CARE FACILITIES AND PRE-SCHOOLS BUILT BEFORE 1978 MUST BE CERTIFIED AND MUST FOLLOW SPECIFIC WORK PRACTICES TO PREVENT LEAD CONTAMINATION.

C. Child occupied facilities are defined by EPA as: Building or portion of building constructed prior to 1978, visited regularly by the same child, under the age of 6 years, on at least two days within any week (Sunday through Saturday period), provided that each day's visit lasts at least three hours and the combined weekly visits last 6 hours, and the combined annual visits last at least 60 hours. Child-occupied facilities may be located in public or commercial buildings or target housing.

1.2 RELATED CONTRACTORS

A. General Contractor will advise all other contractors, subcontractors and trades of the presence of Lead-Based Paint (LBP) and Lead-Containing Materials (LCM) and coordinate all work accordingly.

1.3 DESCRIPTION OF WORK

A. This section specifies the procedures for disturbance and/or removal of lead-based paint/coatings, lead-containing materials, and disposal of removed materials from Kittinger Hall located at the SUNY Erie Community College North Campus in Williamsville, New York as part of Kittinger Hall Boiler Room Upgrades project.

1.4 SCOPE OF WORK

Testing of representative surfaces has been performed for the presence of lead-based paint/coatings at the building included within the limits of the Kittinger Hall Boiler Room Upgrades project. All contractors are responsible for making themselves and their employees aware of the presence, location, and quantity of existing LBP/LCM, and to warn their employees of the potential dangers of disturbing lead-based paint. The requirements referenced in this specification shall apply to all disturbances of LBP/LCM.

A. All work under this contract shall be performed in strict conformance with applicable federal, state and local rules, laws and regulations.

B. The specifications are to be used in conjunction with the contract drawings for this project. A copy of each shall be maintained at the job site at all times.

C. Contractors shall verify all project conditions and material quantities prior to bidding the project. Material quantities listed in any documents provided by the Owner are approximations only and are NOT TO BE considered accurate for bidding purposes.

D. The contractor shall furnish all labor, materials, services, employee training, permits, insurance, and equipment for the disturbance and/or removal of LBP, LCM, and/or components covered with LBP.

E. General Notes:

1. All Lead removal and subsequent clean up activities shall be performed in accordance with these specifications and all applicable standards, codes and regulations as indicated in section 1.8.
2. Waste Disposal Requirements meeting EPA criteria shall be determined by sampling of a composite of the waste material for analysis by TCLP.
3. The contractor shall be responsible for performing TCLP sampling for waste stream classification, unless otherwise directed by the owner. The owner shall be responsible for retaining a third party environmental consultant to perform clearance inspections/sampling prior to re-occupancy in accordance with the NYS Education Department mandate of October 3, 1999.

F. The following materials have been identified to be covered with lead-based paint/coating within the project limits:

1. Yellow natural gas pipes in Mechanical Room 153.
2. Gray stairs stringer leading into Mechanical Room 153.
3. Gray steel handrail at the stairs leading into Mechanical Room 153.
4. White PVC membrane on the roof across the building (pigment imbedded in the roof membrane).
5. Red and black structural beams throughout the building.

Note: Furnishing of this information is not intended to relieve contractors of their responsibilities under OSHA to determine the lead-containing materials that their employees and subcontractors may be exposed to, and to warn their employees of the potential dangers of the disturbance of lead-containing materials.

G. For additional information regarding identified lead-containing materials, refer to prior test data/reports, which are available upon request.

1. Where any lead-containing materials are to be impacted by renovation plans, such activity shall generally take place as follows:

    a. Contractor shall place poly drop cloths on the floor under and around the affected component to collect any dust/chips/debris that may fall during removal operations. Contractor shall install barrier tape around area of removal to restrict access by unauthorized persons. The Contractor shall properly dispose of all removed material and contaminated poly sheeting following waste stream classification.

1.5 QUALITY ASSURANCE

A. Use latest edition, including all addenda, revisions and supplements for all regulatory agencies codes, etc., including but not limited to:

1. Environmental Protection Agency (EPA).
2. Occupational Safety and Health Administration.
3. State of New York codes and laws.
4. All local codes.
5. US-DOT 49 CFR.
6. Guidelines for the Evaluation and Control of Lead-based Paint Hazards in Housing (US Department of Housing and Urban Development).

1.6 QUALIFICATIONS

A. The following qualifications must be met by all prospective bidders:

1. All contractor personnel who will participate in activities that may generate airborne concentrations of lead shall have, at a minimum, such training as specified in OSHA 29 CFR 1926.62 (d). Prior to starting the activities that may generate airborne concentrations of lead, provide workers with blood lead testing in accordance with OSHA 29 CFR 1926.62(d).

1.7 REGULATIONS

A. All work under this contract shall be done in strict accordance with all applicable federal, state, and local regulations, standards, and codes governing lead disturbance and/or removal and any other trade work done in conjunction with this work.

B. The most recent edition of any relevant regulation, standard, document, or code shall be applicable to the work. Where conflict among the requirements or with these specifications exists, the most stringent requirements are applicable.

C. Copies of all standards, regulations, codes, and other applicable documents and subsequent amendments thereto, listed in this section and including this specification, shall be available at the work site.

1.8 SPECIFIC REQUIREMENTS

A. New York State Education Department (NYSED)

1. NYSED regulations governing lead abatement include, but are not limited to:

   a. Sections 101, 207, 409-d, 409-e, 3602 and 3641 of the Education Law
   b. Chapters 56 and 58 of the Laws of 1998.
   c. Section 155.1 of the Regulations of the Commissioner of Education amended, October 7, 1999.

B. Occupational Safety and Health Administration (OSHA)

1. OSHA regulations governing lead disturbance include, but are not limited to:

   a. Title 29 Section 1910.134, respiratory protection.
   b. Title 29 CFR Section 1910.20, access to employee exposure and medical records.
   c. Title 29 CFR Section 1910.1200, hazard communication.
   d. Title 29 CFR Section 1910.95, noise regulation.
   e. Title 29 CFR Part 1926.62, Lead Exposure in Construction; Interim Final Rule.

C. Environmental Protection Agency (EPA)

1. EPA regulations governing hazardous waste disposal include but not limited to:
2.

   a. 40 CFR Part 260, Definitions.
   b. 40 CFR Part 261, Section 3001: Identification and Listing of Hazardous Waste.
   c. 40 CFR Part 262, Section 3002: Standards Applicable to Generators of Hazardous Waste.
   d. 40 CFR Part 263, Section 3003: Standards Applicable to Transporters of Hazardous Waste.
   e. 40 CFR Part 264, Section 3004: Final Standards Applicable to Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities.
   f. 40 CFR Part 267, Temporary Standards for Land Disposal Facilities.
   g. 40 CFR Part 268, Land Disposal Restrictions.
   h. 40 CFR Part 270, 271 & 124, Section 3005: Permits for Treatment, Storage and Disposal of Hazardous Wastes.
   i. 40 CFR Part 745.

D. American National Standards Institute (ANSI)

1. ANSI standards governing lead abatement include, but are not limited to:

   a. Fundamentals governing the design and operation of local exhaust systems, Publication 29.2-79.

b. Practices for respiratory protection, Publication Z88.2-80.

E. Mine Safety and Health Administration (MSHA)

1. Certification of respirators as per 30 CFR Part 11.

F. National Institute for Occupational Safety and Health (NIOSH)

1. NIOSH regulations governing lead abatement include, but are not limited to:

a. Approval of respirators as per 30 CFR PART 11.

G. New York State Requirements

1. State regulations governing Hazardous Waste Disposal include, but are not limited to:

a. 6 NYCRR Part 371, Identification and Listing of Hazardous Wastes, December 25, 1988.
b. 6 NYCRR Part 373-2, Final Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage and Disposal Facilities, December 25, 1988.
c. 6 NYCRR Part 360, Solid Waste Management Facilities, Revised March 27, 1990.

H. Department of Transportation

1. 49 CFR Parts 171-179.

I. Department of Housing and Urban Development

1. Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing. June 1995.

J. Licenses

1. Maintain current licenses as required by applicable federal state or local jurisdictions for the removal, transportation, disposal, or other regulated activity relative to the work of this Contract.

K. New and Amended Regulations

1. Any and all new or amended federal, state, or local regulations becoming effective during this project and not listed are to be considered as part of this specification. Where copies of standards are needed for proper performance of the work, the Contractor is required to obtain such copies directly from the publication source. Although certain copies of standards needed for enforcement of the requirements may be required submittals, the owner's representative

reserves the right to require the Contractor to submit additional copies of these standards as necessary for enforcement of the requirements.

1.9 DEFINITIONS

A. Action Level: Employee exposure, without regard to respiratory protection, to an airborne concentration of lead of thirty (30) micrograms per cubic meter of air, as an 8-hour time weighted average, measured in the breathing zone as defined by 29 CFR 1926.62.

B. Hazardous Waste: Material, including contaminated material, which after testing by the Toxicity Characteristic Leaching Procedure (TCLP), the leachate contains any element in excess of the following:

Arsenic	5mg/l	Barium	100mg/l
Cadmium	1mg/l	Chromium	5mg/l
Lead	5mg/l	Mercury	0.2mg/l
Selenium	1mg/l	Silver	5mg/l

C. Lead-Based Paint: Paint under laboratory analysis that contains 0.5%, by weight or greater elemental lead. Paint analyzed by XRF that contains equal to or greater than 1.0 mg/cm^2.

D. Lead Work Area: That area where lead disturbance operations are performed which is isolated by physical boundaries that assist in the prevention of uncontrolled release of lead dust or debris.

E. Permissible Exposure Limit: Employee exposure, without regard to respiratory protection, to an airborne concentration of lead of fifty (50) micrograms per cubic meter of air, as an 8-hour time weighted average, measured in the breathing zone as defined by 29 CFR 1926.62.

F. Regulated Area: Area(s) where lead work is conducted as defined by 29 CFR 1926.62.

1.10 SUBMITTALS

NOTE: Submittals will not be considered acceptable for review unless they are submitted as a complete package including all specified information. All information shall be submitted in the order listed in this section. Include title pages to identify the information included in the distinct sections. If any of the specified information is not included, contractor shall include a page acknowledging the specified information, and an explanation as to why the information is not included. Pre-work submittals shall be submitted at least ten (10) business days prior to the commencement of work.

A. Pre-Construction: At least ten (10) business days prior to the commencement of activities that may generate airborne concentrations of lead, the Contractor shall provide all required submittals in accordance with the Contract Documents and provisions herein.

The Contractor shall not proceed with disturbance and/or removal method, materials and/or equipment prior to receipt of approval. Any disturbance and/or removal method, material and/or equipment used which are not in compliance with "approved" or "approved as noted" shall be at no cost to the Owner.

The Contractor shall provide copies of the following:

1. Lead-Containing Material Removal Work Plan: The work plan shall include, but not be limited to: the location, size, and details of lead dust control work areas, work procedures, types of equipment, and crew size.
2. OSHA Compliance Program in accordance with OSHA 29 CFR 1926.62(e)(2).
3. Transporter Permits: DEC permit and permit(s) as required by county(s) through which the lead contaminated waste and recycled material is transported to TSDF and/or recycling facility.
4. Disposal Site/Landfill Permit from applicable regulatory agency.

B. The following submittals, documentation, and postings shall be maintained onsite by the Contractor during abatement activities (Subject to owner/owner's representative request and approval):

1. Copies of training/certification records as required by the EPA's RRP rule.
2. Copies of written respiratory program.
3. Proof of current (within last 12 months) physical exam for use of a respirator and provide copy of qualitative fit test for all personnel.
4. Personal air monitoring records and test results as required by OSHA.
5. Safety Data Sheets for products being used on the project.

C. Following the completion of abatement activities, the Contractor shall submit the following Project Close-Out Documentation:

1. Contractor Supervisor's daily activity logs during all phases of the work including preparation, disturbance and/or removal and final cleaning.
2. Personnel paperwork for each Employee actually utilized on project including:

    a. Copy of valid respirator fit test issued within the twelve-month period preceding the conclusion of abatement.
    b. Proof of current (within last 12 months) physical examination indicating ability to safely don respiratory protection and respirator fit tests for all persons required to wear respirators

3. Personal Sampling Records and test results for the project.
4. Waste and recycled materials manifest(s) from TSDF and recycling facility representatives listing dates of delivery, quantity of material, confirmation of receipt in proper, undamaged containers and signature(s) by authorized designated representative(s) including signature of Owner or Owner's Representative.

PART 2 – PRODUCTS AND PROCEDURES

2.1 PRODUCTS

A. Polyethylene Sheeting

1. Polyethylene sheeting shall be at least 6 mil thickness, in widths selected to minimize joints.
2. Polyethylene sheeting utilized for worker decontamination enclosure shall be opaque white.
3. All polyethylene sheeting shall be fire retardant material.

B. Attachment Materials for Polyethylene: Method of attaching polyethylene sheeting shall be agreed upon in advance by the Contractor and Owner or Owner's Representatives and selected to minimize damage to equipment and surfaces. Method of attachment may include any combination of duct tape or other waterproof tape, furring strips, spray glue, staples, nails, screws, or other effective procedures capable of sealing adjacent sheets of polyethylene and capable of sealing polyethylene to dissimilar finished or unfinished surfaces under both wet and dry conditions (including the use of amended water).

C. Disposal Bags: As required, 6 mil polyethylene, pre-printed with labels as required by this specification shall contain the following information:

DANGER
CONTAINS LEAD DUST
AVOID CREATING DUST
OWNER

D. Disposal Drums: metal or fiberboard with locking ring tops, warning labels as required by OSHA, EPA and DOT.

E. Stick-On Labels: per OSHA Requirements.

F. Surfactant (Wetting Agent): 50/50 mixture of Polyoxyethylene Ether and Polyoxyethylene Ester, or equivalent, mixed in a proportion of 1 fluid ounce to 5 gallons of water or as specified by manufacturer. (An equivalent surfactant shall be understood to mean a material with a surface tension of 29 dynes/cm as tested in its properly mixed concentration, using ASTM Method D1331-56 "Surface and Interfacial Tension of Solutions of Surface Active Agents"). Where work area temperature may cause freezing of the amended water solution, the addition of Ethylene Glycol in amounts sufficient to prevent freezing is permitted.

G. Encapsulating Agent: provide an encapsulant specifically designed for application to lead based paint. All materials used shall have a flame spread of less than 25 when dry (when tested in accordance with ASTM-84).

Note: Contractor shall obtain Owner/Owner's Representatives Owner's permission prior to using spray adhesives on building surfaces.

2.2 GENERAL EQUIPMENT

A. A sufficient supply of disposable mops, rags, and sponges for work area cleaning shall be available.

B. A sufficient supply of scaffolding, ladders, lifts, and hand tools, (e.g., scrapers, wire cutters, brushes, utility knives, wire saws, tarps etc.) shall be provided as needed.

C. Low pressure or airless sprayers.

D. Rubber dustpans and rubber squeegees.

E. Brushes utilized for removing loose lead based paint shall have nylon or fiber bristles, not metal.

F. HEPA filtered vacuum cleaners with attachments.

2.3 PERSONNEL PROTECTION

A. Regulatory requirements - Section 1.8

B. Personnel protection procedures - Sections 2.4, 2.5, 2.6, & 2.7

2.4 RESPIRATORY PROTECTION EQUIPMENT

A. Respirators shall be provided to ensure that the workers are not exposed to lead in air concentrations above the PEL of 50 micrograms/cubic meter. Respirators must be worn in accordance with tasks described in 29 CFR part 1926.62, Lead Exposure in Construction; Interim Final Rule. The rules set forth in 29 CFR 1910.134 and 29 CFR 1926.62 shall govern selection, training and use of respiratory protection.

2.5 PROTECTIVE CLOTHING

A. A sufficient supply of disposable or cloth protective coveralls with full sleeves and full legs shall be supplied by the contractor to all employees, as required by 29 CFR 1926.62(g).

B. Additional safety equipment (e.g., hard hats meeting the requirements of ANSI Standard Z89.1-1981, eye protection meeting the requirements of ANSI Standard Z87.1-1979, safety shoes meeting the requirements of ANSI Standard Z41.1-1967, disposable PVC gloves or other work gloves), as necessary, shall be provided to all workers and authorized visitors.

2.6 TRAINING

A. All employees shall have completed, at a minimum, training in accordance with 29 CFR 1926.62.

2.7 MEDICAL SURVEILLANCE

A. Medical surveillance must be provided by the contractor to any employee or agent working on this project in accordance with 29CFR Part 1926 (Lead Exposure in Construction). No worker or supervisor will be allowed to work on this project while blood lead levels are over 30 micrograms / deciliter.

2.8 PERSONAL AIR MONITORING

A. Contractor will be responsible for personal air monitoring of workers, and results given to the Owners Representative for review within 24 hours of sampling.

2.9 ENVIRONMENTAL TESTING

A. The Owner shall be responsible for engaging the services of a third party environmental consultant to conduct any/all necessary clearance wipe sampling. Clearance wipe sampling is required by NYSED for areas where LBP disturbances take place prior to re-occupancy by school district personnel or students. Testing services will be performed under a separate third party contract with the Owner's Representative. According to HUD standards, clearance wipe samples are considered satisfactory when the results are less than 40 micrograms per square foot on floors, 250 micrograms per square foot on interior window sills, and 400 micrograms per square foot on the window troughs.

PART 3 – EXECUTION

3.1 GENERAL

Conduct all lead-based paint disturbance and related work in accordance with the provisions of all applicable standards, codes and regulations.

A. Cordon off entire work area with danger tape or fences to prevent entry of unprotected persons. Always provide a means of ingress/egress for building occupants.

B. Establish emergency and fire exits from the work area as part of the written emergency action plan.

3.2 PREPARATION - WORK AREAS

A. Cordon off work area with contractor fencing or warning tape.

B. A curtain consisting of three interlocking sheets, constructed of 6-mil poly sheeting shall be constructed at entrance to work area. A drop cloth (single layer of 6-mil poly sheeting) shall be placed under and/or around the component that is being removed or disturbed.

C. Access to the work area shall be through a restricted entrance area only.

D. Signs: Caution signs, per 29 CFR 1926.62(m), shall be posted at all locations and approaches to a location where airborne concentrations of lead dust may exceed ambient background levels. Signs shall be conspicuously posted that allow a person to read the sign and take the necessary protective measures to avoid potential exposure.

E. Utilities: The Owner will provide electrical and water utilities. The Contractor shall provide a sufficient supply of power cords and ground fault circuit interrupters. The contractor shall be responsible for making connections to the electric and water supply. Only certified electricians and plumbers shall conduct electrical and plumbing work.

F. Exits: Emergency and fire exits from the work area shall be maintained or alternate exits shall be established according to all applicable codes.

G. Contractors shall utilize engineering controls such as negative pressure ventilation equipment, wet methods, chemical peels and HEPA vacuums and equipment to minimize airborne dust levels.

H. At a minimum, the following work practices shall be followed for removing intact building/mechanical components (doors, doors frames, corkboards, trim, radiators, pipes etc.)

1. Contractor shall install barrier tape and warning signs to restrict access by unauthorized personnel.
2. A drop cloth of 6-mil plastic sheeting shall be placed under and around the component to be removed.
3. Collect any paint chips, dust, or debris that results from removing the building component.
4. All horizontal surfaces in the areas where the components have been removed shall be cleaned, prior to wipe samples being collected.

I. At a minimum, the following work practices shall be followed for the removal/stripping of paint from structural steel.

1. Barrier tape and warning signs shall be placed around the work area to restrict access by unauthorized personnel.
2. In areas where paint will be removed from the structural steel, 6-mil plastic sheeting shall be installed to protect horizontal surfaces within the restricted work area, as well as adjacent areas, as appropriate.
3. HEPA-filtered negative pressure ventilation equipment shall be installed and operated within the work area(s) to help control airborne dust levels for the work area.
4. All surfaces in the work area(s) where the paint/components have been removed shall be cleaned, prior to inspection by the third party environmental consultant.

3.3 ADVERSE WEATHER CONDITIONS

A. Work shall not take place during periods when precipitation is likely unless provisions are made to keep rainwater from mixing with lead contaminated dust and debris. Any

accumulations of water in the work area shall be cleaned immediately and disposed of in accordance with all applicable state and federal regulations.

B. Exterior work shall not take place during periods when high wind is likely to cause dispersal of dust and debris. Halt work procedures if wind is greater than or equal to 15 MPH.

3.4 FINAL CLEAN-UP

A. Remove visible accumulations of materials and debris. HEPA vacuum all surfaces within the work area and within worker/equipment decontamination enclosure system, wet clean, then HEPA vacuum again. Sealed drums, bags, and all equipment used in the work area shall be included in the clean up and shall be removed from work area.

B. Frequency for Cleaning of Dust. Accumulations of dust shall be cleaned off all surfaces on a daily basis using HEPA vacuum and/or wet cleaning methods. Removal work shall stop in time to thoroughly clean work area at the end of each shift.

C. Contractor shall clean all surfaces with wet method wiping and HEPA-filtered vacuum equipment; this will include the cleaning of Contractor's equipment, after cleaning the work area.

D. A visual inspection shall be performed by the Owner’s Environmental Consultant under conditions of adequate lighting provided by the contractor. The work area shall be free of visible debris.

3.5 QUALITY ASSURANCE

A. The owner's representative and/or environmental consultant shall inspect work areas subject to this specification. The contractor will bring into compliance any unsatisfactory conditions as noted within 24 hours of such notice. The contract will be complete only when all conditions of this specification have been met to the satisfaction of the project Owner, and Owner’s Representative.

3.6 ON-SITE STORAGE OF DEBRIS

A. All on site storage of hazardous waste/materials shall conform to the applicable regulations of all Federal, State and local agencies having jurisdiction in such matters, in addition to the other provisions of this document.

B. All debris shall be stored in a secured, locked staging area.

C. Debris shall not be stored in any building at the site.

D. Non-hazardous debris (construction demolition) shall be stored in dumpsters and removed on a weekly basis or more often, unless otherwise specified in writing by the Owner or Owner’s representative.

E. The placement of all dumpsters, trailers, or other storage shall be done with the Owner or Owner's representative's approval. Waste trailer/dumpster locations may be remote from the work area.

F. Conditions caused by the storage of such materials affecting the health and safety of the public including but not limited to fire, dust or vermin, shall be grounds to require the Contractor to remove, relocate, or take other control measures to correct the condition at the Contractor's expense.

3.7 DISPOSAL OF NON-HAZARDOUS WASTE

A. All disposal of waste shall conform to the regulations of all Federal, State and local agencies having jurisdiction.

B. The contractor shall submit to the owner proof of proper disposal consisting of dump tickets from an approved landfill. Proof of proper disposal must be submitted prior to project close-out.

C. Non-hazardous waste shall be disposed of by the contractor at the contractor's expense.

D. Testing of lead-based paint debris, not inclusive of construction and demolition debris as defined by EPA, will be tested by TCLP for waste characterization by the contractor, unless otherwise directed by the owner.

3.8 HAZARDOUS WASTE – LEAD

A. Hazardous Wastes/Lead Waste - Liquid:

1. No water or solvents shall be discharged into any waterway, sewer or on the ground.
2. All liquid waste shall be disposed of by the contractor at the contractor's expense. The contractor shall be responsible for the temporary storage and disposal of all liquid waste. Testing of waste for characterization shall be conducted by the contractor, unless otherwise directed by the owner.
3. The contractor shall submit to the owner proof of proper disposal consisting of, waste hauler license and permit, trailer numbers for all vehicles and trailers used for transport, signed waste manifest and bills of lading for all shipments and from approved and licensed TSD facility. Proof of proper disposal must be submitted on an ongoing basis, within 20 days if disposal site is located within NYS, 45 days if outside NYS, and prior to or at the same time as applications for payment. The contractor will not be paid until proof of proper disposal is submitted.

B. Hazardous Wastes/Lead Waste - Solids:

1. The contractor shall supply a suitable container(s) for the storage of lead waste.
2. The contractor shall be responsible for lining waste containers with two layers of 6-mil polyethylene sheeting. The contractor will keep the waste containers

locked and secured at all times. The contractor shall be responsible for packaging and labeling of all lead waste.

3. The contractor shall test the waste by TCLP for waste stream classification, unless otherwise directed by the owner. All hazardous waste shall be disposed of at the contractor's expense, and disposal shall be as required by federal, state and local laws and/or regulations the waste characteristics as per the TCLP analysis.
4. The contractor shall submit to the owner proof of proper disposal consisting of, waste hauler license and permit, trailer numbers for all vehicles and trailers used for transport, signed waste manifest and bills of lading for all shipments from approved and licensed TSD facility. Proof of proper disposal must be submitted on an ongoing basis, within 20 days if disposal site is located within NYS, 45 days if outside NYS, and prior to or at the same time as applications for payment. Contractor will not be paid until proof of proper disposal is submitted.

3.9 CONTAINER LABELING REQUIREMENTS

A. These requirements shall be enforced whenever hazardous materials or hazardous wastes shall be transported from or to the job site.

B. Hazardous Wastes:

1. Closure Date: All containers shall be marked within 48 hours of being filled and sealed.
2. Labels: Such labels shall be either stenciled/painted on container or on preprinted "bumper sticker" materials. Date may be filled in neatly by hand with either weather/wear resistant paint stick or other indelible marker.
3. Shipping Address: All containers shall be marked with the proper shipping address of the consignee and the shipper's address.
4. DOT Classification: Where required by Federal regulations, DOT, containers shall carry a proper DOT classification diamond (4" x 4") and proper UN#. Where required by law, any trucks used to transport materials shall be properly placarded as to hazard classification.

END OF SECTION 028313

SUNY ERIE COMMUNITY COLLEGE NORTH CAMPUS
KITTINGER HALL BOILER ROOM UPGRADES
DIVISION 02

APPENDIX A: HAZARDOUS MATERIALS REPORT: ACM

PRE-RENOVATION SURVEY

FOR

ASBESTOS-CONTAINING MATERIALS, LEAD-BASED PAINT, POLYCHLORINATED BIPHENYLS IN CAULK/SEALANTS, UNIVERSAL WASTE AND MISCELLANEOUS HAZARDOUS MATERIALS

FOR THE

KITTINGER HALL
BOILER ROOM UPGRADES PROJECT

AT

ERIE COUNTY COMMUNITY COLLEGE NORTH CAMPUS
6205 MAIN STREET, WILLIAMSVILLE, NEW YORK



JULY 2026

PREPARED FOR

IBC Engineering, P.C.
3445 Winton Place, Suite 219
Rochester, NY

FOR SUBMISSION TO

Erie County Department of Public Works
Rath Building
95 Franklin Street
Buffalo, NY

Watts Architects &Engineers
BUFFALO / ROCHESTER / SYRACUSE / NEW YORK

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1.0 – EXECUTIVE SUMMARY

1.0 EXECUTIVE SUMMARY

Watts Architects & Engineers (Watts) was retained by IBC Engineering, P.C. (IBC), to perform a pre-renovation survey for asbestos-containing materials (ACM), lead-based paint (LBP), polychlorinated biphenyls (PCBs) in caulks/sealants and universal/hazardous wastes for the mechanical upgrades at Kittinger Hall (K Building) at the Erie County Community College North campus (ECC) located at 6205 Main Street, Williamsville, New York.

The purpose of the survey was to determine the presence, location and quantity of ACM and PCBs in caulks that may be disturbed during the upcoming renovation project to supplement the previous testing that had been performed. This report addresses all suspect materials within the scope of work.

Per records provided by The Erie County Department of Public Works (DPW) Kittinger Hall (K Building) was built in approximately 1968.

The proposed renovations and limits of disturbance were based on existing plans and discussions with IBC Engineering personnel. The project work will occur mainly in the Boiler Room and will include replacement of boilers, flues and associated piping as well as moving electrical equipment to accommodate the installation of new equipment. A new door will also need to be installed in the exterior wall. Watts investigated areas where work is proposed to be performed on August 6, 2025.

Collected samples were submitted with the chain-of-custody form to AmeriSci Richmond (ELAP No. 10984 and NVLAP No. 101904-0) for asbestos analysis. Copies of Watts' NYSDOL Asbestos, Lead and Mold licenses, employee certifications and laboratory certifications are provided in the appendices to this report.

Field survey work for this project included the following:

- A review of the project scope based on information provided by IBC Engineering and Erie County DPW personnel;
- A review of previous regulated building materials testing and survey reports. Summaries and laboratory data from the prior reports are attached to this report. Available reports include the following:
    - Asbestos, PCB and Lead Based Inspection Report issued by Sienna Environmental Technologies and dated September 2015 prepared for BHNT Architects, PC for the campus wide masonry restoration project.
    - Pre-Renovation Asbestos-Containing Materials, Lead-Based Paint, and Exterior PCB-Containing Materials Inspection Report Toilet Renovations prepared by Sienna Environmental Technologies for Kideney Architects, dated September 1, 2020.
    - Pre-Renovation Environmental Survey for Asbestos-Containing Materials, Lead-Based Paint, Polychlorinated Biphenyls In Caulk/Sealants for the SUNY Erie North

Campus Window and Door Replacement at Kittinger Hall prepared by Watts Architects and Engineers, dated October 2020.

- Pre-Renovation Survey for Asbestos-Containing Materials, Lead-Based Paint, Polychlorinated Biphenyls In Caulk/Sealants,, Universal Waste and Miscellaneous Hazardous Materials For The Kittinger Hall Interior Renovations Project – Revision 1, prepared by Watts Architects and Engineers, dated September 2024.
- Pre-Renovation Asbestos-Containing Materials, Lead-Based Paint and Exterior PCB-Containing Materials Inspection Report, SUNY Erie Community College North Campus, Kittinger Hall Roof Replacement prepared by Encorus Group and dated August 15, 2025.

- Visual site inspections to identify suspect ACM, PCBs and LBP that were identified to be within the project limits;
- Collection and laboratory analysis of bulk samples for asbestos from materials that may be disturbed by the project and which were not previously sampled;
- Utilization of a portable XRF analyzer to test building components within project limits for the presence of LBP;
- Documentation of sample locations on drawings and chain-of-custody forms; and
- Photographs.

ASBESTOS-CONTAINING MATERIALS (ACM)

Watts' onsite activities included the collection and analysis of thirteen (13) bulk samples of materials not previously evaluated within the Kittinger Hall (K Building) project limits and to represent the identified suspect ACM. A material is considered to be ACM if it contains greater than 1% of asbestos.

Based on site observations and laboratory analysis of the samples collected as a part of this investigation and past surveys, the following ACMs were identified within the K Building project limits:

- **Tape style pipe insulation wrap** on domestic water line in Mechanical Room K153. The asbestos-containing wrap is a non-friable material and is in poor condition. There is approximately 10 linear feet of the material in the space. It is unknown at this time if the project scope will require removal of this material.
- ***9" x 9" floor tiles and associated mastic.*** Prior testing reports noted that both 9" x 9" floor tiles and the associated mastic are asbestos-containing. The floor tiles were observed to be in fair to good condition. Classroom K253 has been renovated, and two layers of non-ACM flooring have been installed on top of the asbestos-containing floor tile and mastic. New vertical penetrations for the boiler exhaust will likely disturb the ACM floor tile and mastic in K253 space. Approximately 15 square feet of flooring is anticipated to be disturbed in Room K253.

- ***Mud fitting insulation*** on pipes throughout the basement/crawl spaces. Asbestos-containing mud fitting insulation was observed in the basement crawl spaces throughout K Building. No work is planned in the basement/crawlspace within the current project limits, therefore, no mud fitting insulation is anticipated to be disturbed by the project.
- ***Hot water holding tank adhesive/sealant*** in Mechanical Room K153. The ACM adhesive/sealant was observed adhering the non-ACM gray jacket onto the non-ACM green foam insulation on the hot water holding tank. The tank is approximately 8 feet tall and 38 inches in diameter, with a surface area of approximately 100 square feet.

NON-ASBESTOS-CONTAINING MATERIALS (NON-ACM)

The following materials within the Kittinger Hall project limits were sampled by Watts' personnel as part of this investigation or prior investigations and were determined to be non-ACM:

- Boiler seam rope gasket material
- *Green foam insulation on the hot water holding tank (the adhesive for the jacket on the foam insulation was determined to be asbestos-containing).*
- *Mud insulation on the tan hot water pipe fittings in Mechanical Room K153.*
- *Tan paper jacket with black tar dabs and foil on fiberglass insulation on water lines in Mechanical Room K153.*
- *Gaskets in hot water lines in Mechanical Room K153.*
- *Gray jacket and foil on hot water supply and return lines fiberglass insulation in Mechanical Room K153.*
- *Mud insulation on overhead hot water supply and return lines in Mechanical Room K153.*
- *White end sealant on fiberglass insulation on the hot water piping in Mechanical Room K153.*
- *White fibrous insulation behind the sheet metal jacket on the small boiler in Mechanical Room K153.*
- *Yellow fibrous insulation behind the sheet metal jacket on the large boiler in Mechanical Room K153.*
- *White paper and foil on fiberglass insulation on new-style piping at the large boiler in Mechanical Room K153.*
- *Gaskets on piping connected to the large boiler in Mechanical Room K153.*
- *Gaskets in valves and pumps above the large boiler in Mechanical Room K153.*
- *Wood laminate flooring and associated mastic on top of asbestos-containing 9" x 9" floor tiles.*
- *18" x 18" gray floor tiles on top of asbestos-containing 9" x 9" floor tiles*
- *Tan adhesive beneath 18" gray floor tiles and on top of asbestos-containing 9" x 9" floor tiles.*
- *2' x 4' suspended ceiling tiles pinhole and small fissure pattern.*
- *2' x 2' suspended ceiling tiles small round holes pattern.*
- *2' x 2' suspended ceiling tiles pinhole and small slot pattern.*
- *12" x 12" light green floor tiles on concrete.*

- *12" x 12" light green floor tiles on concrete.*
- *Caulk on the exterior louvers on the building exterior from the unit ventilators.*
- *½" thick black tar and fabric vapor barrier beneath polyisocyanurate insulation on the roof deck.*
- *Soft concrete beneath the non-ACM black tar and fabric vapor barrier on the roof deck.*
- *Black tar sealant along the edges of silver foil jackets on foam insulation to ducts and on roof top air conditioning and air handling units.*
- *Gypsum board and drywall backer.*
- *Joint compound.*
- *Smooth plaster ceiling skim and base coats*

Italics indicates material was sampled as a part of a prior survey

TRACE ASBESTOS MATERIALS

All contractors shall note the following material had detectable levels of asbestos present, but was found to be less than or equal to 1.0% asbestos. Therefore this material is classified as non-ACM:

- Gray jacket on the hot water holding tank in Mechanical Room K153 (the adhesive/sealant for the jacket was determined to be ACM).

All Contractors shall be aware of and follow the applicable OSHA requirements for handling materials that contain trace asbestos less than 1%. Contractors must be in full compliance with 29 CFR 1926.1101 when handling these materials. Workers shall have appropriate asbestos awareness training. Trace asbestos materials shall be removed using wet methods to the extent feasible. Workers shall contain any removed material, establish ground projection and promptly clean up any loose debris for proper disposal.

LEAD-BASED PAINT SUMMARY

Watts AE personnel conducted a field survey for lead-based paint within the K Building using a portable X-Ray Fluorescence Analyzer (XRF). The XRF field survey was conducted to evaluate the presence of lead-based paint (LBP) on building surfaces that may be impacted by the mechanical upgrades project limits. Representative XRF readings were taken on select components that are anticipated to be disturbed by the proposed project.

The LBP survey was performed using the Department of Housing and Urban Development (HUD) protocol. HUD defines LBP, when analyzed by a portable XRF, as paint that contains lead at 1.0 milligram per square centimeter (1.0 mg/cm^2) or greater.

Based on the prior report and representative XRF readings taken on select building components throughout the project limits, **the following surfaces were determined to be coated with lead-based paint (greater than or equal to 1.0 mg/cm^2):**

- Yellow natural gas pipes in Mechanical Room 153.
- Gray stairs stringer leading into Mechanical Room 153.
- Gray steel handrail at the stairs leading into Mechanical Room 153.

- White PVC membrane on the roof across the building (this may be removed by the roof replacement project prior to construction).
- Red and black structural beams throughout the building.

POLYCHLORINATED BIPHENYLS (PCBs)

Watts investigated caulks and sealants within the K Building mechanical upgrades project limits to determine if polychlorinated biphenyls (PCBs) were present in these materials. Suspect materials were identified by Watts based on visual observations made at the time of the site visit. Analysis of laboratory reports from prior projects were reviewed to determine if caulk or sealants contained PCBs and subsequent proper handling and disposal procedures to be followed.

The Environmental Protection Agency (EPA) regulates PCBs and considers any debris generated from construction materials manufactured with PCBs derived from building renovation projects with a concentration of equal to or greater than 50 parts per million (ppm) "PCB bulk product waste". The Toxic Substances Control Act (TSCA) regulations (40 CFR Part 761) prescribes requirements for the proper management of PCB materials, including their handling and disposal. PCB bulk product waste at concentrations $\geq$50 ppm must follow specific storage, transport and disposal requirements.

Summary Laboratory Analysis for PCBs

In accordance with the Toxic Substances Control Act (TSCA) regulations (40 CFR Part 761, the U.S. EPA Environmental Protection Agency (EPA) regulated and prescribes requirements for the proper management of PCB materials, including their handling and disposal. PCB bulk product waste at concentrations greater than or equal to 50 parts per million (50 ppm or 50,000 µg/kg) are defined as "PCB bulk project waste" and must follow specific storage transport and disposal requirements).

All caulks/sealants which may fall within the project limits including window, louver and expansion seam caulks were sampled as a part of prior projects and determined to have **no detectible levels of PCBs**. The analytical reports can be found in Section 4.2 of this report.

UNIVERSAL WASTE AND MISCELLANEOUS HAZARDOUS MATERIALS

Watts conducted an evaluation of universal wastes and miscellaneous hazardous materials that may be disturbed by the Building K mechanical upgrades project. Light components within the project limits are proposed to be replaced as part of the renovation.

Suspended fluorescent light fixtures were observed in Mechanical Room K153. A total of five (5) dual fluorescent fixtures each with two 4-foot mercury-containing bulbs and one ballast were observed. The ballasts for the fluorescent light fixtures appear to be old and are not marked "no-PCBs", therefore they are likely to have PCB oil filled capacitors. A total of ten (10) 4-foot mercury containing bulbs and five (5) ballasts were observed in the mechanical room.

A 500 KVA Square D Power Dry II dry type transformer was observed in Mechanical Room

K153. This type of transformer does not contain di-electric fluid and is not a PCB-containing item. A Mini Break Interrupter Switch with large fuses was observed adjacent to the 500 KVA dry type transformer in Mechanical Room K153. A bank of Square D breakers was also observed in the mechanical room adjacent to the 500 KVA transformer. No suspect ACM panels or materials were observed at the breakers.

The boilers and associated components have gauges which appear to be mercury-containing. As a part of the demolition, these gauges should be disposed of properly under the universal waste rule.

OBSERVATIONS AND COMMENTS

Pipe insulation, mud fittings and jackets associated with mechanical systems within Boiler Room K153 have been sampled and are non-ACM. Mud fitting insulation within some areas of the crawlspace are asbestos-containing, however these areas do not fall within the project limits.

The roofing materials and vapor barrier on the concrete deck at the K Building have been determined to be non-ACM. A soft layer of concrete beneath the non-ACM tar vapor barrier on the hard concrete deck was also determined to be non-ACM.

Included in this report are the following: drawings indicating approximate bulk sample locations, chain-of-custody forms, laboratory results, laboratory accreditations, and consultant's license and certification.

It is the belief of Watts that this testing includes the hazardous materials present within the project limits. However, if additional suspect materials are identified during the project that have not been sampled, it is recommended that samples of each material be collected and analyzed for asbestos, lead-based paint or PCB content as appropriate.

2.0 – ASBESTOS-CONTAINING MATERIALS (ACM)

2.0 ASBESTOS-CONTAINING MATERIALS

Sampling and Laboratory Methodology

A NYSDOL-certified asbestos inspector from Watts collected bulk samples of all suspect ACM that was identified to be associated within the project limits. Bulk samples were collected using simple hand tools from each matrix identified as a potential ACM.

Samples collected were delivered with the proper chain-of-custody forms to AmeriSci Richmond located in Midlothian, VA, a participant in the Environmental Laboratory Approval Program (ELAP) and National Voluntary Laboratory Approval Program (NVLAP). All materials, except cellulose ceiling tiles and non-friable organically bound (NOB) materials, were analyzed using Polarized Light Microscopy (PLM) using Method 198.1. Cellulose ceiling tiles and NOBs, which include, but are not limited to, flooring materials, mastics, and caulks underwent gravimetric reduction and were analyzed by Polarized Light Microscopy (PLM) Method 198.6. Any cellulose ceiling tiles or NOB materials that were found to be negative under PLM were then analyzed by Transmission Electron Microscopy (TEM) Method 198.4. The New York State Department of Health (NYSDOH) protocol requires analysis by TEM if the PLM analysis does not confirm the presence of asbestos. Samples of spray-on fireproofing were also examined optically during analysis for the presence of vermiculite.

This section includes information on all suspect ACM sampled. This section contains the following: a Homogeneous Materials List containing the homogeneous materials identified, their corresponding sample numbers, and whether or not they are ACM, as well as drawings identifying the approximate locations of asbestos bulk samples.

Where possible, Watts visually inspected the identified ACM to assess its condition. The condition of the ACM was classified as good, fair or poor. The requirement for each designation is as follows:

Good: Material with no visible damage or deterioration or showing very limited damage or deterioration.

Fair: The surface of the material is crumbling, blistering, water-stained, gouged, punctured or otherwise damaged with the damage covering less than one tenth of the surface if the damage is evenly distributed or up to 25% of the material if the damage is localized.

Poor: The surface of the material is crumbling, blistering, water-stained, gouged, punctured or otherwise damaged with the damage covering more than one tenth of the surface if the damage is evenly distributed or more than 25% of the material if the damage is localized. Material with large areas hanging from the substrate, delaminated, heavily gouged, crushed, etc.

TABLE 2.1
HOMOGENEOUS MATERIALS LIST
KITTINGER HALL MECHANICAL UPGRADES PROJECT
ERIE COUNTY COMMUNITY COLLEGE NORTH CAMPUS
6205 MAIN STREET, WILLIAMSVILLE, NY

Homogeneous Area (HA)	Material Description	Sample Location	Type	Sample Number	Results (% Asbestos)			ACM (Y/N)
					Friable PLM ELAP 198.1	NOB PLM ELAP 198.6	NOB TEM ELAP 198.4	
1	Textured Plaster Skim Coat	Mechanical Room K153 Ceiling	S	250347-01 250347-02 250347-03	NAD NAD NAD	NA NA NA	NA NA NA	N
2	Textured Plaster Base Coat	Mechanical Room K153 Ceiling	S	250347-04 250347-05 250347-06	NAD NAD NAD	NA NA NA	NA NA NA	N
3	Mud Fitting Insulation	Mechanical Room K153 Adjacent to Hot Water Tank Mechanical Room K153 Behind Compressor Mechanical Room K153 Between Switchgear and Electrical Panels	T	250347-07 250347-08 250347-09	NAD NAD NAD	NA NA NA	NA NA NA	N
4	Boiler Rope Gasket Material	Exposed Boiler Seam	M	250347-10 250347-11	NAD NAD	NA NA	NA NA	N
5	**Tape Style Insulation Wrap on Domestic Water Pipe**	**North Wall of Mechanical Room K153**	**M**	**250347-12** **250347-13**	**NA** **NA**	**0.8% Chrysotile** **0.6% Chrysotile**	**1.9% Chrysotile** **NA/PS**	**Y**

See next page for abbreviations.

Abbreviations:

NA – Not analyzed
NAD – No asbestos detected
HM - Homogeneous Area Material Number
ACM – Asbestos Containing Material greater than 1% asbestos
Trace – Less than 1% asbestos
PLM – Polarized Light Microscopy
Friable – Able to be easily pulverized by hand pressure

Type

T = Thermal System Insulation
S = Surfacing
M = Miscellaneous

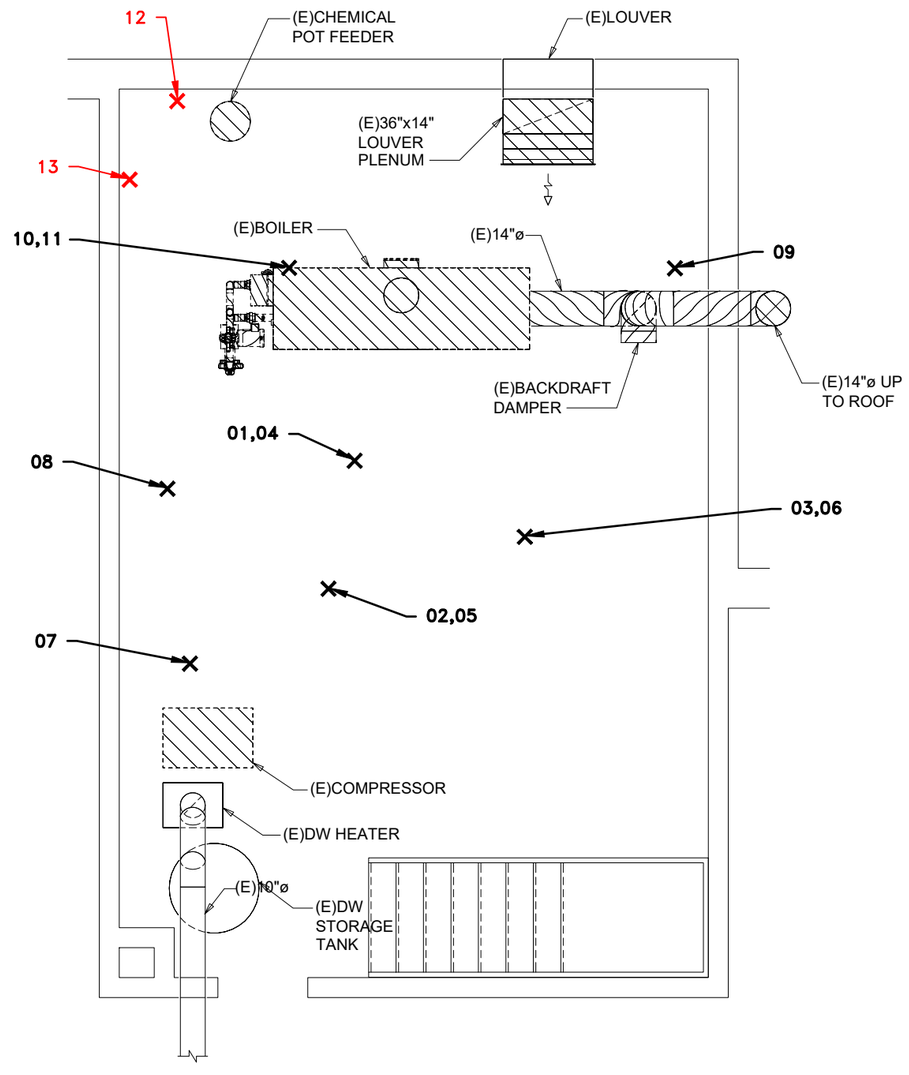
ACM

Y = Yes
N = No

TEM – Transmission Electron Microscopy
NOB – Non Friable Organically Bound

Bold rows identify asbestos-containing materials

2.1 – BULK SAMPLE LOCATION DRAWING



BOILER ROOM PLAN

ALL SAMPLES ARE PREFIXED BY **250347–**

SAMPLES WERE COLLECTED ON AUGUST 6, 2025.

✕ INDICATES APPROXIMATE SAMPLE LOCATION

✕ SAMPLE NUMBERS IN RED WERE IDENTIFIED TO BE ACM.

ASBESTOS BULK SAMPLE LOCATIONS
KITTINGER HALL
BOILER ROOM PLAN

Watts Architects & Engineers
95 Perry Street, Suite 300
Buffalo, NY 14203

SUNY ERIE COMMUNITY COLLEGE
NORTH CAMPUS
6205 MAIN STREET
WILLIAMSVILLE, NY 14221

NOT TO SCALE | MARCH 2026

R:\2025\20250347 ECC K-Building Boile\18. CADD\Env\20250347_SL.dwg Mar 11, 2026, 3:18pm

2.2 – PHOTOGRAPHS



Photo 1 – View of water tank with asbestos-containing adhesive between the insulation and tank.



Photo 2 – View of asbestos-containing floor tile and mastic beneath newer flooring in Room K253.



Photo 3 – View of the exterior of Kittinger Hall in the proposed location of the boiler room access door. It was confirmed that no moisture barrier or through-wall flashings were incorporated into the façade of the building.



Photo 4 – View of the asbestos-containing tape style pipe wrap on a domestic line in Mechanical Room K153.

2.3 – LABORATORY REPORT & CHAIN-OF-CUSTODY FORMS

AmeriSci Richmond
13635 GENITO ROAD
MIDLOTHIAN, VIRGINIA 23112
TEL: (804) 763-1200 • FAX: (804) 763-0493

PLM Bulk Asbestos Report

Watts Architecture & Engineers
Attn: Mark Beyer
95 Perry Street
Suite 300
Buffalo, NY 14203

Date Received 8/8/2025 **AmeriSci Job #** 125081398
Date Examined 08/14/25 **P.O. #**
ELAP # 10984 **Page** 1 **of** 3
RE: 20250347; ECC Kittinger Boiler Replacement; ECC North Campus - Kittinger Hall

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos	Notes
250347-01 1	125081398-01	***No***	NAD (by NYS ELAP 198.1) by David W. Ralbovsky on 08/14/25	
Location: Textured Plaster Skim Coat; Boiler Room Ceiling **Analyst Description:** Off-White/Gray, Heterogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 95%, Perlite 5.0%				
250347-02 1	125081398-02	***No***	NAD (by NYS ELAP 198.1) by David W. Ralbovsky on 08/14/25	
Location: Textured Plaster Skim Coat; Boiler Room Ceiling **Analyst Description:** Off-White/Gray, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose Trace, Non-fibrous 95%, Perlite 5.0%				
250347-03 1	125081398-03	***No***	NAD (by NYS ELAP 198.1) by David W. Ralbovsky on 08/14/25	
Location: Textured Plaster Skim Coat; Boiler Room Ceiling **Analyst Description:** Off-White/Gray, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose Trace, Non-fibrous 95%, Perlite 5.0%				
250347-04 2	125081398-04	***No***	NAD (by NYS ELAP 198.1) by David W. Ralbovsky on 08/14/25	
Location: Plaster Base Coat; Boiler Room Ceiling **Analyst Description:** Gray, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 95%, Perlite 5.0%				
250347-05 2	125081398-05	***No***	NAD (by NYS ELAP 198.1) by David W. Ralbovsky on 08/14/25	
Location: Plaster Base Coat; Boiler Room Ceiling **Analyst Description:** Gray, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 95%, Perlite 5.0%				
250347-06 2	125081398-06	***No***	NAD (by NYS ELAP 198.1) by David W. Ralbovsky on 08/14/25	
Location: Plaster Base Coat; Boiler Room Ceiling **Analyst Description:** Gray, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 95%, Perlite 5.0%				

See Reporting notes on last page

PLM Bulk Asbestos Report

20250347; ECC Kittinger Boiler Replacement; ECC North Campus - Kittinger Hall

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos	Notes
250347-07 3	125081398-07	***No***	NAD (by NYS ELAP 198.1) by David W. Ralbovsky on 08/14/25	

Location: Mud Fitting Insulation; Adjacent To Hot Water Tank (FG Insul With Tan Jacket)
Analyst Description: Gray, Heterogeneous, Non-Fibrous, Bulk Material
Asbestos Types:
Other Material: Cellulose Trace, Fibrous glass 8.0%, Non-fibrous 92%

250347-08 3	125081398-08	***No***	NAD (by NYS ELAP 198.1) by David W. Ralbovsky on 08/14/25	

Location: Mud Fitting Insulation; Behind Compressor (Hot Water Supply Line)
Analyst Description: Gray, Heterogeneous, Non-Fibrous, Bulk Material
Asbestos Types:
Other Material: Fibrous glass 8.0%, Non-fibrous 92%

250347-09 3	125081398-09	***No***	NAD (by NYS ELAP 198.1) by David W. Ralbovsky on 08/14/25	

Location: Mud Fitting Insulation; Between Switchgear And Electrical Panels (Hot Water Return Line)
Analyst Description: Gray, Heterogeneous, Non-Fibrous, Bulk Material
Asbestos Types:
Other Material: Fibrous glass 8.0%, Non-fibrous 92%

250347-10 4	125081398-10	***No***	NAD (by NYS ELAP 198.1) by David W. Ralbovsky on 08/14/25	

Location: Boiler Rope Gasket Material; Exposed Boiler Seam
Analyst Description: White-Orange, Heterogeneous, Fibrous, Bulk Material
Asbestos Types:
Other Material: Fibrous glass 97%, Non-fibrous 3.0%

250347-11 4	125081398-11	***No***	NAD (by NYS ELAP 198.1) by David W. Ralbovsky on 08/14/25	

Location: Boiler Rope Gasket Material; Exposed Boiler Seam
Analyst Description: White-Orange, Heterogeneous, Fibrous, Bulk Material
Asbestos Types:
Other Material: Fibrous glass 97%, Non-fibrous 3.0%

250347-12 5	125081398-12	***Yes***	Inconclusive - Trace Chrysotile detected at 1% or less (NOB by EPA 600/M4-82-020) by David W. Ralbovsky on 08/14/25	*1*

Location: Wrap On Domestic Water Pipe (Tape Style); North Wall Of Boiler Room
Analyst Description: White, Heterogeneous, Non-Fibrous, Bulk Material
Asbestos Types: Chrysotile 0.8%
Other Material: Non-fibrous 25%
Comment: Heat Sensitive (organic): 63.3%; Acid Soluble (inorganic): 10.1%; Inert (Non-asbestos): 25.8%

See Reporting notes on last page

PLM Bulk Asbestos Report

20250347; ECC Kittinger Boiler Replacement; ECC North Campus - Kittinger Hall

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos	Notes
250347-135	125081398-13	***Yes***	Inconclusive - Trace Chrysotile detected at 1% or less (NOB by EPA 600/M4-82-020) by David W. Ralbovsky on 08/14/25	*1*

Location: Wrap On Domestic Water Pipe (Tape Style); North Wall Of Boiler Room

Analyst Description: White, Heterogeneous, Non-Fibrous, Bulk Material
Asbestos Types: Chrysotile 0.6%
Other Material: Non-fibrous 24%

Comment: Heat Sensitive (organic): 64.1%; Acid Soluble (inorganic): 10.8%; Inert (Non-asbestos): 24.5%

Reporting Notes:

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

Analyzed by: David W. Ralbovsky
Date: 8/14/2025

Reviewed by: Cory M. Parnell

*NAD = no asbestos detected, Detection Limit <1%, Reporting Limits: CVES = 1%, 400 Pt Ct = 0.25%, 1000 Pt Ct = 0.1%; "Present" or NVA = "No Visible Asbestos" are observations made during a qualitative analysis (Not covered by NVLAP or NY ELAP accreditations); NA = not analyzed; NA/PS = not analyzed / positive stop; PLM Bulk Asbestos Analysis using Olympus, Model BH-2 microscope, Serial #229707, by EPA 600/R-93/116 per 40 CFR 763 (NVLAP Lab Code 101904-0) and ELAP PLM Analysis Protocol 198.1 for New York friable samples which includes quantitation of any vermiculite observed (198.6 for NOB samples) or EPA 400 pt ct by EPA 600/M4-82-020 (NYSDOH ELAP Lab # 10984); CA ELAP Lab # 2508; Note: PLM is not consistently reliable in detecting asbestos in floor coverings and similar NOB 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 New York State (also see EPA Advisory for floor tile, FR 59, 146, 38970, 8/1/94). NIST Accreditation requirements mandate that this report must not be reproduced except in full without the approval of the laboratory. This PLM report relates ONLY to the items tested.

Client Name: Watts Architecture & Engineers

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

20250347; ECC Kittinger Boiler Replacement; ECC North Campus - Kittinger Hall

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	250347-01	1	----	----	----	----	NAD	NA
Location:	Textured Plaster Skim Coat; Boiler Room Ceiling							
02	250347-02	1	----	----	----	----	NAD	NA
Location:	Textured Plaster Skim Coat; Boiler Room Ceiling							
03	250347-03	1	----	----	----	----	NAD	NA
Location:	Textured Plaster Skim Coat; Boiler Room Ceiling							
04	250347-04	2	----	----	----	----	NAD	NA
Location:	Plaster Base Coat; Boiler Room Ceiling							
05	250347-05	2	----	----	----	----	NAD	NA
Location:	Plaster Base Coat; Boiler Room Ceiling							
06	250347-06	2	----	----	----	----	NAD	NA
Location:	Plaster Base Coat; Boiler Room Ceiling							
07	250347-07	3	----	----	----	----	NAD	NA
Location:	Mud Fitting Insulation; Adjacent To Hot Water Tank (FG Insul With Tan Jacket)							
08	250347-08	3	----	----	----	----	NAD	NA
Location:	Mud Fitting Insulation; Behind Compressor (Hot Water Supply Line)							
09	250347-09	3	----	----	----	----	NAD	NA
Location:	Mud Fitting Insulation; Between Switchgear And Electrical Panels (Hot Water Return Line)							
10	250347-10	4	----	----	----	----	NAD	NA
Location:	Boiler Rope Gasket Material; Exposed Boiler Seam							
11	250347-11	4	----	----	----	----	NAD	NA
Location:	Boiler Rope Gasket Material; Exposed Boiler Seam							
12	250347-12	5	0.276	63.3	10.1	24.7	Chrysotile 0.8	Chrysotile 1.9
Location:	Wrap On Domestic Water Pipe (Tape Style); North Wall Of Boiler Room							
13	250347-13	5	0.129	64.1	10.8	24.5	Chrysotile 0.6	NA/PS
Location:	Wrap On Domestic Water Pipe (Tape Style); North Wall Of Boiler Room							

See Reporting notes on last page

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

20250347; ECC Kittinger Boiler Replacement; ECC North Campus - Kittinger Hall

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

Analyzed by: Cory M. Parnell

Reviewed by: Cory M. Parnell

Date: 8/14/2025

Semi-Quantitative Analysis: NAD = no asbestos detected; NA = not analyzed; NA/PS = not analyzed due to positive stop; Trace = <1%; PLM analysis by EPA 600/R-93/116 per 40 CFR 763 (NVLAP Lab Code 101904-0) or NY ELAP 198.1 for New York friable samples which includes quantitation of any vermiculite observed (198.6 for NOB samples) or EPA 400 pt ct by EPA 600/M4-82-020 (NY ELAP Lab # 10984); TEM prep by EPA 600/R-93/116 Section 2.3 (analysis by Section 2.5, not covered by NVLAP Bulk accreditation); or NY ELAP 198.4 for New York NOB samples (NY ELAP Lab # 10984). Analysis using Jeol, Model JEM-100CX II microscope, Serial #156147-247. ** Warning Notes: Consider PLM fiber diameter 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, soils or other heterogeneous materials for which a combination PLM/TEM evaluation is recommended; Quantitation for beginning weights of <0.1 grams should be considered as qualitative only.

125 081398

WATTS ARCHITECTS & ENGINEERS
ASBESTOS BULK SAMPLE CHAIN-OF-CUSTODY

Client: IBC Engineering
Project: ECC Kittinger Boiler Replacement
Building / Location: ECC North Campus - Kittinger Hall
Contact: Mark A. Beyer at (716) 587-1862
Preliminary Results to: mbeyer@watts-ae.com and Kjanik@Watts-AE.com
Mail Report & Invoice to: Watts Architects & Engineers
95 Perry Street, Buffalo, NY 14203

Date: 8/7/2025
Watts Project No.: 20250347

Analysis Requested:
198.1 x 198.6 x 198.4 x

Turnaround Requested:
___ 3 Hr. ___ 48 Hr.
___ 6 Hr. ___ 72 Hr.
___ 12 Hr. ___ 4 Day
___ 24 Hr. X 5 Day
1 Wk

Sample Number	Material Description	HA	Sample Location	Laboratory Results	
				PLM	TEM
250347-01	Textured Plaster Skim Coat	1	Boiler Room Ceiling		
250347-02	Textured Plaster Skim Coat	1	Boiler Room Ceiling		
250347-03	Textured Plaster Skim Coat	1	Boiler Room Ceiling		
250347-04	Plaster Base Coat	2	Boiler Room Ceiling		
250347-05	Plaster Base Coat	2	Boiler Room Ceiling		
250347-06	Plaster Base Coat	2	Boiler Room Ceiling		
250347-07	Mud Fitting Insulation	3	Adjacent to Hot Water Tank (FG Insul with Tan Jacket)		
250347-08	Mud Fitting Insulation	3	Behind Compressor (Hot Water Supply Line)		
250347-09	Mud Fitting Insulation	3	Between Switchgear and Electrical Panels (Hot Water Return Line)		
250347-10	Boiler Rope Gasket Material	4	Exposed Boiler Seam		
250347-11	Boiler Rope Gasket Material	4	Exposed Boiler Seam		
250347-12	Wrap on Domestic Water Pipe (Tape Style)	5	North Wall of Boiler Room		
250347-13	Wrap on Domestic Water Pipe (Tape Style)	5	North Wall of Boiler Room		

Sampled By: Mark Beyer Date: 8/6/2025 Received By: FedEx Date: 8/7/2025
Relinquished By: Mark Beyer Date: 8/7/2025 Received By: ___ Date: ___

Comments: If PLM NOB is negative, analyze by TEM. Stop at first positive for each homogeneous material description group.
If Vermiculite is detected , cease analysis and contact the Watts Project Manager for further instructions.

Received
AUG 08 2025

2.4 PRIOR ASBESTOS ANALYTICAL REPORTS

AmeriSci Richmond
13635 GENITO ROAD
MIDLOTHIAN, VIRGINIA 23112
TEL: (804) 763-1200 • FAX: (804) 763-1800

PLM Bulk Asbestos Report

Watts Architecture & Engineers
Attn: Ed Jones
95 Perry Street
Suite 300
Buffalo, NY 14203

Date Received 10/05/22
Date Examined 10/18/22
ELAP # 10984
AmeriSci Job # 122101148
P.O. #
Page 1 **of** 14
RE: 21093; ECC North Campus Mechanical Renovation; K Building ECC North, Williamsville, NY

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
21093K-01 1	122101148-01 **Location:** Gray Jacket On The Hot Water Holding Tank; Mechanical Room K153 Insulated Hot Water Holding Tank	***Yes***	0.3% (EPA 600/M4-82-020) by Eric H. Ahles on 10/18/22
	Analyst Description: Gray/White, Heterogeneous, Fibrous, Bulk Material **Asbestos Types:** Chrysotile 0.3% **Other Material:** Cellulose 95%, Non-fibrous 4.8%		
21093K-02 1	122101148-02 **Location:** Gray Jacket On The Hot Water Holding Tank; Mechanical Room K153 Insulated Hot Water Holding Tank	***Yes***	0.5% (EPA 600/M4-82-020) by Eric H. Ahles on 10/18/22
	Analyst Description: Gray/White, Heterogeneous, Fibrous, Bulk Material **Asbestos Types:** Chrysotile 0.5% **Other Material:** Cellulose 95%, Non-fibrous 4.5%		
21093K-03 2	122101148-03 **Location:** Hot Water Holding Tank Adhesive/Sealant Behind Gray Jacket; Mechanical Room K153 Insulated Hot Water Holding Tank, On Green Foam Insulation	***Yes***	4.9% (NOB by NYS ELAP 198.6) by Eric H. Ahles on 10/18/22
	Analyst Description: White, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** Chrysotile 4.9% **Other Material:** Non-Asbestos 47% **Comment:** Heat Sensitive (organic): 12.5%; Acid Soluble (inorganic): 34.8%; Inert (Non-asbestos): 47.8%		
21093K-04 2	122101148-04 **Location:** Hot Water Holding Tank Adhesive/Sealant Behind Gray Jacket; Mechanical Room K153 Insulated Hot Water Holding Tank, On Green Foam Insulation		NA/PS
	Analyst Description: Bulk Material **Asbestos Types:** **Other Material:** **Comment:** Heat Sensitive (organic): 7.5%; Acid Soluble (inorganic): 36.4%; Inert (Non-asbestos): 56.2%		

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Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
21093K-05	122101148-05	***No***	NAD
3	**Location:** Green Foam Insulation On The Hot Water Holding Tank; Mechanical Room K153 Insulated Hot Water Holding Tank Behind Gray Jacket		(by NYS ELAP 198.1) by Eric H. Ahles on 10/18/22
Analyst Description: Green, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			
21093K-06	122101148-06	***No***	NAD
3	**Location:** Green Foam Insulation On The Hot Water Holding Tank; Mechanical Room K153 Insulated Hot Water Holding Tank Behind Gray Jacket		(by NYS ELAP 198.1) by Eric H. Ahles on 10/18/22
Analyst Description: Green, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			
21093K-07	122101148-07	***No***	NAD
3	**Location:** Green Foam Insulation On The Hot Water Holding Tank; Mechanical Room K153 Insulated Hot Water Holding Tank Behind Gray Jacket		(by NYS ELAP 198.1) by Eric H. Ahles on 10/18/22
Analyst Description: Green, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			
21093K-08	122101148-08	***No***	NAD
4	**Location:** Mud Insulation On Tan Hot Water Pipe Fittings; Mechanical Room K153 Tan Water Line At West Wall At Hot Water Holding Tank		(by NYS ELAP 198.1) by Eric H. Ahles on 10/18/22
Analyst Description: Gray, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Fibrous glass 15%, Non-fibrous 85%			
21093K-09	122101148-09	***No***	NAD
4	**Location:** Mud Insulation On Tan Hot Water Pipe Fittings; Mechanical Room K153 Tan Water Lines Vertical Along The East Wall		(by NYS ELAP 198.1) by Eric H. Ahles on 10/18/22
Analyst Description: Gray, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Fibrous glass 15%, Non-fibrous 85%			
21093K-10	122101148-10	***No***	NAD
4	**Location:** Mud Insulation On Tan Hot Water Pipe Fittings; Mechanical Room K153 Tan Water Lines Vertical Along The East Wall		(by NYS ELAP 198.1) by Eric H. Ahles on 10/18/22
Analyst Description: Gray, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Fibrous glass 15%, Non-fibrous 85%			

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Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
21093K-11	122101148-11	***No***	NAD
5	**Location:** Tan Paper Jacket, Black Tar Dabs And Foil On Fiberglass TSI; Mechanical Room K153 Tan Water Lines At The South Wall		(NOB by NYS ELAP 198.6) by Eric H. Ahles on 10/18/22
Analyst Description: Black, Heterogeneous, Non-Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Non-Asbestos 20%			
Comment: Heat Sensitive (organic): 75.7%; Acid Soluble (inorganic): 3.5%; Inert (Non-asbestos): 20.8%			
21093K-12	122101148-12	***No***	NAD
5	**Location:** Tan Paper Jacket, Black Tar Dabs And Foil On Fiberglass TSI; Mechanical Room K153 Tan Water Line At West Wall At Hot Water Holding Tank		(NOB by NYS ELAP 198.6) by Eric H. Ahles on 10/18/22
Analyst Description: Black, Heterogeneous, Non-Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Non-Asbestos 29%			
Comment: Heat Sensitive (organic): 41.8%; Acid Soluble (inorganic): 29.3%; Inert (Non-asbestos): 29.0%			
21093K-13	122101148-13	***No***	NAD
6	**Location:** Gaskets In Hot Water Lines Mechanical Room K153; Mechanical Room K153 Hot Water Supply Valve Along East Wall. 6 Flange Gaskets		(NOB by NYS ELAP 198.6) by Eric H. Ahles on 10/18/22
Analyst Description: Red, Heterogeneous, Non-Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Non-Asbestos 82%			
Comment: Heat Sensitive (organic): 11.7%; Acid Soluble (inorganic): 5.5%; Inert (Non-asbestos): 82.8%			
21093K-14	122101148-14	***No***	NAD
6	**Location:** Gaskets In Hot Water Lines Mechanical Room K153; Mechanical Room K153 Hot Water Return Valve Along East Wall. 6 Flange Gaskets		(NOB by NYS ELAP 198.6) by Eric H. Ahles on 10/18/22
Analyst Description: Red, Heterogeneous, Non-Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Non-Asbestos 74%			
Comment: Heat Sensitive (organic): 13.8%; Acid Soluble (inorganic): 12.0%; Inert (Non-asbestos): 74.3%			
21093K-15	122101148-15	***No***	NAD
7	**Location:** Gray Jacket And Foil On Hot Water Supply And Return Lines Fiberglass TSI; Mechanical Room K153 Fiberglass Insulated Hot Water Supply Line At East Wall		(by NYS ELAP 198.1) by Eric H. Ahles on 10/18/22
Analyst Description: Gray/White, Heterogeneous, Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Cellulose 90%, Non-fibrous 10%			

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Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
21093K-16	122101148-16	***No***	NAD
7	**Location:** Gray Jacket And Foil On Hot Water Supply And Return Lines Fiberglass TSI; Mechanical Room K153 Hot Water Supply Line Above The Large Boiler		(by NYS ELAP 198.1) by Eric H. Ahles on 10/18/22
Analyst Description: Silver/White, Heterogeneous, Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Cellulose 90%, Non-fibrous 10%			
21093K-17	122101148-17	***No***	NAD
8	**Location:** Mud Insulation On Overhead Hot Water Supply And Return Lines; Mechanical Room K153 Hot Water Return Line At East Wall By Valves		(by NYS ELAP 198.1) by Eric H. Ahles on 10/18/22
Analyst Description: Gray, Heterogeneous, Non-Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Cellulose Trace, Fibrous glass 15%, Non-fibrous 85%			
21093K-18	122101148-18	***No***	NAD
8	**Location:** Mud Insulation On Overhead Hot Water Supply And Return Lines; Mechanical Room K153 Hot Water Supply Line Elbow Above Large Boiler		(by NYS ELAP 198.1) by Eric H. Ahles on 10/18/22
Analyst Description: Gray, Heterogeneous, Non-Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Cellulose Trace, Fibrous glass 15%, Non-fibrous 85%			
21093K-19	122101148-19	***No***	NAD
8	**Location:** Mud Insulation On Overhead Hot Water Supply And Return Lines; Mechanical Room K153 Hot Water Supply Line Elbow Above Large Boiler		(by NYS ELAP 198.1) by Eric H. Ahles on 10/18/22
Analyst Description: Gray, Heterogeneous, Non-Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Cellulose Trace, Fibrous glass 15%, Non-fibrous 85%			
21093K-20	122101148-20	***No***	NAD
9	**Location:** White End Sealant Fiberglass Insulation Hot Water Piping; Mechanical Room K153 Newer Insulation Hot Water Supply Pipe Above Large Boiler		(NOB by NYS ELAP 198.6) by Eric H. Ahles on 10/18/22
Analyst Description: White, Heterogeneous, Non-Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Non-Asbestos 17%			
Comment: Heat Sensitive (organic): 46.4%; Acid Soluble (inorganic): 36.1%; Inert (Non-asbestos): 17.5%			

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Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
21093K-21	122101148-21	***No***	NAD
9	**Location:** White End Sealant Fiberglass Insulation Hot Water Piping; Mechanical Room K153 Newer Insulation Hot Water Supply Pipe Above Large Boiler		(NOB by NYS ELAP 198.6) by Eric H. Ahles on 10/18/22
Analyst Description: White, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-Asbestos 16% **Comment:** Heat Sensitive (organic): 47.3%; Acid Soluble (inorganic): 35.9%; Inert (Non-asbestos): 16.7%			
21093K-22	122101148-22	***No***	NAD
10	**Location:** White Fibrous Insulation On Small Boiler Behind Sheet Metal Jacket; Mechanical Room K153 Small Boiler By The Hot Water Holding Tank		(by NYS ELAP 198.1) by Eric H. Ahles on 10/18/22
Analyst Description: White, Heterogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose 2.0%, Fibrous glass 98%, Non-fibrous Trace			
21093K-23	122101148-23	***No***	NAD
10	**Location:** White Fibrous Insulation On Small Boiler Behind Sheet Metal Jacket; Mechanical Room K153 Small Boiler By The Hot Water Holding Tank		(by NYS ELAP 198.1) by Eric H. Ahles on 10/18/22
Analyst Description: White, Heterogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose 2.0%, Fibrous glass 98%, Non-fibrous Trace			
21093K-24	122101148-24	***No***	NAD
11	**Location:** Yellow Fibrous Insulation On Large Boiler Behind Sheet Metal Jacket; Mechanical Room K153 Large Boiler		(by NYS ELAP 198.1) by Eric H. Ahles on 10/18/22
Analyst Description: Yellow, Heterogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose 2.0%, Fibrous glass 98%, Non-fibrous Trace			
21093K-25	122101148-25	***No***	NAD
11	**Location:** Yellow Fibrous Insulation On Large Boiler Behind Sheet Metal Jacket; Mechanical Room K153 Large Boiler		(by NYS ELAP 198.1) by Eric H. Ahles on 10/18/22
Analyst Description: Yellow, Heterogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose 2.0%, Fibrous glass 98%, Non-fibrous Trace			

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Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
21093K-26	122101148-26	***No***	NAD
12	**Location:** White Paper And Foil On Fiberglass New Piping At Large Boiler; Mechanical Room K153 Hot Water Supply Line New Section Above Large Boiler		(NOB by NYS ELAP 198.6) by Eric H. Ahles on 10/18/22
Analyst Description: Silver, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-Asbestos 29% **Comment:** Heat Sensitive (organic): 67.2%; Acid Soluble (inorganic): 3.4%; Inert (Non-asbestos): 29.4%			
21093K-27	122101148-27	***No***	NAD
12	**Location:** White Paper And Foil On Fiberglass New Piping At Large Boiler; Mechanical Room K153 Hot Water Return Line New Section Above Large Boiler		(NOB by NYS ELAP 198.6) by Eric H. Ahles on 10/18/22
Analyst Description: Silver, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-Asbestos 37% **Comment:** Heat Sensitive (organic): 58.8%; Acid Soluble (inorganic): 3.3%; Inert (Non-asbestos): 37.9%			
21093K-28	122101148-28	***No***	NAD
13	**Location:** Gaskets On Piping At The Large Boiler; Mechanical Room K153 Cold Water Supply Line On Side Of The Large Boiler		(NOB by NYS ELAP 198.6) by Eric H. Ahles on 10/18/22
Analyst Description: Red, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-Asbestos 12% **Comment:** Heat Sensitive (organic): 82.0%; Acid Soluble (inorganic): 6.0%; Inert (Non-asbestos): 12.0%			
21093K-29	122101148-29	***No***	NAD
13	**Location:** Gaskets On Piping At The Large Boiler; Mechanical Room K153 Cold Water Supply Line On Side Of The Large Boiler		(NOB by NYS ELAP 198.6) by Eric H. Ahles on 10/18/22
Analyst Description: Red, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-Asbestos 13% **Comment:** Heat Sensitive (organic): 82.4%; Acid Soluble (inorganic): 3.7%; Inert (Non-asbestos): 13.9%			
21093K-30	122101148-30	***No***	NAD
14	**Location:** Gaskets In Red Valves And Pumps Above The Large Boiler; Mechanical Room K153 Red Valves And Pumps Above The Large Boiler. 10 Flange Gaskets		(NOB by NYS ELAP 198.6) by Eric H. Ahles on 10/18/22
Analyst Description: Cream, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-Asbestos 69% **Comment:** Heat Sensitive (organic): 29.4%; Acid Soluble (inorganic): 1.6%; Inert (Non-asbestos): 69.0%			

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Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
21093K-31	122101148-31	***No***	NAD
14	**Location:** Gaskets In Red Valves And Pumps Above The Large Boiler; Mechanical Room K153 Red Valves And Pumps Above The Large Boiler. 10 Flange Gaskets		(NOB by NYS ELAP 198.6) by Eric H. Ahles on 10/18/22
Analyst Description: Cream, Heterogeneous, Non-Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Non-Asbestos 68%			
Comment: Heat Sensitive (organic): 29.1%; Acid Soluble (inorganic): 2.6%; Inert (Non-asbestos): 68.3%			
21093K-32	122101148-32	***Yes***	1.3%
15	**Location:** Mud Fittings On Fiberglass Piping K Building Basement; 1/2" Diameter Line Mud Elbow In Basement Adjacent To Mechanical Room K153		(EPA 600/M4-82-020) by Eric H. Ahles on 10/18/22
Analyst Description: Gray, Heterogeneous, Non-Fibrous, Bulk Material			
Asbestos Types: Chrysotile 1.3%			
Other Material: Fibrous glass 18%, Non-fibrous 80%			
21093K-33	122101148-33		NA/PS
15	**Location:** Mud Fittings On Fiberglass Piping K Building Basement; 1/2" Diameter Line Mud Elbow In Basement Adjacent To Mechanical Room K153		
Analyst Description: Bulk Material			
Asbestos Types:			
Other Material:			
21093K-34	122101148-34		NA/PS
15	**Location:** Mud Fittings On Fiberglass Piping K Building Basement; 1" Diameter Mud Elbow In Basement Adjacent To Mechanical Room K153		
Analyst Description: Bulk Material			
Asbestos Types:			
Other Material:			
21093K-35	122101148-35	***No***	NAD
16	**Location:** Wood Laminate And Mastic On Top Of 9" x 9" Floor Tiles; Room K152 On Top 9" Light Gray Floor Tiles		(NOB by NYS ELAP 198.6) by Eric H. Ahles on 10/18/22
Analyst Description: Brown, Heterogeneous, Non-Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Non-Asbestos 0.8%			
Comment: Heat Sensitive (organic): 70.4%; Acid Soluble (inorganic): 28.8%; Inert (Non-asbestos): 0.8%			

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Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
21093K-36 16	122101148-36 **Location:** Wood Laminate And Mastic On Top Of 9" x 9" Floor Tiles; Room K235 On Top 9" x 9" Green Floor Tiles	***No***	NAD (NOB by NYS ELAP 198.6) by Eric H. Ahles on 10/18/22
Analyst Description: Brown, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-Asbestos 0.3% **Comment:** Heat Sensitive (organic): 65.9%; Acid Soluble (inorganic): 33.9%; Inert (Non-asbestos): 0.3%			
21093K-37 17	122101148-37 **Location:** 18" x 18" Gay Floor Tiles On Top 9" Light Gray Floor Tiles; Room K158 On Top Of 9" Gray Floor Tiles	***No***	NAD (NOB by NYS ELAP 198.6) by Eric H. Ahles on 10/18/22
Analyst Description: Black, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-Asbestos 8.4% **Comment:** Heat Sensitive (organic): 50.3%; Acid Soluble (inorganic): 41.3%; Inert (Non-asbestos): 8.4%			
21093K-38 17	122101148-38 **Location:** 18" x 18" Gay Floor Tiles On Top 9" Light Gray Floor Tiles; Room K158 On Top Of 9" Gray Floor Tiles	***No***	NAD (NOB by NYS ELAP 198.6) by Eric H. Ahles on 10/18/22
Analyst Description: Black, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-Asbestos NAD **Comment:** Heat Sensitive (organic): 78.2%; Acid Soluble (inorganic): 21.8%			
21093K-39 18	122101148-39 **Location:** Tan Adhesive Beneath 18" Gray Floor Tiles And On Top 9" Floor Tiles; Room K158 On Top Of 9" Gray Floor Tiles	***No***	NAD (NOB by NYS ELAP 198.6) by Eric H. Ahles on 10/18/22
Analyst Description: Yellow, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-Asbestos 0.4% **Comment:** Heat Sensitive (organic): 82.6%; Acid Soluble (inorganic): 17.0%; Inert (Non-asbestos): 0.4%			
21093K-40 18	122101148-40 **Location:** Tan Adhesive Beneath 18" Gray Floor Tiles And On Top 9" Floor Tiles; Room K158 On Top Of 9" Gray Floor Tiles	***No***	NAD (NOB by NYS ELAP 198.6) by Eric H. Ahles on 10/18/22
Analyst Description: Yellow, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-Asbestos 0.4% **Comment:** Heat Sensitive (organic): 93.3%; Acid Soluble (inorganic): 6.3%; Inert (Non-asbestos): 0.4%			

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Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
21093K-41	122101148-41	***No***	NAD
19	**Location:** 2' x 4' Suspended Ceiling Tiles Pinhole & Small Fissure Pattern; Room 258 Suspended Ceiling		(NOB by NYS ELAP 198.6) by Eric H. Ahles on 10/18/22
Analyst Description: Beige, Heterogeneous, Non-Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Non-Asbestos 59%			
Comment: Heat Sensitive (organic): 22.5%; Acid Soluble (inorganic): 17.8%; Inert (Non-asbestos): 59.7%			
21093K-42	122101148-42	***No***	NAD
19	**Location:** 2' x 4' Suspended Ceiling Tiles Pinhole & Small Fissure Pattern; Room 256 Suspended Ceiling		(NOB by NYS ELAP 198.6) by Eric H. Ahles on 10/18/22
Analyst Description: Beige, Heterogeneous, Non-Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Non-Asbestos 58%			
Comment: Heat Sensitive (organic): 21.1%; Acid Soluble (inorganic): 20.3%; Inert (Non-asbestos): 58.6%			
21093K-43	122101148-43	***No***	NAD
20	**Location:** 2' x 2' Suspended Ceiling Tiles With Small Round Holes Pattern; Room 236 Suspended Ceiling		(NOB by NYS ELAP 198.6) by Eric H. Ahles on 10/18/22
Analyst Description: Beige, Heterogeneous, Non-Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Non-Asbestos 39%			
Comment: Heat Sensitive (organic): 13.3%; Acid Soluble (inorganic): 47.3%; Inert (Non-asbestos): 39.3%			
21093K-44	122101148-44	***No***	NAD
20	**Location:** 2' x 2' Suspended Ceiling Tiles With Small Round Holes Pattern; Room 231 Suspended Ceiling		(NOB by NYS ELAP 198.6) by Eric H. Ahles on 10/18/22
Analyst Description: Beige, Heterogeneous, Non-Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Non-Asbestos 52%			
Comment: Heat Sensitive (organic): 13.5%; Acid Soluble (inorganic): 34.4%; Inert (Non-asbestos): 52.1%			
21093K-45	122101148-45	***No***	NAD
21	**Location:** 2' x 2" Suspended Ceiling Tiles Pinhole & Small Slot Pattern; Second Floor Corridor At Room 230		(NOB by NYS ELAP 198.6) by Eric H. Ahles on 10/18/22
Analyst Description: Beige, Heterogeneous, Non-Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Non-Asbestos 53%			
Comment: Heat Sensitive (organic): 21.6%; Acid Soluble (inorganic): 24.8%; Inert (Non-asbestos): 53.6%			

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Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
21093K-46	122101148-46	***No***	NAD
21	**Location:** 2' x 2' Suspended Ceiling Tiles With Small Round Holes Pattern; First Floor Corridor At Room 152		(NOB by NYS ELAP 198.6) by Eric H. Ahles on 10/18/22
Analyst Description: Beige, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-Asbestos 49% **Comment:** Heat Sensitive (organic): 27.3%; Acid Soluble (inorganic): 23.2%; Inert (Non-asbestos): 49.6%			
21093K-47	122101148-47	***No***	NAD
22	**Location:** 12" x 12" Light Green Floor Tile On Concrete ; Room 256		(NOB by NYS ELAP 198.6) by Beverly A. Schrage on 10/18/22
Analyst Description: Green, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-Asbestos 23% **Comment:** Heat Sensitive (organic): 14.3%; Acid Soluble (inorganic): 62.4%; Inert (Non-asbestos): 23.3%			
21093K-48	122101148-48	***No***	NAD
22	**Location:** 12" x 12" Light Green Floor Tile On Concrete ; Room 256		(NOB by NYS ELAP 198.6) by Beverly A. Schrage on 10/18/22
Analyst Description: Green, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-Asbestos 33% **Comment:** Heat Sensitive (organic): 13.3%; Acid Soluble (inorganic): 53.0%; Inert (Non-asbestos): 33.7%			
21093K-49	122101148-49	***Yes***	0.8% [1]
23	**Location:** Leveling Compound & Residual Black Mastic Beneath 12" Lt. Green Floor Tiles; Room 256 On Concrete		(NOB by EPA 600/M4-82-02(by Eric H. Ahles on 10/18/22
Analyst Description: Black/Gray, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** Chrysotile 0.8% **Other Material:** Non-Asbestos 38% **Comment:** Heat Sensitive (organic): 38.5%; Acid Soluble (inorganic): 22.0%; Inert (Non-asbestos): 38.7%			
21093K-50	122101148-50	***Yes***	0.4% [1]
23	**Location:** Leveling Compound & Residual Black Mastic Beneath 12" Lt. Green Floor Tiles; Room 256 On Concrete		(NOB by EPA 600/M4-82-02(by Eric H. Ahles on 10/18/22
Analyst Description: Black/Gray, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** Chrysotile 0.4% **Other Material:** Non-Asbestos 25% **Comment:** Heat Sensitive (organic): 44.7%; Acid Soluble (inorganic): 29.4%; Inert (Non-asbestos): 25.5%			

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Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
21093K-51	122101148-51	***No***	NAD
24	**Location:** Caulk Along Exterior Louver To Unit Ventilators; Exterior Of Room 113 Perimeter Of Exterior Louver 1" Wide 11" x 46"		(NOB by NYS ELAP 198.6) by Beverly A. Schrage on 10/18/22
Analyst Description: Gray, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-Asbestos 6.1% **Comment:** Heat Sensitive (organic): 49.7%; Acid Soluble (inorganic): 44.2%; Inert (Non-asbestos): 6.1%			
21093K-52	122101148-52	***No***	NAD
24	**Location:** Caulk Along Exterior Louver To Unit Ventilators; Exterior Of Room 114 Perimeter Of Exterior Louver 1" Wide 11" x 46"		(NOB by NYS ELAP 198.6) by Beverly A. Schrage on 10/18/22
Analyst Description: Gray, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-Asbestos 8.0% **Comment:** Heat Sensitive (organic): 51.4%; Acid Soluble (inorganic): 40.6%; Inert (Non-asbestos): 8.0%			
21093K-53	122101148-53L1	***No***	NAD
25	**Location:** 1/2" Black Tar And Fabric Vapor Barrier Beneath 2 1/2" Poly Iso Foam; K Building Roof Core 1 Northeast Area North Of Access Hatch At EPDM Patch		(NOB by NYS ELAP 198.6) by Beverly A. Schrage on 10/18/22
Analyst Description: Black, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-Asbestos 10% **Comment:** Heat Sensitive (organic): 76.4%; Acid Soluble (inorganic): 12.9%; Inert (Non-asbestos): 10.7%			
21093K-53	122101148-53L2	***No***	NAD
25	**Location:** 1/2" Black Tar And Fabric Vapor Barrier Beneath 2 1/2" Poly Iso Foam; K Building Roof Core 1 Northeast Area North Of Access Hatch At EPDM Patch		(by NYS ELAP 198.1) by Beverly A. Schrage on 10/18/22
Analyst Description: White, Heterogeneous, Non-Fibrous, Soft Concrete **Asbestos Types:** **Other Material:** Non-fibrous 100%			
21093K-54	122101148-54	***No***	NAD
25	**Location:** 1/2" Black Tar And Fabric Vapor Barrier Beneath 2 1/2" Poly Iso Foam; K Building Roof Core 2 West Roof West Area At EPDM Patch Field		(NOB by NYS ELAP 198.6) by Beverly A. Schrage on 10/18/22
Analyst Description: Black, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-Asbestos 13% **Comment:** Heat Sensitive (organic): 73.3%; Acid Soluble (inorganic): 12.9%; Inert (Non-asbestos): 13.8%			

See Reporting notes on last page

PLM Bulk Asbestos Report

21093; ECC North Campus Mechanical Renovation; K Building
ECC North, Williamsville, NY

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
21093K-55	122101148-55	***No***	NAD
26	**Location:** Soft Concrete Roof Deck Beneath Black Tar And Fabric Vapor Barrier; K Building Roof Core 1 Northeast Area North Of Access Hatch At EPDM Patch		(by NYS ELAP 198.1) by Beverly A. Schrage on 10/18/22
Analyst Description: White, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			
21093K-56	122101148-56	***No***	NAD
26	**Location:** Soft Concrete Roof Deck Beneath Black Tar And Fabric Vapor Barrier; K Building Roof Core 2 West Roof West Area At EPDM Patch Field		(by NYS ELAP 198.1) by Beverly A. Schrage on 10/18/22
Analyst Description: White, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			
21093K-57	122101148-57	***Yes***	3.8%
27	**Location:** Black Tar Patches On Base Of Exhaust Fans; K Building South Roof Wing South East Area Ex Fan 1 Corner Patches 0.25 Ft2		(NOB by NYS ELAP 198.6) by Beverly A. Schrage on 10/18/22
Analyst Description: Black, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** Chrysotile 3.8% **Other Material:** Non-Asbestos 8.5% **Comment:** Heat Sensitive (organic): 63.7%; Acid Soluble (inorganic): 24.0%; Inert (Non-asbestos): 8.5%			
21093K-58	122101148-58		NA/PS
27	**Location:** Black Tar Patches On Base Of Exhaust Fans; K Building West Roof West End Base Of Ex Fan 14 Splattered ~1 Ft2		
Analyst Description: Bulk Material **Asbestos Types:** **Other Material:** **Comment:** Heat Sensitive (organic): 99.7%; Acid Soluble (inorganic): 0.3%			
21093K-59	122101148-59	***No***	NAD
28	**Location:** Black Tar Patches On Base Of Vents And Ahu Units; K Building South Roof Center Area New Round Vent Above Pvc Roof Membrane		(NOB by NYS ELAP 198.6) by Beverly A. Schrage on 10/18/22
Analyst Description: Black, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-Asbestos 11% **Comment:** Heat Sensitive (organic): 73.6%; Acid Soluble (inorganic): 15.1%; Inert (Non-asbestos): 11.3%			

See Reporting notes on last page

PLM Bulk Asbestos Report

21093; ECC North Campus Mechanical Renovation; K Building
ECC North, Williamsville, NY

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
21093K-60	122101148-60	***No***	NAD
28	**Location:** Black Tar Patches On Base Of Vents And Ahu Units; K Building North Roof Center Valent Ahu Curb To Sheet Metal Duct		(NOB by NYS ELAP 198.6) by Beverly A. Schrage on 10/18/22
Analyst Description: Black, Heterogeneous, Non-Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Non-Asbestos 18%			
Comment: Heat Sensitive (organic): 70.4%; Acid Soluble (inorganic): 11.6%; Inert (Non-asbestos): 18.0%			
21093K-61	122101148-61	***No***	NAD
29	**Location:** Black Tar Sealant Edges Silver Foil Jackets On Foam Insulation To Ducts; K Building West Roof West End Sheet Metal Ducts At Trane AC 4		(NOB by NYS ELAP 198.6) by Beverly A. Schrage on 10/18/22
Analyst Description: Black, Heterogeneous, Non-Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Non-Asbestos 2.1%			
Comment: Heat Sensitive (organic): 82.0%; Acid Soluble (inorganic): 15.9%; Inert (Non-asbestos): 2.1%			
21093K-62	122101148-62	***No***	NAD
29	**Location:** Black Tar Sealant Edges Silver Foil Jackets On Foam Insulation To Ducts; K Building West Roof West End Sheet Metal Ducts At Trane Ac 3		(NOB by NYS ELAP 198.6) by Beverly A. Schrage on 10/18/22
Analyst Description: Black, Heterogeneous, Non-Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Non-Asbestos 0.4%			
Comment: Heat Sensitive (organic): 91.4%; Acid Soluble (inorganic): 8.2%; Inert (Non-asbestos): 0.4%			
21093K-63	122101148-63	***No***	NAD
29	**Location:** Black Tar Sealant Edges Silver Foil Jackets On Foam Insulation To Ducts; K Building North Roof Center Sheet Metal Ducts At Valent AHU		(NOB by NYS ELAP 198.6) by Beverly A. Schrage on 10/18/22
Analyst Description: Black, Heterogeneous, Non-Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Non-Asbestos 0.4%			
Comment: Heat Sensitive (organic): 92.8%; Acid Soluble (inorganic): 6.8%; Inert (Non-asbestos): 0.4%			

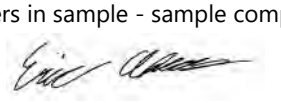
See Reporting notes on last page

PLM Bulk Asbestos Report

21093; ECC North Campus Mechanical Renovation; K Building
ECC North, Williamsville, NY

Reporting Notes:

(1) Physically inseparable layers in sample - sample composited for analysis

Analyzed by: Eric H. Ahles  Reviewed by: Cory M. Parnell 

Date: 10/18/2022

*NAD = no asbestos detected, Detection Limit <1%, Reporting Limits: CVES = 1%, 400 Pt Ct = 0.25%, 1000 Pt Ct = 0.1%; "Present" or NVA = "No Visible Asbestos" are observations made during a qualitative analysis; NA = not analyzed; NA/PS = not analyzed / positive stop; PLM Bulk Asbestos Analysis using Meiji, Model MT 6130 microscope, Serial #1410298, by EPA 600/R-93/116 per 40 CFR 763 (NVLAP Lab Code 101904-0) and ELAP PLM Analysis Protocol 198.1 for New York friable samples which includes quantitation of any vermiculite observed (198.6 for NOB samples) or EPA 400 pt ct by EPA 600/M4-82-020 (NYSDOH ELAP Lab # 10984); CA ELAP Lab # 2508; Note: PLM is not consistently reliable in detecting asbestos in floor coverings and similar NOB 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 New York State (also see EPA Advisory for floor tile, FR 59, 146, 38970, 8/1/94). NIST Accreditation requirements mandate that this report must not be reproduced except in full without the approval of the laboratory. This PLM report relates ONLY to the items tested.

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

21093; ECC North Campus Mechanical Renovation; K Building ECC North, Williamsville, NY

AmeriSci Sample #	Client Sample#	HG Area	NOB Sample Weight (gram)	NOB Heat Sensitive Organic %	NOB Acid Soluble Inorganic %	NOB Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
01	21093K-01	1	----	----	----	----	Chrysotile 0.3	NA
Location:	Gray Jacket On The Hot Water Holding Tank; Mechanical Room K153 Insulated Hot Water Holding Tank							
02	21093K-02	1	----	----	----	----	Chrysotile 0.5	NA
Location:	Gray Jacket On The Hot Water Holding Tank; Mechanical Room K153 Insulated Hot Water Holding Tank							
03	21093K-03	2	0.385	12.5	34.8	51.6	Chrysotile 4.9	Chrysotile 1.1
Location:	Hot Water Holding Tank Adhesive/Sealant Behind Gray Jacket; Mechanical Room K153 Insulated Hot Water Holding Tank, On Green Foam Insulation							
04	21093K-04	2	0.306	7.5	36.4	56.2	NA/PS	NA/PS
Location:	Hot Water Holding Tank Adhesive/Sealant Behind Gray Jacket; Mechanical Room K153 Insulated Hot Water Holding Tank, On Green Foam Insulation							
05	21093K-05	3	----	----	----	----	NAD	NA
Location:	Green Foam Insulation On The Hot Water Holding Tank; Mechanical Room K153 Insulated Hot Water Holding Tank Behind Gray Jacket							
06	21093K-06	3	----	----	----	----	NAD	NA
Location:	Green Foam Insulation On The Hot Water Holding Tank; Mechanical Room K153 Insulated Hot Water Holding Tank Behind Gray Jacket							
07	21093K-07	3	----	----	----	----	NAD	NA
Location:	Green Foam Insulation On The Hot Water Holding Tank; Mechanical Room K153 Insulated Hot Water Holding Tank Behind Gray Jacket							
08	21093K-08	4	----	----	----	----	NAD	NA
Location:	Mud Insulation On Tan Hot Water Pipe Fittings; Mechanical Room K153 Tan Water Line At West Wall At Hot Water Holding Tank							
09	21093K-09	4	----	----	----	----	NAD	NA
Location:	Mud Insulation On Tan Hot Water Pipe Fittings; Mechanical Room K153 Tan Water Lines Vertical Along The East Wall							
10	21093K-10	4	----	----	----	----	NAD	NA
Location:	Mud Insulation On Tan Hot Water Pipe Fittings; Mechanical Room K153 Tan Water Lines Vertical Along The East Wall							
11	21093K-11	5	0.172	75.7	3.5	20.8	NAD	NAD
Location:	Tan Paper Jacket, Black Tar Dabs And Foil On Fiberglass TSI; Mechanical Room K153 Tan Water Lines At The South Wall							
12	21093K-12	5	0.078	41.8	29.3	29.0	NAD	NAD
Location:	Tan Paper Jacket, Black Tar Dabs And Foil On Fiberglass TSI; Mechanical Room K153 Tan Water Line At West Wall At Hot Water Holding Tank							
13	21093K-13	6	0.493	11.7	5.5	82.8	NAD	NAD
Location:	Gaskets In Hot Water Lines Mechanical Room K153; Mechanical Room K153 Hot Water Supply Valve Along East Wall. 6 Flange Gaskets							
14	21093K-14	6	0.440	13.8	12.0	74.3	NAD	NAD
Location:	Gaskets In Hot Water Lines Mechanical Room K153; Mechanical Room K153 Hot Water Return Valve Along East Wall. 6 Flange Gaskets							
15	21093K-15	7	----	----	----	----	NAD	NA
Location:	Gray Jacket And Foil On Hot Water Supply And Return Lines Fiberglass TSI; Mechanical Room K153 Fiberglass Insulated Hot Water Supply Line At East Wall							

See Reporting notes on last page

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

21093; ECC North Campus Mechanical Renovation; K Building ECC North, Williamsville, NY

AmeriSci Sample #	Client Sample#	HG Area	NOB Sample Weight (gram)	NOB Heat Sensitive Organic %	NOB Acid Soluble Inorganic %	NOB Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
16	21093K-16	7	----	----	----	----	NAD	NA
Location:	Gray Jacket And Foil On Hot Water Supply And Return Lines Fiberglass TSI; Mechanical Room K153 Hot Water Supply Line Above The Large Boiler							
17	21093K-17	8	----	----	----	----	NAD	NA
Location:	Mud Insulation On Overhead Hot Water Supply And Return Lines; Mechanical Room K153 Hot Water Return Line At East Wall By Valves							
18	21093K-18	8	----	----	----	----	NAD	NA
Location:	Mud Insulation On Overhead Hot Water Supply And Return Lines; Mechanical Room K153 Hot Water Supply Line Elbow Above Large Boiler							
19	21093K-19	8	----	----	----	----	NAD	NA
Location:	Mud Insulation On Overhead Hot Water Supply And Return Lines; Mechanical Room K153 Hot Water Supply Line Elbow Above Large Boiler							
20	21093K-20	9	0.314	46.4	36.1	17.5	NAD	NAD
Location:	White End Sealant Fiberglass Insulation Hot Water Piping; Mechanical Room K153 Newer Insulation Hot Water Supply Pipe Above Large Boiler							
21	21093K-21	9	0.385	47.3	35.9	16.7	NAD	NAD
Location:	White End Sealant Fiberglass Insulation Hot Water Piping; Mechanical Room K153 Newer Insulation Hot Water Supply Pipe Above Large Boiler							
22	21093K-22	10	----	----	----	----	NAD	NA
Location:	White Fibrous Insulation On Small Boiler Behind Sheet Metal Jacket; Mechanical Room K153 Small Boiler By The Hot Water Holding Tank							
23	21093K-23	10	----	----	----	----	NAD	NA
Location:	White Fibrous Insulation On Small Boiler Behind Sheet Metal Jacket; Mechanical Room K153 Small Boiler By The Hot Water Holding Tank							
24	21093K-24	11	----	----	----	----	NAD	NA
Location:	Yellow Fibrous Insulation On Large Boiler Behind Sheet Metal Jacket; Mechanical Room K153 Large Boiler							
25	21093K-25	11	----	----	----	----	NAD	NA
Location:	Yellow Fibrous Insulation On Large Boiler Behind Sheet Metal Jacket; Mechanical Room K153 Large Boiler							
26	21093K-26	12	0.183	67.2	3.4	29.4	NAD	NAD
Location:	White Paper And Foil On Fiberglass New Piping At Large Boiler; Mechanical Room K153 Hot Water Supply Line New Section Above Large Boiler							
27	21093K-27	12	0.096	58.8	3.3	37.9	NAD	NAD
Location:	White Paper And Foil On Fiberglass New Piping At Large Boiler; Mechanical Room K153 Hot Water Return Line New Section Above Large Boiler							
28	21093K-28	13	0.114	82.0	6.0	12.0	NAD	NAD
Location:	Gaskets On Piping At The Large Boiler; Mechanical Room K153 Cold Water Supply Line On Side Of The Large Boiler							
29	21093K-29	13	0.148	82.4	3.7	13.9	NAD	NAD
Location:	Gaskets On Piping At The Large Boiler; Mechanical Room K153 Cold Water Supply Line On Side Of The Large Boiler							

See Reporting notes on last page

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

21093; ECC North Campus Mechanical Renovation; K Building ECC North, Williamsville, NY

AmeriSci Sample #	Client Sample#	HG Area	NOB Sample Weight (gram)	NOB Heat Sensitive Organic %	NOB Acid Soluble Inorganic %	NOB Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
30	21093K-30	14	0.287	29.4	1.6	69.0	NAD	NAD
Location:	Gaskets In Red Valves And Pumps Above The Large Boiler; Mechanical Room K153 Red Valves And Pumps Above The Large Boiler. 10 Flange Gaskets							
31	21093K-31	14	0.322	29.1	2.6	68.3	NAD	NAD
Location:	Gaskets In Red Valves And Pumps Above The Large Boiler; Mechanical Room K153 Red Valves And Pumps Above The Large Boiler. 10 Flange Gaskets							
32	21093K-32	15	----	----	----	----	Chrysotile 1.3	NA
Location:	Mud Fittings On Fiberglass Piping K Building Basement; 1/2" Diameter Line Mud Elbow In Basement Adjacent To Mechanical Room K153							
33	21093K-33	15	----	----	----	----	NA/PS	NA
Location:	Mud Fittings On Fiberglass Piping K Building Basement; 1/2" Diameter Line Mud Elbow In Basement Adjacent To Mechanical Room K153							
34	21093K-34	15	----	----	----	----	NA/PS	NA
Location:	Mud Fittings On Fiberglass Piping K Building Basement; 1" Diameter Mud Elbow In Basement Adjacent To Mechanical Room K153							
35	21093K-35	16	0.446	70.4	28.8	0.8	NAD	NAD
Location:	Wood Laminate And Mastic On Top Of 9" x 9" Floor Tiles; Room K152 On Top 9" Light Gray Floor Tiles							
36	21093K-36	16	0.503	65.9	33.9	0.3	NAD	NAD
Location:	Wood Laminate And Mastic On Top Of 9" x 9" Floor Tiles; Room K235 On Top 9" x 9" Green Floor Tiles							
37	21093K-37	17	0.629	50.3	41.3	8.4	NAD	NAD
Location:	18" x 18" Gay Floor Tiles On Top 9" Light Gray Floor Tiles; Room K158 On Top Of 9" Gray Floor Tiles							
38	21093K-38	17	0.264	78.2	21.8	0.0	NAD	NAD
Location:	18" x 18" Gay Floor Tiles On Top 9" Light Gray Floor Tiles; Room K158 On Top Of 9" Gray Floor Tiles							
39	21093K-39	18	0.140	82.6	17.0	0.4	NAD	NAD
Location:	Tan Adhesive Beneath 18" Gray Floor Tiles And On Top 9" Floor Tiles; Room K158 On Top Of 9" Gray Floor Tiles							
40	21093K-40	18	0.212	93.3	6.3	0.4	NAD	NAD
Location:	Tan Adhesive Beneath 18" Gray Floor Tiles And On Top 9" Floor Tiles; Room K158 On Top Of 9" Gray Floor Tiles							
41	21093K-41	19	0.129	22.5	17.8	59.7	NAD	NAD
Location:	2' x 4' Suspended Ceiling Tiles Pinhole & Small Fissure Pattern; Room 258 Suspended Ceiling							
42	21093K-42	19	0.144	21.1	20.3	58.6	NAD	NAD
Location:	2' x 4' Suspended Ceiling Tiles Pinhole & Small Fissure Pattern; Room 256 Suspended Ceiling							
43	21093K-43	20	0.281	13.3	47.3	39.3	NAD	NAD
Location:	2' x 2' Suspended Ceiling Tiles With Small Round Holes Pattern; Room 236 Suspended Ceiling							
44	21093K-44	20	0.262	13.5	34.4	52.1	NAD	NAD
Location:	2' x 2' Suspended Ceiling Tiles With Small Round Holes Pattern; Room 231 Suspended Ceiling							

See Reporting notes on last page

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

21093; ECC North Campus Mechanical Renovation; K Building ECC North, Williamsville, NY

AmeriSci Sample #	Client Sample#	HG Area	NOB Sample Weight (gram)	NOB Heat Sensitive Organic %	NOB Acid Soluble Inorganic %	NOB Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
45	21093K-45	21	0.094	21.6	24.8	53.6	NAD	NAD
Location:	2' x 2" Suspended Ceiling Tiles Pinhole & Small Slot Pattern; Second Floor Corridor At Room 230							
46	21093K-46	21	0.194	27.3	23.2	49.6	NAD	NAD
Location:	2' x 2' Suspended Ceiling Tiles With Small Round Holes Pattern; First Floor Corridor At Room 152							
47	21093K-47	22	0.752	14.3	62.4	23.3	NAD	NAD
Location:	12" x 12" Light Green Floor Tile On Concrete ; Room 256							
48	21093K-48	22	0.632	13.3	53.0	33.7	NAD	NAD
Location:	12" x 12" Light Green Floor Tile On Concrete ; Room 256							
49	21093K-49	23	0.248	38.5	22.0	39.4	Chrysotile 0.8	Chrysotile Trace
Location:	Leveling Compound & Residual Black Mastic Beneath 12" Lt. Green Floor Tiles; Room 256 On Concrete							
50	21093K-50	23	0.134	44.7	29.4	25.8	Chrysotile 0.4	Chrysotile Trace
Location:	Leveling Compound & Residual Black Mastic Beneath 12" Lt. Green Floor Tiles; Room 256 On Concrete							
51	21093K-51	24	0.302	49.7	44.2	6.1	NAD	NAD
Location:	Caulk Along Exterior Louver To Unit Ventilators; Exterior Of Room 113 Perimeter Of Exterior Louver 1" Wide 11" x 46"							
52	21093K-52	24	0.517	51.4	40.6	8.0	NAD	NAD
Location:	Caulk Along Exterior Louver To Unit Ventilators; Exterior Of Room 114 Perimeter Of Exterior Louver 1" Wide 11" x 46"							
53L1	21093K-53	25	0.479	76.4	12.9	10.7	NAD	NAD
Location:	1/2" Black Tar And Fabric Vapor Barrier Beneath 2 1/2" Poly Iso Foam; K Building Roof Core 1 Northeast Area North Of Access Hatch At EPDM Patch							
53L2	21093K-53	25	----	----	----	----	NAD	NA
Location:	1/2" Black Tar And Fabric Vapor Barrier Beneath 2 1/2" Poly Iso Foam; K Building Roof Core 1 Northeast Area North Of Access Hatch At EPDM Patch							
54	21093K-54	25	0.599	73.3	12.9	13.8	NAD	NAD
Location:	1/2" Black Tar And Fabric Vapor Barrier Beneath 2 1/2" Poly Iso Foam; K Building Roof Core 2 West Roof West Area At EPDM Patch Field							
55	21093K-55	26	----	----	----	----	NAD	NA
Location:	Soft Concrete Roof Deck Beneath Black Tar And Fabric Vapor Barrier; K Building Roof Core 1 Northeast Area North Of Access Hatch At EPDM Patch							
56	21093K-56	26	----	----	----	----	NAD	NA
Location:	Soft Concrete Roof Deck Beneath Black Tar And Fabric Vapor Barrier; K Building Roof Core 2 West Roof West Area At EPDM Patch Field							
57	21093K-57	27	0.409	63.7	24.0	12.3	Chrysotile 3.8	NA
Location:	Black Tar Patches On Base Of Exhaust Fans; K Building South Roof Wing South East Area Ex Fan 1 Corner Patches 0.25 Ft2							
58	21093K-58	27	0.241	99.7	0.3	0.0	NA/PS	NAD
Location:	Black Tar Patches On Base Of Exhaust Fans; K Building West Roof West End Base Of Ex Fan 14 Splattered ~1 Ft2							

See Reporting notes on last page

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

21093; ECC North Campus Mechanical Renovation; K Building ECC North, Williamsville, NY

AmeriSci Sample #	Client Sample#	HG Area	NOB Sample Weight (gram)	NOB Heat Sensitive Organic %	NOB Acid Soluble Inorganic %	NOB Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
59	21093K-59	28	0.370	73.6	15.1	11.3	NAD	NAD
Location:	Black Tar Patches On Base Of Vents And Ahu Units; K Building South Roof Center Area New Round Vent Above Pvc Roof Membrane							
60	21093K-60	28	0.492	70.4	11.6	18.0	NAD	NAD
Location:	Black Tar Patches On Base Of Vents And Ahu Units; K Building North Roof Center Valent Ahu Curb To Sheet Metal Duct							
61	21093K-61	29	0.327	82.0	15.9	2.1	NAD	NAD
Location:	Black Tar Sealant Edges Silver Foil Jackets On Foam Insulation To Ducts; K Building West Roof West End Sheet Metal Ducts At Trane AC 4							
62	21093K-62	29	0.768	91.4	8.2	0.4	NAD	NAD
Location:	Black Tar Sealant Edges Silver Foil Jackets On Foam Insulation To Ducts; K Building West Roof West End Sheet Metal Ducts At Trane Ac 3							
63	21093K-63	29	0.897	92.8	6.8	0.4	NAD	NAD
Location:	Black Tar Sealant Edges Silver Foil Jackets On Foam Insulation To Ducts; K Building North Roof Center Sheet Metal Ducts At Valent AHU							

Analyzed by: Cory M. Parnell

Reviewed by: Cory M. Parnell

Date: 10/14/2022

Semi-Quantitative Analysis: NAD = no asbestos detected; NA = not analyzed; NA/PS = not analyzed due to positive stop; Trace = <1%; PLM analysis by EPA 600/R-93/116 per 40 CFR 763 (NVLAP Lab Code 101904-0) or NY ELAP 198.1 for New York friable samples which includes quantitation of any vermiculite observed (198.6 for NOB samples) or EPA 400 pt ct by EPA 600/M4-82-020 (NY ELAP Lab # 10984); TEM prep by EPA 600/R-93/116 Section 2.3 (analysis by Section 2.5, not covered by NVLAP Bulk accreditation); or NY ELAP 198.4 for New York NOB samples (NY ELAP Lab # 10984). Analysis using Jeol, Model JEM-100CX II microscope, Serial #156147-247. ** Warning Notes: Consider PLM fiber diameter 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, soils or other heterogeneous materials for which a combination PLM/TEM evaluation is recommended; Quantitation for beginning weights of <0.1 grams should be considered as qualitative only.

12210148

Page: 1 of 4

WATTS ARCHITECTS & ENGINEERS
ASBESTOS BULK SAMPLE CHAIN-OF-CUSTODY

Client: Erie County DPW/IBC Engineering
Project: ECC North Campus Mechanical Renovations
Building / Location: K Building ECC North, Williamsville, NY
Contact: Edward J. Jones at (716) 430-9349
Preliminary Results to: ejones@watts-ae.com and kjanik@watts-ae.com
Mail Report & Invoice to: Watts Architects & Engineers
95 Perry Street, Buffalo, NY 14203

Date: Thursday 09/29/2022
Watts Project No.: 21093

Analysis Requested:
198.1 x 198.6 x 198.4 x

Turnaround Requested:
3 Hr. 48 Hr.
6 Hr. 72 Hr.
12 Hr. 4 Day
24 Hr. X 5 Day
7 Day

Sample Number	Material Description	HA	Sample Location	Laboratory Results PLM	Laboratory Results TEM
21093K-01	Gray jacket on the hot water holding tank	1	Mechanical Room K153 insulated hot water holding tank		
21093K-02	Gray jacket on the hot water holding tank	1	Mechanical Room K153 insulated hot water holding tank		
21093K-03	Hot water holding tank adhesive/sealant behind gray jacket	2	Mechanical Room K153 insulated hot water holding tank, on green foam insulation		
21093K-04	Hot water holding tank adhesive/sealant behind gray jacket	2	Mechanical Room K153 insulated hot water holding tank, on green foam insulation		
21093K-05	Green Foam insulation on the hot water holding tank	3	Mechanical Room K153 insulated hot water holding tank behind gray jacket		
21093K-06	Green Foam insulation on the hot water holding tank	3	Mechanical Room K153 insulated hot water holding tank behind gray jacket		
21093K-07	Green Foam insulation on the hot water holding tank	3	Mechanical Room K153 insulated hot water holding tank behind gray jacket		
21093K-08	Mud insulation on tan hot water pipe fittings	4	Mechanical Room K153 tan water line at west wall at hot water holding tank		
21093K-09	Mud insulation on tan hot water pipe fittings	4	Mechanical Room K153 tan water lines vertical along the east wall		
21093K-10	Mud insulation on tan hot water pipe fittings	4	Mechanical Room K153 tan water lines vertical along the east wall		
21093K-11	Tan paper jacket, black tar dabs and foil on fiberglass TSI	5	Mechanical Room K153 tan water lines at the south wall		
21093K-12	Tan paper jacket, black tar dabs and foil on fiberglass TSI	5	Mechanical Room K153 tan water line at west wall at hot water holding tank		
21093K-13	Gaskets in hot water lines Mechanical Room K153	6	Mechanical Room K153 Hot Water Supply valve along east wall. 6 flange gaskets		
21093K-14	Gaskets in hot water lines Mechanical Room K153	6	Mechanical Room K153 Hot Water Return valve along east wall. 6 flange gaskets		
21093K-15	Gray jacket and foil on hot water supply and return lines fiberglass TSI	7	Mechanical Room K153 fiberglass insulated hot water supply line at east wall		
21093K-16	Gray jacket and foil on hot water supply and return lines fiberglass TSI	7	Mechanical Room K153 Hot Water Supply line above the large boiler		
21093K-17	Mud insulation on overhead hot water supply and return lines	8	Mechanical Room K153 Hot Water Return line at east wall by valves		
21093K-18	Mud insulation on overhead hot water supply and return lines	8	Mechanical Room K153 hot water supply line elbow above large boiler		
21093K-19	Mud insulation on overhead hot water supply and return lines	8	Mechanical Room K153 hot water supply line elbow above large boiler		

Sampled By: Edward J. Jones **Date:** 09/29/22 **Received By:** _____ **Date:** _____

Relinquished By: Edward J. Jones **Date:** 10/04/22 10:00 **Received By:** _____ **Date:** _____

Comments: If PLM NOB is negative, analyze by TEM. Stop at first positive for each homogeneous material description group.
If Vermiculite is detected , cease analysis and contact the Watts Project Manager for further instructions.

Received
OCT 05 2022

122101148

WATTS ARCHITECTS & ENGINEERS
ASBESTOS BULK SAMPLE CHAIN-OF-CUSTODY

Client: Erie County DPW/IBC Engineering
Project: ECC North Campus Mechanical Renovations
Building / Location: K Building ECC North, Williamsville, NY
Contact: Edward J. Jones **at (716) 430-9349**
Preliminary Results to: ejones@watts-ae.com **and** kjanik@watts-ae.com
Mail Report & Invoice to: **Watts Architects & Engineers**
95 Perry Street, Buffalo, NY 14203

Date: Thursday 09/29/2022
Watts Project No.: 21093

Turnaround Requested:
___ 3 Hr. ___ 48 Hr.
___ 6 Hr. ___ 72 Hr.
___ 12 Hr. ___ 4 Day
___ 24 Hr. X 5 Day
7 Day

Analysis Requested:
198.1 x 198.6 x
198.4 x

Sample Number	Material Description	HA	Sample Location	Laboratory Results PLM	Laboratory Results TEM
21093K-20	White end sealant fiberglass insulation hot water piping	9	Mechanical Room K153 newer insulation hot water supply pipe above large boiler		
21093K-21	White end sealant fiberglass insulation hot water piping	9	Mechanical Room K153 newer insulation hot water supply pipe above large boiler		
21093K-22	White fibrous insulation on small boiler behind sheet metal jacket	10	Mechanical Room K153 small boiler by the hot water holding tank		
21093K-23	White fibrous insulation on small boiler behind sheet metal jacket	10	Mechanical Room K153 small boiler by the hot water holding tank		
21093K-24	Yellow fibrous insulation on large boiler behind sheet metal jacket	11	Mechanical Room K153 large boiler		
21093K-25	Yellow fibrous insulation on large boiler behind sheet metal jacket	11	Mechanical Room K153 large boiler		
21093K-26	White paper and foil on fiberglass new piping at large boiler	12	Mechanical Room K153 Hot Water Supply Line new section above large boiler		
21093K-27	White paper and foil on fiberglass new piping at large boiler	12	Mechanical Room K153 Hot Water Return Line new section above large boiler		
21093K-28	Gaskets on piping at the Large Boiler	13	Mechanical Room K153 Cold Water Supply line on side of the large boiler		
21093K-29	Gaskets on piping at the Large Boiler	13	Mechanical Room K153 Cold Water Supply line on side of the large boiler		
21093K-30	Gaskets in red valves and pumps above the Large Boiler	14	Mechanical Room K153 red valves and pumps above the large boiler. 10 flange gask		
21093K-31	Gaskets in red valves and pumps above the Large Boiler	14	Mechanical Room K153 red valves and pumps above the large boiler. 10 flange gask		
21093K-32	Mud fittings on fiberglass piping K Building basement	15	1/2" diameter line mud elbow in basement adjacent to Mechanical Room K153		
21093K-33	Mud fittings on fiberglass piping K Building basement	15	1/2" diameter line mud elbow in basement adjacent to Mechanical Room K153		
21093K-34	Mud fittings on fiberglass piping K Building basement	15	1" diameter mud elbow in basement adjacent to Mechanical Room K153		
21093K-35	Wood laminate and mastic on top of 9" x 9" floor tiles	16	Room K152 on top 9" light gray floor tiles		
21093K-36	Wood laminate and mastic on top of 9" x 9" floor tiles	16	Room K235 on top 9" x 9" green floor tiles		
21093K-37	18" x 18" gay floor tiles on top 9" light gray floor tiles	17	Room K158 on top of 9" gray floor tiles		
21093K-38	18" x 18" gay floor tiles on top 9" light gray floor tiles	17	Room K158 on top of 9" gray floor tiles		

Sampled By: Edward J. Jones **Date:** 09/29/22 **Received By:** _____ **Date:** _____
Relinquished By: Edward J. Jones **Date:** 10/04/22 16:00 **Received By:** _____ **Date:** _____

Received
OCT 05 2022

Comments: If PLM NOB is negative, analyze by TEM. Stop at first positive for each homogeneous material description group.
If Vermiculite is detected , cease analysis and contact the Watts Project Manager for further instructions.

12210148

WATTS ARCHITECTS & ENGINEERS
ASBESTOS BULK SAMPLE CHAIN-OF-CUSTODY

Client: Erie County DPW/IBC Engineering
Project: ECC North Campus Mechanical Renovations
Building / Location: K Building ECC North, Williamsville, NY
Contact: Edward J. Jones at (716) 430-9349
Preliminary Results to: ejones@watts-ae.com and kjanik@watts-ae.com
Mail Report & Invoice to: Watts Architects & Engineers
95 Perry Street, Buffalo, NY 14203

Date: Thursday 09/29/2022
Watts Project No.: 21093

Turnaround Requested:

3 Hr.	48 Hr.
6 Hr.	72 Hr.
12 Hr.	4 Day
24 Hr.	X 5 Day
	7 Day

Analysis Requested:
198.1 x 198.6 x 198.4 x

Sample Number	Material Description	HA	Sample Location	Laboratory Results PLM	Laboratory Results TEM
21093K-39	Tan adhesive beneath 18" gray floor tiles and on top 9" floor tiles	18	Room K158 on top of 9" gray floor tiles		
21093K-40	Tan adhesive beneath 18" gray floor tiles and on top 9" floor tiles	18	Room K158 on top of 9" gray floor tiles		
21093K-41	2' x 4' suspended ceiling tiles pinhole & small fissure pattern	19	Room 258 suspended ceiling		
21093K-42	2' x 4' suspended ceiling tiles pinhole & small fissure pattern	19	Room 256 suspended ceiling		
21093K-43	2' x 2' suspended ceiling tiles with small round holes pattern	20	Room 236 suspended ceiling		
21093K-44	2' x 2' suspended ceiling tiles with small round holes pattern	20	Room 231 suspended ceiling		
21093K-45	2' x 2" suspended ceiling tiles pinhole & small slot pattern	21	Second floor corridor at Room 230		
21093K-46	2' x 2' suspended ceiling tiles with small round holes pattern	21	First floor corridor at Room 152		
21093K-47	12" x 12" light green floor tile on concrete	22	Room 256		
21093K-48	12" x 12" light green floor tile on concrete	22	Room 256		
21093K-49	Leveling compound & residual black mastic beneath 12" lt. green floor tiles	23	Room 256 on concrete		
21093K-50	Leveling compound & residual black mastic beneath 12" lt. green floor tiles	23	Room 256 on concrete		
21093K-51	Caulk along exterior louver to unit ventilators	24	Exterior of Room 113 perimeter of exterior louver 1" wide 11" x 46"		
21093K-52	Caulk along exterior louver to unit ventilators	24	Exterior of Room 114 perimeter of exterior louver 1" wide 11" x 46"		

Sampled By: Edward J. Jones **Date:** 09/29/22 **Received By:** _____ **Date:** _____
Relinquished By: Edward J. Jones **Date:** 10/04/22 10:00 **Received By:** _____ **Date:** _____

Comments: If PLM NOB is negative, analyze by TEM. Stop at first positive for each homogeneous material description group.
If Vermiculite is detected , cease analysis and contact the Watts Project Manager for further instructions.

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OCT 05 2022

12210148

Page: 4 of 4

WATTS ARCHITECTS & ENGINEERS
ASBESTOS BULK SAMPLE CHAIN-OF-CUSTODY

Client: Erie County DPW/IBC Engineering
Project: ECC North Campus Mechanical Renovations
Building / Location: K Building ECC North, Williamsville, NY
Contact: Edward J. Jones **at (716) 430-9349**
Preliminary Results to: ejones@watts-ae.com **and** kjanik@watts-ae.com
Mail Report & Invoice to: **Watts Architects & Engineers**
95 Perry Street, Buffalo, NY 14203

Date: Monday 10/03/2022
Watts Project No.: 21093

Turnaround Requested:

___ 3 Hr.	___ 48 Hr.
___ 6 Hr.	___ 72 Hr.
___ 12 Hr.	___ 4 Day
___ 24 Hr.	X 5 Day
	7 Day

Analysis Requested:
198.1 x 198.6 x 198.4 x

Sample Number	Material Description	HA	Sample Location	Laboratory Results PLM	Laboratory Results TEM
21093K-53	1/2" black tar and fabric vapor barrier beneath 2 1/2" poly iso foam	25	K Building roof Core 1 northeast area north of access hatch at EPDM patch		
21093K-54	1/2" black tar and fabric vapor barrier beneath 2 1/2" poly iso foam	25	K Building roof Core 2 west roof west area at EPDM patch field		
21093K-55	Soft concrete roof deck beneath black tar and fabric vapor barrier	26	K Building roof Core 1 northeast area north of access hatch at EPDM patch		
21093K-56	Soft concrete roof deck beneath black tar and fabric vapor barrier	26	K Building roof Core 2 west roof west area at EPDM patch field		
21093K-57	Black tar patches on base of Exhaust Fans	27	K Building south roof wing south east area Ex Fan 1 corner patches 0.25 ft2		
21093K-58	Black tar patches on base of Exhaust Fans	27	K Building west roof west end base of Ex Fan 14 splattered ~1 ft2		
21093K-59	Black tar patches on base of vents and AHU units	28	K Building south roof center area new round vent above PVC roof membran		
21093K-60	Black tar patches on base of vents and AHU units	28	K Building north roof center Valent AHU curb to sheet metal duct		
21093K-61	Black tar sealant edges silver foil jackets on foam insulation to ducts	29	K Building west roof west end sheet metal ducts at Trane AC 4		
21093K-62	Black tar sealant edges silver foil jackets on foam insulation to ducts	29	K Building west roof west end sheet metal ducts at Trane AC 3		
21093K-63	Black tar sealant edges silver foil jackets on foam insulation to ducts	29	K Building north roof center sheet metal ducts at Valent AHU		

Sampled By: Edward J. Jones **Date:** 10/03/22 **Received By:** _____ **Date:** _____

Relinquished By: Edward J. Jones **Date:** 10/04/22 10:00 **Received By:** _____ **Date:** _____

Comments: If PLM NOB is negative, analyze by TEM. Stop at first positive for each homogeneous material description group.
If Vermiculite is detected , cease analysis and contact the Watts Project Manager for further instructions.

~~Received~~

OCT 05 2022

AmeriSci Richmond
13635 GENITO ROAD
MIDLOTHIAN, VIRGINIA 23112
TEL: (804) 763-1200 • FAX: (804) 763-0493

PLM Bulk Asbestos Report

Watts Architecture & Engineers
Attn: Mark Beyer
95 Perry Street
Suite 300
Buffalo, NY 14203

Date Received 2/20/2026 **AmeriSci Job #** 126021941
Date Examined 02/27/26 **P.O. #**
ELAP # 10984 **Page** 1 **of** 8
RE: 20250347; ECC Kittinger Boiler Replacement; ECC North Campus - Kittinger Hall

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos	Notes
250347-14 6	126021941-01	***No***	NAD (by NYS ELAP 198.1) by Eric H. Ahles on 02/27/26	
Location: Plaster Ceiling Skim Coat; K100 Lecture Hall **Analyst Description:** White, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%				
250347-15 6	126021941-02	***No***	NAD (by NYS ELAP 198.1) by Eric H. Ahles on 02/27/26	
Location: Plaster Ceiling Skim Coat; K100 Lecture Hall **Analyst Description:** White, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%				
250347-16 6	126021941-03	***No***	NAD (by NYS ELAP 198.1) by Eric H. Ahles on 02/27/26	
Location: Plaster Ceiling Skim Coat; K100 Lecture Hall **Analyst Description:** White, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%				
250347-17 6	126021941-04	***No***	NAD (by NYS ELAP 198.1) by Eric H. Ahles on 02/27/26	
Location: Plaster Ceiling Skim Coat; Stairwell Behind K100 Lecture Hall **Analyst Description:** White, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%				
250347-18 6	126021941-05	***No***	NAD (by NYS ELAP 198.1) by Eric H. Ahles on 02/27/26	
Location: Plaster Ceiling Skim Coat; Stairwell Behind K100 Lecture Hall **Analyst Description:** White, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%				
250347-19 7	126021941-06	***No***	NAD (by NYS ELAP 198.1) by Eric H. Ahles on 02/27/26	
Location: Plaster Ceiling Base Coat; Stairwell Behind K100 Lecture Hall **Analyst Description:** Gray, Heterogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%				

See Reporting notes on last page

PLM Bulk Asbestos Report

20250347; ECC Kittinger Boiler Replacement; ECC North Campus - Kittinger Hall

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos	Notes
250347-207	126021941-07	***No***	NAD (by NYS ELAP 198.1) by Eric H. Ahles on 02/27/26	
Location: Plaster Ceiling Base Coat; Stairwell Behind K100 Lecture Hall **Analyst Description:** Gray, Heterogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%				
250347-217	126021941-08	***No***	NAD (by NYS ELAP 198.1) by Eric H. Ahles on 02/27/26	
Location: Plaster Ceiling Base Coat; Stairwell Behind K100 Lecture Hall **Analyst Description:** Gray, Heterogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%				
250347-227	126021941-09	***No***	NAD (by NYS ELAP 198.1) by Eric H. Ahles on 02/27/26	
Location: Plaster Ceiling Base Coat; Stairwell Behind K100 Lecture Hall **Analyst Description:** Gray, Heterogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%				
250347-237	126021941-10	***No***	NAD (by NYS ELAP 198.1) by Eric H. Ahles on 02/27/26	
Location: Plaster Ceiling Base Coat; Stairwell Behind K100 Lecture Hall **Analyst Description:** Gray, Heterogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%				
250347-248	126021941-11	***No***	NAD (by NYS ELAP 198.1) by Eric H. Ahles on 02/27/26	
Location: Pipe Fitting Insulation On Refrigerant Lines; Behind AH-01 In K100 Basement Mechanical Space **Analyst Description:** Gray, Heterogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose Trace, Fibrous glass 20%, Non-fibrous 80%				
250347-258	126021941-12	***No***	NAD (by NYS ELAP 198.1) by Eric H. Ahles on 02/27/26	
Location: Pipe Fitting Insulation On Refrigerant Lines; On Floor Behind AH-01 In K100 Basement Mechanical Space **Analyst Description:** Gray, Heterogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose Trace, Fibrous glass 20%, Non-fibrous 80%				

See Reporting notes on last page

AmeriSci Richmond
13635 GENITO ROAD
MIDLOTHIAN, VIRGINIA 23112
TEL: (804) 763-1200 • FAX: (804) 763-0493

PLM Bulk Asbestos Report

Encorus Group Engineering P.C.
Attn: Sean Fitzgerald
295 Main Street

West Seneca, NY 14141

Date Received 8/4/2025 **AmeriSci Job #** 125081138
Date Examined 08/07/25 **P.O. #**
ELAP # 10984 **Page** 1 **of** 11

RE: 25374; Bell & Spina Architects/ Neil Garry; SUNY ECC Kittinger Hall Roof Replacement/6205 Main Street Williamsville, NY 14221

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos	Notes
20250724-25374-400-1 400	125081138-01	***No***	NAD (by NYS ELAP 198.1) by Eric H. Ahles on 08/07/25	
Location: Mud Packing Insulation - Roof Drain Bowl; Corridor K250 **Analyst Description:** Gray, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Fibrous glass 10%, Non-fibrous 90%				
20250724-25374-400-2 400	125081138-02	***No***	NAD (by NYS ELAP 198.1) by Eric H. Ahles on 08/07/25	
Location: Mud Packing Insulation - Roof Drain Bowl; Corridor K250 **Analyst Description:** Gray, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Fibrous glass 10%, Non-fibrous 90%				
20250724-25374-400-3 400	125081138-03	***No***	NAD (by NYS ELAP 198.1) by Eric H. Ahles on 08/07/25	
Location: Mud Packing Insulation - Roof Drain Bowl; Corridor K250 **Analyst Description:** Gray, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Fibrous glass 10%, Non-fibrous 90%				
20250724-25374-600.1-1 600.1	125081138-04	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by Eric H. Ahles on 08/07/25	*1*
Location: Pipe Insulation Jacket - Fiberglass, Grey, Exterior; Roof 4 **Analyst Description:** Silver, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-Asbestos 17% **Comment:** Heat Sensitive (organic): 8.1%; Acid Soluble (inorganic): 74.2%; Inert (Non-asbestos): 17.7%				
20250724-25374-600.1-2 600.1	125081138-05	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by Eric H. Ahles on 08/07/25	*1*
Location: Pipe Insulation Jacket - Fiberglass, Grey, Exterior; Roof 4 **Analyst Description:** Silver, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-Asbestos 66% **Comment:** Heat Sensitive (organic): 27.1%; Acid Soluble (inorganic): 6.3%; Inert (Non-asbestos): 66.6%				

See Reporting notes on last page

PLM Bulk Asbestos Report

25374; Bell & Spina Architects/ Neil Garry; SUNY ECC Kittinger Hall
Roof Replacement/6205 Main Street Williamsville, NY 14221

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos	Notes
20250724-25374-600.2-1 600.2	125081138-06	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by Eric H. Ahles on 08/07/25	*1*

Location: Pipe Insulation Jacket - Fiberglass, White; Roof 4
Analyst Description: Silver, Heterogeneous, Non-Fibrous, Bulk Material
Asbestos Types:
Other Material: Non-Asbestos 43%
Comment: Heat Sensitive (organic): 43.1%; Acid Soluble (inorganic): 13.2%; Inert (Non-asbestos): 43.7%

20250724-25374-600.2-2 600.2	125081138-07	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by Eric H. Ahles on 08/07/25	*1*

Location: Pipe Insulation Jacket - Fiberglass, White; Roof 4
Analyst Description: Silver, Heterogeneous, Non-Fibrous, Bulk Material
Asbestos Types:
Other Material: Non-Asbestos 45%
Comment: Heat Sensitive (organic): 43.4%; Acid Soluble (inorganic): 11.4%; Inert (Non-asbestos): 45.2%

20250724-25374-600.3-1 600.3	125081138-08	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by Eric H. Ahles on 08/07/25	*1*

Location: Pipe Insulation Mastic Daub - Black; Roof 4
Analyst Description: Black, Heterogeneous, Non-Fibrous, Bulk Material
Asbestos Types:
Other Material: Non-Asbestos NAD
Comment: Heat Sensitive (organic): 98.9%; Acid Soluble (inorganic): 1.1%

20250724-25374-600.3-2 600.3	125081138-09	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by Eric H. Ahles on 08/07/25	*1*

Location: Pipe Insulation Mastic Daub - Black; Roof 4
Analyst Description: Black, Heterogeneous, Non-Fibrous, Bulk Material
Asbestos Types:
Other Material: Non-Asbestos NAD
Comment: Heat Sensitive (organic): 94.0%; Acid Soluble (inorganic): 6.0%

20250724-25374-700-1 700	125081138-10	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by Eric H. Ahles on 08/07/25	*1*

Location: Roofing Repair Compound - White; Roof 5
Analyst Description: White, Heterogeneous, Non-Fibrous, Bulk Material
Asbestos Types:
Other Material: Non-Asbestos 27%
Comment: Heat Sensitive (organic): 36.4%; Acid Soluble (inorganic): 36.1%; Inert (Non-asbestos): 27.5%

20250724-25374-700-2 700	125081138-11	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by Eric H. Ahles on 08/07/25	*1*

Location: Roofing Repair Compound - White; Roof 5
Analyst Description: White, Heterogeneous, Non-Fibrous, Bulk Material
Asbestos Types:
Other Material: Non-Asbestos 28%
Comment: Heat Sensitive (organic): 30.8%; Acid Soluble (inorganic): 40.5%; Inert (Non-asbestos): 28.7%

See Reporting notes on last page

PLM Bulk Asbestos Report

25374; Bell & Spina Architects/ Neil Garry; SUNY ECC Kittinger Hall
Roof Replacement/6205 Main Street Williamsville, NY 14221

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos	Notes
20250724-25374-701-1 701	125081138-12	***Yes***	3.5% (NOB by NYS ELAP 198.6) by Eric H. Ahles on 08/07/25	
Location: Roof Drain Water Cutoff Mastic - Black, Bituminous; Roof 5 **Analyst Description:** Black, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** Chrysotile 3.5% **Other Material:** Non-Asbestos 32% **Comment:** Heat Sensitive (organic): 58.8%; Acid Soluble (inorganic): 5.1%; Inert (Non-asbestos): 32.6%				
20250724-25374-701-2 701	125081138-13		NA/PS	
Location: Roof Drain Water Cutoff Mastic - Black, Bituminous; Roof 5 **Analyst Description:** Bulk Material **Asbestos Types:** **Other Material:** **Comment:** Heat Sensitive (organic): 59.6%; Acid Soluble (inorganic): 6.8%; Inert (Non-asbestos): 33.6%				
20250724-25374-702-1 702	125081138-14	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by Eric H. Ahles on 08/07/25	*1*
Location: Control Joint Sealant - Grey; Roof 4 **Analyst Description:** Gray, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-Asbestos 22% **Comment:** Heat Sensitive (organic): 50.2%; Acid Soluble (inorganic): 27.5%; Inert (Non-asbestos): 22.3%				
20250724-25374-702-2 702	125081138-15	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by Eric H. Ahles on 08/07/25	*1*
Location: Control Joint Sealant - Grey; Roof 4 **Analyst Description:** Gray, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-Asbestos 15% **Comment:** Heat Sensitive (organic): 49.3%; Acid Soluble (inorganic): 35.7%; Inert (Non-asbestos): 15.1%				
20250724-25374-703-1 703	125081138-16	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by Eric H. Ahles on 08/07/25	*1*
Location: Equipment Support Sealant - Beige; Roof 4 **Analyst Description:** Gray, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-Asbestos 60% **Comment:** Heat Sensitive (organic): 33.5%; Acid Soluble (inorganic): 5.6%; Inert (Non-asbestos): 60.9%				
20250724-25374-703-2 703	125081138-17	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by Eric H. Ahles on 08/07/25	*1*
Location: Equipment Support Sealant - Beige; Roof 4 **Analyst Description:** Gray, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-Asbestos 49% **Comment:** Heat Sensitive (organic): 36.4%; Acid Soluble (inorganic): 14.6%; Inert (Non-asbestos): 49.0%				

See Reporting notes on last page

PLM Bulk Asbestos Report

25374; Bell & Spina Architects/ Neil Garry; SUNY ECC Kittinger Hall
Roof Replacement/6205 Main Street Williamsville, NY 14221

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos	Notes
20250724-25374-704-1 704	125081138-18	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by Eric H. Ahles on 08/07/25	*1*

Location: Flashing Tar - Black; Roof 4
Analyst Description: Black, Heterogeneous, Non-Fibrous, Bulk Material
Asbestos Types:
Other Material: Non-Asbestos 20%
Comment: Heat Sensitive (organic): 56.2%; Acid Soluble (inorganic): 23.4%; Inert (Non-asbestos): 20.4%

20250724-25374-704-2 704	125081138-19	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by Eric H. Ahles on 08/07/25	*1*

Location: Flashing Tar - Black; Roof 4
Analyst Description: Black, Heterogeneous, Non-Fibrous, Bulk Material
Asbestos Types:
Other Material: Non-Asbestos 28%
Comment: Heat Sensitive (organic): 53.7%; Acid Soluble (inorganic): 17.4%; Inert (Non-asbestos): 28.9%

20250724-25374-705-1 705	125081138-20	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by Eric H. Ahles on 08/07/25	*1*

Location: Brick Sealant - Beige; Roof 4
Analyst Description: Beige, Heterogeneous, Non-Fibrous, Bulk Material
Asbestos Types:
Other Material: Non-Asbestos 38%
Comment: Heat Sensitive (organic): 30.2%; Acid Soluble (inorganic): 31.2%; Inert (Non-asbestos): 38.6%

20250724-25374-705-2 705	125081138-21	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by Eric H. Ahles on 08/07/25	*1*

Location: Brick Sealant - Beige; Roof 4
Analyst Description: Beige, Heterogeneous, Non-Fibrous, Bulk Material
Asbestos Types:
Other Material: Non-Asbestos 32%
Comment: Heat Sensitive (organic): 32.2%; Acid Soluble (inorganic): 35.0%; Inert (Non-asbestos): 32.8%

20250724-25374-706-1 706	125081138-22	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by Eric H. Ahles on 08/07/25	*1*

Location: Modified Bituminous Roofing Seam Sealant - White, Hard; Roof 4
Analyst Description: White, Heterogeneous, Non-Fibrous, Bulk Material
Asbestos Types:
Other Material: Non-Asbestos 16%
Comment: Heat Sensitive (organic): 42.9%; Acid Soluble (inorganic): 40.2%; Inert (Non-asbestos): 16.9%

20250724-25374-706-2 706	125081138-23	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by Eric H. Ahles on 08/07/25	*1*

Location: Modified Bituminous Roofing Seam Sealant - White, Hard; Roof 4
Analyst Description: White, Heterogeneous, Non-Fibrous, Bulk Material
Asbestos Types:
Other Material: Non-Asbestos 17%
Comment: Heat Sensitive (organic): 40.6%; Acid Soluble (inorganic): 41.6%; Inert (Non-asbestos): 17.8%

See Reporting notes on last page

PLM Bulk Asbestos Report

25374; Bell & Spina Architects/ Neil Garry; SUNY ECC Kittinger Hall
Roof Replacement/6205 Main Street Williamsville, NY 14221

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos	Notes
20250724-25374-707-1 707	125081138-24	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by Eric H. Ahles on 08/07/25	*1*

Location: Skylight Frame Sealant - White & Black Comingled; Roof 3
Analyst Description: White/Black, Heterogeneous, Non-Fibrous, Bulk Material
Asbestos Types:
Other Material: Non-Asbestos 4.3%
Comment: Heat Sensitive (organic): 45.3%; Acid Soluble (inorganic): 50.4%; Inert (Non-asbestos): 4.3%

20250724-25374-707-2 707	125081138-25	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by Eric H. Ahles on 08/07/25	*1*

Location: Skylight Frame Sealant - White & Black Comingled; Roof 3
Analyst Description: White/Black, Heterogeneous, Non-Fibrous, Bulk Material
Asbestos Types:
Other Material: Non-Asbestos 10%
Comment: Heat Sensitive (organic): 43.0%; Acid Soluble (inorganic): 46.8%; Inert (Non-asbestos): 10.3%

20250724-25374-708-1 708	125081138-26	***Yes***	1.9% (NOB by EPA 600/M4-82-020) by Eric H. Ahles on 08/07/25	

Location: Flashing Sealant - White; Roof 1
Analyst Description: White, Heterogeneous, Non-Fibrous, Bulk Material
Asbestos Types: Chrysotile 1.9%
Other Material: Non-Asbestos 52%
Comment: Heat Sensitive (organic): 36.0%; Acid Soluble (inorganic): 9.6%; Inert (Non-asbestos): 52.5%

20250724-25374-708-2 708	125081138-27		NA/PS	

Location: Flashing Sealant - White; Roof 1
Analyst Description: Bulk Material
Asbestos Types:
Other Material:
Comment: Heat Sensitive (organic): 45.9%; Acid Soluble (inorganic): 3.1%; Inert (Non-asbestos): 51.0%

20250724-25374-709-1 709	125081138-28	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by Eric H. Ahles on 08/07/25	*1*

Location: Flashing Sealant - Dark Grey; Roof 7
Analyst Description: Gray, Heterogeneous, Non-Fibrous, Bulk Material
Asbestos Types:
Other Material: Non-Asbestos 31%
Comment: Heat Sensitive (organic): 56.2%; Acid Soluble (inorganic): 12.3%; Inert (Non-asbestos): 31.5%

20250724-25374-709-2 709	125081138-29	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by Eric H. Ahles on 08/07/25	*1*

Location: Flashing Sealant - Dark Grey; Roof 7
Analyst Description: Gray, Heterogeneous, Non-Fibrous, Bulk Material
Asbestos Types:
Other Material: Non-Asbestos 27%
Comment: Heat Sensitive (organic): 60.4%; Acid Soluble (inorganic): 11.7%; Inert (Non-asbestos): 27.9%

See Reporting notes on last page

PLM Bulk Asbestos Report

25374; Bell & Spina Architects/ Neil Garry; SUNY ECC Kittinger Hall
Roof Replacement/6205 Main Street Williamsville, NY 14221

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos	Notes
20250724-25374-710-1 710	125081138-30	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by Eric H. Ahles on 08/07/25	*1*

Location: Single Ply Asphalt Roofing - Black; Roof 7
Analyst Description: Black, Heterogeneous, Non-Fibrous, Bulk Material
Asbestos Types:
Other Material: Non-Asbestos 11%
Comment: Heat Sensitive (organic): 63.9%; Acid Soluble (inorganic): 24.5%; Inert (Non-asbestos): 11.6%

20250724-25374-711.1-1 711.1	125081138-31	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by Eric H. Ahles on 08/07/25	*1*

Location: Modified Bituminous Roofing L1; Roof 4 - RC9
Analyst Description: Black, Heterogeneous, Non-Fibrous, Bulk Material
Asbestos Types:
Other Material: Non-Asbestos 44%
Comment: Heat Sensitive (organic): 53.7%; Acid Soluble (inorganic): 1.5%; Inert (Non-asbestos): 44.8%

20250724-25374-711.1-2 711.1	125081138-32	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by Eric H. Ahles on 08/07/25	*1*

Location: Modified Bituminous Roofing L1; Roof 4 - RC10
Analyst Description: Black, Heterogeneous, Non-Fibrous, Bulk Material
Asbestos Types:
Other Material: Non-Asbestos 51%
Comment: Heat Sensitive (organic): 37.6%; Acid Soluble (inorganic): 10.8%; Inert (Non-asbestos): 51.7%

20250724-25374-711.2-1 711.2	125081138-33	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by Eric H. Ahles on 08/07/25	*1*

Location: Modified Bituminous Roofing L2; Roof 4 - RC9
Analyst Description: Black, Heterogeneous, Non-Fibrous, Bulk Material
Asbestos Types:
Other Material: Non-Asbestos 14%
Comment: Heat Sensitive (organic): 43.3%; Acid Soluble (inorganic): 42.2%; Inert (Non-asbestos): 14.5%

20250724-25374-711.2-2 711.2	125081138-34	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by William M. Dunstan on 08/07/25	*1*

Location: Modified Bituminous Roofing L2; Roof 4 - RC10
Analyst Description: Black, Heterogeneous, Non-Fibrous, Bulk Material
Asbestos Types:
Other Material: Non-fibrous 4.5%
Comment: Heat Sensitive (organic): 43.2%; Acid Soluble (inorganic): 52.3%; Inert (Non-asbestos): 4.5%

20250724-25374-711.3-1 711.3	125081138-35	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by William M. Dunstan on 08/07/25	*1*

Location: Roofing Felt; Roof 4 - RC9
Analyst Description: Black, Heterogeneous, Non-Fibrous, Bulk Material
Asbestos Types:
Other Material: Non-fibrous 0.0%
Comment: Heat Sensitive (organic): 93.9%; Acid Soluble (inorganic): 6.1%

See Reporting notes on last page

PLM Bulk Asbestos Report

25374; Bell & Spina Architects/ Neil Garry; SUNY ECC Kittinger Hall
Roof Replacement/6205 Main Street Williamsville, NY 14221

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos	Notes
20250724-25374-711.3-2 711.3	125081138-36	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by William M. Dunstan on 08/07/25	*1*
Location: Roofing Felt; Roof 4 - RC10 **Analyst Description:** Black, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 0.0% **Comment:** Heat Sensitive (organic): 97.9%; Acid Soluble (inorganic): 2.1%				
20250724-25374-711.4-1 711.4	125081138-37	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by William M. Dunstan on 08/07/25	*1*
Location: Modified Bituminous Roofing L4; Roof 4 - RC9 **Analyst Description:** Black, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 29% **Comment:** Heat Sensitive (organic): 48.8%; Acid Soluble (inorganic): 21.9%; Inert (Non-asbestos): 29.3%				
20250724-25374-711.4-2 711.4	125081138-38	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by William M. Dunstan on 08/07/25	*1*
Location: Modified Bituminous Roofing L4; Roof 4 - RC10 **Analyst Description:** Black, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 23% **Comment:** Heat Sensitive (organic): 52.2%; Acid Soluble (inorganic): 24.2%; Inert (Non-asbestos): 23.7%				
20250724-25374-712.1-1 712.1	125081138-39	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by William M. Dunstan on 08/07/25	*1*
Location: Single Ply Asphalt Roofing - Black; Roof 5 - RC7 **Analyst Description:** Black, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 7.5% **Comment:** Heat Sensitive (organic): 60.6%; Acid Soluble (inorganic): 31.9%; Inert (Non-asbestos): 7.5%				
20250724-25374-712.2-1 712.2	125081138-40	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by William M. Dunstan on 08/07/25	*1*
Location: Tar Infused Asphalt Roofing; Roof 5 - RC7 **Analyst Description:** Black, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 5.6% **Comment:** Heat Sensitive (organic): 81.3%; Acid Soluble (inorganic): 13.0%; Inert (Non-asbestos): 5.6%				
20250724-25374-712.3-1 712.3	125081138-41	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by William M. Dunstan on 08/07/25	*1*
Location: Hot Mop Vapor Barrier; Roof 5 - RC8 **Analyst Description:** Black, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 5.4% **Comment:** Heat Sensitive (organic): 85.5%; Acid Soluble (inorganic): 9.1%; Inert (Non-asbestos): 5.4%				

See Reporting notes on last page

PLM Bulk Asbestos Report

25374; Bell & Spina Architects/ Neil Garry; SUNY ECC Kittinger Hall
Roof Replacement/6205 Main Street Williamsville, NY 14221

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos	Notes
20250724-25374-713.1-1 713.1	125081138-42	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by William M. Dunstan on 08/07/25	*1*

Location: Single Ply Asphalt Roofing - Black; Roof 3 - RC5
Analyst Description: Black, Heterogeneous, Non-Fibrous, Bulk Material
Asbestos Types:
Other Material: Non-fibrous 0.0%
Comment: Heat Sensitive (organic): 97.0%; Acid Soluble (inorganic): 3.0%

20250724-25374-713.2-1 713.2	125081138-43	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by William M. Dunstan on 08/07/25	*1*

Location: Tar Infused Asphalt Roofing; Roof 3 - RC5
Analyst Description: Black, Heterogeneous, Non-Fibrous, Bulk Material
Asbestos Types:
Other Material: Non-fibrous 0.0%
Comment: Heat Sensitive (organic): 99.1%; Acid Soluble (inorganic): 0.9%

20250724-25374-713.3-1 713.3	125081138-44	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by William M. Dunstan on 08/07/25	*1*

Location: Hot Mop Vapor Barrier; Roof 3 - RC5
Analyst Description: Black, Heterogeneous, Non-Fibrous, Bulk Material
Asbestos Types:
Other Material: Non-fibrous 0.0%
Comment: Heat Sensitive (organic): 99.1%; Acid Soluble (inorganic): 0.9%

20250724-25374-714.1-1 714.1	125081138-45	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by William M. Dunstan on 08/07/25	*1*

Location: Tar Infused Asphalt Roofing; Roof 2 - RC4
Analyst Description: Black, Heterogeneous, Non-Fibrous, Bulk Material
Asbestos Types:
Other Material: Non-fibrous 6.9%
Comment: Heat Sensitive (organic): 71.9%; Acid Soluble (inorganic): 21.2%; Inert (Non-asbestos): 6.9%

20250724-25374-714.1-2 714.1	125081138-46	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by William M. Dunstan on 08/07/25	*1*

Location: Tar Infused Asphalt Roofing; Roof 2 - RC4
Analyst Description: Black, Heterogeneous, Non-Fibrous, Bulk Material
Asbestos Types:
Other Material: Non-fibrous 2.3%
Comment: Heat Sensitive (organic): 77.4%; Acid Soluble (inorganic): 20.3%; Inert (Non-asbestos): 2.3%

20250724-25374-714.2-1 714.2	125081138-47	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by William M. Dunstan on 08/07/25	*1*

Location: Roofing Tar Layer; Roof 2 - RC3
Analyst Description: Black, Heterogeneous, Non-Fibrous, Bulk Material
Asbestos Types:
Other Material: Non-fibrous 5.4%
Comment: Heat Sensitive (organic): 70.2%; Acid Soluble (inorganic): 24.5%; Inert (Non-asbestos): 5.4%

See Reporting notes on last page

PLM Bulk Asbestos Report

25374; Bell & Spina Architects/ Neil Garry; SUNY ECC Kittinger Hall
Roof Replacement/6205 Main Street Williamsville, NY 14221

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos	Notes
20250724-25374-714.2-2 714.2	125081138-48	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by William M. Dunstan on 08/07/25	*1*
Location: Roofing Tar Layer; Roof 2 - RC3 **Analyst Description:** Black, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 0.1% **Comment:** Heat Sensitive (organic): 98.2%; Acid Soluble (inorganic): 1.7%; Inert (Non-asbestos): 0.1%				
20250724-25374-714.3-1 714.3	125081138-49	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by William M. Dunstan on 08/07/25	*1*
Location: Hot Mop Vapor Barrier; Roof 2 - RC3 **Analyst Description:** Black, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 0.0% **Comment:** Heat Sensitive (organic): 95.6%; Acid Soluble (inorganic): 4.4%				
20250724-25374-714.3-2 714.3	125081138-50	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by William M. Dunstan on 08/07/25	*1*
Location: Hot Mop Vapor Barrier; Roof 2 - RC3 **Analyst Description:** Black, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 0.0% **Comment:** Heat Sensitive (organic): 85.4%; Acid Soluble (inorganic): 14.6%				
20250724-25374-715.1-1 715.1	125081138-51	***No***	NAD (by NYS ELAP 198.1) by Eric H. Ahles on 08/07/25	
Location: ISO Foam; Roof 1 - RC2 **Analyst Description:** Yellow, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%				
20250724-25374-715.1-2 715.1	125081138-52	***No***	NAD (by NYS ELAP 198.1) by Eric H. Ahles on 08/07/25	
Location: ISO Foam; Roof 1 - RC2 **Analyst Description:** Yellow, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%				
20250724-25374-715.2-1 715.2	125081138-53	***No***	NAD (by NYS ELAP 198.1) by Eric H. Ahles on 08/07/25	
Location: ISO Paper; Roof 1 - RC2 **Analyst Description:** Black, Heterogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose 90%, Fibrous glass 2.0%, Non-fibrous 8.0%				

See Reporting notes on last page

PLM Bulk Asbestos Report

25374; Bell & Spina Architects/ Neil Garry; SUNY ECC Kittinger Hall
Roof Replacement/6205 Main Street Williamsville, NY 14221

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos	Notes
20250724-25374-715.2-2 715.2 **Location:** ISO Paper; Roof 1 - RC2 **Analyst Description:** Black, Heterogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose 90%, Fibrous glass 2.0%, Non-fibrous 8.0%	125081138-54	***No***	NAD (by NYS ELAP 198.1) by Eric H. Ahles on 08/07/25	
20250724-25374-715.3-1 715.3 **Location:** Gypsum Deck; Roof 1 - RC2 **Analyst Description:** White, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose Trace, Non-fibrous 100%	125081138-55	***No***	NAD (by NYS ELAP 198.1) by Eric H. Ahles on 08/07/25	
20250724-25374-715.3-2 715.3 **Location:** Gypsum Deck; Roof 1 - RC2 **Analyst Description:** White, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose Trace, Non-fibrous 100%	125081138-56	***No***	NAD (by NYS ELAP 198.1) by Eric H. Ahles on 08/07/25	
20250724-25374-716.1-1 716.1 **Location:** Single Ply Asphalt Roofing - Black; Roof 1 - RC1 **Analyst Description:** Black, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 5.2% **Comment:** Heat Sensitive (organic): 72.2%; Acid Soluble (inorganic): 22.6%; Inert (Non-asbestos): 5.2%	125081138-57	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by William M. Dunstan on 08/07/25	*1*
20250724-25374-716.2-1 716.2 **Location:** Tar Infused Asphalt Roofing; Roof 1 - RC2 **Analyst Description:** Black, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 4.9% **Comment:** Heat Sensitive (organic): 64.7%; Acid Soluble (inorganic): 30.4%; Inert (Non-asbestos): 4.9%	125081138-58	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by William M. Dunstan on 08/07/25	*1*
20250724-25374-716.3-1 716.3 **Location:** Hot Mop Vapor Barrier; Roof 1 - RC2 **Analyst Description:** Black, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 6.6% **Comment:** Heat Sensitive (organic): 80.7%; Acid Soluble (inorganic): 12.7%; Inert (Non-asbestos): 6.6%	125081138-59	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by William M. Dunstan on 08/07/25	*1*

See Reporting notes on last page

PLM Bulk Asbestos Report

25374; Bell & Spina Architects/ Neil Garry; SUNY ECC Kittinger Hall
Roof Replacement/6205 Main Street Williamsville, NY 14221

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos	Notes
20250724-25374-717-1 717	125081138-60	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by William M. Dunstan on 08/07/25	*1*

Location: Roof Repair Tar - Black; Roof 2
Analyst Description: Black, Heterogeneous, Non-Fibrous, Bulk Material
Asbestos Types:
Other Material: Non-fibrous 11%
Comment: Heat Sensitive (organic): 80.8%; Acid Soluble (inorganic): 7.4%; Inert (Non-asbestos): 11.7%

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos	Notes
20250724-25374-717-2 717	125081138-61	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by William M. Dunstan on 08/07/25	*1*

Location: Roof Repair Tar - Black; Roof 2
Analyst Description: Black, Heterogeneous, Non-Fibrous, Bulk Material
Asbestos Types:
Other Material: Non-fibrous 11%
Comment: Heat Sensitive (organic): 76.5%; Acid Soluble (inorganic): 12.1%; Inert (Non-asbestos): 11.3%

Reporting Notes:

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

Analyzed by: Eric H. Ahles
Date: 8/7/2025



Reviewed by: Cory M. Parnell



*NAD = no asbestos detected, Detection Limit <1%, Reporting Limits: CVES = 1%, 400 Pt Ct = 0.25%, 1000 Pt Ct = 0.1%; "Present" or NVA = "No Visible Asbestos" are observations made during a qualitative analysis (Not covered by NVLAP or NY ELAP accreditations); NA = not analyzed; NA/PS = not analyzed / positive stop; PLM Bulk Asbestos Analysis using Meiji, Model MT 6130 microscope, Serial #1410298, by EPA 600/R-93/116 per 40 CFR 763 (NVLAP Lab Code 101904-0) and ELAP PLM Analysis Protocol 198.1 for New York friable samples which includes quantitation of any vermiculite observed (198.6 for NOB samples) or EPA 400 pt ct by EPA 600/M4-82-020 (NYSDOH ELAP Lab # 10984); CA ELAP Lab # 2508; Note: PLM is not consistently reliable in detecting asbestos in floor coverings and similar NOB 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 New York State (also see EPA Advisory for floor tile, FR 59, 146, 38970, 8/1/94). NIST Accreditation requirements mandate that this report must not be reproduced except in full without the approval of the laboratory. This PLM report relates ONLY to the items tested.

Client Name: Encorus Group Engineering P.C.

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

25374; Bell & Spina Architects/ Neil Garry; SUNY ECC Kittinger Hall Roof Replacement/6205 Main Street Williamsville, NY 14221

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	20250724-25374-400-1	400	----	----	----	----	NAD	NA
Location:	Mud Packing Insulation - Roof Drain Bowl; Corridor K250							
02	20250724-25374-400-2	400	----	----	----	----	NAD	NA
Location:	Mud Packing Insulation - Roof Drain Bowl; Corridor K250							
03	20250724-25374-400-3	400	----	----	----	----	NAD	NA
Location:	Mud Packing Insulation - Roof Drain Bowl; Corridor K250							
04	20250724-25374-600.1-1	600.1	0.377	8.1	74.2	17.7	NAD	NAD
Location:	Pipe Insulation Jacket - Fiberglass, Grey, Exterior; Roof 4							
05	20250724-25374-600.1-2	600.1	0.177	27.1	6.3	66.6	NAD	NAD
Location:	Pipe Insulation Jacket - Fiberglass, Grey, Exterior; Roof 4							
06	20250724-25374-600.2-1	600.2	0.197	43.1	13.2	43.7	NAD	NAD
Location:	Pipe Insulation Jacket - Fiberglass, White; Roof 4							
07	20250724-25374-600.2-2	600.2	0.188	43.4	11.4	45.2	NAD	NAD
Location:	Pipe Insulation Jacket - Fiberglass, White; Roof 4							
08	20250724-25374-600.3-1	600.3	0.207	98.9	1.1	-0.1	NAD	Chrysotile Trace
Location:	Pipe Insulation Mastic Daub - Black; Roof 4							
09	20250724-25374-600.3-2	600.3	0.135	94.0	6.0	-0.1	NAD	Chrysotile Trace
Location:	Pipe Insulation Mastic Daub - Black; Roof 4							
10	20250724-25374-700-1	700	0.332	36.4	36.1	27.5	NAD	NAD
Location:	Roofing Repair Compound - White; Roof 5							
11	20250724-25374-700-2	700	0.371	30.8	40.5	28.7	NAD	NAD
Location:	Roofing Repair Compound - White; Roof 5							
12	20250724-25374-701-1	701	0.226	58.8	5.1	36.1	Chrysotile 3.5	NA
Location:	Roof Drain Water Cutoff Mastic - Black, Bituminous; Roof 5							
13	20250724-25374-701-2	701	0.163	59.6	6.8	33.6	NA/PS	NA
Location:	Roof Drain Water Cutoff Mastic - Black, Bituminous; Roof 5							
14	20250724-25374-702-1	702	0.447	50.2	27.5	22.3	NAD	NAD
Location:	Control Joint Sealant - Grey; Roof 4							
15	20250724-25374-702-2	702	0.327	49.3	35.7	15.1	NAD	NAD
Location:	Control Joint Sealant - Grey; Roof 4							
16	20250724-25374-703-1	703	0.429	33.5	5.6	60.9	NAD	NAD
Location:	Equipment Support Sealant - Beige; Roof 4							

See Reporting notes on last page

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

25374; Bell & Spina Architects/ Neil Garry; SUNY ECC Kittinger Hall Roof Replacement/6205 Main Street Williamsville, NY 14221

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	20250724-25374-703-2	703	0.417	36.4	14.6	49.0	NAD	NAD
Location: Equipment Support Sealant - Beige; Roof 4								
18	20250724-25374-704-1	704	0.248	56.2	23.4	20.4	NAD	NAD
Location: Flashing Tar - Black; Roof 4								
19	20250724-25374-704-2	704	0.264	53.7	17.4	28.9	NAD	NAD
Location: Flashing Tar - Black; Roof 4								
20	20250724-25374-705-1	705	0.447	30.2	31.2	38.6	NAD	NAD
Location: Brick Sealant - Beige; Roof 4								
21	20250724-25374-705-2	705	0.569	32.2	35.0	32.8	NAD	NAD
Location: Brick Sealant - Beige; Roof 4								
22	20250724-25374-706-1	706	0.388	42.9	40.2	16.9	NAD	NAD
Location: Modified Bituminous Roofing Seam Sealant - White, Hard; Roof 4								
23	20250724-25374-706-2	706	0.351	40.6	41.6	17.8	NAD	NAD
Location: Modified Bituminous Roofing Seam Sealant - White, Hard; Roof 4								
24	20250724-25374-707-1	707	0.360	45.3	50.4	4.3	NAD	NAD
Location: Skylight Frame Sealant - White & Black Comingled; Roof 3								
25	20250724-25374-707-2	707	0.271	43.0	46.8	10.3	NAD	NAD
Location: Skylight Frame Sealant - White & Black Comingled; Roof 3								
26	20250724-25374-708-1	708	0.324	36.0	9.6	54.4	Chrysotile 1.9	NA
Location: Flashing Sealant - White; Roof 1								
27	20250724-25374-708-2	708	0.402	45.9	3.1	51.0	NA/PS	NA
Location: Flashing Sealant - White; Roof 1								
28	20250724-25374-709-1	709	0.468	56.2	12.3	31.5	NAD	NAD
Location: Flashing Sealant - Dark Grey; Roof 7								
29	20250724-25374-709-2	709	0.415	60.4	11.7	27.9	NAD	NAD
Location: Flashing Sealant - Dark Grey; Roof 7								
30	20250724-25374-710-1	710	0.295	63.9	24.5	11.6	NAD	NAD
Location: Single Ply Asphalt Roofing - Black; Roof 7								
31	20250724-25374-711.1-1	711.1	0.367	53.7	1.5	44.8	NAD	NAD
Location: Modified Bituminous Roofing L1; Roof 4 - RC9								
32	20250724-25374-711.1-2	711.1	0.334	37.6	10.8	51.7	NAD	NAD
Location: Modified Bituminous Roofing L1; Roof 4 - RC10								

See Reporting notes on last page

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

25374; Bell & Spina Architects/ Neil Garry; SUNY ECC Kittinger Hall Roof Replacement/6205 Main Street Williamsville, NY 14221

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	20250724-25374-711.2-1	711.2	0.345	43.3	42.2	14.5	NAD	NAD
Location: Modified Bituminous Roofing L2; Roof 4 - RC9								
34	20250724-25374-711.2-2	711.2	0.218	43.2	52.3	4.5	NAD	NAD
Location: Modified Bituminous Roofing L2; Roof 4 - RC10								
35	20250724-25374-711.3-1	711.3	0.440	93.9	6.1	0.0	NAD	NAD
Location: Roofing Felt; Roof 4 - RC9								
36	20250724-25374-711.3-2	711.3	0.248	97.9	2.1	0.0	NAD	NAD
Location: Roofing Felt; Roof 4 - RC10								
37	20250724-25374-711.4-1	711.4	0.507	48.8	21.9	29.3	NAD	NAD
Location: Modified Bituminous Roofing L4; Roof 4 - RC9								
38	20250724-25374-711.4-2	711.4	0.280	52.2	24.2	23.7	NAD	NAD
Location: Modified Bituminous Roofing L4; Roof 4 - RC10								
39	20250724-25374-712.1-1	712.1	0.271	60.6	31.9	7.5	NAD	NAD
Location: Single Ply Asphalt Roofing - Black; Roof 5 - RC7								
40	20250724-25374-712.2-1	712.2	0.215	81.3	13.0	5.6	NAD	NAD
Location: Tar Infused Asphalt Roofing; Roof 5 - RC7								
41	20250724-25374-712.3-1	712.3	0.362	85.5	9.1	5.4	NAD	NAD
Location: Hot Mop Vapor Barrier; Roof 5 - RC8								
42	20250724-25374-713.1-1	713.1	0.247	97.0	3.0	0.0	NAD	NAD
Location: Single Ply Asphalt Roofing - Black; Roof 3 - RC5								
43	20250724-25374-713.2-1	713.2	0.222	99.1	0.9	0.0	NAD	NAD
Location: Tar Infused Asphalt Roofing; Roof 3 - RC5								
44	20250724-25374-713.3-1	713.3	0.338	99.1	0.9	0.0	NAD	NAD
Location: Hot Mop Vapor Barrier; Roof 3 - RC5								
45	20250724-25374-714.1-1	714.1	0.530	71.9	21.2	6.9	NAD	NAD
Location: Tar Infused Asphalt Roofing; Roof 2 - RC4								
46	20250724-25374-714.1-2	714.1	0.206	77.4	20.3	2.3	NAD	NAD
Location: Tar Infused Asphalt Roofing; Roof 2 - RC4								
47	20250724-25374-714.2-1	714.2	0.297	70.2	24.5	5.4	NAD	NAD
Location: Roofing Tar Layer; Roof 2 - RC3								
48	20250724-25374-714.2-2	714.2	0.340	98.2	1.7	0.1	NAD	NAD
Location: Roofing Tar Layer; Roof 2 - RC3								

See Reporting notes on last page

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

25374; Bell & Spina Architects/ Neil Garry; SUNY ECC Kittinger Hall Roof Replacement/6205 Main Street Williamsville, NY 14221

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	20250724-25374-714.3-1	714.3	0.223	95.6	4.4	0.0	NAD	NAD
Location:	Hot Mop Vapor Barrier; Roof 2 - RC3							
50	20250724-25374-714.3-2	714.3	0.315	85.4	14.6	0.0	NAD	NAD
Location:	Hot Mop Vapor Barrier; Roof 2 - RC3							
51	20250724-25374-715.1-1	715.1	----	----	----	----	NAD	NA
Location:	ISO Foam; Roof 1 - RC2							
52	20250724-25374-715.1-2	715.1	----	----	----	----	NAD	NA
Location:	ISO Foam; Roof 1 - RC2							
53	20250724-25374-715.2-1	715.2	----	----	----	----	NAD	NA
Location:	ISO Paper; Roof 1 - RC2							
54	20250724-25374-715.2-2	715.2	----	----	----	----	NAD	NA
Location:	ISO Paper; Roof 1 - RC2							
55	20250724-25374-715.3-1	715.3	----	----	----	----	NAD	NA
Location:	Gypsum Deck; Roof 1 - RC2							
56	20250724-25374-715.3-2	715.3	----	----	----	----	NAD	NA
Location:	Gypsum Deck; Roof 1 - RC2							
57	20250724-25374-716.1-1	716.1	0.494	72.2	22.6	5.2	NAD	NAD
Location:	Single Ply Asphalt Roofing - Black; Roof 1 - RC1							
58	20250724-25374-716.2-1	716.2	0.302	64.7	30.4	4.9	NAD	NAD
Location:	Tar Infused Asphalt Roofing; Roof 1 - RC2							
59	20250724-25374-716.3-1	716.3	0.346	80.7	12.7	6.6	NAD	NAD
Location:	Hot Mop Vapor Barrier; Roof 1 - RC2							
60	20250724-25374-717-1	717	0.325	80.8	7.4	11.7	NAD	NAD
Location:	Roof Repair Tar - Black; Roof 2							
61	20250724-25374-717-2	717	0.364	76.5	12.1	11.3	NAD	NAD
Location:	Roof Repair Tar - Black; Roof 2							

See Reporting notes on last page

Client Name: Encorus Group Engineering P.C.

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

25374; Bell & Spina Architects/ Neil Garry; SUNY ECC Kittinger Hall Roof Replacement/6205 Main Street Williamsville, NY 14221

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

Analyzed by: Cory M. Parnell

Reviewed by: Cory M. Parnell

Date: 8/7/2025

Semi-Quantitative Analysis: NAD = no asbestos detected; NA = not analyzed; NA/PS = not analyzed due to positive stop; Trace = <1%; PLM analysis by EPA 600/R-93/116 per 40 CFR 763 (NVLAP Lab Code 101904-0) or NY ELAP 198.1 for New York friable samples which includes quantitation of any vermiculite observed (198.6 for NOB samples) or EPA 400 pt ct by EPA 600/M4-82-020 (NY ELAP Lab # 10984); TEM prep by EPA 600/R-93/116 Section 2.3 (analysis by Section 2.5, not covered by NVLAP Bulk accreditation); or NY ELAP 198.4 for New York NOB samples (NY ELAP Lab # 10984). Analysis using Jeol, Model JEM-100CX II microscope, Serial #156147-247. ** Warning Notes: Consider PLM fiber diameter 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, soils or other heterogeneous materials for which a combination PLM/TEM evaluation is recommended; Quantitation for beginning weights of <0.1 grams should be considered as qualitative only.

ENCORUS GROUP
23 Mechanic Street, Springville, NY 14141 | 295 Main Street, West Seneca, NY 14224 | encorus.com 716.592.3980

125081136

Bulk Chain of Custody

Email Report to:	labresults@encorus.com	**Turn Around Time**
		☐ RUSH
Client/Contact:	Bell & Spina Architects	☐ 24 Hour
	Neil Garry	☐ 48 Hour
Project/Location:	SUNY ECC Kittinger Hall Roof Replacement	☑ 72 Hour
	6205 Main Street Williamsville, NY 14221	☐ 5 Day
Project No.:	25374	Other:

Analysis Requested:			**Protocol:**	**Notes:**
PLM	☑	☑	Negative PLM to TEM per ELAP protocols	
TEM	☑	☑	Positive Stop by HAN-ID#	
PCB	☐	☐	Layered analysis requested for:	
Other:		61	Total # of Samples	

Sample Name					
Date	**Project**	**HAN**	**ID#**	**Description of Sample**	**Location of Sample**
20250724	25374	400	1	Mud Packing Insulation - Roof Drain Bowl	Corridor K250
20250724	25374	400	2	Mud Packing Insulation - Roof Drain Bowl	Corridor K250
20250724	25374	400	3	Mud Packing Insulation - Roof Drain Bowl	Corridor K250
20250724	25374	600.1	1	Pipe Insulation Jacket - Fiberglass, Grey, Exterior	Roof 4
20250724	25374	600.1	2	Pipe Insulation Jacket - Fiberglass, Grey, Exterior	Roof 4
20250724	25374	600.2	1	Pipe Insulation Jacket - Fiberglass, White	Roof 4
20250724	25374	600.2	2	Pipe Insulation Jacket - Fiberglass, White	Roof 4
20250724	25374	600.3	1	Pipe Insulation Mastic Daub - Black	Roof 4
20250724	25374	600.3	2	Pipe Insulation Mastic Daub - Black	Roof 4
20250724	25374	700	1	Roofing Repair Compound - White	Roof 5
20250724	25374	700	2	Roofing Repair Compound - White	Roof 5
20250724	25374	701	1	Roof Drain Water Cutoff Mastic - Black, Bituminous	Roof 5
20250724	25374	701	2	Roof Drain Water Cutoff Mastic - Black, Bituminous	Roof 5
20250724	25374	702	1	Control Joint Sealant - Grey	Roof 4
20250724	25374	702	2	Control Joint Sealant - Grey	Roof 4
20250724	25374	703	1	Equipment Support Sealant - Beige	Roof 4
20250724	25374	703	2	Equipment Support Sealant - Beige	Roof 4
20250724	25374	704	1	Flashing Tar - Black	Roof 4
20250724	25374	704	2	Flashing Tar - Black	Roof 4
20250724	25374	705	1	Brick Sealant - Beige	Roof 4
20250724	25374	705	2	Brick Sealant - Beige	Roof 4
20250724	25374	706	1	Modified Bituminous Roofing Seam Sealant - White, Hard	Roof 4
20250724	25374	706	2	Modified Bituminous Roofing Seam Sealant - White, Hard	Roof 4

Received

Sampled by: Daniel G. Korff/Dave Richardson Date: 07/24/2025
Relinquished by: Daniel G. Korff Date + Time:07/31/2025 1630
Received by: Date + Time:

AUG 04 2025

ENCORUS GROUP
23 Mechanic Street | 295 Main Street | encorus.com
Springville, NY 14141 | West Seneca, NY 14224 | 716.592.3980

Bulk Chain of Custody

125081138

20250724	25374	707	1	Skylight Frame Sealant - White & Black Comingled	Roof 3
20250724	25374	707	2	Skylight Frame Sealant - White & Black Comingled	Roof 3
20250724	25374	708	1	Flashing Sealant - White	Roof 1
20250724	25374	708	2	Flashing Sealant - White	Roof 1
20250724	25374	709	1	Flashing Sealant - Dark Grey	Roof 7
20250724	25374	709	2	Flashing Sealant - Dark Grey	Roof 7
20250724	25374	710	1	Single Ply Asphalt Roofing - Black	Roof 7
20250724	25374	711.1	1	Modified Bituminous Roofing L1	Roof 4 - RC9
20250724	25374	711.1	2	Modified Bituminous Roofing L1	Roof 4 - RC10
20250724	25374	711.2	1	Modified Bituminous Roofing L2	Roof 4 - RC9
20250724	25374	711.2	2	Modified Bituminous Roofing L2	Roof 4 - RC10
20250724	25374	711.3	1	Roofing Felt	Roof 4 - RC9
20250724	25374	711.3	2	Roofing Felt	Roof 4 - RC10
20250724	25374	711.4	1	Modified Bituminous Roofing L4	Roof 4 - RC9
20250724	25374	711.4	2	Modified Bituminous Roofing L4	Roof 4 - RC10
20250724	25374	712.1	1	Single Ply Asphalt Roofing - Black	Roof 5 - RC7
20250724	25374	712.2	1	Tar Infused Asphalt Roofing	Roof 5 - RC7
20250724	25374	712.3	1	Hot Mop Vapor Barrier	Roof 5 - RC8
20250724	25374	713.1	1	Single Ply Asphalt Roofing - Black	Roof 3 - RC5
20250724	25374	713.2	1	Tar Infused Asphalt Roofing	Roof 3 - RC5
20250724	25374	713.3	1	Hot Mop Vapor Barrier	Roof 3 - RC5
20250724	25374	714.1	1	Tar Infused Asphalt Roofing	Roof 2 - RC4
20250724	25374	714.1	2	Tar Infused Asphalt Roofing	Roof 2 - RC4
20250724	25374	714.2	1	Roofing Tar Layer	Roof 2 - RC3
20250724	25374	714.2	2	Roofing Tar Layer	Roof 2 - RC3
20250724	25374	714.3	1	Hot Mop Vapor Barrier	Roof 2 - RC3
20250724	25374	714.3	2	Hot Mop Vapor Barrier	Roof 2 - RC3
20250724	25374	715.1	1	ISO Foam	Roof 1 - RC2
20250724	25374	715.1	2	ISO Foam	Roof 1 - RC2
20250724	25374	715.2	1	ISO Paper	Roof 1 - RC2
20250724	25374	715.2	2	ISO Paper	Roof 1 - RC2
20250724	25374	715.3	1	Gypsum Deck	Roof 1 - RC2
20250724	25374	715.3	2	Gypsum Deck	Roof 1 - RC2
20250724	25374	716.1	1	Single Ply Asphalt Roofing - Black	Roof 1 - RC1
20250724	25374	716.2	1	Tar Infused Asphalt Roofing	Roof 1 - RC2
20250724	25374	716.3	1	Hot Mop Vapor Barrier	Roof 1 - RC2
20250724	25374	717		Roof Repair Tar - Black	Roof 2
20250724	25374	717		Roof Repair Tar - Black	Roof 2

Received
AUG 04 2025

Sampled by: Daniel G. Korff/Dave Richardson Date: 07/24/2025
Relinquished by: Daniel G. Korff Date + Time:07/31/2025 1630
Received by: Date + Time:

3.0 – LEAD-BASED PAINT

3.0 LEAD BASED PAINT

Methodology

Painted building components were grouped by testing combinations. A testing combination is characterized by location, component type, substrate, and visible color. Refer to section 3.1 for a complete listing of all XRF readings that were taken for this project. Each XRF reading is identified by the side of the building it was collected from (North, East, South or West), the component analyzed, the substrate and the paint color of the visible paint film.

The LBP survey was performed using the Department of Housing and Urban Development (HUD) protocol. Certain aspects of the HUD guidelines are typically applied to public and commercial buildings, most commonly the levels used to establish LBP. HUD defines LBP, when analyzed by a portable XRF, as paint that contains lead at 1.0 milligram per square centimeter or greater. When paint chips are analyzed by Atomic Absorption Spectroscopy (AAS), HUD defines LBP as paint containing 0.5 percent or greater (>0.5%) lead by weight.

For the purposes of this project, the Lead Renovation, Repair and Painting Rule 40 CFR 745 Subpart E and the Occupational Safety & Health Administration's (OSHA) Lead in Construction Standard (29 CFR 1926.62) applies.

All contractors are to be responsible for conducting all work in accordance with applicable federal, state, and local requirements, including OSHA 29 CFR 1926.62: Lead exposure in construction: Interim final rule for all activities during which an employee may be occupationally exposed to lead. All contractors shall ensure that their employees wear proper personal protective equipment and/or utilize appropriate work methods to prevent elevated blood lead levels or exposure above the permissible exposure limit. Disposal of generated paint chips shall be in compliance with all applicable federal and state regulations regarding lead.

All contractors are responsible for complying with the US EPA's Lead Renovation, Repair and Painting Rule (RRP rule). Use of heat guns shall be limited to a temperature less than 1,000 ^{o} F as not to generate lead fumes. Use of chemical stripping agents is not allowed at this facility unless specifically authorized and approved by the facility management and the Owners' environmental representative.

29 CFR 1926.62 applies to all construction work where an employee may be occupationally exposed to lead. Construction work is defined as work for construction, alteration and/or repair, including painting and decorating. It includes but is not limited to the following:

- Demolition or salvage of structures where lead or materials containing lead are present;
- Removal or encapsulation of materials containing lead;
- New construction, alteration, repair, or renovation of structures, substrates, or portions thereof, that contain lead, or materials containing lead;
- Installation of products containing lead;
- Lead contamination/emergency cleanup;
- Transportation, disposal, storage, or containment of lead or materials containing lead on the site or location at which construction activities are performed; and

- Maintenance operations associated with the construction activities.

XRF Calibration

In order to field verify the calibration and accuracy of the XRF equipment; "calibration checks" are made both by the equipment itself and by the operator. Before the XRF will allow any testing for lead-based paint, it requires a "standardization" reading. This is accomplished by placing the standardization clip over the end of the XRF when prompted by the XRF. Upon the completion of the standardization reading, the XRF will display a Pass or Fail result. If the standardization is successful, the operator checks the calibration of the XRF against National Institute of Standards and Technology (NIST) lead samples that were provided by the manufacturer. The operator's calibration checks are taken at the beginning and the end of the testing period, and approximately every four hours, if necessary. The calibration checks are acceptable if the average of the three readings is between 0.8 and 1.2 mg/cm^2 (utilizing the error correction factor). Standardization and calibration readings were within the acceptable limits for the readings collected for this project. A table presenting XRF readings and results is included in the following subsection.

This report is based primarily on the results of visual site observations and a general survey of the surfaces that may be disturbed by the mechanical upgrades at Kittinger Hall at the Erie County Community College north campus. Representative XRF readings were taken from each distinct type of building component within project limit to determine if those components were covered with lead-based paint. A full building survey for lead-based paint was not conducted.

The lead-based paint survey was performed by Watts on September 29 - 30, 2022 and



Edward J. Jones - Lead Inspector
Certification Number - LPP-R-128144-2

3.1 – X-RAY FLUORESCENCE ANALYZER (XRF) LEAD DATA TABLES

XRF READINGS
KITTINGER HALL MECHANICAL UPGRADES
ERIE COUNTY COMMUNITY COLLEGE NORTH CAMPUS
WILLIAMSVILLE, NY

Testing Dates: SEPTEMBER 29, 2022 **Viken pb200i S/N 2900**

Reading	Room	Side	Component	Substrate	Color	Condition	Floor	Results (mg/cm^2)
September 29, 2022								
Kittinger Hall, K Building								
#1	Calibration							1.1
#2	Calibration							1.1
#3	Calibration							1.1
#4	Calibration Blank							0
#5	Calibration Blank							0
#6	Calibration Blank							0.1
#7	Calibration Blank							0.1
#8	Mech Room 153	North	Wall	Concrete	Yellow	Intact	First	0.3
#9	Mech Room 153	East	Wall	Concrete	Yellow	Intact	First	0.2
#10	Mech Room 153	South	Wall	Concrete	Yellow	Intact	First	0.4
#11	Mech Room 153	West	Wall	Concrete	Yellow	Intact	First	0.3
#12	Mech Room 153	East	Hot Water Holding Tank	Cloth	Grey	Intact	First	0.1
#13	Mech Room 153	East	HW Holding Tank Legs	Steel	Grey	Intact	First	0
#14	Mech Room 153	North	Small HW Boiler	Steel	Grey	Intact	First	0.2
#15	**Mech Room 153**	**West**	**Natural Gas Pipe**	**Steel**	**Yellow**	**Intact**	**First**	**1.7**
#16	Mech Room 153	South	Large Boiler	Steel	Grey	Intact	First	0.1
#17	Mech Room 153	North	Large Boiler	Steel	Grey	Intact	First	0.2
#18	Mech Room 153	North	Pumps at Large Boiler	Steel	Red	Intact	First	0
#19	Mech Room 153	North	Motor to Pumps	Steel	Red	Intact	First	0.1
#20	Mech Room 153	North	Large Breaker Panel Cabinet	Steel	Grey	Intact	First	0.1
#21	Mech Room 153	South	Large Breaker Panel Cabinet	Steel	Grey	Intact	First	0.1
#22	Mech Room 153	West	500 KVA Transformer	Steel	Grey	Intact	First	0.2
#23	Mech Room 153	East	500 KVA Transformer	Steel	Grey	Intact	First	0.1
#24	Mech Room 153	East	Small Electric Panel Boxes	Steel	Grey	Intact	First	0.2
#25	Mech Room 153	East	Small Electric Panel Boxes	Steel	Grey	Intact	First	0.1
#26	Mech Room 153	East	Small Electric Panel Boxes	Steel	Green	Intact	First	0.2
#27	Mech Room 153	East	HW Supply Valve	Steel	Grey	Intact	First	0.1
#28	Mech Room 153	East	HW Supply Valve	Steel	Grey	Intact	First	0
#29	Mech Room 153	East	Mud Elbow HW Pipes	mud	Tan	Intact	First	0
#30	**Mech Room 153**	**East**	**Natural Gas Pipe**	**Steel**	**Yellow**	**Intact**	**First**	**1.2**
#31	**Mech Room 153**	**North**	**Stairs Stringer**	**Steel**	**Grey**	**Intact**	**First**	**3**
#32	**Mech Room 153**	**North**	**Stairs Hand Rail**	**Steel**	**Grey**	**Intact**	**First**	**4.8**

XRF READINGS
KITTINGER HALL MECHANICAL UPGRADES
ERIE COUNTY COMMUNITY COLLEGE NORTH CAMPUS
WILLIAMSVILLE, NY

Testing Dates: SEPTEMBER 29, 2022 **Viken pb200i S/N 2900**

Reading	Room	Side	Component	Substrate	Color	Condition	Floor	Results (mg/cm^2)
#33	Mech Room 153	North	Small Boiler Flue	Metal	Silver	Intact	First	0
#34	Mech Room 153	South	Large Boiler Flue	Metal	Silver	Intact	First	0.1
#35	Mech Room 153	East	Compressor	Steel	Yellow	Intact	First	0.1
#36	Mech Room 153	South	Compressor	Steel	Yellow	Intact	First	0.2
#37	Mech Room 153	N/A	Floor	Concrete	Grey	Intact	First	0.1
#38	Mech Room 153	N/A	Transformer Pad	Concrete	Grey	Intact	First	0.3
#39	Mech Room 153	N/A	Large Boiler Pad	Concrete	Grey	Intact	First	0.1
#40	Mech Room 153	N/A	Floor Striping	Concrete	Yellow	Intact	First	0.3
#41	Room 154	South	Wall	CMU	Yellow	Intact	First	0.1
#42	Room 154	East	Wall	CMU	Yellow	Intact	First	0.1
#43	Room 154	West	Wall	CMU	Yellow	Intact	First	0.2
#44	Room 154	South	Unit Ventilator	Steel	Tan	Intact	First	0.1
#45	Room 154	South	Pipe Enclosure	Steel	Tan	Intact	First	0.1
#46	Room 154	South	Unit Ventilator	Steel	Tan	Intact	First	0.1
#47	Room 152	South	Unit Ventilator	Steel	Tan	Intact	First	0.1
#48	Room 156	South	Unit Ventilator	Steel	White	Intact	First	0.1
#49	Room 156	South	Fin Tube Pipe Cover	Steel	White	Intact	First	0.1
#50	Room 156	South	Wall	CMU	White	Intact	First	0
#51	Calibration							1.1
#52	Calibration							1.2
#53	Calibration							1.1
#54	Calibration Blank							0.1
#55	Calibration Blank							0.1
#56	Calibration Blank							0.2
#57	Room 157	North	Wall	CMU	White	Intact	First	0.1
#58	Room 157	North	Unit Ventilator	Steel	White	Intact	First	0.2
#59	Room 157	North	Fin Tube Pipe Cover	Steel	White	Intact	First	0.1
#60	Room 262	North	Wall	CMU	White	Intact	Second	0.2
#61	Room 262	North	Unit Ventilator	Steel	White	Intact	Second	0.2
#62	Room 262	North	Fin Tube Pipe Cover	Steel	White	Intact	Second	0.2
#63	Room 262	North	Wall	CMU	White	Intact	Second	0.2
#64	Room 262	North	Unit Ventilator	Steel	White	Intact	Second	0.1
#65	Room 262	North	Fin Tube Pipe Cover	Steel	White	Intact	Second	0
#66	Room 262	North	Drywall Box Out	Drywall	White	Intact	Second	0.2
#67	Room 256	South	Unit Ventilator	Steel	White	Intact	Second	0.1
#68	Room 256	South	Fin Tube Pipe Cover	Steel	White	Intact	Second	0.1
#69	Room 236	West	Unit Ventilator	Steel	Grey	Intact	Second	0.1
#70	Room 236	West	Fin Tube Pipe Cover	Steel	Tan	Intact	Second	0
#71	Room 236	West	Wall	CMU	White	Intact	Second	0.1

XRF READINGS
KITTINGER HALL MECHANICAL UPGRADES
ERIE COUNTY COMMUNITY COLLEGE NORTH CAMPUS
WILLIAMSVILLE, NY

Testing Dates: SEPTEMBER 29, 2022 **Viken pb200i S/N 2900**

Reading	Room	Side	Component	Substrate	Color	Condition	Floor	Results (mg/cm^2)
#72	Roof	South	Exhaust Fan 9	Steel	Silver	Intact	Roof	0.1
#73	**Roof**	**South**	**Roof Membrane**	**PVC Membrane**	**White**	**Intact**	**Roof**	**1.1**
#74	**Roof**	**South**	**Roof Membrane**	**PVC Membrane**	**White**	**Intact**	**Roof**	**1.1**
#75	Roof	West	Exhaust Fan 8 Side	Steel	Silver	Intact	Roof	0
#76	Roof	East	Exhaust Fan 8 Side	Steel	Silver	Intact	Roof	0
#77	Roof	West	Exhaust Fan 4	Steel	Pink	Intact	Roof	0.2
#78	Roof	East	Exhaust Fan 1 Base	Steel	Black	Intact	Roof	0.3
#79	Roof	North	Carrier AC Unit	Steel	Grey	Intact	Roof	0.1
#80	Roof	South	Carrier AC Unit	Steel	Grey	Intact	Roof	0.2
#81	Roof	South	AC Dunnage	PVC Membrane	White	Intact	Roof	0.1
#82	Roof	East	AC Dunnage	PVC Membrane	White	Intact	Roof	0.1
#83	Roof	North	Center Eaton Fan	Steel	Grey	Intact	Roof	0
#84	Roof	North	Dunnage	Steel	Silver	Intact	Roof	0.1
#85	Roof	West	Valent AHU	Steel	Grey	Intact	Roof	0.1
#86	Roof	East	Valent AHU	Steel	Grey	Intact	Roof	0.1
#87	Roof	East	Dunnage	PVC Membrane	White	Intact	Roof	0
#88	Roof	North	Gas Pipe	Steel	Yellow	Intact	Roof	0
#89	Roof	North	Gas Pipe	Steel	Yellow	Intact	Roof	0.2
#90	**Roof**	**North**	**Roof Membrane**	**PVC**	**White**	**Intact**	**Roof**	**1.4**
#91	Roof	West	Exhaust Fan West End	PVC Membrane	Pink	Intact	Roof	0.1
#92	Roof	North	West Trane AC	Steel	Grey	Intact	Roof	0.2
#93	Roof	South	West Trane AC	Steel	Grey	Intact	Roof	0.1
#94	Roof	South	Duct	Foil	Silver	Intact	Roof	0.1
#95	Roof	West	Empty Dunnage	Steel	Silver	Intact	Roof	0.2
#96	Roof	West	Dunnage	PVC Membrane	White	Intact	Roof	0.2
#97	Roof	South	Valent Duct	Foil	Silver	Intact	Roof	0.1
#98	Room 216	South	Wall	CMU	Light Brown	Intact	Second	0.2
#99	Room 216	South	Unit Ventilator	Steel	Light Brown	Intact	Second	0.2
#100	Room 216	South	Fin Tube Pipe Cover	Steel	Light Brown	Intact	Second	0.2
#101	Room 113	East	Wall	CMU	Yellow	Intact	First	0.3
#102	Room113	East	Unit Ventilator	Steel	Tan	Intact	First	0
#103	Room 113	East	Fin Tube Pipe Cover	Steel	Grey	Intact	First	0.2
#104	Room 113	East	Exterior Louver	Steel	Silver	Intact	First	0.3
#105	Room 113	East	Stone Panel Exterior Wall	Stone Panel	White	Intact	First	0.1

XRF READINGS
KITTINGER HALL MECHANICAL UPGRADES
ERIE COUNTY COMMUNITY COLLEGE NORTH CAMPUS
WILLIAMSVILLE, NY

Testing Dates: SEPTEMBER 29, 2022 **Viken pb200i S/N 2900**

Reading	Room	Side	Component	Substrate	Color	Condition	Floor	Results (mg/cm^2)
#106	Calibration							1
#107	Calibration							1.1
#108	Calibration							1
#109	Calibration Blank							0
#110	Calibration Blank							0
#111	Calibration Blank							0.1

Bold **Exceeds 1.0 mg/cm^2**

N/A No Specific Direction Applicable

CMU Concrete Masonry Unit Block Wall

4.0 - POLYCHLORINATED BIPHENYLS IN CAULK/SEALANTS

4.0 POLYCHLORINATED BIPHENYLS (PCBs) IN CAULKS

Sampling and Laboratory Methodology

The Environmental Protection Agency (EPA) regulates PCBs and considers any debris generated from construction materials manufactured with PCBs derived from building renovation projects with a concentration of greater than or equal to 50 parts per million (ppm) as PCB bulk product waste. The Toxic Substances Control Act (TSCA) regulations (40 CFR Part 761) prescribes requirements for the proper management of PCB materials, including their handling and disposal. PCB bulk product waste at concentrations ≥50 ppm must follow specific storage, transport and disposal requirements.

All caulks/sealants which may fall within the project limits including window, louver and expansion seam caulks were sampled as a part of prior projects and determined to have **no detectible levels of PCBs**. The analytical reports can be found in Section 4.2 of this report.

4.1 –PRIOR PCB ANALYTICAL REPORTS AND CHAIN-OF-CUSTODY FORMS

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: Watts Architecture & Engineering (4637)
Address: 95 Perry Street Suite 300
Buffalo, NY 14203

Attn:

Project: ECC North Campus Mechanical
Location: ECC North Williamsville NY
Number: 21093

Order #: 490475

Matrix Bulk
Received 10/03/22
Reported 10/06/22

PO Number: 7628

Sample ID / Parameter	Cust. Sample ID	Location / Method	Result	RL*	Units	Analysis Date	Analyst
490475-001	21093-PK 01	K-Bldg Ext Room 113 Caulk					
Semi-volatile Organic Compounds							
Aroclor - 1016		SW846 8082A	**<466**	466	µg/kg	10/05/22	AE
Aroclor - 1221		SW846 8082A	**<466**	466	µg/kg	10/05/22	AE
Aroclor - 1232		SW846 8082A	**<466**	466	µg/kg	10/05/22	AE
Aroclor - 1242		SW846 8082A	**<466**	466	µg/kg	10/05/22	AE
Aroclor - 1248		SW846 8082A	**<466**	466	µg/kg	10/05/22	AE
Aroclor - 1254		SW846 8082A	**<466**	466	µg/kg	10/05/22	AE
Aroclor - 1260		SW846 8082A	**<466**	466	µg/kg	10/05/22	AE
Aroclor - 1262		SW846 8082A	**<466**	466	µg/kg	10/05/22	AE
Aroclor - 1268		SW846 8082A	**<466**	466	µg/kg	10/05/22	AE
490475-002	21093-PB 01	B-Bldg Roof Chimney Caulk					
Semi-volatile Organic Compounds							
Aroclor - 1016		SW846 8082A	**<482**	481	µg/kg	10/05/22	AE
Aroclor - 1221		SW846 8082A	**<482**	481	µg/kg	10/05/22	AE
Aroclor - 1232		SW846 8082A	**<482**	481	µg/kg	10/05/22	AE
Aroclor - 1242		SW846 8082A	**<482**	481	µg/kg	10/05/22	AE
Aroclor - 1248		SW846 8082A	**<482**	481	µg/kg	10/05/22	AE
Aroclor - 1254		SW846 8082A	**<482**	481	µg/kg	10/05/22	AE
Aroclor - 1260		SW846 8082A	**<482**	481	µg/kg	10/05/22	AE
Aroclor - 1262		SW846 8082A	**<482**	481	µg/kg	10/05/22	AE
Aroclor - 1268		SW846 8082A	**<482**	481	µg/kg	10/05/22	AE
490475-003	21093-PB 02	B-Bldg Roof Wht Caulk					
Semi-volatile Organic Compounds							
Aroclor - 1016		SW846 8082A	**<469**	469	µg/kg	10/05/22	AE
Aroclor - 1221		SW846 8082A	**<469**	469	µg/kg	10/05/22	AE
Aroclor - 1232		SW846 8082A	**<469**	469	µg/kg	10/05/22	AE
Aroclor - 1242		SW846 8082A	**<469**	469	µg/kg	10/05/22	AE
Aroclor - 1248		SW846 8082A	**<469**	469	µg/kg	10/05/22	AE
Aroclor - 1254		SW846 8082A	**<469**	469	µg/kg	10/05/22	AE

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: Watts Architecture & Engineering (4637)
Address: 95 Perry Street Suite 300
Buffalo, NY 14203

Attn:

Project: ECC North Campus Mechanical
Location: ECC North Williamsville NY
Number: 21093

Order #: 490475

Matrix Bulk
Received 10/03/22
Reported 10/06/22

PO Number: 7628

Sample ID / Parameter	Cust. Sample ID	Location / Method	Result	RL*	Units	Analysis Date	Analyst
490475-003	21093-PB 02	B-Bldg Roof Wht Caulk					
Aroclor - 1260		SW846 8082A	**<469**	469	µg/kg	10/05/22	AE
Aroclor - 1262		SW846 8082A	**<469**	469	µg/kg	10/05/22	AE
Aroclor - 1268		SW846 8082A	**<469**	469	µg/kg	10/05/22	AE
490475-004	21093-PB 03	B-Bldg Ext Rm B110 Caulk					
Semi-volatile Organic Compounds							
Aroclor - 1016		SW846 8082A	**<481**	481	µg/kg	10/05/22	AE
Aroclor - 1221		SW846 8082A	**<481**	481	µg/kg	10/05/22	AE
Aroclor - 1232		SW846 8082A	**<481**	481	µg/kg	10/05/22	AE
Aroclor - 1242		SW846 8082A	**<481**	481	µg/kg	10/05/22	AE
Aroclor - 1248		SW846 8082A	**<481**	481	µg/kg	10/05/22	AE
Aroclor - 1254		SW846 8082A	**<481**	481	µg/kg	10/05/22	AE
Aroclor - 1260		SW846 8082A	**<481**	481	µg/kg	10/05/22	AE
Aroclor - 1262		SW846 8082A	**<481**	481	µg/kg	10/05/22	AE
Aroclor - 1268		SW846 8082A	**<481**	481	µg/kg	10/05/22	AE

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: Watts Architecture & Engineering (4637)
Address: 95 Perry Street Suite 300
Buffalo, NY 14203

Attn:

Project: ECC North Campus Mechanical
Location: ECC North Williamsville NY
Number: 21093

Order #: 490475

Matrix Bulk
Received 10/03/22
Reported 10/06/22

PO Number: 7628

Sample ID / Parameter	Cust. Sample ID / Method	Result	RL*	Units	Analysis Date	Analyst
490475-10/06/22 03:03 PM						

Reviewed By: **Kelly Muncy**
Manager

Surrogate Recoveries

490475-001 - PCB	
DCB	MI
TCMX	MI
490475-002 - PCB	
DCB	MI
TCMX	MI
490475-003 - PCB	
DCB	MI
TCMX	98%
490475-004 - PCB	
DCB	MI
TCMX	MI

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 63558
Virginia	VELAP 12088

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 e-mail: info@slabinc.com

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490475

V:\490\490475

kfinnemore 10/3/2022 8:53:18 AM
UPS 1Z2E28998468879440

Submitting Co.	Watts Architects and Engineers	Lab WO#		Phone	(716) 206-5100
95 Perry Street, Suite 300		Acct #	4637	Fax	(716) 206-5199
Buffalo, NY 14203		State of Collection	NY	E-Mail	ejones@watts-ae.com

Project Name: ECC North campus Mechanical UPGrades
Project Location: ECC North, Williamsville, NY
Project Number: 21093
Purchase Order # 21093
TAT Requested (Business Day) ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☒ 5 ☐ 10 ☐ Other: _____

Special Instructions [include requests for special reporting or data packages]

Minimum detection of 50 PPM requried

e-mail results to: ejones@watts-ae.com

Sample #	Date Sampled	Time Sampled	# Containers	Composite	Grab	Matrix: Drinking Water	Waste Water	Ground Water	Soil / Sludge	Air	Wipe	Oil	Solid	Other
21093-PR01 K-Bldg Exterior Room 113 UV Louver caulk	09/29/22	16:00	1		X								X	
21093-PB01 B-Bldg Roof Chimney Flashing caulk, 300 wing chimney	09/30/22	14:00	1		X								X	
21093-PB02 B-Bldg Roof white caulk on vents wing 300 North vents	09/30/22	14:30	1		X								X	
21093-PB03 B-Bldg Exterior Room B110 UV Louver caulk	09/30/22	15:30	1		X								X	

BTEX 602 ☐ MTBE ☐ Naphthalene ☐	Purgeable Aromatics 8021 ☐	Petrol Hydrocarbons GC 8015M Diesel ☐ 8015M Gas ☐	TPH 418.1 ☐	Corrosivity ☐ Reactivity ☐ Flashpoint, Closed Cup ☐	Volatile Organics 624 ☐ 8260 ☐	Semivolatile Organics 625 ☐ 8270 ☐	PAHs 610 ☐ 8270 ☐ 8310 By HPLC ☐	TCLP Semi-Vols ☐ BNAs ☐ Pest ☐ Herb ☐ VOAs ☐ Full ☐	Pesticides 608 ☐ 8081 ☐ Herbicides 8151 ☐ PCB's 8082 ☒	Other
									X	
									X	
									X	
									X	

Sampled by
NAME Edward J Jones
SIGNATURE Edward J Jones
DATE/TIME 09/30/22

Relinquished to lab by
NAME Edward J Jones
SIGNATURE Edward J Jones
DATE/TIME 10/01/2022 15:30

Preserved ☒ Yes ☐ No ☐ Ambient temp ☐ Ice °C ____ pH ____ Cl ____ ☐R ☐S ☐X

☐ Receive a physical copy of report.

Sample Disposal
If samples over req. weight (Refer to Fee Schedule)
☐ Return to Sender (Shipping fees)
☒ Disposal by lab ($50 fee)

Shipping Methods
☐ FX ☒ UPS ☐ USM
☐ HD ☐ DB
WB: _____

Chain-of-Custody documentation continued internally within lab. Terms and conditions page 2.

Environmental Hazards Services, L.L.C.
7469 Whitepine Rd
Richmond, VA 23237
Telephone: 800.347.4010

PCB Bulk Analysis Report

Report Number: 15-09-01342

Client: Sienna Environmental
350 Elmwood Avenue
Buffalo, NY 14222-2204

Received Date: 09/10/2015
Reported Date: 09/16/2015

Project/Test Address: SET 2701; ECC North Campus; Bldg. K

Client Number: 33-5983

Fax Number: 716-332-3136

Laboratory Results

Lab Sample Number: 15-09-01342-001
Client Sample Number: 2701-660
Sample Matrix: Caulk
Reporting Limit (mg/kg): 8.7

Preparation Date: 09/13/2015
Analysis Date: 09/14/2015
Sample Weight (g): 1.151
Narrative ID:

Aroclor 1016 (mg/kg)	Aroclor 1221 (mg/kg)	Aroclor 1232 (mg/kg)	Aroclor 1242 (mg/kg)	Aroclor 1248 (mg/kg)	Aroclor 1254 (mg/kg)	Aroclor 1260 (mg/kg)
<8.7	<8.7	<8.7	<8.7	<8.7	<8.7	<8.7

Lab Sample Number: 15-09-01342-002
Client Sample Number: 2701-661
Sample Matrix: Caulk
Reporting Limit (mg/kg): 9.5

Preparation Date: 09/13/2015
Analysis Date: 09/14/2015
Sample Weight (g): 1.054
Narrative ID:

Aroclor 1016 (mg/kg)	Aroclor 1221 (mg/kg)	Aroclor 1232 (mg/kg)	Aroclor 1242 (mg/kg)	Aroclor 1248 (mg/kg)	Aroclor 1254 (mg/kg)	Aroclor 1260 (mg/kg)
<9.5	<9.5	<9.5	<9.5	<9.5	<9.5	<9.5

Lab Sample Number: 15-09-01342-003
Client Sample Number: 2701-663
Sample Matrix: Caulk
Reporting Limit (mg/kg): 9.2

Preparation Date: 09/13/2015
Analysis Date: 09/14/2015
Sample Weight (g): 1.098
Narrative ID:

Aroclor 1016 (mg/kg)	Aroclor 1221 (mg/kg)	Aroclor 1232 (mg/kg)	Aroclor 1242 (mg/kg)	Aroclor 1248 (mg/kg)	Aroclor 1254 (mg/kg)	Aroclor 1260 (mg/kg)
<9.2	<9.2	<9.2	<9.2	<9.2	<9.2	<9.2

Environmental Hazards Services, L.L.C

Client Number: 33-5983 Report Number: 15-09-01342
Project/Test Address: SET 2701; ECC North Campus; Bldg. K

Lab Sample Number:	15-09-01342-004	Preparation Date:	09/13/2015
Client Sample Number:	2701-667	Analysis Date:	09/14/2015
Sample Matrix:	Caulk	Sample Weight (g):	1.028
Reporting Limit (mg/kg):	9.8	Narrative ID:	

Aroclor 1016 (mg/kg)	Aroclor 1221 (mg/kg)	Aroclor 1232 (mg/kg)	Aroclor 1242 (mg/kg)	Aroclor 1248 (mg/kg)	Aroclor 1254 (mg/kg)	Aroclor 1260 (mg/kg)
<9.8	<9.8	<9.8	<9.8	<9.8	<9.8	<9.8

Preparation Method: EPA SW846 3540C
Analysis Method: EPA SW846 8082A
Analyst: Anthony Dee

Reviewed By Authorized Signatory: _____

Julie Dickerson
Laboratory Administrator

The condition of the samples analyzed was acceptable upon receipt per laboratory protocol unless otherwise noted on this report. All internal quality control requirements associated with the batch were met, unless otherwise noted. Results represent the analysis of samples submitted by the client. Sample location, description, area, volume, etc., was provided by the client. This report cannot be used by the client to claim product endorsement by NVLAP or any agency of the U.S. Government. This report shall not be reproduced except in full, without the written consent of the Environmental Hazards Service, L.L.C. Virginia Certification #460172 NY ELAP #11714.

Legend g = gram mg/kg = milligram per kilogram

SIENNA ENVIRONMENTAL TECHNOLOGIES

350 Elmwood Ave. • Buffalo, NY 14222
Ⓟ 716-332.3134 Ⓕ 716.332.3136

Chain of Custody Document

Fax/Email Report to: LabResults@siennaet.com

Client/Contact: BHNT Architects / Gregory Usewicz

Building/Location: ECC North Campus - Bldg K

Job #: SET 2701 Total # Samples: _____

5 DAY Turn around (circle)

RUSH 48 Hour 24 Hour ~~72 Hour~~

_____ PLM _____ TEM _____ AAS (OTHER) PCB-8082

Sample #				Description of Sample	Location of Sample	Notes
Date	Job	HAN	ID#			
9/8/15	2701	0060	PCB	Light Grey Caulk	E-North	
		0061	PCB	Dark Grey Caulk	E-West	
		0063	PCB	White Caulk	E-South	
		0067	PCB	Tan Expansion Caulk	E-East	

15-09-01342

Due Date: 09/17/2015 (Thursday) AF

Notes:
Yes ☑ No ☐ Negative PLM to TEM per ELAP protocols
Yes ☑ No ☐ Positive stop by HAN
Layered analysis is expected - Sample HAN-ID # _____

Sampled By: _____ Date: 9/8/15

Relinquished By: _____ Date: 9/8/15

Received By: _____ Date: 9-10-15

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: Watts Architecture & Engineering (4637)
Address: 95 Perry Street Suite 300
Buffalo, NY 14203

Attn:

Project: ECC Kittinger Boiler Replcment
Location: ECC North Campus - Kittinger
Number: 20250347

Order #: 673328

Matrix Bulk
Received 02/23/26
Reported 02/24/26

PO Number: 7628

Sample ID / Parameter	Cust. Sample ID / Method	Result	RL*	Units	Analysis Date	Analyst
673328-001	250347-PCB01 / Ext Louver Clk					
Semi-volatile Organic Compounds						
Aroclor - 1016	SW846 8082A / 3550C	**<476**	475	µg/kg	02/24/26	NM
Aroclor - 1221	SW846 8082A / 3550C	**<476**	475	µg/kg	02/24/26	NM
Aroclor - 1232	SW846 8082A / 3550C	**<476**	475	µg/kg	02/24/26	NM
Aroclor - 1242	SW846 8082A / 3550C	**<476**	475	µg/kg	02/24/26	NM
Aroclor - 1248	SW846 8082A / 3550C	**<476**	475	µg/kg	02/24/26	NM
Aroclor - 1254	SW846 8082A / 3550C	**<523**	523	µg/kg	02/24/26	NM
Aroclor - 1260	SW846 8082A / 3550C	**<476**	475	µg/kg	02/24/26	NM
Aroclor - 1262	SW846 8082A / 3550C	**<476**	475	µg/kg	02/24/26	NM
Aroclor - 1268	SW846 8082A / 3550C	**<476**	475	µg/kg	02/24/26	NM

673328-02/24/26 11:12 AM

Reviewed By: **Ahmed Elnasseh**
Analyst

Surrogate Recoveries

673328-001 - PCB

DCB	98%
TCMX	62%

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: Watts Architecture & Engineering (4637)
Address: 95 Perry Street Suite 300
Buffalo, NY 14203

Attn:

Project: ECC Kittinger Boiler Replcment
Location: ECC North Campus - Kittinger
Number: 20250347

Order #: 673328

Matrix Bulk
Received 02/23/26
Reported 02/24/26

PO Number: 7628

Sample ID / Parameter	Cust. Sample ID / Method	Location	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 13789

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 e-mail: info@slabinc.com

R 1

673328

V:\673\673328

aelnasseh 2/23/2026 9:46:06 AM
UPS 1Z2E28999070769696

Submitting Co.	Watts Architecture and Engineering	**Lab WO#**		**Phone**	(716) 206-5164
95 Perry Street Suite 300		**Acct #**	4637	**Fax \ Email**	MBeyer@Watts-AE.com
Buffalo, New York 14203		****State of Collection**	New York	****Cert. Required**	☐ Yes ☒ No
Project Name:	ECC Kittinger Boiler Replacement				
Project Location:	ECC North Campus - Kittinger Hall				
Project Number:	20250347				
Purchase Order #					
TAT Requested (Business Day)	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☒ 5 ☐ 10 *All jobs received past 3PM will begin its TAT the next business day*				

Special Instructions [include requests for special reporting or data packages]

Sample #	**Date Sampled	**Time Sampled	# Containers	Lab Use: Chlorine (Cl)	Lab Use: Temp *	Lab Use: pH	Matrix: Drinking Water	Matrix: Waste Water	Matrix: Ground Water	Matrix: Soil / Sludge	Matrix: Wipe	Matrix: Oil or Air	Matrix: Bulk	Analysis Request: BTEX ☐ MTBE ☐ Naphthalene ☐	Purgeable Aromatics 8021 ☐	Petrol Hydrocarbons GC 8015M Diesel ☐ 8015M Gas ☐	TPH 418.1 ☐	Corrosivity ☐ Reactivity ☐ Flashpoint, Closed Cup ☐	Volatile Organics 624 ☐ 8260 ☐	Semivolatile Organics 625 ☐ 8270 ☐	PAHs 610 ☐ 8270 ☐ 8310 By HPLC ☐	TCLP Semi-Vols ☐ BNAs ☐ Pest ☐ Herb ☐ VOAs ☐ Full ☐	Pesticides 608 ☐ 8081 ☐ Herbicides 8151 ☐ PCB's 8082 ☒	Other
250347-PCB-01 Exterior Louver Caulk - Kittinger K100	2/17	1130	1										X										X	

All soil and aqueous samples must be sent in adequate quantity for duplicate analysis to be performed per EPA requirements. Failure to perform a sample duplicate analysis, due to a lack of sample quantity, will lead to a disclaimer on the report. All problem jobs without customer response held over 30 days will be voided and disposed of.

Sampled by	**Relinquished to lab by**	For Lab Use:
NAME Mark Beyer	NAME Mark Beyer	
SIGNATURE	SIGNATURE	
DATE / TIME February 18, 2026	DATE / TIME February 18, 2026	

Sample Disposal ☐ Return to Sender (shipping fees) ☐ Disposal by Lab ($50 fee for excessive weight)

* Temperature taken with IR Gun A. **Required.

Chain-of-Custody documentation continued internally within lab. Terms and conditions page 2.

Environmental Hazards Services, L.L.C.
7469 Whitepine Rd
Richmond, VA 23237
Telephone: 800.347.4010

PCB Bulk Analysis Report

Report Number: 15-09-01342

Client: Sienna Environmental
350 Elmwood Avenue
Buffalo, NY 14222-2204

Received Date: 09/10/2015
Reported Date: 09/16/2015

Project/Test Address: SET 2701; ECC North Campus; Bldg. K

Client Number: 33-5983

Fax Number: 716-332-3136

Laboratory Results

Lab Sample Number: 15-09-01342-001
Client Sample Number: 2701-660
Sample Matrix: Caulk
Reporting Limit (mg/kg): 8.7

Preparation Date: 09/13/2015
Analysis Date: 09/14/2015
Sample Weight (g): 1.151
Narrative ID:

Aroclor 1016 (mg/kg)	Aroclor 1221 (mg/kg)	Aroclor 1232 (mg/kg)	Aroclor 1242 (mg/kg)	Aroclor 1248 (mg/kg)	Aroclor 1254 (mg/kg)	Aroclor 1260 (mg/kg)
<8.7	<8.7	<8.7	<8.7	<8.7	<8.7	<8.7

Lab Sample Number: 15-09-01342-002
Client Sample Number: 2701-661
Sample Matrix: Caulk
Reporting Limit (mg/kg): 9.5

Preparation Date: 09/13/2015
Analysis Date: 09/14/2015
Sample Weight (g): 1.054
Narrative ID:

Aroclor 1016 (mg/kg)	Aroclor 1221 (mg/kg)	Aroclor 1232 (mg/kg)	Aroclor 1242 (mg/kg)	Aroclor 1248 (mg/kg)	Aroclor 1254 (mg/kg)	Aroclor 1260 (mg/kg)
<9.5	<9.5	<9.5	<9.5	<9.5	<9.5	<9.5

Lab Sample Number: 15-09-01342-003
Client Sample Number: 2701-663
Sample Matrix: Caulk
Reporting Limit (mg/kg): 9.2

Preparation Date: 09/13/2015
Analysis Date: 09/14/2015
Sample Weight (g): 1.098
Narrative ID:

Aroclor 1016 (mg/kg)	Aroclor 1221 (mg/kg)	Aroclor 1232 (mg/kg)	Aroclor 1242 (mg/kg)	Aroclor 1248 (mg/kg)	Aroclor 1254 (mg/kg)	Aroclor 1260 (mg/kg)
<9.2	<9.2	<9.2	<9.2	<9.2	<9.2	<9.2

Environmental Hazards Services, L.L.C

Client Number: 33-5983 Report Number: 15-09-01342
Project/Test Address: SET 2701; ECC North Campus; Bldg. K

Lab Sample Number:	15-09-01342-004	Preparation Date:	09/13/2015
Client Sample Number:	2701-667	Analysis Date:	09/14/2015
Sample Matrix:	Caulk	Sample Weight (g):	1.028
Reporting Limit (mg/kg):	9.8	Narrative ID:	

Aroclor 1016 (mg/kg)	Aroclor 1221 (mg/kg)	Aroclor 1232 (mg/kg)	Aroclor 1242 (mg/kg)	Aroclor 1248 (mg/kg)	Aroclor 1254 (mg/kg)	Aroclor 1260 (mg/kg)
<9.8	<9.8	<9.8	<9.8	<9.8	<9.8	<9.8

Preparation Method: EPA SW846 3540C
Analysis Method: EPA SW846 8082A
Analyst: Anthony Dee

Reviewed By Authorized Signatory: _____

Julie Dickerson
Laboratory Administrator

The condition of the samples analyzed was acceptable upon receipt per laboratory protocol unless otherwise noted on this report. All internal quality control requirements associated with the batch were met, unless otherwise noted. Results represent the analysis of samples submitted by the client. Sample location, description, area, volume, etc., was provided by the client. This report cannot be used by the client to claim product endorsement by NVLAP or any agency of the U.S. Government. This report shall not be reproduced except in full, without the written consent of the Environmental Hazards Service, L.L.C. Virginia Certification #460172 NY ELAP #11714.

Legend g = gram mg/kg = milligram per kilogram

SIENNA ENVIRONMENTAL TECHNOLOGIES

350 Elmwood Ave. • Buffalo, NY 14222
Ⓟ 716-332.3134 Ⓕ 716.332.3136

Chain of Custody Document

Fax/Email Report to: LabResults@siennaet.com

Client/Contact: BHNT Architects / Gregory Usewicz

Building/Location: ECC North Campus - Bldg K

Job #: SET 2701 Total # Samples: _____

5 DAY Turn around (circle)

RUSH 48 Hour 24 Hour ~~72 Hour~~

_____ PLM _____ TEM _____ AAS (OTHER) PCB-8082

Sample #				Description of Sample	Location of Sample	Notes
Date	Job	HAN	ID#			
9/8/15	2701	0060	PCB	Light Grey Caulk	E-North	
		0061	PCB	Dark Grey Caulk	E-West	
		0063	PCB	White Caulk	E-South	
		0067	PCB	Tan Expansion Caulk	E-East	

15-09-01342

Due Date: 09/17/2015 (Thursday) AF

Notes:
Yes ☑ No ☐ Negative PLM to TEM per ELAP protocols
Yes ☑ No ☐ Positive stop by HAN
Layered analysis is expected - Sample HAN-ID # _____

Sampled By: _____ Date: 9/8/15

Relinquished By: _____ Date: 9/8/15

Received By: _____ Date: 9-10-15

Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102 Fax (860) 645-0823

NY # 11301

Sample Id Cross Reference

August 12, 2025

SDG I.D.: GCT90811

Project ID: SUNY ECC KITTINGER HALL ROOF REPLACEMENT

Client Id	Lab Id	Matrix	Col Date
25374 702 CONTROL JOINT SEALAN	CT90811	CAULK	07/24/25 0:00
25374 703 EQUIPMENT SUPPORT SE	CT90812	CAULK	07/24/25 0:00
25374 705 BRICK SEALANT-BEIGE	CT90813	CAULK	07/24/25 0:00
25374 706 MODIFIED BITUMINOUS R	CT90814	CAULK	07/24/25 0:00
25374 707 SKYLIGHT FRAME SEALA	CT90815	CAULK	07/24/25 0:00
25374 708 FLASHING SEALANT-WHI	CT90816	CAULK	07/24/25 0:00
25374 709 FLASHING SEALANT-DAR	CT90817	CAULK	07/24/25 0:00

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

Analysis Report

August 12, 2025

FOR: Attn:
Encorus Group Engineering, P.C
25 Mechanic Street
Springville, NY 14141

Sample Information		Custody Information		Date	Time
Matrix:	CAULK	Collected by:	DGK	07/24/25	
Location Code:	ENCORUS	Received by:	SW	08/04/25	10:04
Rush Request:	Standard	Analyzed by:	see "By" below		
P.O.#:	25374				

Laboratory Data

SDG ID: GCT90811
Phoenix ID: CT90811

Project ID: SUNY ECC KITTINGER HALL ROOF REPLACEMENT
Client ID: 25374 702 CONTROL JOINT SEALANT-GREY

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Caulk Extraction for PCB	Completed				08/07/25	AC1/S/Z	SW3545A
Polychlorinated Biphenyls							
PCB-1016	ND	0.98	mg/Kg	2	08/08/25	SC	SW8082A
PCB-1221	ND	0.98	mg/Kg	2	08/08/25	SC	SW8082A
PCB-1232	ND	0.98	mg/Kg	2	08/08/25	SC	SW8082A
PCB-1242	ND	0.98	mg/Kg	2	08/08/25	SC	SW8082A
PCB-1248	ND	0.98	mg/Kg	2	08/08/25	SC	SW8082A
PCB-1254	ND	0.98	mg/Kg	2	08/08/25	SC	SW8082A
PCB-1260	ND	0.98	mg/Kg	2	08/08/25	SC	SW8082A
PCB-1262	ND	0.98	mg/Kg	2	08/08/25	SC	SW8082A
PCB-1268	ND	0.98	mg/Kg	2	08/08/25	SC	SW8082A
QA/QC Surrogates							
% DCBP	67		%	2	08/08/25	SC	30 - 150 %
% DCBP (Confirmation)	64		%	2	08/08/25	SC	30 - 150 %
% TCMX	51		%	2	08/08/25	SC	30 - 150 %
% TCMX (Confirmation)	51		%	2	08/08/25	SC	30 - 150 %

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference

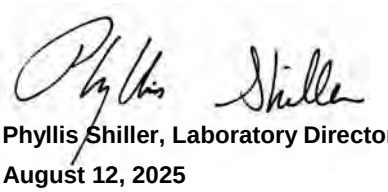
RL/PQL=Reporting/Practical Quantitation Level (Equivalent to NELAC LOQ, Limit of Quantitation) ND=Not Detected at RL/PQL
BRL=Below Reporting Level L=Biased Low
QA/QC Surrogates: Surrogates are compounds (preceeded with a %) added by the lab to determine analysis efficiency. Surrogate results(%) listed 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

August 12, 2025

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

ACCREDITED IN ACCORDANCE WITH nelac NY # 11301

Analysis Report

August 12, 2025

FOR: Attn:
Encorus Group Engineering, P.C
25 Mechanic Street
Springville, NY 14141

Sample Information		Custody Information		Date	Time
Matrix:	CAULK	Collected by:	DGK	07/24/25	
Location Code:	ENCORUS	Received by:	SW	08/04/25	10:04
Rush Request:	Standard	Analyzed by:	see "By" below		
P.O.#:	25374				

Laboratory Data

SDG ID: GCT90811
Phoenix ID: CT90812

Project ID: SUNY ECC KITTINGER HALL ROOF REPLACEMENT
Client ID: 25374 703 EQUIPMENT SUPPORT SEALANT-BEIGE

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Caulk Extraction for PCB	Completed				08/07/25	AC1/S/Z	SW3545A
Polychlorinated Biphenyls							
PCB-1016	ND	0.75	mg/Kg	2	08/08/25	SC	SW8082A
PCB-1221	ND	0.75	mg/Kg	2	08/08/25	SC	SW8082A
PCB-1232	ND	0.75	mg/Kg	2	08/08/25	SC	SW8082A
PCB-1242	ND	0.75	mg/Kg	2	08/08/25	SC	SW8082A
PCB-1248	ND	0.75	mg/Kg	2	08/08/25	SC	SW8082A
PCB-1254	ND	0.75	mg/Kg	2	08/08/25	SC	SW8082A
PCB-1260	ND	0.75	mg/Kg	2	08/08/25	SC	SW8082A
PCB-1262	ND	0.75	mg/Kg	2	08/08/25	SC	SW8082A
PCB-1268	ND	0.75	mg/Kg	2	08/08/25	SC	SW8082A
QA/QC Surrogates							
% DCBP	61		%	2	08/08/25	SC	30 - 150 %
% DCBP (Confirmation)	59		%	2	08/08/25	SC	30 - 150 %
% TCMX	45		%	2	08/08/25	SC	30 - 150 %
% TCMX (Confirmation)	49		%	2	08/08/25	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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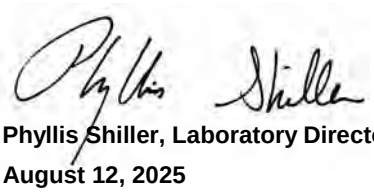


Phyllis Shiller, Laboratory Director

August 12, 2025

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

ACCREDITED IN ACCORDANCE WITH nelac NY # 11301

Analysis Report

August 12, 2025

FOR: Attn:
Encorus Group Engineering, P.C
25 Mechanic Street
Springville, NY 14141

Sample Information		Custody Information		Date	Time
Matrix:	CAULK	Collected by:	DGK	07/24/25	
Location Code:	ENCORUS	Received by:	SW	08/04/25	10:04
Rush Request:	Standard	Analyzed by:	see "By" below		
P.O.#:	25374				

Laboratory Data

SDG ID: GCT90811
Phoenix ID: CT90813

Project ID: SUNY ECC KITTINGER HALL ROOF REPLACEMENT
Client ID: 25374 705 BRICK SEALANT-BEIGE

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Caulk Extraction for PCB	Completed				08/07/25	AC1/S/Z	SW3545A
Polychlorinated Biphenyls							
PCB-1016	ND	0.75	mg/Kg	2	08/08/25	SC	SW8082A
PCB-1221	ND	0.75	mg/Kg	2	08/08/25	SC	SW8082A
PCB-1232	ND	0.75	mg/Kg	2	08/08/25	SC	SW8082A
PCB-1242	ND	0.75	mg/Kg	2	08/08/25	SC	SW8082A
PCB-1248	ND	0.75	mg/Kg	2	08/08/25	SC	SW8082A
PCB-1254	ND	0.75	mg/Kg	2	08/08/25	SC	SW8082A
PCB-1260	ND	0.75	mg/Kg	2	08/08/25	SC	SW8082A
PCB-1262	ND	0.75	mg/Kg	2	08/08/25	SC	SW8082A
PCB-1268	ND	0.75	mg/Kg	2	08/08/25	SC	SW8082A
QA/QC Surrogates							
% DCBP	57		%	2	08/08/25	SC	30 - 150 %
% DCBP (Confirmation)	55		%	2	08/08/25	SC	30 - 150 %
% TCMX	42		%	2	08/08/25	SC	30 - 150 %
% TCMX (Confirmation)	45		%	2	08/08/25	SC	30 - 150 %

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference

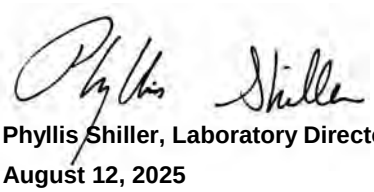
RL/PQL=Reporting/Practical Quantitation Level (Equivalent to NELAC LOQ, Limit of Quantitation) ND=Not Detected at RL/PQL
BRL=Below Reporting Level L=Biased Low
QA/QC Surrogates: Surrogates are compounds (preceeded with a %) added by the lab to determine analysis efficiency. Surrogate results(%) listed 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

August 12, 2025

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

ACCREDITED IN ACCORDANCE WITH nelac NY # 11301

Analysis Report

August 12, 2025

FOR: Attn:
Encorus Group Engineering, P.C
25 Mechanic Street
Springville, NY 14141

Sample Information		Custody Information		Date	Time
Matrix:	CAULK	Collected by:	DGK	07/24/25	
Location Code:	ENCORUS	Received by:	SW	08/04/25	10:04
Rush Request:	Standard	Analyzed by:	see "By" below		
P.O.#:	25374				

Laboratory Data

SDG ID: GCT90811
Phoenix ID: CT90814

Project ID: SUNY ECC KITTINGER HALL ROOF REPLACEMENT
Client ID: 25374 706 MODIFIED BITUMINOUS ROOFING SEAM SALANT-WHITE, HRD

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Caulk Extraction for PCB	Completed				08/07/25	AC1/S/Z	SW3545A
Polychlorinated Biphenyls							
PCB-1016	ND	0.88	mg/Kg	2	08/08/25	SC	SW8082A
PCB-1221	ND	0.88	mg/Kg	2	08/08/25	SC	SW8082A
PCB-1232	ND	0.88	mg/Kg	2	08/08/25	SC	SW8082A
PCB-1242	ND	0.88	mg/Kg	2	08/08/25	SC	SW8082A
PCB-1248	ND	0.88	mg/Kg	2	08/08/25	SC	SW8082A
PCB-1254	ND	0.88	mg/Kg	2	08/08/25	SC	SW8082A
PCB-1260	ND	0.88	mg/Kg	2	08/08/25	SC	SW8082A
PCB-1262	ND	0.88	mg/Kg	2	08/08/25	SC	SW8082A
PCB-1268	ND	0.88	mg/Kg	2	08/08/25	SC	SW8082A
QA/QC Surrogates							
% DCBP	61		%	2	08/08/25	SC	30 - 150 %
% DCBP (Confirmation)	60		%	2	08/08/25	SC	30 - 150 %
% TCMX	50		%	2	08/08/25	SC	30 - 150 %
% TCMX (Confirmation)	52		%	2	08/08/25	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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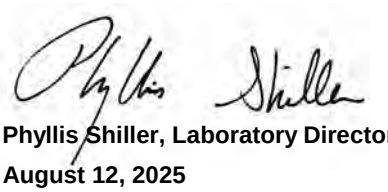
If you are the client above and have any questions concerning this testing, please do not hesitate to contact Phoenix Client Services at ext.200.
The contents of this report cannot be discussed with anyone other than the client listed above without their written consent.



Phyllis Shiller, Laboratory Director

August 12, 2025

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

ACCREDITED IN ACCORDANCE WITH nelac NY # 11301

Analysis Report

August 12, 2025

FOR: Attn:
Encorus Group Engineering, P.C
25 Mechanic Street
Springville, NY 14141

Sample Information		Custody Information		Date	Time
Matrix:	CAULK	Collected by:	DGK	07/24/25	
Location Code:	ENCORUS	Received by:	SW	08/04/25	10:04
Rush Request:	Standard	Analyzed by:	see "By" below		
P.O.#:	25374				

Laboratory Data

SDG ID: GCT90811
Phoenix ID: CT90815

Project ID: SUNY ECC KITTINGER HALL ROOF REPLACEMENT
Client ID: 25374 707 SKYLIGHT FRAME SEALANT-WHITE & BLACK COMINGLD

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Caulk Extraction for PCB	Completed				08/07/25	AC1/S/Z	SW3545A
Polychlorinated Biphenyls							
PCB-1016	ND	0.99	mg/Kg	2	08/09/25	SC	SW8082A
PCB-1221	ND	0.99	mg/Kg	2	08/09/25	SC	SW8082A
PCB-1232	ND	0.99	mg/Kg	2	08/09/25	SC	SW8082A
PCB-1242	ND	0.99	mg/Kg	2	08/09/25	SC	SW8082A
PCB-1248	ND	0.99	mg/Kg	2	08/09/25	SC	SW8082A
PCB-1254	ND	0.99	mg/Kg	2	08/09/25	SC	SW8082A
PCB-1260	ND	0.99	mg/Kg	2	08/09/25	SC	SW8082A
PCB-1262	ND	0.99	mg/Kg	2	08/09/25	SC	SW8082A
PCB-1268	ND	0.99	mg/Kg	2	08/09/25	SC	SW8082A
QA/QC Surrogates							
% DCBP	58		%	2	08/09/25	SC	30 - 150 %
% DCBP (Confirmation)	55		%	2	08/09/25	SC	30 - 150 %
% TCMX	49		%	2	08/09/25	SC	30 - 150 %
% TCMX (Confirmation)	46		%	2	08/09/25	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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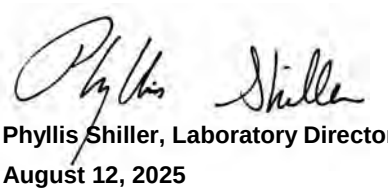

Phyllis Shiller, Laboratory Director

August 12, 2025

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

ACCREDITED IN ACCORDANCE WITH nelac NY # 11301

Analysis Report

August 12, 2025

FOR: Attn:
Encorus Group Engineering, P.C
25 Mechanic Street
Springville, NY 14141

Sample Information		Custody Information		Date	Time
Matrix:	CAULK	Collected by:	DGK	07/24/25	
Location Code:	ENCORUS	Received by:	SW	08/04/25	10:04
Rush Request:	Standard	Analyzed by:	see "By" below		
P.O.#:	25374				

Laboratory Data

SDG ID: GCT90811
Phoenix ID: CT90816

Project ID: SUNY ECC KITTINGER HALL ROOF REPLACEMENT
Client ID: 25374 708 FLASHING SEALANT-WHITE

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Caulk Extraction for PCB	Completed				08/07/25	AC1/S/Z	SW3545A
Polychlorinated Biphenyls							
PCB-1016	ND	0.87	mg/Kg	2	08/08/25	SC	SW8082A
PCB-1221	ND	0.87	mg/Kg	2	08/08/25	SC	SW8082A
PCB-1232	ND	0.87	mg/Kg	2	08/08/25	SC	SW8082A
PCB-1242	ND	0.87	mg/Kg	2	08/08/25	SC	SW8082A
PCB-1248	ND	0.87	mg/Kg	2	08/08/25	SC	SW8082A
PCB-1254	ND	0.87	mg/Kg	2	08/08/25	SC	SW8082A
PCB-1260	ND	0.87	mg/Kg	2	08/08/25	SC	SW8082A
PCB-1262	ND	0.87	mg/Kg	2	08/08/25	SC	SW8082A
PCB-1268	ND	0.87	mg/Kg	2	08/08/25	SC	SW8082A
QA/QC Surrogates							
% DCBP	52		%	2	08/08/25	SC	30 - 150 %
% DCBP (Confirmation)	51		%	2	08/08/25	SC	30 - 150 %
% TCMX	44		%	2	08/08/25	SC	30 - 150 %
% TCMX (Confirmation)	42		%	2	08/08/25	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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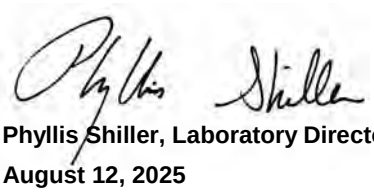

Phyllis Shiller, Laboratory Director

August 12, 2025

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

ACCREDITED IN ACCORDANCE WITH nelac NY # 11301

Analysis Report

August 12, 2025

FOR: Attn:
Encorus Group Engineering, P.C
25 Mechanic Street
Springville, NY 14141

Sample Information		Custody Information		Date	Time
Matrix:	CAULK	Collected by:	DGK	07/24/25	
Location Code:	ENCORUS	Received by:	SW	08/04/25	10:04
Rush Request:	Standard	Analyzed by:	see "By" below		
P.O.#:	25374				

Laboratory Data

SDG ID: GCT90811
Phoenix ID: CT90817

Project ID: SUNY ECC KITTINGER HALL ROOF REPLACEMENT
Client ID: 25374 709 FLASHING SEALANT-DARK GREY

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Caulk Extraction for PCB	Completed				08/07/25	AC1/S/Z	SW3545A
Polychlorinated Biphenyls							
PCB-1016	ND	0.72	mg/Kg	2	08/08/25	SC	SW8082A
PCB-1221	ND	0.72	mg/Kg	2	08/08/25	SC	SW8082A
PCB-1232	ND	0.72	mg/Kg	2	08/08/25	SC	SW8082A
PCB-1242	ND	0.72	mg/Kg	2	08/08/25	SC	SW8082A
PCB-1248	ND	0.72	mg/Kg	2	08/08/25	SC	SW8082A
PCB-1254	ND	0.72	mg/Kg	2	08/08/25	SC	SW8082A
PCB-1260	ND	0.72	mg/Kg	2	08/08/25	SC	SW8082A
PCB-1262	ND	0.72	mg/Kg	2	08/08/25	SC	SW8082A
PCB-1268	ND	0.72	mg/Kg	2	08/08/25	SC	SW8082A
QA/QC Surrogates							
% DCBP	42		%	2	08/08/25	SC	30 - 150 %
% DCBP (Confirmation)	40		%	2	08/08/25	SC	30 - 150 %
% TCMX	33		%	2	08/08/25	SC	30 - 150 %
% TCMX (Confirmation)	34		%	2	08/08/25	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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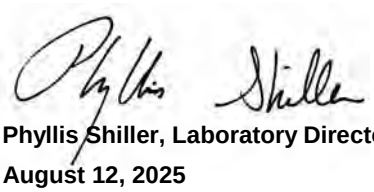


Phyllis Shiller, Laboratory Director

August 12, 2025

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

August 12, 2025

QA/QC Data

SDG I.D.: GCT90811

Parameter	Blank	Blk RL	LCS %	LCSD %	LCS RPD	MS %	MSD %	MS RPD	% Rec Limits	% RPD Limits
QA/QC Batch 797156 (mg/Kg), QC Sample No: CT90811 (CT90811, CT90812, CT90813, CT90814, CT90815, CT90816, CT90817)										
Polychlorinated Biphenyls										
PCB-1016	ND	0.5	69	66	4.4				40 - 140	30
PCB-1221	ND	0.5							40 - 140	30
PCB-1232	ND	0.5							40 - 140	30
PCB-1242	ND	0.5							40 - 140	30
PCB-1248	ND	0.5							40 - 140	30
PCB-1254	ND	0.5							40 - 140	30
PCB-1260	ND	0.5	78	66	16.7				40 - 140	30
PCB-1262	ND	0.5							40 - 140	30
PCB-1268	ND	0.5							40 - 140	30
% DCBP (Surrogate Rec)	91	%	86	78	9.8				30 - 150	30
% DCBP (Surrogate Rec) (Confirm	84	%	82	73	11.6				30 - 150	30
% TCMX (Surrogate Rec)	73	%	69	66	4.4				30 - 150	30
% TCMX (Surrogate Rec) (Confirm	74	%	71	75	5.5				30 - 150	30

If there are any questions regarding this data, please call Phoenix Client Services at extension 200.

RPD - Relative Percent Difference
LCS - Laboratory Control Sample
LCSD - Laboratory Control Sample Duplicate
MS - Matrix Spike
MS Dup - Matrix Spike Duplicate
NC - No Criteria
Intf - Interference
(ISO) - Isotope Dilution

Phyllis Shiller, Laboratory Director
August 12, 2025

Tuesday, August 12, 2025

Criteria: None

State: NY

Sample Criteria Exceedances Report

GCT90811 - ENCORUS

SampNo	Acode	Phoenix Analyte	Criteria	Result	RL	Criteria	RL Criteria	Analysis Units

*** No Data to Display ***

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

August 12, 2025 SDG I.D.: GCT90811

The following analysis comments are made regarding exceptions to criteria not already noted in the Analysis Report or QA/QC Report: None.

Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102 Fax (860) 645-0823

ACCREDITED IN ACCORDANCE WITH nelac NY # 11301

NY Temperature Narration

August 12, 2025

SDG I.D.: GCT90811

The samples in this delivery group were received at 21.1°C.
(Note acceptance criteria for relevant matrices is above freezing up to 6°C)

ENCORUS GROUP
23 Mechanic Street | Springville, NY 14141
295 Main Street | West Seneca, NY 14224
encorus.com | 716.592.3980

Bulk Chain of Custody

Email Report to:	Labresults@Encorus.com	**Turn Around Time**
		☐ 24 Hour
Client/Contact:	Bell & Spina Architects	☐ 48 Hour
	Neil Garry	☐ 72 Hour
Project/Location:	SUNY ECC Kittinger Hall Roof Replacement	☐ 5 Day
	6205 Main Street Williamsville, NY 14221	☑ Standard
Project No.:	25374	Other:

Analysis Requested:		**Protocol:**		**Notes:**
PLM	☐	☐	Negative PLM to TEM per ELAP protocols	
TEM	☐	☐	Positive Stop by HAN-ID#	
PCB	☑	☐	Layered analysis requested for:	
Other:		7	Total # of Samples	

Sample Name					
Date	**Project**	**HAN**	**ID#**	**Description of Sample**	**Location of Sample**
20250724	25374	702	1	Control Joint Sealant - Grey	Roof 4 90811
20250724	25374	703	1	Equipment Support Sealant - Beige	Roof 4 90812
20250724	25374	705	1	Brick Sealant - Beige	Roof 4 90813
20250724	25374	706	1	Modified Bituminous Roofing Seam Sealant - White, Hard	Roof 4 90814
20250724	25374	707	1	Skylight Frame Sealant - White & Black Comingled	Roof 3 90815
20250724	25374	708	1	Flashing Sealant - White	Roof 1 90816
20250724	25374	709	1	Flashing Sealant - Dark Grey	Roof 7 90817

Sampled by: Daniel G. Korff — Date: 07/24/2025 — ★ Rec 1x bag per ID - JW
Relinquished by: Daniel G. Korff — Date + Time: 08/01/2025 1630
Received by: FedEx — Date + Time: 8/4/25 10:04
8/4/25 10:04

5.0 – UNIVERSAL WASTE AND HAZARDOUS MATERIALS

5.0 UNIVERSAL WASTE AND MISCELLANEOUS HAZARDOUS MATERIALS

Watts conducted a limited Hazardous/Universal materials inventory within the limits of the proposed project. The following items were identified that may require removal within the project limits and would be considered universal/hazardous waste:

Fluorescent Lights

Currently, almost all fluorescent lamps, when tested, are characterized as a hazardous waste due to their mercury content. On July 6, 1999, the United States Environmental Protection Agency (EPA) published a final rule in the Federal Register that added hazardous waste lamps to the Universal Waste Rule. On October 22, 1999, NYSDEC issued an Enforcement Directive to allow hazardous waste lamps to be regulated as universal wastes. The Universal Waste Rule allows for less stringent standards for storing, transporting and collecting wastes, however, they still must comply will full hazardous waste requirements for final recycling, treatment or disposal. Disposal/recycling of fluorescent bulbs is conducted by various vendors. Disposal/recycling involves packaging fluorescent lamps to avoid breakage, proper labeling, shipping them by an approved transporter and compliance with applicable disposal regulations.

After conducting the site investigation, Watts observed 10 fluorescent bulbs within the project limits. Unless reused, all these bulbs should be removed and properly packaged for recycling or disposal.

PCB/DEHP Light Ballasts & Transformers

Before the EPA banned the use of PCBs in 1978, PCBs were used within the liquid-filled capacitors inside of the fluorescent light ballasts and electrical transformers. Watts examined several ballasts associated with the overhead building lighting and most observed ballasts were electronic that typically do not contain a liquid filled capacitor. However, some of the older fluorescent light fixtures/ballasts observed in the Basement did not contain information stating they are electronic or non-PCB. Given the age of the units, it is possible that PCB-containing ballasts are present.

Please note that all oil-filled light ballasts manufactured since 1978 which do not contain PCBs should be marked by the manufacturer with the statement on a 'No-PCB' sticker. The Toxic Substances Control Act (TSCA) regulates ballasts that contain PCBs under 40 CFR 761.60. In addition, the Comprehensive Emergency Response Compensation and Liability Act (CERCLA) regulates the disposal of non-leaking PCB-containing ballasts. CERCLA requires building owners and waste generators to notify the National Response Center at (800) 424-8802 when disposing a pound or more of PCBs (roughly the equivalent of twelve to sixteen (12-16) fluorescent ballasts) in a 24-hour period. New York State environmental regulations also apply to PCB light ballasts and reference labeling, storage, transportation and disposal of PCB ballasts. Disposal of PCB ballasts should be via high-temperature incineration (required if the ballast is leaking), recycling, or chemical/hazardous waste disposal.

Please also note that since the use of PCBs in small capacitors was banned by TSCA for all fluorescent light ballasts, DEHP (Di-2-ethylhexyl phthalate), a dielectric fluid became the closest substitute. DEHP was used in fluorescent light fixtures from 1980-1991 and it is estimated that approximately 25%-50% of currently installed ballasts or one-half of all non-PCB ballasts contain DEHP. However, DEHP is a probable human carcinogen and listed as a hazardous waste by the Resource Conservation and Recovery Act (RCRA) when it is discarded as a commercial chemical product. The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), known as the Superfund Law, lists DEHP as a hazardous substance. Furthermore, New York State Department of Environmental Conservation does not permit landfilling of ballasts that contain DEHP. As a result, the disposal of DEHP ballasts should be handled with the same precautions as the disposal of PCB containing ballasts. The proper disposal of DEHP containing ballasts is by recycling the metals, incineration of the capacitor, and receipt of a Certificate of Destruction.

Subsequent to the manufacturing of liquid-filled ballasts with PCBs and/or DEHP, manufacturers began using non-liquid filled capacitors within ballasts. These types of ballasts are often referred to as electronic ballasts and they contain a dry metallic capacitor. Electronic ballasts that do not contain liquid-filled capacitors will typically exceed RCRA lead toxicity limits for disposal, and as such, should be properly recycled.

Watts estimates that there are 5 total ballasts located within the project limits that contain capacitors with environmental concerns.

Watts recommends that the Contractor removing the fluorescent bulbs examine the labeling on the ballasts at the time of their removal to determine if the ballast has a liquid filled or non-liquid filled capacitor within the ballast. All light ballasts manufactured since 1978 which do not contain PCBs should be marked by the manufacturer with statement a 'No-PCB' on the sticker. However, no manufacturers currently label with regards to use of or non-use of DEHP. Therefore, if the ballast contains a liquid filled capacitor, it should be properly disassembled, the capacitor incinerated, and the remaining materials within the ballast either properly recycled or disposed of. All ballasts that contain a non-liquid filled capacitor should be disassembled, the capacitor properly recycled, and the remaining materials within the ballast either properly recycled or disposed of.

6.0 – LABORATORY ACCREDITATIONS

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. CORY M. PARNELL
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 Mate	Item 198.8 of Manual

Serial No.: 70357

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.

United States Department of Commerce
National Institute of Standards and Technology

Certificate of Accreditation to ISO/IEC 17025:2017

NVLAP LAB CODE: 101904-0

AmeriSci Richmond

Midlothian, VA

is accredited by the National Voluntary Laboratory Accreditation Program for specific services, listed on the Scope of Accreditation, for:

Asbestos Fiber Analysis

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communique on ISO/IEC 17025).

2025-07-01 through 2026-06-30

Effective Dates

For the National Voluntary Laboratory Accreditation Program

National Voluntary Laboratory Accreditation Program

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017

AmeriSci Richmond
dba AmeriSci Richmond
13635 Genito Road
Midlothian, VA 23112
Cory M. Parnell
Phone: 804-763-1200
Email: cparnell@amerisci.com
http://www.amerisci.com

ASBESTOS FIBER ANALYSIS

NVLAP LAB CODE 101904-0

Bulk Asbestos Analysis

Code	*Description*
18/A01	EPA -- 40 CFR Appendix E to Subpart E of Part 763, Interim Method of the Determination of Asbestos in Bulk Insulation Samples
18/A03	EPA 600/R-93/116: Method for the Determination of Asbestos in Bulk Building Materials

Airborne Asbestos Analysis

Code	*Description*
18/A02	U.S. EPA's "Interim Transmission Electron Microscopy Analytical Methods-Mandatory and Nonmandatory-and Mandatory Section to Determine Completion of Response Actions" as found in 40 CFR, Part 763, Subpart E, Appendix A.

For the National Voluntary Laboratory Accreditation Program

Effective 2025-07-01 through 2026-06-30

7.0– CONSULTANT'S LICENSE AND CERTIFICATION

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

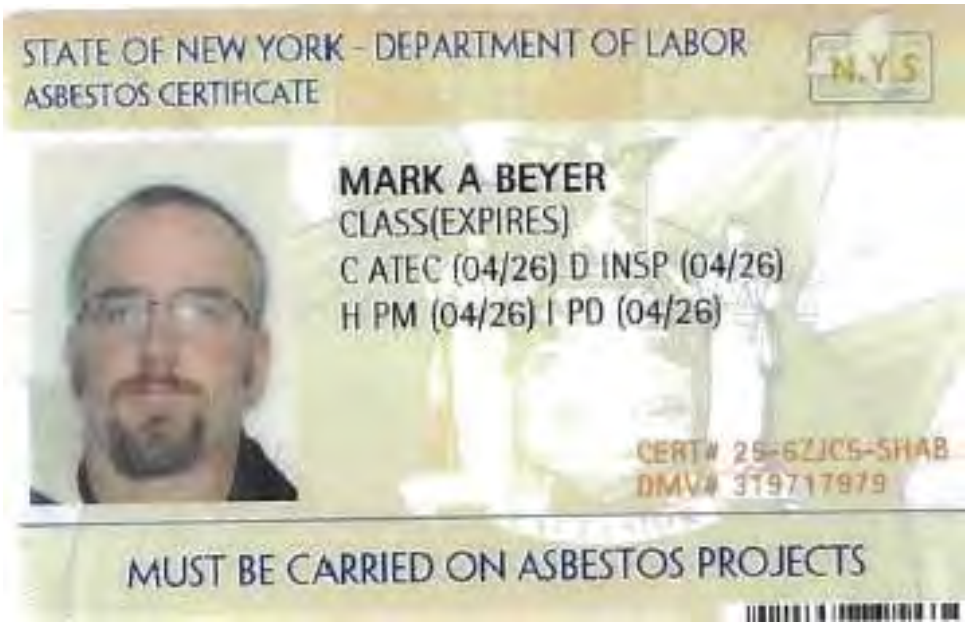
Watts Architecture & Engineering, D.P.C.
95 Perry Street, Suite 300, Buffalo, NY, 14203

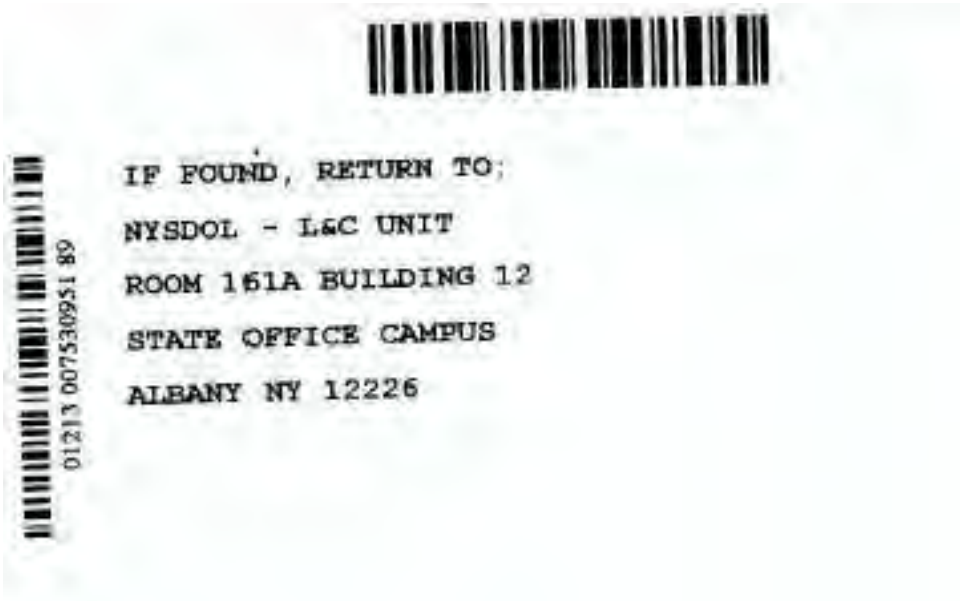
License Number: 68007
License Class: RESTRICTED
Date of Issue: 08/23/2024
Expiration Date: 09/30/2025
Duly Authorized Representative: Kevin Janik

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





Mark Beyer

C – Air Sampling Technician
D - Inspector
H – Project Monitor
I – Project Designer

Watts
Architects
&Engineers

United States Environmental Protection Agency

This is to certify that

Watts Architecture & Engineering

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 21, 2027

LBP-1952-3
Certification #

March 19, 2024
Issued On

Marc Edmonds, Chief
Risk Assessment Management Branch 2.

Watts
Architects
&Engineers

United States Environmental Protection Agency

This is to certify that



Edward J Jones

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 January 02, 2028

LBP-R-128144-3
Certification #

December 26, 2024
Issued On

Ben Conetta

Ben Conetta, Manager
Chemicals and Multimedia Programs Branch

SUNY ERIE COMMUNITY COLLEEGE NORTH CAMPUS
KITTINGER HALL BOILER ROOM UPGRADES
DIVISION 03
CONCRETE SPECIFICATIONS
PAGE 1

SECTION	DESCRIPTION
030131	CONCRETE REHABILITATION
031000	CONCRETE FORMING AND ACCESSORIES
032000	CONCRETE REINFORCING
033000	CAST–IN–PLACE CONCRETE
033500	CONCRETE FINISHING
033900	CONCRETE CURING

SECTION 030131 - CONCRETE REHABILITATION

PART 1 GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

A. Joint Sealers: Section 079200.

1.02 REFERENCES

A. Except as shown or specified, the Work of this Section shall conform to the requirements of International Concrete Repair Institute (ICRI), 3166 S. River Rd., Suite 132, Des Plaines, IL 60018, (847) 827-0830, www.icri.org.
   1. ICRI Guideline No. 310.1R-2008 Guide for Surface Preparation for the Repair of Deteriorated Concrete Resulting from Reinforcing Steel Corrosion (formerly Guideline No. 03730).

1.03 SUBMITTALS

A. Product Data: Manufacturer's specifications and installation instructions for factory packaged products.

1.04 QUALITY ASSURANCE

A. Material Container Labels: Material containers shall bear the manufacturer's label indicating manufacturer's name, trade name of product, lot number, shelf life of product, and mix ratio (if applicable).

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to the site in original, sealed containers. Do not deliver materials that have exceeded shelf-life limitation set forth by the manufacturer.

B. Comply with manufacturer's printed instructions for storing and handling materials.

1.06 PROJECT CONDITIONS

A. Environmental Requirements: Comply with the product manufacturer's printed limitations and instructions.

PART 2 PRODUCTS

2.01 COMPANIES

A. The Euclid Chemical Company, 19218 Redwood Rd., Cleveland, OH 44110-2799, (800) 321-7628, www.euclidchemical.com.

B. Sika Corporation, 201 Polito Ave., Lyndhurst, NJ 07071, (800) 933-7452, www.sikausa.com.

C. Kaufman Products, Inc., 3811 Curtis Ave., Baltimore, MD 21226, (800) 637-6372, www.kaufmanproducts.net.

2.02 MATERIALS

A. The following brand names are specified to establish product generic type and standard of quality. Other comparable products in the manufacturer's same product series may be required to closely fit the particular job conditions. Use appropriate product for depth of patch and temperature at time of application. More than one product may be required for a particular type of patching mortar. When a color choice is available, select the color to match adjoining concrete as closely as practicable. A bonding agent/primer and/or sealer shall be used as recommended by the patching mortar manufacturer.

B. Cement/Acrylic/Latex Base Patching Mortars:
1. Type C-1 Patching Mortar: "Verticoat", by The Euclid Chemical Company; "SikaTop 122 Plus" or "SikaTop 123 Plus" by Sika Corp; "Patchwell VO" or "HiCap Plus" by Kaufman Products, Inc.
2. Type C-2 Patching Mortar: "SikaTop 121 Plus", "SikaTop 122 Plus" or "SikaTop 111 Plus" by Sika Corp.; "Patchwell Kit", "Patchwell Deep", "SureFlow 040", or "SureFlow 042" by Kaufman Products, Inc.; "Thincoat" or "Concrete Coat" by The Euclid Chemical Company.

C. Cleaning Agent, Bonding Agent/Primer, Sealer/Topcoat: As recommended by the patching mortar manufacturer, including primer for the reinforcing steel and primer for the concrete substrate.

PART 3 EXECUTION

3.01 PREPARATION

A. Protection: Cover or otherwise protect adjacent surfaces not being repaired.

B. Surface Preparation:
1. Prepare surfaces to be repaired in accordance with the product manufacturer's printed instructions and as specified.
2. Cut out and remove cracked, spalled, and disintegrated concrete. Cut back to sound concrete. Cut edges of patch perpendicular to surface of patch, unless otherwise recommended by mortar manufacturer. If steel reinforcing bars are exposed, chip concrete out from behind exposed length of bars as required for a minimum clearance around circumference

of bar of 3/4 inch. In addition, cut a minimum of one inch of sound concrete away from each end of exposed length of reinforcing bars.

3. Remove paint, oils, grease, dirt, salt deposits, laitance and other contaminants from surfaces to be patched. Use cleaning agent where required.
4. Clean areas to be patched with oil-free air or water under pressure, except as otherwise recommended by the mortar manufacturer.

3.02 PATCHING CONCRETE

A. Patch concrete as soon as possible after completion of surface preparation.

B. Mixing Patching Mortar: Comply with mortar manufacturer's printed instructions. Proportion components and sizes of aggregate as recommended by mortar manufacturers for the particular job conditions.

C. Patch concrete in accordance with the product manufacturer's printed instructions.

1. Coat contact surfaces of existing concrete and steel reinforcing with a bonding agent/primer as recommended in the product manufacturer's instructions.

D. Bring patches out to the original surfaces in true planes. Finish patches to match texture of adjoining concrete as close as possible.

E. Cure patches in accordance with the product manufacturer's printed instructions.

3.03 CLEANING

A. Clean up spatters and droppings.

3.04 PROTECTION

A. Protect mortar after placement in accordance with the product manufacturer's printed instructions.

END OF SECTION

SECTION 031000 - CONCRETE FORMING AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Formwork for cast-in-place concrete.
2. Shoring, bracing, and anchorage.
3. Architectural form liners.
4. Form accessories.
5. Form stripping.

B. Related Requirements:
1. Section 032000 - Concrete Reinforcing: Reinforcing steel and required supports for cast-in-place concrete.
2. Section 033000 - Cast-in-Place Concrete: Cast-in-place or in-situ concrete for structural building frame, slabs-on-grade, and other concrete components associated with building.
3. Section 055000 - Metal Fabrications: Product requirements for metal fabrications for placement by this Section.

1.2 REFERENCE STANDARDS

A. American Concrete Institute:
1. ACI 117 - Specification for Tolerances for Concrete Construction and Materials.
2. ACI 301 - Specifications for Structural Concrete.
3. ACI 318 - Building Code Requirements for Structural Concrete.
4. ACI 347 - Guide to Formwork for Concrete.

B. American Forest & Paper Association:
1. AF&PA - National Design Specification (NDS) for Wood Construction.

C. American Society of Mechanical Engineers:
1. ASME A17.1 - Safety Code for Elevators and Escalators.

D. APA - The Engineered Wood Association:
1. APA/EWA PS 1 - Voluntary Product Standard - Structural Plywood.

E. ASTM International:
1. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types).
2. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials.

1.3 COORDINATION

A. Section 013000 - Administrative Requirements: Requirements for coordination.

B. Coordinate Work of this Section with other Sections of Work in forming and placing openings, slots, reglets, recesses, sleeves, bolts, anchors, other inserts, and components of other Work.

1.4 SUBMITTALS

A. Section 013300 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit manufacturer information on void form materials.

C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

A. Perform Work according to ACI 347, 301, and 318.

B. For wood products furnished for Work of this Section, comply with AF&PA.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Section 016000 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Inspection: Accept void forms on Site in manufacturer's original packaging and inspect for damage.

C. Store materials off ground in a ventilated and protected manner to prevent deterioration from moisture.

PART 2 - PRODUCTS

2.1 WOOD FORM MATERIALS

A. Plywood Forms:
   1. Application: Exposed finish concrete.
   2. Description:
      a. Comply with APA/EWA PS 1.
      b. Panels: Full size, 4 by 8 feet.
      c. Label each panel with grade trademark of APA/EWA.
   3. Plywood for Surfaces to Receive Membrane Waterproofing:
      a. Minimum Thickness: 5/8 inch.
      b. Grade: APA/EWA "B-B Plyform Structural I Exterior."
   4. Plywood with "Smooth Finish" Indicated on Drawings:
      a. Minimum Thickness: 3/4 inch.
      b. Grade: APA/EWA "HD Overlay Plyform Structural I Exterior."

2.2 PREFABRICATED FORMS

A. Manufacturers:

1. EFCO - Economy Forms Corp.
2. Molded Fiber Glass Construction Products.
3. Sonoco Products Co.
4. Symons by Dayton Superior.
5. Wall-Ties & Forms, Inc.
6. Western Forms.

B. Preformed Steel Forms:
   1. Description: Matched, tightly fitted, and stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished surfaces.
   2. Minimum Thickness: 16 gage.

C. FRP Forms: Matched, tightly fitted, and stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished concrete surfaces.

D. Steel Forms:
   1. Description: Sheet steel, suitably reinforced.
   2. Design: For particular use as indicated on Drawings.

E. Framing, Studding, and Bracing: [Stud] [or] [No. 3 structural light-framing grade].

2.3 FORMWORK ACCESSORIES

A. Form Ties:
   1. Type: Snap off.
   2. Material: Galvanized
   3. Free of defects capable of leaving holes larger than 1 inch in concrete surface.
   4. Manufacturers:
      a. Heckmann Building Products, Inc.
      b. Symons by Dayton Superior.
      c. Wall-Ties & Forms, Inc.

B. Spreaders:
   1. Description: Standard, non-corrosive metal-form clamp assembly, of type acting as spreaders and leaving no metal within 1 inch of concrete face.
   2. Wire ties, wood spreaders, or through bolts are not permitted.

C. Form Release Agent:
   1. Description: Colorless mineral oil that will not stain concrete or absorb moisture or impair natural bonding or color characteristics of coating intended for use on concrete.
   2. Manufacturers:
      a. Architectural Concrete Chemicals, LLC.
      b. Nox-Crete Products Group.

D. Corners:
   1. Type: Chamfer
   2. Size: 3/4 by 3/4 inches.
   3. Lengths: Maximum possible.

4. Manufacturers:
   a. BoMetals, Inc.
   b. Wall-Ties & Forms, Inc.

E. Vapor Retarder:
1. Description: Polyethylene sheet.
2. Thickness: 10 mils. Include Manufacturers recommended adhesive or pressure-sensitive tape.
3.

F. Bituminous Joint Filler: Comply with ASTM D1751.

G. Nails, Spikes, Lag Bolts, Through Bolts, Anchorages: Size, strength, and character to maintain formwork in place while placing concrete.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 017000 - Execution and Closeout Requirements: Requirements for installation examination.

B. Verify lines, levels, and centers before proceeding with formwork.

C. Verify that dimensions agree with Drawings.

D. If formwork is placed after reinforcement resulting in insufficient concrete cover over reinforcement, request instructions from Architect/Engineer before proceeding.

3.2 INSTALLATION

A. Earth Forms: Not permitted.

B. Formwork:
1. Provide top form for sloped surfaces steeper than 1.5 horizontal to 1 vertical to hold shape of concrete during placement, unless it can be demonstrated that top forms can be omitted.
2. Construct forms to correct shape and dimensions, mortar-tight, braced, and of sufficient strength to maintain shape and position under imposed loads from construction operations.
3. Camber forms where necessary to produce level finished soffits unless indicated otherwise on Drawings.
4. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:
   a. Class A, 1/8 inch for smooth-formed finished surfaces.
   b. Class C, 1/2 inch for rough-formed finished surfaces.
5. Positioning:
   a. Carefully verify horizontal and vertical positions of forms.
   b. Correct misaligned or misplaced forms before placing concrete.

6. Complete wedging and bracing before placing concrete.
7. Erect formwork, shoring, and bracing to achieve design requirements according to ACI 318.
8. Stripping:
    a. Arrange and assemble formwork to permit dismantling and stripping.
    b. Do not damage concrete during stripping.
    c. Permit removal of remaining principal shores.
9. Obtain approval of Architect/Engineer before framing openings in structural members not indicated on Drawings.
10. Install chamfer strips on external corners of beams, joists , columns , and walls.
11. Install void forms according to manufacturer instructions.
12. Do not patch formwork.
13. Leave forms in place for minimum number of days according to ACI 347.

C. Form Removal:
1. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads, and removal has been approved by Architect/Engineer.
2. Loosen forms carefully; do not wedge pry bars, hammers, or tools against finish concrete surfaces scheduled for exposure to view.
3. Store removed forms in manner that surfaces to be in contact with fresh concrete will not be damaged.
4. Discard damaged forms.
5. Form Release Agent:
    a. Apply according to manufacturer instructions.
    b. Apply prior to placement of reinforcing steel, anchoring devices, and embedded items.
    c. Do not apply form release agent if concrete surfaces are indicated to receive special finishes or applied coverings that may be affected by agent.
    d. Soak inside surfaces of untreated forms with clean water, and keep surfaces coated prior to placement of concrete.
6. Form Cleaning:
    a. Clean forms as erection proceeds to remove foreign matter within forms.
    b. Clean formed cavities of debris prior to placing concrete.
    c. Flush with water or use compressed air to remove remaining foreign matter.
    d. Ensure that water and debris drain to exterior through cleanout ports.
    e. Cold Weather:
        1) During cold weather, remove ice and snow from within forms.
        2) Do not use de-icing salts.
        3) Do not use water to clean out forms, unless formwork and concrete construction proceed within heated enclosure; use compressed air or other dry method to remove foreign matter.
7. Reuse and Coating of Forms:
    a. Thoroughly clean forms and reapply form coating before each reuse.
    b. For exposed Work, do not reuse forms with damaged faces or edges.
    c. Apply form coating to forms according to manufacturer instructions.
    d. Do not coat forms for concrete indicated to receive "scored finish."

e. Apply form coatings before placing reinforcing steel.

D. Forms for Smooth Finish Concrete:
1. Use steel, plywood, or lined-board forms.
2. Use clean and smooth plywood and form liners, uniform in size, and free from surface and edge damage capable of affecting resulting concrete finish.
3. Install form lining with close-fitting square joints between separate sheets without springing into place.
4. Use full-sized sheets of form liners and plywood wherever possible.
5. Tape joints to prevent protrusions in concrete.
6. Apply forming and strip wood forms in a manner to protect corners and edges.
7. Level and continue horizontal joints.
8. Keep wood forms wet until stripped.

E. Framing, Studding, and Bracing:
1. Maximum Spacing of Studs:
   a. Boards: Maximum 16 inches o.c.
   b. Plywood: 12 inches o.c.
2. Size framing, bracing, centering, and supporting members for sufficient strength to maintain shape and position under imposed loads from construction operations.
3. Construct beam soffits of material minimum 2 inches thick.
4. Distribute bracing loads over base area on which bracing is erected.
5. When placed on ground, protect against undermining, settlement, and accidental impact.

F. Form Anchors and Hangers:
1. Do not use anchors and hangers leaving exposed metal at concrete surface.
2. Symmetrically arrange hangers supporting forms from structural-steel members to minimize twisting or rotation of member.
3. Penetration of structural-steel members is not permitted.

G. Inserts, Embedded Parts, and Openings:
1. Install formed openings for items to be embedded in or passing through concrete Work.
2. Locate and set in place items required to be cast directly into concrete.
3. Install accessories straight, level, and plumb, and ensure that items are not disturbed during concrete placement.
4. Openings:
   a. Provide temporary ports or openings in formwork as required to facilitate cleaning and inspection.
   b. Locate openings at bottom of forms to allow flushing water to drain.
5. Close temporary openings with tight-fitting panels, flush with inside face of forms, and neatly fitted such that joints will not be apparent in exposed concrete surfaces.

H. Form Ties:
1. Provide sufficient strength and quantity to prevent spreading of forms.
2. Place ties at least 1 inch away from finished surface of concrete.

3. Leave inner rods in concrete when forms are stripped.
4. Space form ties equidistant, symmetrical, and aligned vertically and horizontally unless indicated otherwise on Drawings.

I. Arrange formwork to allow proper erection sequence and to permit form removal without damage to concrete.

J. Construction Joints:
1. Install surfaced pouring strip where construction joints intersect on exposed surfaces to provide straight line at joints.
2. Just prior to subsequent concrete placement, remove strip and tighten forms to conceal shrinkage.
3. Appearance:
   a. Show no overlapping of construction joints.
   b. Construct joints to present same appearance as butted plywood joints.
4. Arrange joints in continuous line straight, true, and sharp.

K. Embedded Items:
1. Make provisions for pipes, sleeves, anchors, inserts, reglets, anchor slots, nailers, waterstops, and other features.
2. Do not embed wood or uncoated aluminum in concrete.
3. Obtain installation and setting information for embedded items furnished under other Sections.
4. Securely anchor embedded items in correct location and alignment prior to placing concrete.
5. Ensure that conduits and pipes, including those made of coated aluminum, meet requirements of ACI 318 regarding size and location limitations.

L. Openings for Items Passing through Concrete:
1. Frame openings in concrete where indicated on Drawings.
2. Establish exact locations, sizes, and other conditions required for openings and attachment of Work specified under other Sections.
3. Coordinate Work to avoid cutting and patching of concrete after placement.
4. Perform cutting and repairing of concrete required as result of failure to provide required openings.

M. Screeds:
1. Set screeds and establish levels for tops of and finish on concrete slabs.
2. Slope slabs to drain where required or as indicated on Drawings.
3. Before depositing concrete, remove debris from space to be occupied by concrete and thoroughly wet forms; remove freestanding water.

N. Screed Supports:
1. For concrete over waterproof membranes and vapor retarder membranes, use cradle-, pad-, or base-type screed supports that will not puncture membrane.
2. Staking through membrane is not permitted.

O. Cleanouts and Access Panels:

1. Provide removable cleanout sections or access panels at bottoms of forms to permit inspection and effective cleaning of loose dirt, debris, and waste material.
2. Clean forms and surfaces against which concrete is to be placed.
3. Remove chips, sawdust, and other debris.
4. Thoroughly blow out forms with compressed air just before concrete is placed.

3.3 TOLERANCES

A. Tolerances: Construct formwork to produce completed concrete surfaces within construction tolerances according to ACI 117.

3.4 FIELD QUALITY CONTROL

A. Section 014000 - Quality Requirements: Requirements for inspecting and testing.

3.5 ATTACHMENTS

A. Foundation Walls Not Exposed to View: Site-fabricated plywood coated with form oil.

B. Foundation Walls Exposed to View: preformed steel forms.

C. Supported Floor Slabs: Prefabricated glass-fiber pan forms, treated for exposed-to-view finish.

END OF SECTION

SECTION 032000 - CONCRETE REINFORCING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Reinforcing bars.
2. Welded wire fabric.
3. Reinforcement accessories.

B. Related Requirements:
1. Section 031000 - Concrete Forming and Accessories: Form materials and accessories required to form cast-in-place concrete.
2. Section 033000 - Cast-in-Place Concrete: Cast-in-place or in-situ concrete for structural building frame, slabs on grade, and other concrete components associated with building.
3. Section 033500 - Concrete Finishing: Reinforcement for concrete floor toppings.

1.2 REFERENCE STANDARDS

A. American Concrete Institute:
1. ACI 301 - Specifications for Structural Concrete.
2. ACI 318 - Building Code Requirements for Structural Concrete.
3. ACI 530/530.1 - Building Code Requirements and Specification for Masonry Structures.
4. ACI SP-66 - ACI Detailing Manual.

B. ASTM International:
1. ASTM A184 - Standard Specification for Welded Deformed Steel Bar Mats for Concrete Reinforcement.
2. ASTM A615 - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
3. ASTM A704 - Standard Specification for Welded Steel Plain Bar or Rod Mats for Concrete Reinforcement.
4. ASTM A706 - Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement.
5. ASTM A767 - Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement.
6. ASTM A775 - Standard Specification for Epoxy-Coated Steel Reinforcing Bars.
7. ASTM A884 - Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement.
8. ASTM A934 - Standard Specification for Epoxy-Coated Prefabricated Steel Reinforcing Bars.
9. ASTM A996 - Standard Specification for Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcement.
10. ASTM A1064 - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.

C. Concrete Reinforcing Steel Institute:
1. CRSI 10-MSP - Manual of Standard Practice.
2. CRSI 10PLACE - Placing Reinforcing Bars.

1.3 COORDINATION

A. Section 013000 - Administrative Requirements: Requirements for coordination.

B. Coordinate Work of this Section with placement of formwork, formed openings, and other Work.

1.4 PREINSTALLATION MEETINGS

A. Section 013000 - Administrative Requirements: Requirements for preinstallation meeting.

1.5 SUBMITTALS

A. Section 013300 - Submittal Procedures: Requirements for submittals.

B. Shop Drawings:
   1. Indicate bar sizes, spacings, locations, splice locations, and quantities of reinforcing steel and welded wire fabric.
   2. Indicate bending and cutting schedules.
   3. Indicate supporting and spacing devices.

C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.6 QUALITY ASSURANCE

A. Perform Work according to CRSI 10-MSP, ACI 301 & ACI 318.

B. Prepare Shop Drawings according to ACI SP-66.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Section 016000 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.

C. Store materials according to manufacturer instructions.

D. Protection:
   1. Protect materials from moisture by storing in clean, dry location remote from construction operations areas.
   2. Provide additional protection according to manufacturer instructions.

1.8 EXISTING CONDITIONS

A. Field Measurements:
   1. Verify field measurements prior to fabrication.
   2. Indicate field measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 REINFORCEMENT

A. Reinforcing Steel:

1. Comply with ASTM A615.
2. Yield Strength: 60 ksi.
3. Billet Bars: Deformed.
4. Finish: Uncoated

B. Plain Wire:
1. Comply with ASTM A1064.
2. Finish: Uncoated

C. Welded Deformed Wire Fabric:
1. Comply with ASTM A1064.
2. Configuration: Flat sheets
3. Finish: Uncoated

2.2 FABRICATION

A. Fabricate concrete reinforcement according to CRSI 10-MSP.

B. Form standard hooks for 180-degree bends , 90-degree bends, stirrups and tie hooks, and seismic hooks as indicated on Drawings.

C. Form reinforcement bends with minimum diameters according to ACI 318.

D. Fabricate column reinforcement with offset bends at reinforcement splices.

E. Form ties and stirrups from following:
1. Bars No. 10 and Smaller: No. 3 deformed bars
2. Bars No. 11 and Larger: No. 4 deformed bars

F. Splicing:
1. If not indicated on Drawings, locate reinforcement splices at point of minimum stress.
2. Obtain approval of splice locations from Architect/Engineer.

2.3 ACCESSORY MATERIALS

A. Tie Wire:
1. Minimum 16 gage, annealed type, uncoated.

B. Chairs, Bolsters, Bar Supports, and Spacers:
1. Size and Shape: To strengthen and support reinforcement during concrete placement conditions.
2. Furnish load-bearing pad on bottom to prevent vapor retarder puncture.

C. Special Chairs, Bolsters, Bar Supports, and Spacers Adjacent to Weather-Exposed Concrete Surfaces:
1. Material: Plastic-tipped, Stainless steel.
2. Size and Shape: To meet Project conditions.

D. Reinforcing Splicing Devices:
1. Type: Mechanical set screw,swaged or threaded; full tension.
2. Size: To fit joined reinforcing.
3. Manufacturers:
   a. Dur-O-Wal; a Hohmann & Barnard company.

b. ERICO; nVent.
c. Symons by Dayton Superior.

2.4 SOURCE QUALITY CONTROL

A. Section 014000 - Quality Requirements: Requirements for testing, inspection, and analysis.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Place, support, and secure reinforcement against displacement.

B. Do not deviate from the required position beyond specified tolerance.

C. Do not weld crossing reinforcement bars for assembly.

D. Do not displace or damage vapor retarder.

E. Accommodate placement of formed openings.

F. Spacing:
1. Space reinforcement bars with minimum clear spacing according to ACI 318
2. If bars are indicated in multiple layers, place upper bars directly above lower bars.

G. Maintain minimum concrete cover around reinforcement according to ACI 318 as follows:
1. Footings and Concrete Formed against Earth: 3 inches.
2. Concrete Exposed to Earth or Weather:
   a. No. 6 Bars and Larger: 2 inches
   b. No. 5 Bars and Smaller: 1-1/2 inches
3. Supported Slabs, Walls, and Joists:
   a. No. 14 Bars and Larger: 1-1/2 inches
   b. No. 11 Bars and Smaller: 3/4 inch
4. Beams and Columns: 1-1/2 inches
5. Shell and Folded Plate Members:
   a. No. 6 Bars and Larger: 3/4 inch
   b. No. 5 Bars and Smaller: 1/2 inch

H. Bond and ground reinforcement as specified in Section 260526 - Grounding and Bonding for Electrical Systems.

3.2 TOLERANCES

A. Section 014000 - Quality Requirements: Requirements for tolerances.

B. Install reinforcement within following tolerances for flexural members, walls, and compression members:
1. Reinforcement Depth Greater Than 8 Inches:
   a. Depth Tolerance: Plus or Minus 3/8 inch
   b. Minus 3/8 inch
2. Reinforcement Depth Less Than or Equal to 8 Inches:
   a. Depth Tolerance: Plus or Minus 1/2 inch
   b. Minus 1/2 inch

C. Foundation Walls: Install reinforcement within tolerances according to ACI 530/530.1.

3.3 FIELD QUALITY CONTROL

A. Section 014000 - Quality Requirements: Requirements for inspecting and testing.

B. Perform field testing according to ACI 318.

C. Provide unrestricted access to Work and cooperate with appointed inspection and testing firm.

D. Reinforcement Inspection:
   1. Placement Acceptance: Inspect specified and ACI 318 material requirements and specified placement tolerances.
   2. Periodic Placement Inspection: Inspect for correct materials, fabrication, sizes, locations, spacing, concrete cover, and splicing.

END OF SECTION

SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. Provide all materials and labor necessary to complete all concrete, plain and reinforced, as indicated on Drawings or as specified in these specifications and as required to complete the Project. Work, without limiting the generality thereof, includes:
   1. Installation of concrete to slabs on grade, housekeeping slabs, and other incidental concrete Work.
   2. Concrete pads for mechanical equipment.
   3. Furnishing and installation of admixtures.
   4. Work of other trades required to be built into concrete, such as inserts for connections to steel members, anchors, embedded plates, and reinforcing dowels.
   5. Providing vapor retarder below slabs on grade.
   6. Finishing of concrete as specified herein or as indicated on Drawings.

B. Related Requirements:
   1. Section 031000 - Concrete Forming and Accessories:
   2. Section 032000 - Concrete Reinforcing: Requirements for reinforcing steel and supports.
   3. Section 033500 - Concrete Finishing: Finishing of concrete floor surfaces.
   4. Section 033900 - Concrete Curing: Curing of concrete floor surfaces.

1.2 DEFINITIONS

A. Cementitious Materials: The materials that are subject to compliance with requirements, such as Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash, slag cement, other pozzolans, and silica fume.

B. Conventional Concrete: A type of concrete that has a specified compressive strength of less than 8,000 psi.

C. High-Strength Concrete (HSC): A type of concrete that has a specified compressive strength of 8,000 psi or greater.

D. Self-Consolidating Concrete (SCC**)**: A type of highly flowable, non-segregating concrete that can spread into place, fill formwork, and encapsulate reinforcement without any mechanical consolidation.

E. Strain Hardening: The ability to carry increasing tensile load beyond the point of first crack.

F. Strain Softening: The ability to carry a reduced (but nonzero) tensile load beyond the point of first crack.

G. Ultra-High-Performance Concrete: A type of concrete that has a minimum specified compressive strength of 22,000 psi with specified durability, tensile ductility, and toughness requirements; fibers are generally included to achieve specified requirements.

H. Water-Cementitious Materials Ratio (w/cm): The ratio by weight of water to cementitious materials.

1.3 REFERENCE STANDARDS

A. American Association of State Highway and Transportation Officials (AASHTO):
1. AASHTO M182 - Standard Specification for Burlap Cloth Made from Jute or Kenaf and Cotton Mats.

B. American Concrete Institute:
1. ACI 117 (117M) - Specification for Tolerances for Concrete Construction and Materials.
2. ACI 232.3R - Report on High-Volume Fly Ash Concrete for Structural Applications.
3. ACI 228.1R - Report on Methods for Estimating In-Place Concrete Strength.
4. ACI 239R - Ultra-High-Performance Concrete: An Emerging Technology Report.
5. ACI 301 (301M) - Specifications for Structural Concrete.
6. ACI 302.1R - Guide for Concrete Floor and Slab Construction.
7. ACI 305R - Guide to Hot Weather Concreting.
8. ACI 305.1 (305.1M) - Specification for Hot Weather Concreting.
9. ACI 306.1 - Standard Specification for Cold Weather Concreting.
10. ACI 306R - Guide to Cold Weather Concreting.
11. ACI 308.1 (308.1M) - Specification for Curing Concrete.
12. ACI 318 (318M) - Building Code Requirements for Structural Concrete.
13. ACI 350.5 (350.5M) - Specifications for Environmental Concrete Structures.
14. ACI 357.3R - Guide for Design and Construction of Waterfront and Coastal Concrete Marine Structures.
15. ACI 362.1R - Guide for the Design and Construction of Durable Concrete Parking Structures.
16. ACI 363.2R - Guide to Quality Control and Assurance of High-Strength Concrete.
17. ACI 440R - Report on Fiber-Reinforced Polymer (FRP) Reinforcement for Concrete Structures.

C. ASTM International:
1. ASTM A820/A820M - Standard Specification for Steel Fibers for Fiber-Reinforced Concrete
2. ASTM C31/C31M - Standard Practice for Making and Curing Concrete Test Specimens in the Field.
3. ASTM C33/C33M - Standard Specification for Concrete Aggregates.
4. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
5. ASTM C42/C42M - Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.

6. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete.
7. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete.
8. ASTM C150/C150M - Standard Specification for Portland Cement.
9. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete.
10. ASTM C172/C172M - Standard Practice for Sampling Freshly Mixed Concrete.
11. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
12. ASTM C231/C231M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
13. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete.
14. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
15. ASTM C330/C330M - Standard Specification for Lightweight Aggregates for Structural Concrete.
16. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete.
17. ASTM C567/C567M - Standard Test Method for Determining Density of Structural Lightweight Concrete.
18. ASTM C595/C595M - Standard Specification for Blended Hydraulic Cements.
19. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.
20. ASTM C685/C685M - Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing.
21. ASTM C845/C845M - Standard Specification for Expansive Hydraulic Cement.
22. ASTM C881/C881M - Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete.
23. ASTM C979/C979M - Standard Specification for Pigments for Integrally Colored Concrete.
24. ASTM C989/C989M - Standard Specification for Slag Cement for Use in Concrete and Mortars.
25. ASTM C1017/C1017M - Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
26. ASTM C1059/C1059M - Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete.
27. ASTM C1064/C1064M - Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete.
28. ASTM C1074 - Standard Practice for Estimating Concrete Strength by the Maturity Method.
29. ASTM C1077 - Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation.
30. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).
31. ASTM C1116/C1116M - Standard Specification for Fiber-Reinforced Concrete.
32. ASTM C1157/C1157M - Standard Performance Specification for Hydraulic Cement.
33. ASTM C1218/C1218M - Standard Test Method for Water-Soluble Chloride in Mortar and Concrete.

34. ASTM C1240 - Standard Specification for Silica Fume Used in Cementitious Mixtures.
35. ASTM C1260 - Standard Test Method for Potential Alkali Reactivity of Aggregates (Mortar-Bar Method).
36. ASTM C1293 - Standard Test Method for Determination of Length Change of Concrete Due to Alkali-Silica Reaction.
37. ASTM C1315 - Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete.
38. ASTM C1567 - Standard Test Method for Determining the Potential Alkali-Silica Reactivity of Combinations of Cementitious Materials and Aggregate (Accelerated Mortar-Bar Method).
39. ASTM C1602/C1602M - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete.
40. ASTM C1611/C1611M - Standard Test Method for Slump Flow of Self-Consolidating Concrete.
41. ASTM C1778 - Standard Guide for Reducing the Risk of Deleterious Alkali-Aggregate Reaction in Concrete.
42. ASTM D994/D994M - Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type).
43. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
44. ASTM D1752 - Standard Specification for Preformed Sponge Rubber, Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction.
45. ASTM D6690 - Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements.
46. ASTM E154/E154M - Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover.
47. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection.
48. ASTM E1155 (E1155M) - Standard Test Method for Determining FF Floor Flatness and FL Floor Levelness Numbers.
49. ASTM E1643 - Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.
50. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs.
51. ASTM E1993/E1993M - Standard Specification for Bituminous Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs.

D. National Ready Mixed Concrete Association (NRMCA):
   1. NRMCA - Certification of Ready Mixed Concrete Production Facilities.

E. National Sanitation Foundation (NSF):
   1. NSF/ANSI Standard 61 - Drinking Water System Components - Health Effects.

F. U.S. Army Corps of Engineers:
   1. CRD-C 48 - Standard Test Method for Water Permeability of Concrete.

1.4 COORDINATION

A. Coordinate placement of control and expansion joint devices with erection of concrete formwork and placement of form accessories.

1.5 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project Site
   1. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
      a. Contractor's superintendent.

1.6 SUBMITTALS

A. Product Data: Submit data on the following:
   1. Portland cement.
   2. Aggregates.
   3. Admixtures:
      a. Include limitations of use, such as restrictions on cementitious materials, supplementary cementitious materials, air entrainment, aggregates, temperature at time of concrete placement, relative humidity at time of concrete placement, curing conditions, and use of other admixtures.
   4. Curing materials:
   5. Joint fillers.
   6. Repair materials.

B. Design Mixtures: For each concrete mixture, include the following:
   1. Mixture identification.
   2. Minimum 28-day compressive strength.
   3. Durability exposure class.
   4. Maximum water-cementitious materials ratio.
   5. Slump limit.
   6. Air content.
   7. Nominal maximum aggregate size.
   8. Indicate amounts of mixing water to be withheld for later addition at Project Site, if permitted.
   9. Submit intended placement method.
   10. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
   11. Submit separate mix designs if admixtures are required for the following:
      a. Hot and cold weather concrete Work.
      b. Air-entrained concrete Work.

C. Qualification Data: Submit data for the following:
   1. Installer: Include copies of applicable ACI certificates.
   2. Ready-mixed concrete manufacturer.

D. Shop Drawings:
   1. Construction Joint Layout:

a. Indicate proposed construction joints required to construct structure.
b. Location of construction joints is subject to approval of Architect/Engineer.

E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: A qualified Installer employing Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor certified as ACI Flatwork Concrete Finisher/Technician, or an ACI Concrete Flatwork Technician with experience installing and finishing concrete, and incorporating permeability-reducing admixtures.
1. Post-Installed Concrete Anchors Installers: ACI-certified Adhesive Anchor Installer.

B. Ready-Mixed Concrete Manufacturer Qualifications: A firm experienced manufacturing ready-mixed concrete products that complies with ASTM C94/C94M requirements for production facilities and equipment.
1. Manufacturer certified in accordance with NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

C. Concrete Testing Service: Employ and pay an independent testing laboratory, acceptable to the Owner, Architect/Engineer to perform material evaluation tests and to review concrete mix designs proposed by Contractor to conform to this Specification.

D. Laboratory Testing Agency Qualifications: A testing agency qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated and employing an ACI-certified Concrete Quality Control Technical Manager.
1. Personnel performing laboratory tests are required to be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician, Grade I. Testing agency laboratory supervisors are required to be ACI-certified Concrete Laboratory Testing Technician, Grade II.

E. Field Quality-Control Testing Agency Qualifications: An independent agency qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated.
1. Personnel conducting field tests are required to be qualified as ACI Concrete Field Testing Technician, Grade 1, in accordance with ACI CPP 610.1 or an equivalent certification program.

F. Alkali-Silica Reactivity Testing: Aggregates used in the concrete shall be tested by an independent testing agency for alkali-silica reactivity in accordance with ASTM C1260. Agencies approved for this testing are as follows:
1. American Engineering Testing, Inc.
2. 350 Cleveland Avenue N
3. Saint Paul, MN 55224-1804
4. ATC Associates, Inc.
5. 40 Strafello Drive
6. Avon, MA 02322-1169

7. CTL Group
8. 5400 Old Orchard Road
9. Skokie, IL 60077-1030
10. Simpson Gumpertz & Heger
11. 42 Seyon Street, Building 1, Suite 500
12. Waltham, MA 02453-8355

G. Additional Testing and Inspection Services:
1. If required, Owner's testing agency will perform additional testing and inspection services to verify conformance to Contract Documents as listed below:
   a. Inspect concrete batching, mixing, and delivery operations.
   b. Inspect forms, foundation preparation, reinforcement, embedded items, reinforcement placement, and concrete placing, finishing, and curing operations.
   c. Sample concrete at point of placement and other locations as directed by Architect/Engineer and perform required tests.
   d. Review manufacturer's report for shipment of cement, reinforcement, and prestressing tendons, and conduct laboratory tests or spot checks of materials received for compliance with specifications.
   e. Other testing or inspection services as required by Architect/Engineer.
2. Provide Owner's testing agency with requested documentation and access to perform testing and inspection activities.

1.8 AMBIENT CONDITIONS

A. Section 015000 - Temporary Facilities and Controls: Requirements for ambient condition control facilities for product storage and installation.

B. Cold-Weather Placement: Comply with ACI 301, ACI 306.1, and as follows:
1. Protect concrete Work from physical damage or reduced strength caused by frost, freezing actions, or low temperatures.
2. When average high and low temperature is expected to fall below 40 deg. F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
3. Do not use frozen materials or materials containing ice or snow.
4. Do not place concrete in contact with surfaces less than 35 deg. F, other than reinforcing steel.
5. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

C. Hot-Weather Placement: Comply with ACI 301 and ACI 305.1, and as follows:
1. Maintain concrete temperature at time of discharge not to exceed 95 deg. F.
2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

A. ACI Publications: Comply with ACI 301 unless modified by requirements in the Contract Documents.

2.2 CONCRETE MATERIALS

A. Concrete Source Limitations:
   1. Obtain all concrete mixtures from a single ready-mixed concrete manufacturer for entire Project.
   2. Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant.
   3. Obtain aggregate from single source.
   4. Obtain each type of admixture from single source from single manufacturer.

B. Concrete Components:
   1. Cement:
      a. Comply with ASTM C150/C150M, Type I/II
      b. Type: Portland.
   2. Blended Cement:
      a. Comply with ASTM C595/C595M.
      b. Type: GU.
      c. Color: Gray
   3. Normal Weight Aggregates:
      a. Comply with ASTM C33/C33M Class 3S coarse aggregate or better, graded. Provide aggregates from a single source.
         1) Alkali-Silica Reaction: Comply with one of the following:
            a) Expansion Result of Aggregate: Not more than 0.04 percent at one year when tested in accordance with ASTM C1293.
            b) Expansion Results of Aggregate and Cementitious Materials in Combination: Not more than 0.10 percent at an age of 16 days when tested in accordance with ASTM C1567.
            c) Alkali Content in Concrete: Not more than 4 lb./cu. yd. for moderately reactive aggregate or 3 lb./cu. yd. for highly reactive aggregate, when tested in accordance with ASTM C1293 and categorized in accordance with ASTM C1778, based on alkali content being calculated in accordance with ACI 301.
      b. Coarse Aggregate Maximum Size: 1 inch nominal.
      c. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
   4. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

a. Air-Entraining Admixture: ASTM C260/C260M.
b. Water-Reducing Admixture: ASTM C494/C494M, Type A.
c. Retarding Admixture: ASTM C494/C494M, Type B.
d. Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type D.
e. High-Range, Water-Reducing Admixture: ASTM C494/C494M, Type F.
f. High-Range, Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type G.
g. Plasticizing and Retarding Admixture:
   1) Comply with ASTM C1017/C1017M.
   2) Type I, plasticizing

5. Water and Water Used to Make Ice: ASTM C94/C94M, potable.

2.3 VAPOR RETARDERS

A. Sheet Vapor Retarder, Class A: ASTM E1745, Class A, not less than 10 mils thick. Include manufacturer's recommended adhesive or pressure-sensitive tape.
   1. Manufacturers:
      a. Carlisle Coatings & Waterproofing Inc.
      b. Fortifiber Building Systems Group.
      c. GCP Applied Technologies Inc.
      d. ISI Building Products.
      e. Raven Industries, Inc.
      f. Reef Industries, Inc.
      g. Stego Industries, LLC.
      h. W.R. Meadows, Inc.

2.4 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
   1. Manufacturers:
      a. Bon Tool Co.
      b. Brickform; a division of Solomon Colors.
      c. Dayton Superior.
      d. Euclid Chemical Company (The); an RPM company.
      e. Kaufman Products, Inc.
      f. Lambert Corporation.
      g. Laticrete International, Inc.
      h. Master Builders Solutions.
      i. Nox Crete products group.
      j. Sika Corporation.
      k. SpecChem, LLC.
      l. TK Products.
      m. Vexcon Chemicals Inc.
      n. W.R. Meadows, Inc.

B. Concrete Curing Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.

C. Concrete Curing Reusable Moisture-Retaining Covers, ASTM C171:
   1. Burlap-polyethylene sheet.
      a. 10 oz. burlap laminated onto 5 mil white coated polyethylene.
      b. Reusable, natural burlap provides moisture absorption.
      c. Coated white poly reflects sunlight and intense heat rays.
      d. Quality lamination between the two fabrics.
      e. Size: 10-by-100-foot roll.
   2. Provide wet cure blankets comprised of a non-woven polypropylene fabric coated with a white-pigmented polyethylene, complying with ASTM C171; total thickness varies per manufacturer. Acceptable products are as follows
      a. HydraCure reusable, reflective wet cure blankets as manufactured by PNA Construction Technologies, thickness 40 mils.
      b. Transguard? 4000 as manufactured by Reef Industries, Inc., thickness 42 mils.
      c. Conkure 80 as manufactured by Raven Industries, thickness 17 mils.

2.5 RELATED MATERIALS

A. Joint Devices and Filler:
   1. Joint Filler,
      a. Description: Asphalt-impregnated fiberboard or felt.
      b. Comply with ASTM D1751.
      c. Thickness: 1/2 inch.
      d. Profile: rentangular.
   2. Sealant:
      a. Description: Two-component, semi rigid, 100 percent solids**,** epoxy resin with a Type A shore durometer hardness of 80 per ASTM D 2240.

B. Nonshrink Grout:
   1. Manufacturers:
      a. CGM, Incorporated.
      b. Euclid Chemical Company (The); an RPM company.
      c. Laticrete International, Inc.
      d. QUIKRETE.
      e. Sika Corporation.
   2. Description: Premixed compound consisting of non-metallic aggregate, cement, and water-reducing and plasticizing agents.
   3. Comply with ASTM C1107/C1107M.
   4. Minimum Compressive Strength: 2,400 psi in 48 hours and 7,000 psi in 28 days.

C. Bonding Agent:
   1. Manufacturers:
      a. Euclid Chemical Company (The); an RPM company.
      b. Metalcrete Industries.
      c. QUIKRETE.
      d. Sika Corporation.
      e. W.R. Meadows, Inc.
   2. Description: Latex emulsion complying with ASTM C1059

2.6 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, in accordance with ACI 301.
   1. Use a qualified testing agency for preparing and reporting proposed mixture designs, based on laboratory trial mixtures.

B. Admixtures: Use in accordance with manufacturer's written instructions.
   1. Use water-reducing, high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
   2. Use water-reducing and -retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.

2.7 CONCRETE MIXTURES

A. Select proportions for normal weight concrete according to ACI 301, Method **1**.

B. Provide Concrete with the following properties:

Portion of Structure	28-day Minimum Strength (psi)	Slump (± 1")	Maximum Water/Cement Ratio	Maximum Coarse Aggregate Size (ASTM C33)	Air Content (± 1-½%)
Interior housekeep-ing pads	4000	4"	0.50	#57	2%
Pavements, side-walks and curbs	5000	4"	0.40	#57	6%

C. Average Compressive Strength Reduction: Not permitted.

D. Ready-Mixed Concrete: Mix and deliver concrete according to ASTM C94

E. Site-Mixed Concrete: Mix concrete according to ACI 318.

2.8 CONCRETE MIXING

A. Ready-Mix Concrete: Comply with requirements of ASTM C94, and ASTM C1116 and as herein specified. Delete references for allowing additional water to be added to batch for material with insufficient slump. Addition of water to the batch will not be permitted.
   1. During hot weather, or under conditions contributing to rapid setting of concrete, a shorter mixing time than specified in ASTM C94/C94M may be required. When air temperature is between 85 deg. F and 90 deg. F, reduce mixing and delivery time from 90 minutes to 75 minutes, and when air temperature is above 90 deg. F, reduce mixing and delivery time to 60 minutes.
   2. During cold weather, concrete shall not be mixed while the temperature is below 40 degrees without the permission of the Construction Manager. If permission is granted for mixing under such conditions, aggregates or water, or both, shall be

heated and the concrete shall be placed at a temperature between 50 deg. F and 80 deg. F.

3. Retempering of concrete by adding water or any other material is not permitted.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions:
   1. Before placing concrete, verify that installation of concrete forms, accessories, and reinforcement, and embedded items is complete and that required inspections have been performed.
   2. Do not proceed until unsatisfactory conditions have been corrected.

B. Verify requirements for concrete cover over reinforcement.

C. Verify that anchors, seats, plates, reinforcement, and other items to be cast into concrete are accurately placed, positioned securely, and will not interfere with placing concrete.

3.2 PREPARATION

A. Previously Placed Concrete:
   1. Prepare previously placed concrete by cleaning with steel brush and applying bonding agent.
   2. Remove laitance, coatings, and unsound materials.

B. In locations where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels, and pack solid with nonshrink grout.

C. Remove debris and ice from formwork, reinforcement, and concrete substrates.

D. Remove water from areas receiving concrete before concrete is placed.

E. Provide reasonable auxiliary services to accommodate field testing and inspections, acceptable to testing agency, including the following:
   1. Daily access to the Work.
   2. Incidental labor and facilities necessary to facilitate tests and inspections.
   3. Secure space for storage, initial curing, and field curing of test samples, including source of water and continuous electrical power at Project Site during Site curing period for test samples.
   4. Security and protection for test samples and for testing and inspection equipment at Project Site.

3.3 INSTALLATION OF VAPOR RETARDER

A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder in accordance with ASTM E1643 and manufacturer's written instructions.
   1. Install vapor retarder with longest dimension parallel with direction of concrete pour.

2. Face laps away from exposed direction of concrete pour.
3. Lap vapor retarder over footings and grade beams not less than 6 inches, sealing vapor retarder to concrete.
4. Lap joints 6 inches and seal with manufacturer's recommended tape.
5. Terminate vapor retarder at the top of floor slabs, grade beams, and pile caps, sealing entire perimeter to floor slabs, grade beams, foundation walls, or pile caps.
6. Seal penetrations in accordance with vapor retarder manufacturer's instructions.
7. Protect vapor retarder during placement of reinforcement and concrete.
    a. Repair damaged areas by patching with vapor retarder material, overlapping damages area by 6 inches on all sides, and sealing to vapor retarder.

3.4 INSTALLATION

A. Placing Concrete:
1. Place concrete according to ACI 301
2. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:
    a. Class A, 1/8 inch for smooth-formed finished surfaces.
    b. Class C, 1/2 inch for rough-formed finished surfaces.
3.
4. Notify testing laboratory and Architect/Engineer, minimum 24 hours prior to commencement of operations.
5. Ensure that reinforcement, inserts, embedded parts, formed expansion and contraction joints are not disturbed during concrete placement.
6. Joint Filler:
    a. Separate slabs on grade from vertical surfaces joint filler.
    b. Place joint filler in floor slab pattern placement sequence; set top to required elevations; secure to resist movement by wet concrete.
    c. Extend joint filler from bottom of slab to within 1/4 inch of finished slab surface.
7. Joint Devices:
    a. Coordination: Install construction joint devices in coordination with floor slab pattern placement sequence; set top to required elevations; secure to resist movement by wet concrete.
    b. Install joint device anchors, maintaining correct position to allow joint cover to be flush with floor and wall finish.
    c. Install joint covers in one-piece length when adjacent construction activity is complete.
    d. Apply sealants in joint devices as specified in Section 079000 - Joint Protection.
8. Deposit concrete at final position, preventing segregation of mix.
9. Place concrete in continuous operation for each panel or section as determined by predetermined joints.
10. Consolidate concrete.
11. Maintain records of concrete placement, including date, location, quantity, air temperature, and test samples taken.

12. Place concrete continuously between predetermined expansion, control, and construction joints.
13. Do not interrupt successive placement and do not permit cold joints to occur.
14. Saw-Cut Joints:
    a. Saw-cut joints within 12 hours after placing.
    b. Use 3/16 inch thick blade.
    c. Cut into ¼ depth of slab thickness.

B. Separate Floor Toppings:
1. Prior to placing floor topping, remove deleterious material, roughen substrate concrete surface, and broom and vacuum clean.
2. Place required reinforcement and other items to be cast in concrete.
3. Apply bonding agent to substrate.

C. Concrete Finishing:
1. Provide formed concrete surfaces to be left exposed walls, columns, beams, joists with smooth-rubbed finish.
2. Finish concrete floor surfaces as specified in Section 033500 - Concrete Finishing

D. Curing and Protection:
1. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
2. Protect concrete footings from freezing for minimum of 7 days.
3. Maintain concrete with minimal moisture loss at relatively constant temperature for period as necessary for hydration of cement and hardening of concrete.
4. Cure concrete floor surfaces as specified in Section 033900 - Concrete Curing

3.5 FIELD QUALITY CONTROL

A. Section 014000 - Quality Requirements: Requirements for inspecting and testing.

B. Perform **[inspection and**] testing according to Building Code of New York State.

C. Provide unrestricted access to Work and cooperate with appointed testing and inspection firm.

D. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of Work.

E. Concrete Inspections:
1. Continuous Placement Inspection: Inspect for proper installation procedures.
2. Periodic Curing Inspection: Inspect for specified curing temperature and procedures.

F. Strength Test Samples:
1. Sampling Procedures: Comply with ASTM C172.
2. Cylinder Molding and Curing Procedures:
    a. Comply with ASTM C31.

b. Cylinder Specimens: Field cured.

3. Sample concrete and make one set of four cylinders for every 50 cu. yd. or less of each class of concrete placed each day, and for every 5,000 sq. ft. of surface area for slabs and walls.
4. If volume of concrete for a class of concrete would provide less than five sets of cylinders, take samples from five randomly selected batches, or from every batch if less than five batches are used.
5. Make one additional cylinder during cold weather concreting and field cure.

G. Field Testing:
1. Slump Test Method: Comply with ASTM C143.
2. Air Content Test Method: Comply with ASTM C173.
3. Temperature Test Method: Comply with ASTM C1064.
4. Compressive Strength Concrete:
   a. Measure slump and temperature for each sample.
   b. Measure air content in air-entrained concrete for each sample.

H. Cylinder Compressive Strength Testing:
1. Test Method: Comply with ASTM C39/C39M.
2. Test Acceptance: According to ACI 318.
3. Test one cylinder at seven days.
4. Test two cylinders at 28 days.
5. Retain one cylinder for for testing when requested by Architect/Engineer.
6. Dispose of remaining cylinders if testing is not required.

I. Core Compressive Strength Testing:
1. Sampling and Testing Procedures: Comply with ASTM C42/C42M.
2. Test Acceptance: According to ACI 318
3. Drill three cores for each failed strength test from failed concrete.

J. Measure floor and slab flatness and levelness in accordance with ASTM E1155 within 48 hours of completion of floor finishing and promptly report test results to Architect.

K. Patching:
1. Allow Architect/Engineer to inspect concrete surfaces immediately upon removal of forms.
2. Honeycombing or Embedded Debris in Concrete:
   a. Not acceptable.
   b. Notify Architect/Engineer upon discovery.
3. Patch imperfections as directed by Architect/Engineer.

L. Defective Concrete:
1. Description: Concrete not conforming to required lines, details, dimensions, tolerances, or specified requirements.
2. Repair or replacement of defective concrete will be determined by Architect/Engineer.
3. Do not patch, fill, touch up, repair, or replace exposed concrete except upon express direction of Architect/Engineer for each individual area.

END OF SECTION

SECTION 033500 - CONCRETE FINISHING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Finishing concrete floors.
2. Floor surface treatment.

B. Related Requirements:
1. Section 033000 - Cast-in-Place Concrete: Prepared concrete floors ready to receive finish; control and formed expansion and contraction joints and joint devices.
2. Section 033900 - Concrete Curing: Procedures for curing horizontal and vertical concrete surfaces.

1.2 REFERENCE STANDARDS

A. American Concrete Institute:
1. ACI 301 - Specifications for Structural Concrete for Buildings.
2. ACI 302.1 - Guide to Concrete Floor and Slab Construction.

B. ASTM International:
1. ASTM E1155 - Standard Test Method for Determining FF Floor Flatness and FL Floor Levelness Numbers.
2. ASTM C1371 - Standard Test Method for Determination of Emittance of Materials Near Room Temperature Using Portable Emissometers.
3. ASTM C1549 - Standard Test Method for Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer.
4. ASTM E408 - Standard Test Methods for Total Normal Emittance of Surfaces Using Inspection-Meter Techniques.
5. ASTM E903 - Standard Test Method for Solar Absorptance, Reflectance, and Transmittance of Materials Using Integrating Spheres.
6. ASTM E1918 - Standard Test Method for Measuring Solar Reflectance of Horizontal and Low-Sloped Surfaces in the Field.
7. ASTM E1980 - Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces.

1.3 COORDINATION

A. Section 013000 - Administrative Requirements: Requirements for coordination.

B. Coordinate Work of this Section with concrete floor placement and concrete floor curing.

1.4 SUBMITTALS

A. Section 013300 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit manufacturer information on compatibilities, and limitations.

C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Section 016000 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.

C. Store materials according to manufacturer instructions.

D. Protection:
   1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
   2. Provide additional protection according to manufacturer instructions.

1.6 AMBIENT CONDITIONS

A. Section 015000 - Temporary Facilities and Controls: Requirements for ambient condition control facilities for product storage and installation.

B. Temporary Lighting:
   1. Light Source: Minimum 200 W.
   2. Quantity: One for each 425 sq. ft. of floor being finished.
   3. Placement: 8 feet above floor surface.

C. Heat: Maintain minimum ambient temperature of 50 deg. F.

D. Ventilation: Sufficient to prevent injurious gases from temporary heat or other sources from affecting personnel or concrete.

PART 2 - PRODUCTS

2.1 COMPOUNDS - SEALERS

A. Sealer: Interior (Non-Polished Floors)
   1. Penetrating Liquid Floor Treatment: Clear, chemically reactive, waterborne solution of inorganic silicate or siliconate materials and proprietary components; odorless; colorless; that penetrates, hardens, and densifies concrete surfaces.
      a. Products: Subject to compliance with requirements, provide one of the following:
         1) ChemMasters; Chemisil Plus.
         2) ChemTec Int'l; ChemTec One.
         3) Conspec by Dayton Superior; Intraseal.
         4) Curecrete Distribution Inc.; Ashford Formula.
         5) Dayton Superior Corporation; Day-Chem Sure Hard (J-17).

6) Edoco by Dayton Superior; Titan Hard.
7) Euclid Chemical Company (The); Euco Diamond Hard.
8) Kaufman Products, Inc.; SureHard.
9) L&M Construction Chemicals, Inc.; Seal Hard.
10) Meadows, W. R., Inc.; LIQUI-HARD.
11) Metalcrete Industries; Floorsaver.
12) Nox-Crete Products Group; Duro-Nox.
13) Symons by Dayton Superior; Buff Hard.
14) US SPEC, Division of US Mix Products Company; US SPEC Industraseal.
15) Vexcon Chemicals, Inc.; Vexcon StarSeal PS Clear.

B. Sealer: Interior (Polished floors)
1. Penetrating Liquid Floor Treatments for Polished Concrete Finish: Clear, waterborne solution of inorganic silicate or siliconate materials and proprietary components; odorless; that penetrates, hardens, and is suitable for polished concrete surfaces.
a. Products: Subject to compliance with requirements, provide one of the following:
b. Advanced Floor Products; Retro-Plate 99.
c. L&M Construction Chemicals, Inc.; FGS Hardener Plus.
d. QuestMark, a division of CentiMark Corporation; DiamondQuest Densifying Impregnator Application.

C. Sealer: Exterior
1. Penetrating Sealer: High penetration silane sealer providing minimum 95 percent screening per NCHRP 244 standards for chloride ion penetration resistance. Apply 2 coats where indicated at the manufacturer's suggested rate according to its written instructions. Do not exceed 125 square feet per gallon coverage. Provide 10 year warranty.
a. Products: Subject to compliance with requirements, provide one of the following:
1) Euclid Chemical Company; Euco-Guard S-40.
2) L&M Construction Chemicals, Inc.; Aquapel Plus.
3) Sonneborn, Division of ChemRex.; Penetrating Sealer 40 VOC.
b.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 017000 - Execution and Closeout Requirements: Requirements for application examination.

B. Verify that floor surfaces are acceptable to receive Work of this Section.

3.2 APPLICATION

A. Concrete Floor Finishing:

1. Comply with ACI 301
2. Wood-float surfaces receiving quarry tile, ceramic tile, cementitious terrazzo , and floors with full-bed setting system.
3. Steel-trowel surfaces receiving carpeting, resilient flooring, seamless flooring, thin-set terrazzo, thin-set quarry tile, thin-set ceramic tile.
4. Steel-trowel surfaces which are to be exposed.
5. Floor Drains:
    a. In areas with floor drains, maintain design floor elevation at walls.
    b. Slope surfaces uniformly to drains as indicated on Drawings.

B. Floor Surface Treatment:
1. Apply sealer on floor surfaces as listed above.

3.3 TOLERANCES

A. Section 014000 - Quality Requirements: Requirements for tolerances.

B. Maximum Variation of Surface Flatness for Exposed Concrete Floors: 1/4 inch in 10 feet.

C. Maximum Variation of Surface Flatness under Seamless Resilient Flooring: 1/4 inch in 10 feet.

3.4 FIELD QUALITY CONTROL

A. Section 014000 - Quality Requirements: Requirements for inspecting and testing.

END OF SECTION

SECTION 033900 - CONCRETE CURING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Initial and final curing of horizontal and vertical concrete surfaces.

B. Related Requirements:
1. Section 033000 - Cast-in-Place Concrete: Cast-in-place or in-situ concrete for structural building frames, slabs on fill or grade, and other concrete components associated with construction.
2. Section 033500 - Concrete Finishing: Surface finishing of concrete floor slabs and toppings.

1.2 REFERENCE STANDARDS

A. American Concrete Institute:
1. ACI 301 - Specifications for Structural Concrete.
2. ACI 302.1 - Guide to Concrete Floor and Slab Construction.
3. ACI 308.1 - Specification for Curing Concrete.
4. ACI 318 - Building Code Requirements for Structural Concrete and Commentary.

B. ASTM International:
1. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete.
2. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
3. ASTM C1315 - Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete.
4. ASTM D2103 - Standard Specification for Polyethylene Film and Sheeting.

1.3 SUBMITTALS

A. Section 013300 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit manufacturer's information on curing compounds, mats, paper, and film, including compatibilities and limitations.

1.4 QUALITY ASSURANCE

A. Perform Work according to ACI 301.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Section 016000 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.

C. Store materials according to manufacturer instructions.

D. Protection:
1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
2. Provide additional protection according to manufacturer instructions.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Moisture-Retaining Cover: Natural cellulose fiber encapsulated fabric sheeting capable of 7 or 14 day wet curing while maintaining 100 percent relative humidity.
1. Description:
a. Bonded to prevent separation during handling and placement.
b. Comply with ASTM C171
c. Product:
1) Sika Corporation; [Ultracure NCF]
2) ConKure – Concure 80
3) Greenstreak – UltraCure NCF Poly Backing
4) Or approved equivalent

B. Concrete Curing Reusable Moisture-Retaining Covers, ASTM C171, capable of 7 day wet curing while maintaining 100 percent relative humidity:
1. Burlap-polyethylene sheet.
a. 10 oz. burlap laminated onto 5 mil white coated polyethylene.
b. Reusable, natural burlap provides moisture absorption.
c. Coated white poly reflects sunlight and intense heat rays.
d. Quality lamination between the two fabrics.
e. Size: 10-by-100-foot roll.
2. Provide wet cure blankets comprised of a non-woven polypropylene fabric coated with a white-pigmented polyethylene, complying with ASTM C171; total thickness varies per manufacturer. Acceptable products are as follows:
a. Sika Corporation; Ultracure NCF
b. Greenstreak – UltraCure NCF Poly Backing
c. HydraCure reusable, reflective wet cure blankets as manufactured by PNA Construction Technologies, thickness 40 mils.
d. Transguard 4000 as manufactured by Reef Industries, Inc., thickness 42 mils.
e. Conkure 80 as manufactured by Raven Industries, thickness 17 mils.

C. Water: Potable; not detrimental to concrete.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 017000 - Execution and Closeout Requirements: Requirements for application examination.

B. Verify that substrate surfaces are ready to be cured.

3.2 APPLICATION

A. Horizontal Surfaces:
   1. Moisture- Retaining cover
      a. Saturate area to where curing blanket is to be placed.
      b. Spread blanket over floor slab with fabric side down .
      c. Spray with water until mats are saturated and maintain in saturated condition for seven days.

3.3 PROTECTION

A. Section 017000 - Execution and Closeout Requirements: Requirements for protecting finished Work.

B. Do not permit traffic over unprotected floor surfaces.

END OF SECTION

SUNY ERIE COMMUNITY COLLEEGE NORTH CAMPUS
KITTINGER HALL BOILER OOM UPGRADES
DIVISION 04
MASONRY SPECIFICATIONS
PAGE 1

SECTION	DESCRIPTION
040120.63	BRICK MASONRY REPAIR
040513	MASONRY MORTARING
040516	MASONRY GROUTING
042000	UNIT MASONRY

SECTION 040120.63 - BRICK MASONRY REPAIR

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. Repairing brick masonry.
   2. Removing abandoned anchors.
   3. Painting steel uncovered during the work.

1.3 DEFINITIONS

A. Low-Pressure Spray: 100 to 400 psi; 4 to 6 gpm.

B. Rebuilding (Setting) Mortar: Mortar used to set and anchor masonry in a structure, distinct from pointing mortar installed after masonry is set in place.

C. Saturation Coefficient: Ratio of the weight of water absorbed during immersion in cold water to weight absorbed during immersion in boiling water; used as an indication of resistance of bricks to freezing and thawing.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.
   1. Review methods and procedures related to brick masonry repair including, but not limited to, the following:
      a. Verify brick masonry repair specialist's personnel, equipment, and facilities needed to make progress and avoid delays.
      b. Materials, material application, sequencing, tolerances, and required clearances.
      c. Quality-control program.
      d. Coordination with building occupants.

1.5 SEQUENCING AND SCHEDULING

A. Order sand and gray Portland cement for colored mortar immediately after approval of Samples. Take delivery of and store at Project site enough quantity to complete Project.

B. Work Sequence: Perform brick masonry repair work in the following sequence, which includes work specified in this and other Sections:
   1. Remove plant growth.
   2. Inspect masonry for open mortar joints and point them before cleaning to prevent the intrusion of water and other cleaning materials into the wall.

3. Remove paint.
4. Clean masonry.
5. Rake out mortar from joints surrounding masonry to be replaced and from joints adjacent to masonry repairs along joints.
6. Repair masonry, including replacing existing masonry with new masonry materials.
7. Rake out mortar from joints to be repointed.
8. Point mortar and sealant joints.
9. After repairs and re-pointing have been completed and cured, perform a final cleaning to remove residues from this work.
10. Where water repellents are to be used on or near masonry work, delay application of these chemicals until after pointing and cleaning.

1.6 SUBMITTALS

A. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.

B. Manufacturers' 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.
2. Include recommendations for product application and use.
3. Include test data substantiating that products comply with requirements.

E. Shop Drawings:
1. Include plans, elevations, sections, and locations of replacement bricks on the structure, showing relation of existing and new or relocated units.
2. Show provisions for expansion joints or other sealant joints.
3. Show provisions for flashing, lighting fixtures, conduits, and weep holes as required.

F. Samples for Initial Selection: For the following:
1. Colored Mortar: Submit sets of mortar that will be left exposed in the form of sample mortar strips, 6 inches long by 1/4 inch wide, set in aluminum or plastic channels.
    a. Have each set contain a close color range of at least three Samples of different mixes of colored sands and cements that produce a mortar matching existing, cleaned mortar when cured and dry.
    b. Submit with precise measurements on ingredients, proportions, gradations, and source of colored sands from which each Sample was made.
2. Sand Types Used for Mortar: Minimum 8 oz. of each in plastic screw-top jars.
3. Patching Compound: Submit sets of patching compound Samples in the form of plugs (patches in drilled holes) in sample units of masonry of the range of masonry colors on the building.
    a. Have each set contain a close color range of at least three Samples of different mixes of patching compound that matches the variations in existing masonry when cured and dry.

4. Include similar Samples of accessories involving color selection.

G. Samples for Verification: For the following:
1. Each type of brick unit to be used for replacing existing units. Include sets of Samples to show the full range of shape, color, and texture to be expected. For each brick type, provide straps or panels containing at least four bricks. Include multiple straps for brick with a wide range.
2. Each type of patching compound in the form of briquettes, at least 3 inches long by 1-1/2 inches wide. Document each Sample with manufacturer and stock number or other information necessary to order additional material.
3. Accessories: Each type of accessory and miscellaneous support.

H. Qualification Data: For brick masonry repair specialist including field supervisors and workers.

I. Preconstruction Test Reports: For replacement bricks.

J. Quality-control program.

1.7 QUALITY ASSURANCE

A. Brick Masonry Repair Specialist Qualifications: Engage an experienced brick masonry repair firm to perform work of this Section. Firm shall have completed work similar in material design, and to the extent indicated for this Project with a record of successful in-service performance. Experience in only installing masonry is insufficient experience for masonry repair work.
1. Field Supervision: Brick masonry repair specialist firm shall maintain experienced full-time supervisors on Project site during times that brick masonry repair work is in progress.
2. Brick Masonry Repair Worker Qualifications: When bricks are being patched, assign at least one worker per crew who is trained and certified by manufacturer of patching compound to apply its products.

B. Quality-Control Program: Prepare a written quality-control program for this Project to systematically demonstrate the ability of personnel to properly follow methods and use materials and tools without damaging masonry. Include provisions for supervising performance and preventing damage.

C. Mockups: Prepare mockups of brick masonry repair to demonstrate aesthetic effects and to set quality standards for materials and execution and for fabrication and installation.
1. Masonry Repair: Prepare sample areas for each type of masonry repair work performed. If not otherwise indicated, size each mockup is not smaller than two adjacent whole units or approximately 24 inches in least dimension. Construct sample areas in locations in existing walls where directed by the Owner unless otherwise indicated. Demonstrate quality of materials, workmanship, and blending with existing work. Include the following as a minimum:
a. Replacement: Four brick units replaced.
b. Patching: Three small holes as directed for each type of brick indicated to be patched.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless the Owner specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver bricks to Project site strapped together in suitable packs or pallets or in heavy-duty cartons and protected against impact and chipping.

B. Deliver packaged materials to Project site in manufacturer's original and unopened containers, labeled with manufacturer's name and type of products.

C. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

D. Store sand where grading and other required characteristics can be maintained and contamination avoided.

E. Handle bricks to prevent overstressing, chipping, defacement, and other damage.

1.9 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit brick masonry repair work to be performed according to product manufacturers' written instructions and specified requirements.

B. Temperature Limits: Repair brick masonry only when air temperature is between 40 and 90 deg F and is predicted to remain so for at least seven days after completion of the Work unless otherwise indicated.

C. Cold-Weather Requirements: Comply with the following procedures for masonry repair unless otherwise indicated:
   1. When air temperature is below 40 deg F, heat mortar ingredients, masonry repair materials, and existing masonry walls to produce temperatures between 40 and 120 deg F.
   2. When mean daily air temperature is below 40 deg F, provide enclosure and heat to maintain temperatures above 32 deg F within the enclosure for seven days after repair.

D. Hot-Weather Requirements: Protect masonry repairs when temperature and humidity conditions produce excessive evaporation of water from mortar and repair materials. Provide artificial shade and wind breaks and use cooled materials as required to minimize evaporation. Do not apply mortar to substrates with temperatures of 90 deg F and above unless otherwise indicated.

E. For manufactured repair materials, perform work within the environmental limits set by each manufacturer.

PART 2 – PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Source Limitations: Obtain each type of material for repairing brick masonry (brick, cement, sand, etc.) from single source with resources to provide materials of consistent quality in appearance and physical properties.

2.2 MASONRY MATERIALS

1. Brick Matching Sample: Units with colors, color variation within units, surface texture, and physical properties that match Owner's 's sample. Match existing units in size and shape.
   a. Physical Properties: According to ASTM C67 and as follows:
      1) Compressive Strength: 3000 psi (20.7 MPa) minimum average of 5; 2500 psi (17.2 MPa) minimum individual.
      2) 24-Hour Cold-Water Submersion Absorption: ≤ 8.0%.
      3) Five-Hour Boil Absorption: 20.0% maximum individual.
      4) Saturation Coefficient: 0.78 maximum average of 5; 0.80 maximum individual
      5) Initial Rate of Absorption: ≤ 30 g/min·30 in²
   b. For Owner's 's sample that exhibits a range of colors or color variation within units, provide brick that proportionally matches that range rather than brick that matches an individual color within that range.
2. Special Shapes:
   a. Provide molded, 100 percent solid shapes for applications where core holes or "frogs" could be exposed to view or weather when in final position and where shapes produced by sawing would result in sawed surfaces being exposed to view.
   b. Provide specially ground units, shaped to match patterns, for arches and where indicated.
   c. Mechanical chopping or breaking brick, or bonding pieces of brick together by adhesive, are unacceptable procedures for fabricating special shapes.
3. Tolerances as Fabricated: According to tolerance requirements in ASTM C216, Type FBX**.**

2.3 MORTAR MATERIALS

A. Portland Cement: ASTM C150, Type I or Type II, except Type III may be used for cold-weather construction; white or gray, or both where required for color matching of mortar.
   1. Provide cement containing not more than 0.60 percent total alkali when tested according to ASTM C114.

B. Hydrated Lime: ASTM C207, Type S.

C. Mortar Cement: ASTM C1329.
   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. Cemex, Inc.
      b. Holcim US.
      c. Approved Equivalent.

D. Mortar Sand: ASTM C144.
   1. Exposed Mortar: Match size, texture, and gradation of existing mortar sand as closely as possible. Blend several sands if necessary to achieve suitable match.
   2. Colored Mortar: Natural sand or ground marble, granite, or other sound stone of color necessary to produce required mortar color.

E. Mortar Pigments: ASTM C979, compounded for use in mortar mixes, and having a record of satisfactory performance in masonry mortars.
   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. Davis Colors.
      b. LANXESS Corporation.
      c. Solomon Colors, Inc.
      d. Approved Equivalent.

F. Water: Potable.

2.4 MANUFACTURED REPAIR MATERIALS

A. Brick Patching Compound: Factory-mixed cementitious product that is custom manufactured for patching brick masonry.
   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. Cathedral Stone Products, Inc.
      b. Conproco Corporation.
      c. Edison Coatings, Inc.
      d. Approved Equivalent.
   2. Use formulation that is vapor and water permeable (equal to or more than the brick), exhibits low shrinkage, has lower modulus of elasticity than bricks being repaired, and develops high bond strength to all types of masonry.
   3. Use formulation having working qualities and retardation control to permit forming and sculpturing where necessary.
   4. Formulate patching compound in colors and textures to match each brick being patched. Provide no fewer than three colors to enable matching of the color, texture, and variation of each unit.

2.5 ACCESSORY MATERIALS

A. Setting Buttons and Shims: Resilient plastic, nonstaining to masonry, sized to suit joint thicknesses and bed depths of bricks, less the required depth of pointing materials unless removed before pointing.

B. Masking Tape: Nonstaining, nonabsorbent material; compatible with mortar, joint primers, sealants, and surfaces adjacent to joints; and that easily comes off entirely, including adhesive.

C. Other Products: Select materials and methods of use based on the following, subject to approval of a mockup:
   1. Previous effectiveness in performing the work involved.
   2. Minimal possibility of damaging exposed surfaces.
   3. Consistency of each application.
   4. Uniformity of the resulting overall appearance.
   5. Do not use products or tools that could leave residue on surfaces.

2.6 MORTAR MIXES

A. Measurement and Mixing: Measure cementitious materials and sand in a dry condition by volume or equivalent weight. Do not measure by shovel; use known measure. Mix materials in a clean, mechanical batch mixer.

B. Colored Mortar: Produce mortar of color required by using specified ingredients. Do not alter specified proportions without Owner's 's approval.
   1. Mortar Pigments: Where mortar pigments are indicated, do not add pigment exceeding 10 percent by weight of the cementitious or binder materials, except for carbon black, which is limited to 2 percent, unless otherwise demonstrated by a satisfactory history of performance.

C. Do not use admixtures in mortar unless otherwise indicated.

D. Mixes: Mix mortar materials in the following proportions:
   1. **.**
   2. Rebuilding (Setting) Mortar by Type: ASTM C270, Proportion Specification, Type N unless otherwise indicated; with cementitious material limited to mortar cement.
   3. Pigmented, Colored Mortar: Add mortar pigments to produce exposed, setting (rebuilding) mortar of colors required.

PART 3 – EXECUTION

3.1 PROTECTION

A. Prevent mortar from staining face of surrounding masonry and other surfaces.
   1. Cover sills, ledges, and other projecting items to protect them from mortar droppings.
   2. Keep wall area wet below rebuilding and repair work to discourage mortar from adhering.
   3. Immediately remove mortar splatters in contact with exposed masonry and other surfaces.

B. Remove gutters and downspouts and associated hardware adjacent to masonry and store during masonry repair. Reinstall when repairs are complete.
   1. Provide temporary rain drainage during work to direct water away from building.

3.2 MASONRY REPAIR, GENERAL

A. Appearance Standard: Repaired surfaces are to have a uniform appearance as viewed from 15 feet away by Architect and Owner.

3.3 BRICK REMOVAL AND REPLACEMENT

A. At locations indicated, remove bricks that are damaged, spalled, or deteriorated. Carefully remove entire units from joint to joint, without damaging surrounding masonry, in a manner that permits replacement with full-size units.
   1. When removing single bricks, remove material from center of brick and work toward outside edges.

B. Support and protect remaining masonry that surrounds removal area.

C. Maintain flashing, reinforcement, lintels, and adjoining construction in an undamaged condition. Coordinate with new flashing, reinforcement, and lintels, which are specified in other Sections**.**

D. Notify the Owner of unforeseen detrimental conditions including voids, cracks, bulges, and loose units in existing masonry backup, rotted wood, rusted metal, and other deteriorated items.

E. Remove in an undamaged condition as many whole bricks as possible.
1. Remove mortar, loose particles, and soil from brick by cleaning with hand chisels, brushes, and water.
2. Remove sealants by cutting close to brick with utility knife and cleaning with solvents.
3. Store brick for reuse. Store off ground, on skids, and protected from weather.
4. Deliver cleaned brick not required for reuse to Owner unless otherwise indicated.

F. Clean masonry surrounding removal areas by removing mortar, dust, and loose particles in preparation for brick replacement.

G. Replace removed damaged brick with another removed brick in good condition, where possible, matching existing brick. Do not use broken units unless they can be cut to usable size.

H. Install replacement brick and support panel and coursing pattern of existing brick. If cutting is required, use a motor-driven saw designed to cut masonry with clean, sharp, unchipped edges.
1. Maintain joint width for replacement units to match existing joints.
2. Use setting buttons or shims to set units accurately spaced with uniform joints.
3. Install replacement brick panel system fastening to existing metal frame construction with 5/8 in. (16 mm) support ties. Tool exposed mortar joints in repaired areas to match joints of surrounding existing brickwork.
4. Rake out mortar used for laying brick before mortar sets according to Section 040120.64 "Brick Masonry Repointing." Point at same time as repointing of surrounding area.

I. Curing: Cure mortar by maintaining in thoroughly damp condition for at least 72 consecutive hours, including weekends and holidays.
1. Hairline cracking within the mortar or mortar separation at edge of a joint is unacceptable. Completely remove such mortar and repoint.

3.4

A. Notify Owner if steel is exposed during masonry removal. Where Owner determines that steel is structural, or for other reasons cannot be totally removed, prepare and paint it as follows:
1. Surface Preparation: Remove paint, rust, and other contaminants according to SSPC-SP 2, "Hand Tool Cleaning", as applicable to comply with paint manufacturer's recommended preparation.
2. Antirust Coating: Immediately paint exposed steel with two coats of antirust coating, following coating manufacturer's written instructions and without exceeding manufacturer's recommended rate of application (dry film thickness per coat).

B. If on inspection and rust removal, the thickness of a steel member is found to be reduced from rust by more than 1/16 inch, notify Owner before proceeding.

3.5 BRICK MASONRY PATCHING

A. Patch the following bricks unless another type of repair or replacement is indicated:
   1. Bricks with holes.
      a. Bricks with chipped edges or corners. Patch chipped edges or corners measuring more than 3/4 inch in least dimension.
      b. Bricks with small areas of deep deterioration. Patch deep deteriorations measuring more than 3/4 inch in least dimension and more than 1/4 inch deep.

B. Remove and replace existing patches.

3.6 FINAL CLEANING

A. After mortar has fully hardened, thoroughly clean exposed masonry surfaces of excess mortar and foreign matter; use wood scrapers, stiff-nylon or -fiber brushes, and clean water applied by low-pressure spray.
   1. Do not use metal scrapers or brushes.
   2. Do not use acidic or alkaline cleaners.

B. Clean adjacent non-masonry surfaces. Use detergent and soft brushes or cloths.

C. Remove masking materials, leaving no residues that could trap dirt.

3.7 FIELD QUALITY CONTROL

A. Owner’s Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections. Allow inspectors to use lift devices and scaffolding, as needed, to perform inspections.

B. Notify Owner in advance of times when lift devices and scaffolding will be relocated. Do not relocate lift devices and scaffolding until Owner has had reasonable opportunity to make inspections and observations of work areas at lift device or scaffold location.

3.8 MASONRY WASTE DISPOSAL

A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Owner's property.

B. Masonry Waste: Remove masonry waste and legally dispose of off Owner’s 's property.

END OF SECTION 040120.63

SECTION 040513 - MASONRY MORTARING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Mortar for masonry.

B. Related Requirements:

1. Section 040100 - Maintenance of Masonry: Bedding and pointing mortar for masonry restoration Work.
2. Section 042000 - Unit Masonry: Installation of mortar.
3. Section 042300 - Glass Unit Masonry: Glass-block unit masonry of plain and decorative designs.
4. Section 042500 - Unit Masonry Panels: Installation of mortar.
5. Section 042600 - Single-Wythe Unit Masonry: Installation of mortar.
6. Section 042613 - Veneer Unit Masonry: Installation of mortar.
7. Section 042723 - Cavity Wall Unit Masonry: Installation of mortar.
8. Section 044213 - Masonry-Supported Stone Cladding: Installation of mortar.
9. Section 044216 - Steel-Stud-Supported Stone Cladding: Installation of mortar.
10. Section 071900 - Water Repellents: Water-repellent admixtures.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Section 012000 - Price and Payment Procedures: Contract Sum/Price modification procedures.

B. Mortar Materials:

1. Basis of Measurement: By cubic yd.
2. Basis of Payment: Includes mortar materials and preparation ready for placement.

C. Mortar in Place - Brick, Concrete Masonry Unit:

1. Basis of Measurement: By square foot.
2. Basis of Payment: Includes tooled mortar placement.

1.3 REFERENCE STANDARDS

A. American Concrete Institute:

1. ACI 530/530.1 - Building Code Requirements and Specification for Masonry Structures.

B. ASTM International:

1. ASTM C5 - Standard Specification for Quicklime for Structural Purposes.
2. ASTM C91 - Standard Specification for Masonry Cement.
3. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar.
4. ASTM C150 - Standard Specification for Portland Cement.
5. ASTM C199 - Standard Test Method for Pier Test for Refractory Mortars.
6. ASTM C206 - Standard Specification for Finishing Hydrated Lime.
7. ASTM C270 - Standard Specification for Mortar for Unit Masonry.
8. ASTM C387 - Standard Specification for Packaged, Dry, Combined Materials for Concrete and High Strength Mortar.
9. ASTM C595 - Standard Specification for Blended Hydraulic Cements.
10. ASTM C780 - Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry.
11. ASTM C1142 - Standard Specification for Extended Life Mortar for Unit Masonry.
12. ASTM C1314 - Standard Test Method for Compressive Strength of Masonry Prisms.
13. ASTM C1329 - Standard Specification for Mortar Cement.
14. ASTM C1357 - Standard Test Methods for Evaluating Masonry Bond Strength.

1.4 SUBMITTALS

A. Section 013300 - Submittal Procedures: Requirements for submittals.

B. Samples: Submit two samples of mortar, illustrating mortar color and color range.

C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

D. Design Data: Submit required environmental conditions, admixture limitations, and design mix if property specification of ASTM C270 is to be used.

E. Test and Evaluation Reports:

1. Indicate compliance of mortar to property requirements of ASTM C270, mortar to requirements of ASTM C1142, component mortar materials to requirements of ASTM C270 and test and evaluation reports to ASTM C780 for aggregate ratio and water content, air content, consistency, and compressive strength.

F. Manufacturer Instructions: Submit premixed mortar installation instructions.

G. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.

H. Qualifications Statement:

1. Submit qualifications for manufacturer.

1.5 SUSTAINABLE DESIGN SUBMITTALS

A. Section 018113 - Sustainable Design Requirements: Requirements for sustainable design submittals.

B. Manufacturer's Certificate: Certify that following products meet or exceed specified sustainable design requirements:

1. Materials Resources Certificates:

a. Certify recycled material content for recycled content products.
b. Certify source for regional materials and distance from Project Site.

C. Product Cost Data: Submit cost of products to verify compliance with Project sustainable design requirements. Exclude cost of labor and equipment to install products.

1. Provide cost data for following products:

a. Products with recycled material content.
b. Regional products.

1.6 QUALITY ASSURANCE

A. Comply with ACI 530/530.1.

B. Perform Work according to standards.

C. Maintain copies of each standard affecting Work of this Section on Site.

1.7 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years documented experience.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Section 016000 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.

C. Store materials according to manufacturer instructions.

D. Protection:

1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
2. Provide additional protection according to manufacturer instructions.

1.9 AMBIENT CONDITIONS

A. Section 015000 - Temporary Facilities and Controls: Requirements for ambient condition control facilities for product storage and installation.

B. Cold Weather Requirements: Comply with ACI 530/530.1 if ambient temperature or temperature of masonry units is less than 40 degrees F.

C. Hot Weather Requirements: Comply with ACI 530/530.1 if ambient temperature is greater than 100 degrees F or ambient temperature is greater than 90 degrees F with wind velocity greater than 8 mph.

PART 2 - PRODUCTS

2.1 MORTAR

A. Manufacturers:

1. CTS Cement Manufacturing Corporation.
2. Glen-Gery Corporation.
3. Holcim (US) Inc.
4. Lafarge North America Inc.
5. Lehigh Hanson; HeidelbergCement Group.
6. QUIKRETE.
7. Solomon Colors Inc.
8. Southern Grouts & Mortars, Inc.

B. Substitutions: As specified in Section 016000 - Product Requirements.

2.2 SUSTAINABILITY CHARACTERISTICS

A. Section 018113 - Sustainable Design Requirements: Requirements for sustainable design compliance.

2.3 MATERIALS

A. Portland Cement:

1. Comply with ASTM C150, Type I.
2. Color: Gray.

B. Mortar Color:

1. Description: Mineral oxide pigment.
2. Color: as selected.

C. Water Repellents:

1. As specified in Section 071900 - Water Repellents.

D. Calcium Chloride: Not allowed.

2.4 MIXES

A. Mortar Mixes:
1. Mortar for Structural Masonry: Comply with ASTM C270, Type S using property specification.
2. Mortar for Non-Structural Masonry: Comply with ASTM C270, Type S using property specification.

PART 3 - EXECUTION

3.1 PREPARATION

A. Section 017000 - Execution and Closeout Requirements: Requirements for installation preparation.

B. Apply bonding agent to existing concrete masonry unit surfaces.

C. Mortar Mixing:

1. Thoroughly mix mortar ingredients according to ASTM C270 in quantities needed for immediate use.
2. Achieve uniformly damp sand immediately before mixing process.
3. Add mortar color and admixtures to achieve uniform mix and coloration.
4. Retemper only within two hours of mixing.

3.2 INSTALLATION

A. According to ACI 530/530.1.

3.3 FIELD QUALITY CONTROL

A. Testing:

1. Frequency: One set of specified tests for every 2,000 sq. ft. of completed wall area.
2. Mortar Mix: Comply with ASTM C780 for aggregate ratio and water content, air content, consistency, and compressive strength.
3. Flexural Bond Strength of Mortar and Masonry Units:

a. Comply with ASTM C1357.

b. Test in conjunction with applicable masonry unit Sections.

4. Compressive Strength of Mortar and Masonry:

a. Comply with ASTM C1314.
b. Test in conjunction with applicable masonry unit Sections.

3.4 ATTACHMENTS

A. Exterior Cavity Wall: Brick masonry with Type S mortar and Type N pointing mortar.

B. Loading Dock Area, No. 100: Concrete masonry unit partitions with Type N mortar.

C. Conference Room 102: Glass unit masonry with Type N mortar and Type O pointing mortar.

END OF SECTION

SECTION 040516 - MASONRY GROUTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Grout for masonry.

B. Related Requirements:
   1. Section 042000 - Unit Masonry: Installation of grout.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Section 012000 - Price and Payment Procedures: Contract Sum/Price modification procedures.

B. Grout Materials:

   1. Basis of Measurement: By cubic yd.
   2. Basis of Payment: Includes grout materials and preparation ready for placement.

C. Grout in Place - Concrete Masonry Unit:

   1. Basis of Measurement: By square foot.
   2. Basis of Payment: Includes grout placement, tooled.

1.3 REFERENCE STANDARDS

A. American Concrete Institute:

   1. ACI 530/530.1 - Building Code Requirements and Specification for Masonry Structures.

B. ASTM International:

   1. ASTM C94 - Standard Specification for Ready-Mixed Concrete.
   2. ASTM C143 - Standard Test Method for Slump of Hydraulic-Cement Concrete.
   3. ASTM C150 - Standard Specification for Portland Cement.
   4. ASTM C404 - Standard Specification for Aggregates for Masonry Grout.
   5. ASTM C476 - Standard Specification for Grout for Masonry.
   6. ASTM C595 - Standard Specification for Blended Hydraulic Cements.
   7. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.
   8. ASTM C1019 - Standard Test Method for Sampling and Testing Grout.
   9. ASTM C1157 - Standard Performance Specification for Hydraulic Cement.
   10. ASTM C1314 - Standard Test Method for Compressive Strength of Masonry Prisms.

1.4 SUBMITTALS

A. Section 013300 - Submittal Procedures: Requirements for submittals.

B. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

C. Test and Evaluation Reports: Submit compliance with grout property requirements according to ASTM C476, component grout materials according to ASTM C476, and test and evaluation reports according to ASTM C1019.

D. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.

1.5 SUSTAINABLE DESIGN SUBMITTALS

A. Section 018113 - Sustainable Design Requirements: Requirements for sustainable design submittals.

B. Manufacturer's Certificate: Certify that following products meet or exceed specified sustainable design requirements.

1. Materials Resources Certificates:

   a. Certify recycled material content for recycled content products.
   b. Certify source for regional materials and distance from Project Site.

C. Product Cost Data: Submit cost of products to verify compliance with Project sustainable design requirements. Exclude cost of labor and equipment to install products.

1. Provide cost data for following products:

   a. Products with recycled material content.
   b. Regional products.

1.6 QUALITY ASSURANCE

A. Perform Work according to ACI 530/530.1.

B. Perform Work according to standards.

C. Maintain copies of each standard affecting Work of this Section on Site.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Section 016000 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.

C. Store materials according to manufacturer instructions.

D. Protection:

1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
2. Provide additional protection according to manufacturer instructions.

1.8 AMBIENT CONDITIONS

A. Section 015000 - Temporary Facilities and Controls: Requirements for ambient condition control facilities for product storage and installation.

B. Cold Weather Requirements: According to ACI 530/530.1 if ambient temperature or temperature of masonry units is less than 40 degrees F.

C. Hot Weather Requirements: According to ACI 530/530.1 if ambient temperature is greater than 100 degrees F or if ambient temperature is greater than 90 degrees F with wind velocity greater than 8 mph.

PART 2 - PRODUCTS

2.1 MASONRY GROUT

A. Manufacturers:

1. CTS Cement Manufacturing Corporation.
2. Glen-Gery Corporation.
3. Holcim (US) Inc.
4. Lafarge North America Inc.
5. Lehigh Hanson; HeidelbergCement Group.
6. QUIKRETE.
7. Solomon Colors Inc.
8. Southern Grouts & Mortars, Inc.

B. Substitutions: As specified in Section 016000 - Product Requirements.

C. Furnish materials according to standards.

2.2 SUSTAINABILITY CHARACTERISTICS

A. Section 018113 - Sustainable Design Requirements: Requirements for sustainable design compliance.

2.3 MATERIALS

A. Portland Cement: Comply with ASTM C150 Type I.

2.4 MIXES

A. Grout:

1. Grout for Non-Structural Masonry:

   a. Compressive Strength: 3,000 psi at 28 days.
   b. Slump: 8 to 11 inches.
   c. Mixing: According to ASTM C476.

2. Grout for Structural Masonry:

   a. Compressive Strength: 3,000 psi at 28 days.
   b. Slump: 8 to 11 inches.
   c. Mixing: According to ASTM C476.

3. Application:

   a. Coarse Grout: Grouting spaces with minimum 4-inch dimension in each direction.
   b. Fine Grout: Grouting other spaces.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 017000 - Execution and Closeout Requirements: Requirements for installation examination.

B. Request inspection of spaces to be grouted.

3.2 INSTALLATION

A. Mixing:

1. Mix grout according to ASTM C94 as modified to use ingredients complying with ASTM C476.

B. Comply with ACI 530/530.1.

3.3 FIELD QUALITY CONTROL

A. Section 017000 - Execution and Closeout Requirements: Requirements for testing, adjusting, and balancing.

B. Testing:

1. Mix: Comply with ASTM C1019 for compressive strength, and comply with ASTM C143 for slump.
2. Compressive Strength of Mortar, Grout, and Masonry: Comply with ASTM C1314.

3.4 ATTACHMENTS

A. Masonry Bond Beams and Grouted Core Cells: 2,000 psi grout, fine aggregate.

B. Masonry Pilasters: 4,000 psi grout, coarse aggregate.

END OF SECTION

SECTION 042000 - UNIT MASONRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Brick and concrete masonry units.
2. Prefaced brick and concrete masonry units.
3. Decorative concrete masonry.
4. Firebrick, clay flue lining, reinforcement, anchorage, and accessories.

B. Related Requirements:

1. Section 032000 - Concrete Reinforcing: Product requirements for steel reinforcing in masonry cavities and cores for installation by this Section.
2. Section 040513 - Masonry Mortaring.
3. Section 040516 - Masonry Grouting.
4. Section 051200 - Structural Steel Framing.
5. Section 055000 - Metal Fabrications: Product requirements for fabricated steel items for placement by this Section.

C. Allowances: Include under provisions of Section 012000 - Price and Payment Procedures. Installation is included in this Section and is part of Contract Sum/Price.

1.2 REFERENCE STANDARDS

A. American Concrete Institute:

1. ACI 530/530.1 - Building Code Requirements and Specification for Masonry Structures and Related Commentaries.

B. ASTM International:

1. ASTM A82 - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
2. ASTM A153- Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
3. ASTM A240 - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
4. ASTM A307 - Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength.
5. ASTM A580 - Standard Specification for Stainless Steel Wire.
6. ASTM A615 - Standard Specification for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement.

7. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
8. ASTM A951 - Standard Specification for Steel Wire for Masonry Joint Reinforcement.
9. ASTM B370 - Standard Specification for Copper Sheet and Strip for Building Construction.
10. ASTM B695 - Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel.
11. ASTM C27 - Standard Classification of Fireclay and High-Alumina Refractory Brick.
12. ASTM C34 - Standard Specification for Structural Clay Load-Bearing Wall Tile.
13. ASTM C55 - Standard Specification for Concrete Building Brick.
14. ASTM C56 - Standard Specification for Structural Clay Nonloadbearing Tile.
15. ASTM C62 - Standard Specification for Building Brick (Solid Masonry Units Made from Clay or Shale).
16. ASTM C67 - Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile.
17. ASTM C73 - Standard Specification for Calcium Silicate Brick (Sand-Lime Brick).
18. ASTM C90 - Standard Specification for Loadbearing Concrete Masonry Units.
19. ASTM C126 - Standard Specification for Ceramic Glazed Structural Clay Facing Tile, Facing Brick, and Solid Masonry Units.
20. ASTM C129 - Standard Specification for Nonloadbearing Concrete Masonry Units.
21. ASTM C140 - Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units.
22. ASTM C212 - Standard Specification for Structural Clay Facing Tile.
23. ASTM C216 - Standard Specification for Facing Brick (Solid Masonry Units Made from Clay or Shale).
24. ASTM C315 - Standard Specification for Clay Flue Liners and Chimney Pots.
25. ASTM C530 - Standard Specification for Structural Clay Nonloadbearing Screen Tile.
26. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.
27. ASTM C652 - Standard Specification for Hollow Brick (Hollow Masonry Units Made from Clay or Shale).
28. ASTM C744 - Standard Specification for Prefaced Concrete and Calcium Silicate Masonry Units.
29. ASTM C1261 - Standard Specification for Firebox Brick for Residential Fireplaces.
30. ASTM C1283 - Standard Practice for Installing Clay Flue Lining.
31. ASTM C1314 - Standard Test Method for Compressive Strength of Masonry Prisms.
32. ASTM C1405 - Standard Specification for Glazed Brick (Single Fired, Brick Units).
33. ASTM D226 - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.
34. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
35. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.

1.3 COORDINATION

A. Section 013000 - Administrative Requirements: Requirements for coordination.

1.4 PREINSTALLATION MEETINGS

A. Section 013000 - Administrative Requirements: Requirements for preinstallation meeting.

B. Convene minimum one week prior to commencing Work of this Section.

1.5 SUBMITTALS

A. Section 013300 - Submittal Procedures: Requirements for submittals.

B. Product Data:

1. Submit data for masonry units and other accessories.
2. Indicate initial rate of absorption for clay and shale brick.

C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

D. Source Quality-Control Submittals: Indicate results of shop and/or factory tests and inspections.

E. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.

F. Qualifications Statements:

1. Submit qualifications for installer.

1.6 SUSTAINABLE DESIGN SUBMITTALS

A. Section 018113 - Sustainable Design Requirements: Requirements for sustainable design submittals.

B. Manufacturer's Certificate: Certify that the following products meet or exceed specified sustainable design requirements.

1. Materials Resources Certificates:

a. Certify source and origin for salvaged and reused products.
b. Certify recycled material content for recycled content products.
c. Certify source for regional materials and distance from Project Site.

C. Product Cost Data: Submit cost of products to verify compliance with Project sustainable design requirements. Exclude cost of labor and equipment to install products.

1. Provide cost data for the following products:

a. Salvaged, refurbished, and reused products.
b. Products with recycled material content.
c. Regional products.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Section 017000 - Execution and Closeout Requirements: Requirements for maintenance materials.

1.8 QUALITY ASSURANCE

A. Perform Work according to ACI 530/530.1.

B. Maintain copies of each standard affecting the Work of this Section on Project Site.

1.9 QUALIFICATIONS

A. Installer: Company specializing in performing Work of this Section with minimum three years documented experience.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Section 016000 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

1.11 AMBIENT CONDITIONS

A. Section 015000 - Temporary Facilities and Controls: Requirements for ambient condition control facilities for product storage and installation.

B. Do not store reinforcing material directly on ground. Utilize blocking and other methods to prevent rust on accessories prior to installation.

C. Cold Weather Requirements: According to ACI 530.1 when ambient temperature or temperature of masonry units is less than 40 degrees F.

D. Hot Weather Requirements: According to ACI 530.1 when ambient temperature is greater than 100 degrees F or ambient temperature is greater than 90 degrees F with wind velocity greater than 8 mph.

1.12 EXISTING CONDITIONS

A. Field Measurements: Verify elevations, dimensions, and alignment of foundations and other supporting construction prior to beginning Work. Indicate field measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 PERFORMANCE AND DESIGN CRITERIA

A. Concrete Masonry Compressive Strength (f'm): 2,000 psi; determined by prism test method.

1. Concrete Masonry Units (CMU): 2,800 psi minimum net area compressive strength.

2.2 UNIT MASONRY ASSEMBLIES

A. Masonry Unit

1. Manufacturers:

a. Acme Brick Company.
b. Belden Brick Company (The).
c. Endicott Clay Products Co.
d. General Shale Brick.
e. Oldcastle Building Envelope (OBE); CRH Americas.

2. Substitutions: Section 016000 - Product Requirements.

2.3 SUSTAINABILITY CHARACTERISTICS

A. Section 018113 - Sustainable Design Requirements: Requirements for sustainable design compliance.

2.4 MATERIALS

A. Hollow Load-Bearing CMU: ASTM C90; normal weight.

B. Hollow Non-load-bearing CMU: ASTM C129; normal weight.

C. CMU Size: Nominal modular size of 8 inches by 8 inches by 16 inches.

D. Special CMU Shape: Furnish special units for 90-degree corners. Shape to profile indicated; surface texture on sides and ends.

2.5 ACCESSORIES

A. Single-Wythe Joint Reinforcement: ASTM A951; ladder type; steel; 0.148-inch-diameter side rods with 0.148-inch-diameter cross ties hot-dip galvanized.

B. Reinforcing Steel: ASTM A615, 60 ksi yield grade, deformed billet bars, uncoated finish.

C. Wall Ties

1. Manufacturers:

a. Hohmann & Barnard, Inc.
b. Wire-Bond.

2. Substitutions: Section 016000 - Product Requirements.

D. Anchor Rods: ASTM A307; Grade C; J- or L-shaped; complete with washers and heavy hex nuts; sized for minimum 15-inch embedment galvanized finish.

1. Hot-Dip Galvanizing: ASTM A153.
2. Mechanical Galvanizing: ASTM B695, Class 55.

E. Mortar and Grout: As specified in Sections 040513 – Masonry Mortaring and 040516 – Masonry Grouting.

F. Integral Flashings

1. Manufacturers:

a. Barnes & Cone Architectural Masonry.
b. Timloc Building Products.

2. Substitutions: Section 016000 - Product Requirements.

G. Plastic Flashings: Sheet neoprene; 20 mil thick.

H. Preformed Control Joints: Rubber material. Furnish with corner and T-accessories, cement-fused joints. Profile as indicated on Drawings.

I. Joint Filler: Closed cell polyethylene oversized 50 percent to joint width; self-expanding; 1/2 inch wide by maximum lengths.

J. Masonry Core Insulation: Molded expanded polystyrene, ASTM C578, Type 1; insulation specially molded to fit into block cores at the block plant prior to shipment.

1. Manufacturers:

a. Concrete Block Insulating Systems.
b. Shelter Enterprises Inc.

2. Substitutions: Section 016000 - Product Requirements.

K. Cavity Drain Material: Open polyethylene mesh thickness required to fill cavity space and shaped to ensure moisture drainage to cavity weeps.

1. Manufacturers:

a. Advanced Building Products Inc.
b. CavClear/Archovations, Inc.
c. Dur-O-Wal; a Hohmann & Barnard company.
d. Mortar Net Solutions.

2. Substitutions: Section 016000 - Product Requirements.

L. Steel Lintels: Sizes as indicated on Drawings; hot-dipped galvanized.

2.6 SOURCE QUALITY CONTROL

A. Section 014000 - Quality Requirements: Requirements for testing, inspection, and analysis.

B. Testing: Test brick efflorescence according to ASTM C67. Brick rated greater than "slightly effloresced" is not acceptable.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 017000 - Execution and Closeout Requirements: Requirements for installation examination.

B. Verify that field conditions are acceptable and ready to receive Work.

C. Verify that items provided by other Sections of Work are properly sized and located.

D. Verify that built-in items are in proper location and ready for roughing into masonry Work.

3.2 PREPARATION

A. Section 017000 - Execution and Closeout Requirements: Requirements for installation preparation.

B. Direct and coordinate placement of metal anchors supplied to other Sections.

C. Furnish temporary bracing during installation of masonry Work. Maintain in place until building structure provides permanent support.

3.3 INSTALLATION

A. Establish lines, levels, and coursing indicated. Protect from displacement.

B. Maintain masonry courses to uniform dimension. Form bed and head joints of uniform thickness.

C. Coursing of CMU:

1. Bond: Running.
2. Coursing: One unit and one mortar joint to equal 8 inches.
3. Mortar Joints: Concave.

D. Placing and Bonding:

1. Lay hollow masonry units with face shell bedding on head and bed joints.
2. Buttering corners of joints or excessive furrowing of mortar joints are not permitted.
3. Remove excess mortar as Work progresses.
4. Interlock intersections and external corners.
5. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment is required, remove mortar and replace.
6. Perform Project Site cutting of masonry units with proper tools to assure straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.
7. Isolate masonry from vertical structural framing members with movement joint as indicated on Drawings.
8. Isolate top of masonry from horizontal structural framing members and slabs or decks with compressible joint filler.

E. Joint Reinforcement and Anchorage - Single-Wythe Masonry:

1. Install horizontal joint reinforcement 16 inches o.c. vertically.
2. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.
3. Place joint reinforcement continuous in first and second joint below top of walls.
4. Lap joint reinforcement ends minimum 6 inches.
5. Reinforce stack-bonded unit joint corners and intersections with strap anchors 16 inches o.c.
6. Embed wall ties in masonry backing to bond veneer at maximum 16 inches o.c. vertically and 16 inches o.c. horizontally. Place wall ties at maximum 8 inches o.c. vertically within 8 inches of jamb of wall openings.

F. Masonry Flashings:

1. Extend flashings horizontally through outer wythe at foundation walls above ledges, shelf angles, and lintels under parapet caps at bottom of walls and and turn down on outside face to form drip.
2. Lap end joints minimum 6 inches and seal watertight.
3. Turn flashing; fold and seal at corners, bends, and interruptions.

G. Masonry Core Insulation Inserts:

H. Install masonry core insulation inserts at masonry manufacturing plant prior to delivery to Site.

I. Do not remove inserts except where specifically noted on Drawings. Ensure that all inserts are properly installed in each course prior to installing subsequent courses.

J. Lintels:

1. Install loose steel lintels over openings.
2. Install reinforced unit masonry lintels over miscellaneous openings less than 12 inches wide where lintels are not scheduled or indicated.
3. Do not splice reinforcing bars.
4. Support and secure reinforcing bars from displacement.
5. Place and consolidate grout fill without displacing reinforcing.
6. Allow masonry lintels to attain specified strength before removing temporary supports.
7. Maintain minimum 8-inch bearing on each side of opening.

K. Grouted Components:

1. Reinforce bond beams and pilasters as indicated on Drawings. Maintain minimum of 1 inch clearance from bottom web.
2. Lap splices bar diameters as required by code.
3. Support and secure reinforcing bars from displacement.
4. Place and consolidate grout fill without displacing reinforcing.
5. At bearing locations, fill masonry cores with grout for minimum 12 inches both sides of opening.

L. Reinforced Masonry:

1. Lay masonry units with cores vertically aligned and clear of mortar and unobstructed.
2. Place reinforcement bars as indicated on Drawings.
3. Splice reinforcement as indicated on Drawings.
4. Support and secure reinforcement from displacement.
5. Place and consolidate grout fill without displacing reinforcing.
6. Place grout according to ACI 530.1.

M. Control Joints:

1. Install control joints at the following maximum spacings, unless otherwise indicated on Drawings:

    a. Exterior Walls: 20 feet o.c. and within 24 inches on one side of each interior and exterior corner.
    b. Interior Walls: 30 feet o.c.
    c. At changes in wall height.

2. Do not continue horizontal joint reinforcement through control joints.
3. Size control joint as specified in Section 079000 - Joint Protection for sealant performance.

N. Expansion Joints:

1. Form expansion joints as indicated on Drawings.
2. Do not continue horizontal joint reinforcement through expansion joints.

O. Built-in Work:

1. As Work progresses, install built-in metal door frames, fabricated metal frames, metal window frames, wood nailing strips, fireplace accessories, anchor bolts, plates and other items to be built in the Work and furnished by other Sections.
2. Install built-in items plumb and level.
3. Bed anchors of metal door frames in adjacent mortar joints. Fill frame voids solid with grout or mortar. Fill adjacent masonry cores with grout minimum 12 inches from framed openings.
4. Do not build in materials subject to deterioration.

P. Cutting and Fitting:

1. Cut and fit for chases, pipes, conduit, sleeves, and grounds Coordinate with other Sections of Work to provide correct size, shape, and location.
2. Obtain Architect/Engineer's approval prior to cutting or fitting masonry Work not indicated or where appearance or strength of masonry Work may be impaired.

Q. Installation Standards: Install masonry Work according to standards.

3.4 TOLERANCES

A. Section 014000 - Quality Requirements: Requirements for tolerances.

B. Maximum Variation from Alignment of Columns and Pilasters: 1/4 inch.

C. Maximum Variation from Unit to Adjacent Unit: 1/16 inch.

D. Maximum Variation from Plane of Wall: 1/4 inch in 10 feet and 1/2 inch in 20 feet or more.

E. Maximum Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.

F. Maximum Variation from Level Coursing: 1/8 inch in 3 feet and 1/4 inch in 10 feet; 1/2 inch in 30 feet.

G. Maximum Variation of Joint Thickness: 1/8 inch in 3 feet.

H. Maximum Variation from Cross Sectional Thickness of Walls: ¼ inch.

I. Maximum Variation for Steel Reinforcement:

1. Install reinforcement within the tolerances specified in ACI 530.1 for foundation walls.
2. Plus or minus 1/2 inch when distance from centerline of steel to opposite face of masonry is 8 inches or less.
3. Plus or minus 1 inch when distance is between 8 and 24 inches.
4. Plus or minus 1-1/4 inch when distance is greater than 24 inches.
5. Plus or minus 2 inches from location along face of wall.

3.5 FIELD QUALITY CONTROL

A. Section 017000 - Execution and Closeout Requirements: Requirements for testing, adjusting, and balancing.

B. Brick Units: Test each type according to ASTM C67, 5 random units for each 50,000 units installed.

C. CMU: Test each type according to ASTM C140.

D. Prism Tests: Test compressive strength of completed reinforced masonry according to ASTM C1314.

3.6 CLEANING

A. Section 017000 - Execution and Closeout Requirements: Requirements for cleaning.

B. Remove excess mortar and mortar smears as Work progresses.

C. Replace defective mortar. Match adjacent Work.

D. Clean soiled surfaces with cleaning solution.

E. Use non-metallic tools in cleaning operations.

3.7 PROTECTION

A. Section 017000 - Execution and Closeout Requirements: Requirements for protecting finished Work.

B. Protect exposed external corners subject to damage.

C. Protect base of walls from mud and mortar splatter.

D. Protect masonry and other items built into masonry walls from mortar droppings and staining caused by mortar.

E. Protect tops of masonry Work with waterproof coverings secured in place without damaging masonry. Provide coverings where masonry is exposed to weather when Work is not in progress. Maintain protection on tops of completed exterior walls until installation of permanent waterproof cap materials.

3.8 ATTACHMENTS

A. Exterior Wall: Composite masonry with exterior wythe of "dark brown" face brick veneer, bonded with wire ladder reinforcement to inner wythe of interior-facing, split-faced concrete block masonry (CMU) with 2 inch space for insulation.

B. Interior Partitions: Single-wythe CMU.

C. Interior Decorative Block Partitions: Scored masonry units at east wall of Entry 101.

D. Interior Fire Walls: One- and two-hour walls of grout-filled concrete masonry with locations identified on Drawings.

E. Interior Load-Bearing Walls: North and south walls of Mechanical Room 147.

END OF SECTION

SUNY ERIE COMMUNITY COLLEEGE NORTH CAMPUS
KITTINGER HALL BOIELR ROOM UPGRADES
DIVISION 05
METALS SPECIFICATIONS
PAGE 1

SECTION	DESCRIPTION
051200	STRUCTURAL STEEL FRAMING
055000	METAL FABRICATIONS
055119	METAL GRATING STAIRS
055213	PIPE TUBE AND RAILINGS

SECTION 051200 - STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Structural shapes.
2. Channels and angles.
3. Hollow structural sections.
4. Structural pipe.
5. Structural plates and bars.
6. Floor plates.
7. Bolts, connectors, and anchors.
8. Grout.

B. Related Requirements:
1. Section 036000 - Grouting: Grout for setting base plates.
2. Section 052100 - Steel Joist Framing: Framing requirements as indicated in this Section.
3. Section 053113 - Steel Floor Decking: Support framing for small openings in floor deck.
4. Section 053123 - Steel Roof Decking: Support framing for small openings in roof deck.
5. Section 055000 - Metal Fabrications: Steel fabrications affecting structural steel work.

1.2 REFERENCE STANDARDS

A. American Institute of Steel Construction:
1. AISC 303 - Code of Standard Practice for Structural Steel Buildings and Bridges.
2. AISC 341 - Seismic Provisions for Structural Steel Buildings.
3. AISC 360 - Specification for Structural Steel Buildings.

B. American Society of Civil Engineers:
1. ASCE 19 - Structural Applications of Steel Cables for Buildings.

C. American Welding Society:
1. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination.
2. AWS D1.1 - Structural Welding Code - Steel.

D. ASTM International:
1. ASTM A36 - Standard Specification for Carbon Structural Steel.
2. ASTM A53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
3. ASTM A108 - Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished.

4. ASTM A123 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
5. ASTM A193 - Standard Specification for Alloy-Steel and Stainless Steel Bolting for High Temperature or High Pressure Service and Other Special Purpose Applications.
6. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength.
7. ASTM A325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
8. ASTM A354 - Standard Specification for Quenched and Tempered Alloy Steel Bolts, Studs, and Other Externally Threaded Fasteners.
9. ASTM A449 - Standard Specification for Hex Cap Screws, Bolts and Studs, Steel, Heat Treated, 120/105/90 ksi Minimum Tensile Strength, General Use.
10. ASTM A490 - Standard Specification for Structural Bolts, Alloy Steel, Heat Treated, 150 ksi Minimum Tensile Strength.
11. ASTM A500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
12. ASTM A501 - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
13. ASTM A514 - Standard Specification for High-Yield-Strength, Quenched and Tempered Alloy Steel Plate, Suitable for Welding.
14. ASTM A529 - Standard Specification for High-Strength Carbon-Manganese Steel of Structural Quality.
15. ASTM A563 - Standard Specification for Carbon and Alloy Steel Nuts.
16. ASTM A572 - Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel.
17. ASTM A588 - Standard Specification for High-Strength Low-Alloy Structural Steel, up to 50 ksi [345 MPa] Minimum Yield Point, with Atmospheric Corrosion Resistance.
18. ASTM A618 - Standard Specification for Hot-Formed Welded and Seamless High-Strength Low-Alloy Structural Tubing.
19. ASTM A780 - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
20. ASTM A786 - Standard Specification for Hot-Rolled Carbon, Low-Alloy, High-Strength Low-Alloy, and Alloy Steel Floor Plates.
21. ASTM A847 - Standard Specification for Cold-Formed Welded and Seamless High-Strength, Low Alloy Structural Tubing with Improved Atmospheric Corrosion Resistance.
22. ASTM A913 - Standard Specification for High-Strength Low-Alloy Steel Shapes of Structural Quality, Produced by Quenching and Self-Tempering Process.
23. ASTM A992 - Standard Specification for Structural Steel Shapes.
24. ASTM B695 - Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel.
25. ASTM E94 - Standard Guide for Radiographic Examination.
26. ASTM E164 - Standard Practice for Contact Ultrasonic Testing of Weldments.
27. ASTM E165 - Standard Practice for Liquid Penetrant Examination for General Industry.
28. ASTM E709 - Standard Guide for Magnetic Particle Testing.
29. ASTM F436 - Standard Specification for Hardened Steel Washers.

30. ASTM F959 - Standard Specification for Compressible-Washer-Type Direct Tension Indicators for Use with Structural Fasteners.
31. ASTM F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength.
32. ASTM F1852 - Standard Specification for "Twist Off" Type Tension Control Structural Bolt/Nut/Washer Assemblies, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
33. ASTM F2329 - Standard Specification for Zinc Coating, Hot-Dip, Requirements for Application to Carbon and Alloy Steel Bolts, Screws, Washers, Nuts, and Special Threaded Fasteners.

E. Research Council on Structural Connections:
1. RCSC - Specification for Structural Joints Using ASTM A325 or A490 Bolts.

F. SSPC: The Society for Protective Coatings:
1. SSPC - Steel Structures Painting Manual.
2. SSPC Paint 15 - Steel Joist Shop Primer/Metal Building Primer.
3. SSPC Paint 20 - Zinc-Rich Coating (Type I - Inorganic and Type II - Organic).
4. SSPC SP 3 - Power Tool Cleaning.
5. SSPC SP 6 - Commercial Blast Cleaning.
6. SSPC SP 10 - Near-White Blast Cleaning.

1.3 COORDINATION

A. Section 013000 - Administrative Requirements: Requirements for coordination.

B. Coordinate Work of this Section with following:
1. Section 055000 - Metal Fabrications for miscellaneous steel supports other than structural steel.

1.4 SUBMITTALS

A. Section 013300 - Submittal Procedures: Requirements for submittals.

B. Shop Drawings:
1. Indicate profiles, sizes, spacing, locations of structural members, openings, attachments, and bolts.
2. Connections
3. Cambers
4. Indicate welded connections with AWS A2.4 welding symbols. Indicate net weld lengths.

C. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification within previous 12 months.

D. Source Quality-Control Submittals: Indicate results of shop tests and inspections.

E. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.

F. Qualifications Statements:
1. Submit qualifications for fabricator, erector, shop painter, and welders.

1.5 QUALITY ASSURANCE

A. Perform Work according to following:
1. Structural Steel: AISC 303 ASIC 341 and AISC 360.
2. High-Strength Bolted Connections: RCSC - Specification for Structural Joints Using ASTM A325 or ASTM A490 Bolts.

1.6 QUALIFICATIONS

A. Fabricator:
1. Company specializing in fabricating products specified in this Section with minimum three years' documented experience with following current AISC Certification:
a. Standard Steel Building Structures (STD).
b. Conventional Steel Building Structures (SBD).

B. Erector:
1. Company specializing in performing Work of this Section with minimum three years' documented experience with following current AISC Certification:
a. Certified Steel Erector (CSE).

C. Welders and Welding Procedures: AWS D1.1 qualified within previous 12 months.

PART 2 - PRODUCTS

2.1 STRUCTURAL STEEL

A. Structural W-Shapes: ASTM A992

B. Structural S-Shapes: ASTM A36.

C. Structural T-Shapes: Cut from structural W-shapes.

D. Channels and Angles: ASTM A36

E. Round, Hollow Structural Sections: ASTM A500, Grade B

F. Rectangular, Hollow Structural Sections: ASTM A500, Grade B

G. Structural Pipe: ASTM A53, Grade B

H. Structural Plates and Bars: ASTM A36

2.2 BOLTS, CONNECTORS, AND ANCHORS

A. Bolts: Heavy-hex, structural type.
1. ASTM A325; Type 1

2. ASTM A490; Type 1

B. Nuts: ASTM A563; Grade heavy-hex type.
   1. Finish: Plain

C. Washers:
   1. ASTM F436.
   2. Type 1
   3. Furnish clipped washers where space limitations require.
   4. Finish: Plain Direct tension indicators are compressible washers. Type 325 is used with ASTM A325 (A325M) bolts, and Type 490 is used with ASTM A490 (A490M) bolts.

D. Compressible-Washer-Type Direct Tension Indicators:
   1. ASTM F959.
   2. Type: 325 or 490 (match bolts)

E. Tension Control Assemblies:
   1. ASTM F1852.
   2. Type 1, heavy hex or round head, twist-off type.
   3. Furnish with washers and heavy hex nuts.

F. Shear Connectors:
   1. ASTM A108.
   2. Grades 1015 through 1020 headed, unfinished, and according to AWS D1.1.
   3. Type B.

G. Anchor Rods:
   1. ASTM F1554; Grade 36
   2. Shape: Headed.
   3. Plate Washers: ASTM A36.

H. Threaded Rods:
   1. ASTM A36
   2. Finish: Unfinished

I. Forged Structural Steel Hardware:
   1. Clevises and Turnbuckles: ASTM A108; Grade 1085.
   2. Eye Nuts and Eye Bolts: ASTM A108; Grade 1030.
   3. Sleeve Nuts: ASTM A108; Grade 1018.
   4. Rod Ends, Yoke Ends and Pins, Cotter Pins, and Coupling Nuts: Carbon steel.

2.3 WELDING MATERIALS

A. Welding Materials:
   1. AWS D1.1.
   2. Type required for materials being welded.

2.4 FABRICATION

A. Space shear stud connectors uniformly, unless indicated otherwise on Drawings.

B. Fabricate connections for bolt, nut, and washer connectors.

C. Develop required camber for members.

2.5 FINISHES

A. Leave structural steel members unprimed.

2.6 ACCESSORIES

A. Grout:
   1. Non-shrink type; premixed compound consisting of nonmetallic aggregate, cement, water-reducing, and plasticizing additives.
   2. Capable of developing minimum compressive strength of 7,000 psi at 28 days.

2.7 SOURCE QUALITY CONTROL

A. Section 014000 - Quality Requirements: Requirements for testing, inspection, and analysis.

B. Testing: Test bolted and welded connections as specified in PART 3 for field quality control tests.

C. Certificate of Compliance: When fabricator is approved by authorities having jurisdiction, submit certificate of compliance indicating Work performed at fabricator's facility conforms to Contract Documents.
   1. Specified shop tests are not required for Work performed by approved fabricator.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 017000 - Execution and Closeout Requirements: Requirements for installation examination.

B. Verify that bearing surfaces are at correct elevation.

C. Verify that anchor rods are set in correct locations and arrangements, with correct exposure for steel attachment.

3.2 PREPARATION

A. Section 017000 - Execution and Closeout Requirements: Requirements for installation preparation.

B. Furnish templates for installation of anchor rods and embedment in concrete and masonry work.

3.3 ERECTION

A. Allow for erection loads and for sufficient temporary bracing to maintain structure safe, plumb, and in alignment until completion of erection and installation of permanent bracing.

B. Field-weld components and shear connectors as indicated on Drawings & Shop Drawings.

C. Field-connect members with threaded fasteners; torque to required resistance and snug-tighten for bearing-type connections, unless noted otherwise

D. Do not field-cut or alter structural members without approval of Architect/Engineer.

E. After erection, touch up welds and abrasions to match shop finishes.

3.4 GROUT INSTALLATION

A. Shim bearing plates and equipment supports to proper elevation, and snug-tighten anchor bolts.

B. Fill void under bearing surface with grout; install and pack grout to remove air pockets.

C. Moist-cure grout.

D. Remove forms after grout is set; trim grout edges to form smooth surface, splayed 45 degrees.

E. Tighten anchor bolts after grout has cured for a minimum of three days.

3.5 TOLERANCES

A. Section 014000 - Quality Requirements: Requirements for tolerances.

B. Maximum Variation from Plumb: 1/4 inch per story, noncumulative.

C. Maximum Offset from Alignment: 1/4 inch.

3.6 FIELD QUALITY CONTROL

A. Section 017000 - Execution and Closeout Requirements: Requirements for testing, adjusting, and balancing.

B. Bolted Connections: Inspect according to AISC 303.
   1. Visually inspect all bolted connections.
   2. Direct Tension Indicators: Comply with requirements of ASTM F959, and verify that gaps are less than gaps specified in Table 2.

C. Welding: Inspect welds according to AWS D1.1.
   1. Use certified welders, and conduct inspections and tests as required. Record types and locations of defects found in Work. Record work required and performed to correct deficiencies.
   2. Visually inspect all welds.
   3. Ultrasonic Inspection: ASTM E164; perform on each full-penetration weld.
   4. Liquid Penetrant Inspection: ASTM E165.
   5. Magnetic Particle Inspection: ASTM E709; performed on:
      a. 20 % of all connection fillet welds at random, final pass only.
      b. 20 % of all continuity plate and bracing gusset plate fillet welds at random, final pass only.
      c. 100 % of tension member fillet welds (i.e. hanger connection plates and other similar connections) for root and final passes.
      d. 20 % of length of built-up column member partial penetration and fillet welds at random for root and final passes.
      e. 100 % of length of built-up girder member partial penetration and fillet welds at random for root and final passes.

D. Correct defective bolted connections and welds.

END OF SECTION

SECTION 055000 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Ledge and shelf angles.
2. Structural supports for miscellaneous attachments.

B. Related Requirements:
1. Section 033000 - Cast-In-Place Concrete: Execution requirements for embedded anchors and attachments for metal fabrications specified by this Section in concrete.
2. Section 042000 - Unit Masonry: Execution requirements for embedded anchors and attachments for metal fabrications specified by this Section in masonry.
3. Section 051200 - Structural Steel Framing: Structural steel column anchor bolts.

1.2 REFERENCE STANDARDS

A. American Architectural Manufacturers Association:
1. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum.
2. AAMA 2603 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels.
3. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels.
4. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.

B. American National Standards Institute:
1. ANSI A14.3 - American National Standard (ASC) for Ladders - Fixed - Safety Requirements.

C. American Welding Society:
1. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination.
2. AWS D1.1 - Structural Welding Code - Steel.
3. AWS D1.6 - Structural Welding Code - Stainless Steel.

D. ASTM International:
1. ASTM A36 - Standard Specification for Carbon Structural Steel.
2. ASTM A53- Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
3. ASTM A123 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

4. ASTM A153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
5. ASTM A193 - Standard Specification for Alloy-Steel and Stainless Steel Bolting for High Temperature or High Pressure Service and Other Special Purpose Applications.
6. ASTM A240 - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
7. ASTM A269 - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
8. ASTM A276 - Standard Specification for Stainless Steel Bars and Shapes.
9. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength.
10. ASTM A312 - Standard Specification for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes.
11. ASTM A325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
12. ASTM A354 - Standard Specification for Quenched and Tempered Alloy Steel Bolts, Studs, and Other Externally Threaded Fasteners.
13. ASTM A500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
14. ASTM A501 - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
15. ASTM A554 - Standard Specification for Welded Stainless Steel Mechanical Tubing.
16. ASTM A563 - Standard Specification for Carbon and Alloy Steel Nuts.
17. ASTM A572 - Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel.
18. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
19. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
20. ASTM A780 - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
21. ASTM A992 - Standard Specification for Structural Steel Shapes.
22. ASTM B26 - Standard Specification for Aluminum-Alloy Sand Castings.
23. ASTM B85 - Standard Specification for Aluminum-Alloy Die Castings.
24. ASTM B177 - Standard Guide for Engineering Chromium Electroplating.
25. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
26. ASTM B210 - Standard Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes.
27. ASTM B211 - Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold Finished Bar, Rod, and Wire.
28. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
29. ASTM B695 - Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel.
30. ASTM F436 - Standard Specification for Hardened Steel Washers.

31. ASTM F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105 ksi Yield Strength.

E. Builders Hardware Manufacturers Association (BHMA):
1. ANSI/BHMA A156.20 - American National Standard for Strap and Tee Hinges and Hasps.

F. National Ornamental & Miscellaneous Metals Association:
1. NOMMA Guideline 1 - Joint Finishes.

G. SSPC: The Society for Protective Coatings:
1. SSPC - Steel Structures Painting Manual.
2. SSPC Paint 15 - Steel Joist Shop Primer/Metal Building Primer.
3. SSPC Paint 20 - Zinc-Rich Coating (Type I - Inorganic and Type II - Organic).
4. SSPC SP 1 - Solvent Cleaning.
5. SSPC SP 10 - Near-White Blast Cleaning.

1.3 SUBMITTALS

A. Section 013300 - Submittal Procedures: Requirements for submittals.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.

1.4 QUALITY ASSURANCE

A. Finish joints according to NOMMA Guideline 1.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Section 016000 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Inspection: Accept metal fabrications on-Site in labeled shipments. Inspect for damage.

C. Protect metal fabrications from damage by exposure to weather or by ground contact.

1.6 EXISTING CONDITIONS

A. Field Measurements: Verify field measurements prior to fabrication. Indicate field measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 LINTELS

A. Description:
1. Steel sections.

2. Size and Configuration:
   a. As indicated on Drawings.
3. Exterior Location Finish: Galvanized
4. Interior Location Finish: Prime paint, one coat.

2.2 LEDGE AND SHELF ANGLES

A. Ledge and Shelf Angles Channels and Plates Not Attached to Structural Framing:
   1. For support of metal decking joists & masonry.
   2. Finish: Galvanized

2.3 BOLLARDS

A. Description:
   1. Steel pipe, concrete filled.
   2. Crowned cap.
   3. Size: as indicated on Drawings.
   4. Finish: Galvanized

B. Concrete Fill:
   1. Minimum Compressive Strength: 3,000 psi.
   2. As specified in Section 033000 - Cast-in-Place Concrete.

C. Anchors: Concealed type as indicated on Drawings.

2.4 MATERIALS

A. Steel:
   1. Structural W Shapes: ASTM A992.
   2. Structural Shapes: ASTM A36
   3. Channels and Angles: ASTM A36
   4. Steel Plate: ASTM A36
   5. Hollow Structural Sections: ASTM A500, Grade B
   6. Steel Pipe:
      a. ASTM A53, Grade B
   7. Sheet Steel: ASTM A653, Grade 33 Structural Quality.
   8. Bolts: ASTM A325; Type 1.
   9. Nuts: ASTM A563; heavy-hex type.
   10. Washers: ASTM F436; Type 1.
   11. Welding Materials: AWS D1.1; type required for materials being welded.

B. Bolts, Nuts, and Washers for Equipment and Piping:
   1. Carbon Steel:
      a. Structural Connections: ASTM A307, Grade A, hot-dip galvanized.
      b. Anchor Bolts: ASTM A307, Grade A, hot-dip galvanized.
      c. Pipe and Equipment Flange Bolts: ASTM A193, Grade B-7.
   2. Stainless Steel: Type 316 stainless steel, Class 2; ASTM A193 for bolts; ASTM A194 for nuts.

2.5 FABRICATION

A. Fit and shop-assemble items in largest practical sections for delivery to Site.

B. Fabricate items with joints tightly fitted and secured.

C. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small, uniform radius.

D. Exposed Welded Joints: NOMMA Guideline 1

E. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.

F. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

G. Fabrication Tolerances:
1. Squareness: 1/8 inch maximum difference in diagonal measurements.
2. Maximum Offset between Faces: 1/16 inch.
3. Maximum Misalignment of Adjacent Members: 1/16 inch.
4. Maximum Bow: 1/8 inch in 48 inches.
5. Maximum Deviation from Plane: 1/16 inch in 48 inches.

2.6 FINISHES

A. Steel:
1. Prepare surfaces to be primed according to SSPC SP 2
2. Do not prime surfaces in direct contact with concrete or where field welding is required.
3. Prime-paint items with **two coats** except where galvanizing is specified.
4. Galvanizing: ASTM A123; hot-dip galvanize after fabrication.
5. Galvanizing for Fasteners, Connectors, and Anchors:
   a. Hot-Dip Galvanizing: ASTM A153.
   b. Mechanical Galvanizing: ASTM B695; Class 50 minimum.
6. Bolts: Mechanically galvanized.
7. Nuts: Mechanically galvanized.
8. Washers: Mechanically galvanized.
9. Shop Primer: SSPC Paint 15, Type 1, red oxide.
10. Touchup Primer: Match shop primer.
11. Touchup Primer for Galvanized Surfaces:
    a. SSPC Paint 20, Type I - Inorganic
    b. ASTM A780.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 013000 - Administrative Requirements: Requirements for installation examination.

B. Verify that field conditions are acceptable and are ready to receive Work.

3.2 PREPARATION

A. Section 017000 - Execution and Closeout Requirements: Requirements for installation preparation.

B. Clean and strip primed steel items to bare metal where Site welding is required.

C. Supply steel items required to be cast into concrete or embedded in masonry with setting templates to appropriate sections.

3.3 INSTALLATION

A. Install items plumb and level, accurately fitted, and free from distortion or defects.

B. Make provisions for erection stresses. Install temporary bracing to maintain alignment until permanent bracing and attachments are installed.

C. Field-weld components indicated on Drawings

D. Perform field welding according to AWS D1.1.

E. Obtain approval of Architect/Engineer prior to Site cutting or making adjustments not scheduled.

3.4 TOLERANCES

A. Maximum Variation from Plumb: ¼ inch per story or for every 12 feet in height, whichever is greater, non-cumulative.

B. Maximum Variation from Level: 1/16 inch in 3 feet and ¼ inch in 10 feet.

C. Maximum Offset from Alignment: ¼ inch.

D. Maximum Out-of-Position: ¼ inch.

3.5 FIELD QUALITY CONTROL

A. Welding: Inspect welds according to AWS D1.1.

B. Replace damaged or improperly functioning hardware.

C. After erection, touch up welds, abrasions, and damaged finishes with prime paint or galvanizing repair paint to match shop finishes.

D. Touch up factory-applied finishes according to manufacturer-recommended procedures.

3.6 ADJUSTING

A. Section 017000 - Execution and Closeout Requirements: Requirements for starting and adjusting.

B. Adjust operating hardware and lubricate as necessary for smooth operation.

END OF SECTION

SECTION 055119 - METAL GRATING STAIRS

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. Industrial Class stairs with steel-grating treads.
2. Steel railings and guards attached to metal stairs.
3. Steel handrails attached to walls adjacent to metal stairs.

1.3 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written instructions to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorages for metal stairs**,** railings, and guards.

1. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry.
2. Deliver such items to Project site in time for installation.

C. Coordinate locations of hanger rods and struts with other work so they do not encroach on required stair width and are within fire-resistance-rated stair enclosure.

D. Schedule installation of railings and guards so wall attachments are made only to completed walls.

1. Do not support railings and guards temporarily by any means that do not satisfy structural performance requirements.

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 metal grating stairs and the following:

1. Gratings.
2. Woven-wire mesh.
3. Welded-wire mesh.
4. Shop primer products.
5. Grout.

E. Shop Drawings:

1. Include plans, elevations, sections, details, attachment to other work, and welding procedure specifications (WPS).
2. Indicate sizes of metal sections, thickness of metals, profiles, holes, and field joints.
3. Include plan at each level.
4. Indicate locations of anchors, weld plates, and blocking for attachment of wall-mounted handrails.

F. Delegated-Design Submittal: For stairs**,** railings, and guards, including analysis data signed and sealed by the qualified professional engineer, licensed in the State of New York, responsible for their preparation.

G. Qualification Data: For professional engineer's experience with providing delegated-design engineering services of the kind indicated, including documentation that engineer is licensed and registered in the State of New York.

H. Welding certificates.

I. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

J. Source quality-control reports.

1. Documentation to confirm compliance

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Fabricator of products.

B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code - Steel."

C. If the value of the 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.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store materials to permit easy access for inspection and identification.

1. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers.
2. Protect steel members and packaged materials from corrosion and deterioration.
3. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures.

a. Repair or replace damaged materials or structures as directed.

B. Store and handle galvanized steel members per the recommendations of the American Galvanized Association.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, licensed and registered to practice in the State of New York, to design stairs**,** railings, and guards, including attachment to building construction.

B. Structural Performance of Stairs: Metal stairs shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Uniform Load: 100 lbf/sq. ft.
2. Concentrated Load: 300 lbf applied on an area of 4 sq. in.
3. Uniform and concentrated loads need not be assumed to act concurrently.
4. Stair Framing: Capable of withstanding stresses resulting from railing and guard loads in addition to loads specified above.
5. Limit deflection of treads, platforms, and framing members to L/360.

C. Structural Performance of Railings and Guards: Railings and guards, including attachment to building construction, shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Handrails and Top Rails of Guards:

a. Uniform load of 50 lbf/ft. applied in any direction.
b. Concentrated load of 200 lbf applied in any direction.

c. Uniform and concentrated loads need not be assumed to act concurrently.

2. Infill of Guards:

a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft..
b. Infill load and other loads need not be assumed to act concurrently.

3. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

a. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

D. Seismic Performance of Stairs: Metal stairs shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. Component Importance Factor: Per design parameters indicated.

2.2 METALS

A. Metal Surfaces: Provide materials with smooth, flat surfaces unless otherwise indicated. For components exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

B. Steel Plates, Shapes, and Bars: ASTM A36.

C. Rolled-Steel Floor Plate: ASTM A786, rolled from plate complying with ASTM A36 or ASTM A283, Grade C or D.

D. Steel Bars for Grating Treads: ASTM A36 or steel strip, ASTM A1011 or ASTM A1018.

E. Steel Wire Rod for Grating Crossbars: ASTM A510.

F. Aluminum Bars for Grating Treads: ASTM B221 extruded aluminum, alloys as follows:

1. 6061-T6 or 6063-T6, for bearing bars of gratings and shapes.
2. 6061-T1, for grating crossbars.

G. Steel Tubing for Railings and Guards: ASTM A500 (cold formed).

1. Provide galvanized finish for exterior installations and where indicated.

H. Steel Pipe for Railings and Guards: ASTM A53, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.

I. Cast Iron: Either gray iron, ASTM A48, or malleable iron, ASTM A47, unless otherwise indicated.

J. Cast-Abrasive Nosings: Cast iron, with an integral abrasive, as-cast finish consisting of aluminum oxide, silicon carbide, or a combination of both.

2.3 FASTENERS

A. General: Provide zinc-plated fasteners with coating complying with ASTM B633 or ASTM F1941, Class Fe/Zn 12 for exterior use, and Class Fe/Zn 5 where built into exterior walls.

1. Select fasteners for type, grade, and class required.

B. Fasteners for Anchoring Railings and Guards to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings and guards to other types of construction indicated.

C. Bolts and Nuts: Regular hexagon-head bolts, ASTM A307, Grade A; with hex nuts, ASTM A563; and, where indicated, flat washers.

1. Structural Steel Connections: ASTM F3125, Grade A325 Type 1.

D. Anchor Bolts: ASTM F1554, Grade 36, of dimensions indicated; with nuts, ASTM A563; and, where indicated, flat washers.

1. Provide mechanically deposited or hot-dip, zinc-coated anchor bolts for stairs indicated to be shop primed with zinc-rich primer.

E. Post-Installed Anchors: chemical anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E488, conducted by a qualified independent testing agency.

1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941, Class Fe/Zn 5, unless otherwise indicated.

2. Material for Interior Locations Where Stainless Steel Is Indicated: Alloy Group 1 stainless-steel bolts, ASTM F593, and nuts, ASTM F594.
3. Material for Exterior Locations: Alloy Group 2 stainless-steel bolts, ASTM F593, and nuts, ASTM F594.

2.4 MISCELLANEOUS MATERIALS

A. Welding Electrodes: Comply with AWS requirements and welding procedure specification.

B. Shop Primers: Provide primers that comply with Section 099123 "Interior Painting."

C. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.

1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.

D. Zinc-Rich Primer: Comply with SSPC-Paint 20, Type I-A, Level 2, and compatible with topcoat.

E. Nonmetallic, Shrinkage-Resistant Grout: ASTM C1107, factory-packaged, nonmetallic aggregate grout; recommended by manufacturer for interior use; noncorrosive and nonstaining; mixed with water to consistency suitable for application and a 30-minute working time.

2.5 FABRICATION, GENERAL

A. Provide complete stair assemblies, including metal framing, hangers, railings, guards, clips, brackets, bearing plates, and other components necessary to support and anchor stairs and platforms on supporting structure.

1. Join components by welding or bolting unless otherwise indicated.
2. Use connections that maintain structural value of joined pieces.

B. Assemble stairs**,** railings, and guards in shop to greatest extent possible.

1. Disassemble units only as necessary for shipping and handling limitations.
2. Clearly mark units for reassembly and coordinated installation.

C. Cut, drill, and punch metals cleanly and accurately.

1. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated.
2. Remove sharp or rough areas on exposed surfaces.

D. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

E. Form exposed work with accurate angles and surfaces and straight edges.

F. Weld connections to comply with the following:

1. Comply with AWS requirements and approved welding procedure specifications.
2. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
3. Obtain fusion without undercut or overlap.
4. Remove welding flux immediately.
5. Weld exposed corners and seams continuously unless otherwise indicated.
6. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Finish #4 - Good quality, uniform undressed weld with minimal splatter.

G. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible.

1. Where exposed fasteners are required, use Phillips flat-head (countersunk**)** screws or bolts unless otherwise indicated.
2. Locate joints where least conspicuous.
3. Fabricate joints that are exposed to weather in a manner to exclude water.
4. Provide weep holes where water may accumulate internally.

2.6 FABRICATION OF STEEL-FRAMED STAIRS

A. NAAMM Stair Standard: Comply with NAAMM AMP 510, "Metal Stairs Manual," for Industrial Class, unless more stringent requirements are indicated.

B. Stair Framing:

1. Fabricate stringers of steel channels.

    a. Stringer Size: As required to comply with "Performance Requirements" Article or As indicated on Drawings.
    b. Provide closures for exposed ends of channel stringers.
    c. Finish: Shop primed.

2. Construct platforms and tread supports of steel plate or channel headers and miscellaneous framing members as required to comply with "Performance Requirements" Article or as indicated on Drawings.

    a. Provide closures for exposed ends of channel framing.
    b. Finish: Shop primed.

3. Weld stringers to headers; weld or bolt framing members to stringers and headers.
4. Where stairs are enclosed by gypsum board assemblies, provide hanger rods or struts to support landings from floor construction above or below.

    a. Locate hanger rods and struts where they do not encroach on required stair width and are within the fire-resistance-rated stair enclosure.

5. Where masonry walls support metal stairs, provide temporary supporting struts designed for erecting steel stair components before installing masonry.

6. Fabricate treads and platforms from welded steel or pressure-locked steel grating with openings in gratings no more than 1/2 inch in least dimension.

    a. Surface: Serrated.
    b. Finish: Shop primed.

7. Fabricate grating treads with rolled-steel floor plate nosing and with steel angle or steel plate carrier at each end for stringer connections.

    a. Secure treads to stringers with bolts.

8. Fabricate grating platforms with nosing matching that on grating treads.

    a. Secure grating to platform framing by welding.

C. Risers: Open.

D. Toe Plates: Provide toe plates around openings and at edge of open-sided floors and platforms, and at open ends and open back edges of treads.

1. Material and Finish: Steel plate to match finish of other steel items.
2. Fabricate to dimensions and details indicated.

2.7 FABRICATION OF STAIR RAILINGS AND GUARDS

A. Comply with applicable requirements in Section 055213 "Pipe and Tube Railings."

B. Fabricate railings and guards to comply with requirements indicated for design, dimensions, details, finish, and member sizes, including wall thickness of member, post spacings, wall bracket spacing, and anchorage, but not less than that needed to withstand indicated loads.

1. Rails and Posts: Minimum 1/4-inch wall thickness 1-5/8-inch- diameter top and bottom rails and 1-1/2-inch- square posts.
2. Intermediate Rails Infill: 1-5/8-inch- diameter intermediate rails spaced less than 12 inches clear.

C. Welded Connections: Fabricate railings and guards with welded connections.

1. Fabricate connections that are exposed to weather in a manner that excludes water.

    a. Provide weep holes where water may accumulate internally.

2. Cope components at connections to provide close fit or use fittings designed for this purpose.
3. Weld all around at connections, including at fittings.
4. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
5. Obtain fusion without undercut or overlap.
6. Remove flux immediately.
7. Finish welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Finish #4 - Good quality, uniform undressed weld with minimal splatter as shown in NAAMM AMP 521.

D. Form changes in direction of railings and guards as follows:

1. As detailed.

2. By radius bends of radius indicated or by inserting prefabricated elbow fittings of radius indicated.

E. For changes in direction made by bending, use jigs to produce uniform curvature for each repetitive configuration required.

1. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.

F. Close exposed ends of railing and guard members with prefabricated end fittings.

G. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated.

1. Close ends of returns unless clearance between end of rail and wall is 1/4 inch or less.

H. Connect posts to stair framing by direct welding unless otherwise indicated.

I. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, end closures, flanges, miscellaneous fittings, and anchors for interconnecting components and for attaching to other work.

1. Furnish inserts and other anchorage devices for connecting to concrete or masonry work.
2. For galvanized railings and guards, provide galvanized fittings, brackets, fasteners, sleeves, and other ferrous-metal components.
3. For nongalvanized railings and guards, provide nongalvanized ferrous-metal fittings, brackets, fasteners, and sleeves, except galvanize anchors embedded in exterior masonry and concrete construction.
4. Provide type of bracket with flange tapped for concealed anchorage to threaded hanger bolt and that provides 1-1/2-inch clearance from inside face of handrail to finished wall surface.

J. Fillers: Provide fillers made from steel plate, or other suitably crush-resistant material, where needed to transfer wall bracket loads through wall finishes to structural supports.

1. Size fillers to suit wall finish thicknesses and to produce adequate bearing area to prevent bracket rotation and overstressing of substrate.

2.8 FINISHES

A. Finish metal stairs after assembly.

B. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with **SSPC**-SP 3, "Power Tool Cleaning."

C. Apply shop primer to uncoated surfaces of metal stair components, except those with galvanized finishes and those to be embedded in concrete or masonry unless otherwise indicated. Comply

with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify elevations of floors, bearing surfaces and locations of bearing plates, and other embedments for compliance with requirements.

1. For wall-mounted railings, verify locations of concealed reinforcement within gypsum board and plaster assemblies.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF METAL STAIRS

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal stairs to in-place construction.

1. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors.

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal stairs. Set units accurately in location, alignment, and elevation, measured from established lines and levels and free of rack.

C. Install metal stairs by welding stair framing to steel structure or to weld plates cast into concrete unless otherwise indicated.

1. Grouted Baseplates: Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen to improve bond to surfaces.

a. Clean bottom surface of baseplates.
b. Set steel-stair baseplates on wedges, shims, or leveling nuts.
c. After stairs have been positioned and aligned, tighten anchor bolts.
d. Do not remove wedges or shims, but if protruding, cut off flush with edge of bearing plate before packing with grout.
e. Promptly pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

1) Neatly finish exposed surfaces; protect grout and allow to cure.

2) Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.

D. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

E. Fit exposed connections accurately together to form hairline joints.

1. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations.
2. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
3. Comply with requirements for welding in "Fabrication, General" Article.

3.3 INSTALLATION OF RAILINGS AND GUARDS

A. Adjust railing and guard systems before anchoring to ensure matching alignment at abutting joints with tight, hairline joints.

1. Space posts at spacing indicated or, if not indicated, as required by design loads.
2. Plumb posts in each direction, within a tolerance of 1/16 inch in 3 feet.
3. Align rails and guards so variations from level for horizontal members and variations from parallel with rake of stairs for sloping members do not exceed 1/4 inch in 12 feet.
4. Secure posts, rail ends, and guard ends to building construction as follows:

a. Anchor posts to steel by welding to steel supporting members.
b. Anchor handrail and guard ends to concrete and masonry with steel round flanges welded to rail and guard ends and anchored with post-installed anchors and bolts.

B. Attach handrails to wall with wall brackets.

1. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.
2. Secure wall brackets to building construction as required to comply with performance requirements.

a. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
b. For hollow masonry anchorage, use toggle bolts.

3.4 REPAIR

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 099123 "Interior Painting."

END OF SECTION 055119

SECTION 055213 - PIPE AND TUBE RAILINGS

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. Steel railings.
2. Aluminum railings.
3. Stainless steel railings.

1.3 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

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:

1. Manufacturer's product lines of mechanically connected railings.
2. Expanded metal infill panels.
3. Perforated metal infill panels.
4. Woven-wire mesh infill panels.

5. Fasteners.
6. Post-installed anchors.
7. Handrail brackets.
8. Shop primer.
9. Intermediate coats and topcoats.
10. Bituminous paint.
11. Nonshrink, nonmetallic grout.
12. Anchoring cement.
13. Metal finishes.
14. Paint products.

E. Shop Drawings: Include plans, elevations, sections, details, attachments to other work, and welding procedure specifications (WPS).

Samples for Initial Selection: For products involving selection of color, texture, or design, including mechanical finishes.

G. Samples for Verification: For each type of exposed finish required.

1. Sections of each distinctly different linear railing member, including handrails, top rails, posts, and balusters, including finish.
2. Fittings and brackets.
3. Assembled Sample of railing system, made from full-size components, including top rail, post, handrail, and infill. Sample need not be full height.

    a. Show method of connecting and finishing members at intersections.

Delegated-Design Submittal: For railings, including analysis and design data signed and sealed by the qualified professional engineer, licensed in the State of New York, responsible for their preparation.

Qualification Data: For professional engineer's experience with providing delegated-design engineering services of the kind indicated, including documentation that engineer is licensed and registered in the State of New York

Welding certificates.

Mill Certificates: Signed by manufacturers of stainless steel products, certifying that products furnished comply with requirements.

Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

Product Test Reports: For tests on railings performed by a qualified testing agency, in accordance with ASTM E894 and ASTM E935.

N. Research Reports: For post-installed anchors, from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.

Source quality-control reports.

Documentation to confirm compliance.

1.5 QUALITY ASSURANCE

Welding Qualifications: Qualify procedures and personnel in accordance with the following:

1. AWS D1.1, "Structural Welding Code - Steel."

If the value of the 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.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect mechanical finishes on exposed surfaces of railings from damage by applying a strippable, temporary protective covering before shipping.

1.7 FIELD CONDITIONS

Field Measurements: Verify actual locations of walls and other construction contiguous with railings by field measurements before fabrication.

1. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers.
2. Protect steel members and packaged materials from corrosion and deterioration.
3. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures.

    a. Repair or replace damaged materials or structures as directed.

B. Store and handle galvanized steel members per the recommendations of the American Galvanized Association.

PART 2 - PRODUCTS

PERFORMANCE REQUIREMENTS

Delegated Design: Engage a qualified professional engineer, licensed and registered to practice in the State of New York, to design railings, including attachment to building construction.

B. Structural Performance: Railings, including attachment to building construction, shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

Handrails and Top Rails of Guards:

a. Uniform load of 50 lbf/ ft. applied in any direction.
b. Concentrated load of 200 lbf applied in any direction.
c. Uniform and concentrated loads need not be assumed to act concurrently.

2. Infill of Guards:

a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft..
b. Infill load and other loads need not be assumed to act concurrently.

Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.

B. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails unless otherwise indicated.

1. Provide type of bracket with flange tapped for concealed anchorage to threaded hanger bolt and that provides 1-1/2-inch clearance from inside face of handrail to finished wall surface.

2.3 STEEL RAILINGS

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. Hollaender Mfg. Co.
2. Kee Safety, Inc.
3. VIVA Railings, LLC.
4. Approved equivalent.

Source Limitations: Obtain each type of railing from single source from single manufacturer.

Tubing: ASTM A500 (cold formed) or ASTM A513, Type 5.

Pipe: ASTM A53, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.

Provide galvanized finish for exterior installations and where indicated.

E. Plates, Shapes, and Bars: ASTM A36.

F. Cast Iron Fittings: Either gray iron, ASTM A48, or malleable iron, ASTM A47, unless otherwise indicated.

G. Expanded Metal Infill Panels: ASTM F1267, Type I (expanded).

1. Style Designation: 3/4 number 13.

2.4 FASTENERS

A. Fastener Materials:

1. Ungalvanized-Steel Railing Components: Plated steel fasteners complying with ASTM F1941, Class Fe/Zn 5 for zinc coating.

Hot-Dip Galvanized Railing Components: Type 316 stainless steel or hot-dip zinc-coated steel fasteners complying with ASTM A153 or ASTM F2329 for zinc coating.

B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction and capable of withstanding design loads.

C. Fasteners for Interconnecting Railing Components:

Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless otherwise indicated.

2. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless exposed fasteners are unavoidable or are the standard fastening method for railings indicated.

Provide Phillips flat-head machine screws for exposed fasteners unless otherwise indicated.

Post-Installed Anchors: Fastener systems with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC193 or ICC-ES AC308.

Material for Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B633 or ASTM F1941, Class Fe/Zn 5, unless otherwise indicated.

ISCELLANEOUS MATERIALS

A. Handrail Brackets: Cast iron center of handrail 2-1/2 inches from face of railing.

Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.

1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.

Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.

Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout, complying with ASTM C1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

E. Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound.

2.6 FABRICATION

A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.

B. Shop assemble railings to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations.

1. Clearly mark units for reassembly and coordinated installation.
2. Use connections that maintain structural value of joined pieces.

C. Cut, drill, and punch metals cleanly and accurately.

1. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated.
2. Remove sharp or rough areas on exposed surfaces.

D. Form work true to line and level with accurate angles and surfaces.

E. Fabricate connections that are exposed to weather in a manner that excludes water.

1. Provide weep holes where water may accumulate.
2. Locate weep holes in inconspicuous locations.

F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.

G. Connections: Fabricate railings with welded or bolted connections unless otherwise indicated.

Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.

1. Comply with AWS requirements and approved welding procedure specifications.
2. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
3. Obtain fusion without undercut or overlap.
4. Remove flux immediately.
5. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Finish #2 welds; good appearance, completely sanded joint, some undercutting and pinholes acceptable.

Form changes in direction as follows:

As detailed.

2. By flush bends.
3. Bends to smallest radius that will not result in distortion of railing member.

Bend members in jigs to produce uniform curvature for each configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.

K. Close exposed ends of hollow railing members with prefabricated cap and end fittings of same metal and finish as railings.

L. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch or less.

M. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.

At brackets and fittings fastened to plaster or gypsum board partitions, provide crush-resistant fillers or other means to transfer loads through wall finishes to structural supports and prevent bracket or fitting rotation and crushing of substrate.

N. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work.

1. Fabricate anchorage devices capable of withstanding loads imposed by railings.
2. Coordinate anchorage devices with supporting structure.

For railing posts set in concrete, provide stainless steel sleeves not less than 6 inches long with inside dimensions not less than 1/2 inch greater than outside dimensions of post, with metal plate forming bottom closure.

2.7 STEEL AND IRON FINISHES

A. For nongalvanized-steel railings, provide nongalvanized ferrous-metal fittings, brackets, fasteners, and sleeves; however, hot-dip galvanize anchors to be embedded in exterior concrete or masonry.

Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with SSPC-SP 6/NACE No. 3.

EXECUTION

3.1 EXAMINATION

Examine plaster and gypsum board assemblies, where reinforced to receive anchors, to verify that locations of concealed reinforcements are clearly marked for Installer. Locate reinforcements and mark locations if not already done.

3.2 INSTALLATION, GENERAL

A. Perform cutting, drilling, and fitting required for installing railings.

1. Fit exposed connections together to form tight, hairline joints.
2. Install railings level, plumb, square, true to line; without distortion, warp, or rack.
3. Set railings accurately in location, alignment, and elevation; measured from established lines and levels.
4. Do not weld, cut, or abrade surfaces of railing components that are coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.

Set posts plumb within a tolerance of 1/16 inch in 3 feet.

6. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.

B. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1. Coat concealed surfaces of aluminum that will be in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

C. Adjust railings before anchoring to ensure matching alignment at abutting joints.

D. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.3 RAILING CONNECTIONS

Nonwelded Connections: Use mechanical or adhesive joints for permanently connecting railing components. Use wood blocks and padding to prevent damage to railing members and fittings. Seal recessed holes of exposed locking screws, using plastic cement filler colored to match finish of railings.

B. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article, whether welding is performed in the shop or in the field.

Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve, extending 2 inches beyond joint on either side; fasten internal sleeve securely to one side; and locate joint within 6 inches of post.

3.4 ANCHORING POSTS

Use stainless steel pipe sleeves preset and anchored into concrete for installing posts. After posts are inserted into sleeves, fill annular space between post and sleeve with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions.

B. Form or core-drill holes not less than 5 inches deep and 3/4 inch larger than OD of post for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions.

Cover anchorage joint with flange of same metal as post, welded to post after placing anchoring material.

D. Leave anchorage joint exposed with anchoring material flush with adjacent surface.

Anchor posts to metal surfaces with flanges, angle type, or floor type, as required by conditions, connected to posts and to metal supporting members as follows:

For steel railings, weld flanges to post and bolt to metal supporting surfaces.

2. For aluminum railings, attach posts as indicated, using fittings designed and engineered for this purpose.
3. For stainless steel railings, weld flanges to post and bolt to supporting surfaces.

ATTACHING RAILINGS

Anchor railing ends to concrete and masonry with flanges connected to railing ends and anchored to wall construction with anchors and bolts.

B. Attach handrails to walls with wall brackets**,** except where end flanges are used. Provide brackets with 1-1/2-inch clearance from inside face of handrail and finished wall surface.

1. Use type of bracket with flange tapped for concealed anchorage to threaded hanger bolt.
2. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.

C. Secure wall brackets and railing end flanges to building construction as follows:

1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
2. For hollow masonry anchorage, use toggle bolts.

3.6 REPAIR

A. Touchup Painting:

Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

a. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

PROTECTION

A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.

B. Restore finishes damaged during installation and construction period, so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit or provide new units.

END OF SECTION 055213

SUNY ERIE COMMUNITY COLLEEGE NORTH CAMPUS
KITTINGER HALL BOILER ROOM UPGRADES
DIVISION 07
THERMAL AND MOISTURE PROTECTION SPECIFICATIONS
PAGE 1

SECTION	**DESCRIPTION**
078000	FIRESTOPPING
079200	JOINT SEALANTS

SECTION 078400 - FIRESTOPPING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Provide firestop systems consisting of a material, or combination of materials installed to retain the integrity of fire resistance rated construction by maintaining an effective barrier against the spread of flame, smoke and/or hot gases through penetrations, fire resistive joints, and perimeter openings in accordance with the requirements of the Building Code for this project.

B. Firestop systems shall be used in locations including, but not limited to, the following:

1. Penetrations through fire resistance rated floor and roof assemblies including both empty openings and openings containing penetrants.
2. Penetrations through fire resistance rated wall assemblies including both empty openings and openings containing penetrants.
3. Membrane penetrations in fire resistance rated wall assemblies where items penetrate one side of the barrier.
4. Joints between fire resistance rated assemblies.
5. Perimeter gaps between rated floors/roofs and an exterior wall assembly.

C. Related Sections include, but are not limited to, the following:

1. Division 21 – Fire Suppression
2. Division 22 – Plumbing
3. Division 23 – Heating, Ventilating and Air Conditioning
4. Division 26 – Electrical
5. Division 27 – Communications
6. Division 28 – Electrical Safety and Security

1.3 REFERENCES

A. New York State Uniform Fire Prevention and Building Code

B. National Fire Protection Association (NFPA)

1. NFPA 101 (Life Safety Code)

C. American Society For Testing and Materials Standards (ASTM):

1. ASTM E84: Standard Test Method for Surface Burning Characteristics of Building Materials.
2. ASTM E814: Standard Test Method for Fire Tests of Through-Penetration Firestops.

3. ASTM E1966: Test Method for Resistance of Building Joint Systems.
4. ASTM E1399: Test Method for Cyclic Movement and Measuring Minimum and Maximum Joint Width.
5. ASTM E119: Methods of Fire Tests of Building Construction and Materials.
6. ASTM E2174: Standard Practice for On-Site Inspection of Installed Fire Stops
7. ASTM E2307: Standard Test Method for Determining the Fire Endurance of Perimeter Fire Barrier Systems Using the Intermediate-Scale, Multi Story Test Apparatus (ISMA)
8. ASTM E2393-04 Standard Practice for On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers

D. Underwriters Laboratories Inc. (UL):
1. UL Qualified Firestop Contractor Program.
2. UL 263: Fire Tests of Building Construction and Materials.
3. UL 723: Surface Burning Characteristics of Building Materials.
4. UL 1479: Fire Tests of Through-Penetration Fire Stops.
5. UL 2079: Tests for Fire Resistance of Building Joint Systems.

E. UL Fire Resistance Directory -Volume 2:
1. Through-Penetration Firestop Devices (XHJI)
2. Fire Resistive Ratings (BXUV)
3. Through-Penetration Firestop Systems (XHEZ)
4. Fill, Void, or Cavity Material (XHHW)

F. Omega Point Laboratories (OPL)
1. Building Products, Materials & Assemblies – Volume II

G. Factory Mutual Research (FM):
1. FM 4991: FM Approval Standard of Firestop Contractors – Class 4991

1.4 DEFINITIONS

A. Firestopping: The use of a material or combination of materials in a fire-rated structure (wall or floor) where it has been breached, so as to restore the integrity of the fire rating on that wall or floor.

B. System: The use of a specific firestop material or combination of materials in conjunction with a specific wall or floor construction type and a specific penetrant(s).

C. Barrier: Any bearing or non-bearing wall or floor that has an hourly fire and smoke rating.

D. Through-penetration: Any penetration of a fire-rated wall or floor that completely breaches the barrier.

E. Membrane-penetration: Any penetration in a fire-rated wall or floor/roof-ceiling assembly that breaches only one side of the barrier.

F. Fire Resistive/Construction Joint: Any gap, joint, or opening, whether static or dynamic, between two fire rated barriers including where the top of a wall meets a floor; wall edge to wall edge applications; floor edge to floor edge configurations; floor edge to wall.

G. Perimeter Barrier: Any gap, joint, or opening, whether static or dynamic, between a fire rated floor assembly and an exterior wall assembly.

H. Approved Testing Agencies: Not limited to: Underwriters Laboratory (UL), Factory Mutual (FM), Warnock Hersey, and Omega Point Laboratory (OPL).

1.5 PERFORMANCE REQUIREMENTS

A. Penetrations: Provide through-penetration and membrane-penetration firestop systems that are produced and installed to resist the spread of fire, passage of smoke and other hot gases according to requirements indicated, to restore the original fire-resistance rating of assembly penetrated.

1. Provide and install complete penetration firestopping systems that have been tested and approved by nationally accepted testing agencies per ASTM E814 or UL 1479 fire tests in a configuration that is representative of field conditions.

2. F-Rated Systems: Provide firestop systems with F-ratings indicated, as determined per ASTM E814 or UL 1479, but not less than one (1) hour or the fire resistance rating of the assembly being penetrated.

3. T-Rated Systems: Provide firestop systems with T-ratings indicated, as well as F-ratings, as determined per ASTM E814 or UL 1479, and where required by the Building Code for floor penetrations which are not located within the cavity of a wall.

4. L- Rated Systems: Provide firestop systems with L- ratings less than 5cfm/sf.

5. W-Rated systems: Provide firestop systems that are resistant to water. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems.

6. For penetrations involving non-metallic, CPVC, PVC, or plastic piping, tubing or conduit, provide firestop systems that are chemically compatible in accordance with Manufacturer requirements.

7. For penetrations involving insulated piping, provide firestop systems not requiring removal of insulation.

8. For penetrations involving fire or fire/smoke dampers, only firestop products approved by the damper manufacturer shall be installed in accordance with the damper installation instructions.

B. Fire Resistive Joints: Provide joint systems with fire resistance assembly ratings indicated, as determined by UL 2079 (ASTM E1399 and E1966), but not less than the fire resistance assembly rating of the construction in which the joint occurs. Firestopping assemblies must be capable of withstanding anticipated movements for the installed field conditions.

1. For firestopping assemblies exposed to view, traffic, moisture, and physical damage, provide products that after curing do not deteriorate when exposed to these conditions both during and after construction.

2. For floor penetrations exposed to possible loading and traffic, provide firestop systems capable of supporting floor loads involved either by installing floor plates or by other means, as specified by the Architect.

3. L- Rated Systems: Provide firestop systems with L- ratings less than 5cfm/sf.

C. Firestopping products shall have flame spread ratings less than 25 and smoke-developed ratings less than 450, as determined per ASTM E 84. Note: Firestop products installed in plenum spaces shall have a smoke developed rating less that 50.

D. Engineering Judgment (EJ): Where there is no specific third party tested and classified firestop system available for an installed condition, the Contractor shall obtain from the firestopping material manufacturer an Engineering Judgment (EJ) to be submitted to the Design Professional and where required the Authority Having Jurisdiction for approval prior to installation. The EJ shall follow International Firestop Council (IFC) guidelines. Note: Tested and Listed firestop systems are to be used before an Engineering Judgment (EJ). Engineeing Judgments (EJ) shall not be utilized as an alternative to proper construction or coordination.

1.6 SUBMITTALS

A. Product Data: For each type of firestopping product selected. Manufacturers certification must verify that firestopping materials are free of asbestos, lead and contain volatile organic compounds (VOCs) within limits of the local jurisdiction.

B. Design Listings: Submit system design listings, including illustrations, from a qualified testing and inspecting agency that is applicable to each firestop configuration.

C. Installation Instructions: Submit the manufacturer's installation instruction for each firestop assembly.

D. Where there is no specific third party tested and classified firestop system available for a particular configuration, the Contractor shall obtain from the firestopping material manufacturer an Engineering Judgment (EJ) for submittal.

E. Material Safety Data Sheet (MSDS): Submit for each type of firestopping product selected.

F. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Submit documents as per 1.7.

G. A quality control manual approved by FM or UL (if applicable).

H. Firestop Schedule: Submit schedule (see appendix A) itemizing the following:

1. Manufacturer's product reference numbers and/or drawing numbers.
2. Listing agency's design number.
3. Penetrating Item Description/Limits: Material, size, insulated or uninsulated, and combustibility.
4. Maximum allowable annular space or maximum size opening.
5. Wall type construction.
6. Floor type construction.
7. Hourly Fire resistance rating of wall or floor.
8. F rating.
9. T rating for floor penetrations not in a cavity of a wall. The F and T ratings shall be equal.
10. L and W rating, if applicable.

I. Firestop Application Log: A separate binder shall be prepared and kept on site for use by the Inspection Agency and the Authority Having Jurisdiction. The binder shall contain the following:

1. The binder shall be a three (3) ring binder.
2. Firestop Schedule (see appendix A)
3. All approved firestopping assemblies including engineering judgments shall be provided and organized by trade.
4. Copy of manufacturer's installation instruction for each firestop assembly.
5. A matrix or table of contents listing each assembly shall be provided.
6. The binder shall be updated as new firestop assemblies or EJ's are added.
7. The binder shall be kept on-site at a location approved by the Owner.
8. Qualifications or Certification of each Installer

1.7 QUALITY ASSURANCE

A. Provide firestopping system design listings from UL, FM, Warnock Hersey or OPL in accordance with the appropriate ASTM Standard(s) per article 1.5.

B. Contractor Qualifications: An acceptable Firestop Contractor shall be:

1. Licensed by State or Local Authority where applicable, or
2. FM Research approved in accordance with FM Standard 4991, or
3. UL Qualified Firestop Contractor, or
4. Meet the following requirements
   i. Installation personnel shall be trained by the approved firestop manufacturer.
   ii. The installation firm shall be experienced in installing firestop systems and fire resistive joint systems similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful performance.
   iii. Qualifications include having the necessary experience, staff, and training to install manufacturer's products per specified tested and listed system requirements.
   iv. Minimum of three (3) years experience and shown to have successfully completed not less than 5 comparable scale projects and provide references.

C. Single Source Limitations: Obtain firestop systems for all conditions from a single manufacturer. The only exception is where a listed firestop system is available for a specific opening from another manufacturer, it shall be utilized before an Engineering Judgment.

D. Materials from different firestop manufacturers shall not be installed in the same firestop system or opening.

E. Firestopping material shall be asbestos and lead free and shall not incorporate nor require the use of hazardous solvents.

F. Firestopping sealants must be flexible, allowing for normal movement.

G. Firestopping materials shall not shrink upon drying as evidenced by cracking or pulling back from contact surfaces such that a void is created.

H. Firestopping materials shall be moisture resistant, and may not dissolve in water after curing.

I. Materials used shall be in accordance with the manufacturer's written installation instructions.

J. Identify installed firestop systems with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches (150 mm) of edge of the firestop systems so that labels will be visible to anyone seeking to remove penetrating items or firestop systems. In addition, for perimeter or joint firestop systems attach labels at locations every 20 feet or at least each section where separated. Use mechanical fasteners for metal labels. For plastic labels, use self-adhering type with adhesives capable of permanently bonding labels to surfaces on which labels are placed and provide a label material that will result in partial destruction of label if removal is attempted. Include the following information on labels:

1. The words "Warning - Firestop System - Do Not Disturb. Notify Building Management of Any Damage."
2. Contractor's name, address, and phone number.
3. Firestop system designation of applicable testing and listing agency.
4. Date of installation.
5. Firestop system manufacturer's name.
6. Installer's name.
7. Inspector's name (if applicable)

K. Inspection of penetrations through fire rated floor and wall assemblies shall be in accordance with ASTM E2174, Standard Practice for On-Site Inspection of Installed Fire Stops and ASTM E2393-04 Standard Practice for On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers. The Owner may engage a qualified, independent inspection agency, or material testing agency to perform these inspections.

L. In high-rise buildings or in buildings assigned to Risk Category III or IV, Special inspection for through-penetrations, membrane penetration firestops, fire-resistant joint systems and perimeter fire barrier systems shall be conducted by an approved agency.

M. Field Mock-up Installations: Prior to installing firestopping, erect mock-up installations for each type firestop system indicated in the Firestop Schedule to verify selections made and to establish standard of quality and performance by which the firestopping work will be judged by the Owner or Owner's Representative. Obtain acceptance of mock-up installations by the Owner or Owner's Representative before start of firestopping installation. Provide at least 72 hours notice to Owner or Owner's Representative prior to inspection.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver firestopping products to Project site in original, unopened containers or packages with intact and legible manufacturer's labels identifying product and manufacturer, date of manufacture/expiration, lot number, listing agency's classification marking, and mixing instructions for multi-component materials.

B. Store and handle materials per manufacturer's instructions to prevent deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

C. All firestop materials shall be installed prior to expiration date.

1.9 PROJECT CONDITIONS

A. Environmental Limitations: Install firestopping when ambient or substrate temperatures are within limits permitted by the manufacturer's written instructions. Do not install firestopping when substrates are wet due to rain, frost, condensation, or other causes.

B. Ventilate per the manufacturers written instructions on the product's Material Safety Data Sheet.

C. Verify the condition of the substrates before starting work.

D. Care should be taken to ensure that firestopping materials are installed so as not to contaminate adjacent surfaces.

1.10 COORDINATION

A. Coordinate areas prior to firestopping installation with the Owner, Construction Manager and/or all other Contractors.

B. Coordinate construction of openings and penetrating items to ensure that firestopping assemblies are installed according to specified requirements. Opening shall not exceed maximum restrictions allowable for annular spacing per listing or acceptable Engineering Judgments.

C. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-penetration firestop systems.

D. Do not conceal firestopping installations until the Owner's inspection agency or Authorities Having Jurisdiction have examined each installation.

E. Schedule firestopping after installation of penetrants and joints but prior to concealing or obstructing access to areas requiring firestopping.

F. Preinstallation Conference: This conference should be a joint meeting attended by the Owner's Representative and all prime contractors, respective firestopping sub-contractors and firestopping company field advisor to review project requirements. The agenda for the conference should include the following topics:

1. Review scope of work.
2. Review shop drawings and firestop application log.
3. Review mock-up requirements.
4. Discuss identification labels and locations.
5. Review schedule, coordination and sequencing with all trades.
6. Review any engineering judgments or other special requirements.
7. Function and frequency of inspections and testing labs.

G. Destructive testing shall be performed at mock up and at pre determined intervals according to ASTM E 2174 and ASTM E 2393-04 by the inspector and with the installing Contractor present. Inspector to test for in place installation conformance to tested and listed system or engineering judgment details. Non conformances will result in additional destructive testing, at the cost of the installer.

PART 2 - PRODUCTS

2.1 FIRESTOPPING, GENERAL

A. Firestopping products specified in system design listings by approved testing agencies may be used providing they conform to the construction type, penetrant type, annular space requirements and fire rating involved in each separate assembly.

B. Manufacturer of firestopping products shall have been successfully producing and supplying these products for a period of not less than three years and be able to show evidence of at least ten projects where similar products have been installed and accepted.

C. Accessories: Provide components for each firestop system that is needed to install fill materials and to comply with "Performance Requirements" Article. Use only components specified by the firestopping manufacturer and by the approved testing agencies for the firestop systems indicated. Accessories include, but are not limited to the following items:

1. Permanent forming/damming/backing materials, including the following:
    i. Slag wool fiber insulation.
    ii. Foams or sealants used to prevent leakage of fill materials in liquid state.
    iii. Fire-rated form board.
    iv. Polyethylene/polyurethane backer rod.
    v. Rigid polystyrene board.
2. Temporary forming materials.
3. Substrate primers.
4. Steel sleeves

D. All firestopping products and systems shall be designed and installed so that the basic sealing system will allow the full restoration of the thermal and fire resistance properties of the barrier being penetrated with minimal repair if penetrants are subsequently removed.

2.2 MIXING

A. For those products requiring mixing before application, comply with firestopping manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

2.3 MANUFACTURERS

A. Subject to compliance with the requirements, provide products by one of the following or equivalent manufacturers:

1. Grace Construction Products.
2. Nelson Firestop Products.
3. Hilti Firestop Products.
4. A/D Fire Protection Systems Inc.

5. RectorSeal Corporation (The).
6. Specified Technologies Inc.
7. 3M; Fire Protection Products Division.
8. Tremco; Sealant/Weatherproofing Division.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. Verify that all pipes, conduits, cables, and/or other items which penetrate fire-rated construction have been permanently installed prior to installation of firestops.

3.2 PREPARATION

A. Surface Cleaning: Clean out openings immediately before installing firestop systems to comply with written recommendations of firestopping manufacturer and the following requirements:

1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of firestop systems.
2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with firestop systems. Remove loose particles remaining from cleaning operation.
3. Remove laitance and form-release agents from concrete.

3.3 FIRESTOP SYSTEMS INSTALLATION

A. General: Install firestop systems to comply with “Performance Requirements” article in Part 1 and firestopping manufacturer’s written installation instructions and published drawings for products and applications indicated.

B. Installation of firestopping shall be performed by an applicator/installer qualified as described in article 1.7.

C. Apply firestopping in accordance with approved testing agencies listed system designs or manufacturer’s EJ per the manufacturer’s installation instructions.

D. Verify that environmental conditions are safe and suitable for installation of firestop products.

E. Install forming/damming/backing materials and other accessories required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire resistance ratings required.

F. Install joint forming/damming materials and other accessories required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths of installed firestopping material relative to joint widths that allow optimum movement capability and achieve fire resistance ratings required.

G. Install metal framing, curtain wall insulation, mechanical attachments, safing materials and firestop materials as applicable within the system design.

H. Install fill materials for firestop systems by proven techniques to produce the following results:

1. Fill voids, joints and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
2. Apply materials so they fully contact and adhere to substrates formed by openings and penetrating items.
3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.
4. Tool non-sag firestop materials after their application and prior to the time skinning begins. Use tooling agents approved by the firestopping manufacturer.

I. On vertical pipe penetrations, lift riser clamps to permit the installation of firestopping around the entire pipe penetration. For penetrations involving fire or fire/smoke dampers, only firestop products approved by the damper manufacturer shall be installed in accordance with the damper installation instructions.

3.4 FIELD QUALITY CONTROL

A. Inspecting Agency: Authorities Having Jurisdiction, the Owner, or Owner's Representative shall be allowed to perform random destructive testing during inspection of firestop systems to verify compliance per listings or manufacturer's installation instructions. All areas of work must be accessible until inspection by the applicable Authorities Having Jurisdiction and inspection agencies. The contractor shall be responsible to repair all tested assemblies with no cost to the owner.

B. Proceed with enclosing firestop systems with other construction only after inspections are complete.

C. Where deficiencies are found, repair or replace firestop systems so they comply with requirements.

3.5 CLEANING AND PROTECTION

A. Clean off excess fill materials adjacent to openings, as Work progresses by methods and with cleaning materials that are approved in writing by firestopping manufacturer(s) and that do not damage materials in which openings occur. Leave finished work in neat, clean condition with no evidence of spillovers or damage to adjacent surfaces.

B. Provide final protection and maintain conditions during and after installation that ensure firestop systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated firestop systems immediately and install new materials to produce firestop systems complying with specified requirements.

ERIE COUNTY DEPARTMENT OF PUBLIC WORKS
OFFICE OF THE COMMISSIONER

FIRESTOP SCHEDULE

Project No:	Contractor Name and Address:	Date Submitted:
Project Title:	Supplier/Installer Name and Address:	Company Field Advisor Name and Address:
	Manufacturer Name and Address:	

Manufacturer's Product Reference Numbers and/or Drawing Numbers	U.L., FM, Warnock Hersey or Omega Point Lab Penetration Design Nos.	Penetrating Item: Material, Size, Insulated, Combustible, Joint, Perimeter, etc. Description:	Maximum Allowable Annular Space or Maximum Size Opening	Wall type Construction		Floor Type Construction	Fire Resistance Rating of Wall or Floor (Hourly)	F Rating	T Rating (floors Only)	L Rating (if available)	W Rating (if available)
				DES.	CONST.						
Example No. 1 DCFSS-130	UL #130	Maximum 4" Steel Pipe Non-Insulated		P4	6" CMU	N.A.	1 Hour	1 Hour	N.A	.	
Example No. 2 5300-ICF88.01	UL #591	Maximum 4" PVC Pipe		N.A.	N.A.	UL # D916	3 Hour	1 Hour	2 Hour		
Exmple No. 3	CW-S-2006	Curtain Wall/Perimeter	6” to 12”	NA	NA	4 ½” Reinforced LW	2 Hour	2 Hour	NA	1 CFM/ Lin	

Manufacturer's Product Reference Numbers and/or Drawing Numbers	U.L., FM, Warnock Hersey or Omega Point Lab Penetration Design Nos.	Penetrating Item: Material, Size, Insulated, Combustible, Joint, Perimeter, etc. Description:	Maximum Allowable Annular Space or Maximum Size Opening	Wall type Construction		Floor Type Construction	Fire Resistance Rating of Wall or Floor (Hourly)	F Rating	T Rating (floors Only)	L Rating (if available)	W Rating (if available)
				DES.	CONST.						
						concrete				Ft.	

SECTION 079200 - JOINT SEALANTS

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. Silicone joint sealants.
2. Nonstaining silicone joint sealants.
3. Urethane joint sealants.
4. Latex joint sealants.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

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 joint-sealant product.

1. Including manufacturer’s installation instructions.

E. Quality Control Submittals:

1. Installer’s Qualifications Data: Affadavit required under Quality Assurance Article
2. Company Field Advisor Data: Name, Business Address and Telephone Number of Company Field Advisor

F. Samples:

1. Joint Fillers: 24 inches long full section.
2. Gaskets: 24 inches long full section.
3. Joint Primer/Sealer/Conditioners: 1 pint.
4. Backer Rods: 24 inches long full section.
5. Bond Breaker Tape: 24 inches long full section.
6. Sealants: 1 pint or standard tube

G. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

H. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2-inch-wide joints formed between two 6-inch- long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

I. Joint-Sealant Schedule: Include the following information:

1. Joint-sealant application, joint location, and designation.
2. Joint-sealant manufacturer and product name.
3. Joint-sealant formulation.
4. Joint-sealant color.

J. Qualification Data: For qualified testing agency.

K. Product Test Reports: For each kind of joint sealant, for tests performed by manufacturer and witnessed by a qualified testing agency.

L. Preconstruction Laboratory Test Schedule: Include the following information for each joint sealant and substrate material to be tested:

1. Joint-sealant location and designation.
2. Manufacturer and product name.
3. Type of substrate material.
4. Proposed test.
5. Number of samples required.

M. Preconstruction Laboratory Test Reports: From sealant manufacturer, indicating the following:

1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
2. Interpretation of test results and written recommendations for primers and substrate preparation are needed for adhesion.

N. Preconstruction Field-Adhesion-Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on testing specified in "Preconstruction Testing" Article.

O. Field-Adhesion-Test Reports: For each sealant application tested.

P. Sample Warranties: For special warranties.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

1. The persons installing the sealants and their supervisor shall be personally experienced in the installation of sealants and shall have been regularly employed by a company engaged in the installation of sealants for a minimum of two years.

a. Furnish to the Owner the names and addresses of five similar projects which the foregoing people have worked on during the past two years.
b. Furnish a letter from the sealant manufacturer, stating that the foregoing people are authorized to install the manufacturer's sealant materials and that the manufacturer's specifications are applicable to the requirements of this Project.

B. Product Testing: Test joint sealants using a qualified testing agency.

1. Testing Agency Qualifications: Qualified according to ASTM C1021 to conduct the testing indicated.
2. Test and validate sealants used for exterior weathersealing per the Sealant Waterproofing Restoration Institute (SWRI).

C. Container Labels: Include manufacturer's name, trade name of product, kind of material, federal specification number (if applicable), expiration date (if applicable), and packaging date or batch number.

D. Mockups: Install sealant in mockups of assemblies specified in other Sections that are indicated to receive joint sealants specified in this Section. Use materials and installation methods specified in this Section.

1.6 PRECONSTRUCTION TESTING

A. Preconstruction Laboratory Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.

1. Adhesion Testing: Use ASTM C794 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
2. Compatibility Testing: Use ASTM C1087 to determine sealant compatibility when in contact with glazing and gasket materials.

3. Stain Testing: Use ASTM C1248 to determine stain potential of sealant when in contact with stone and masonry substrates.
4. Submit manufacturer's recommended number of pieces of each type of material, including joint substrates, joint-sealant backings, and miscellaneous materials.
5. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.

6. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures, including use of specially formulated primers.
7. Testing will not be required if joint-sealant manufacturers submit data that are based on previous testing, not older than 24 months, of sealant products for adhesion to, staining of, and compatibility with joint substrates and other materials matching those submitted.

B. Preconstruction Field-Adhesion Testing: Before installing sealants, field test their adhesion to Project joint substrates as follows:

1. Locate test joints where indicated on Project or, if not indicated, as directed by Owner's Representative.
2. Conduct field tests for each kind of sealant and joint substrate.
3. Notify Owner's Representative seven days in advance of dates and times when test joints will be erected.
4. Arrange for tests to take place with joint-sealant manufacturer's technical representative present.

    a. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1.1 in ASTM C1193 or Method A, Tail Procedure, in ASTM C1521.

        1) For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.

5. Report whether sealant failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. For sealants that fail adhesively, retest until satisfactory adhesion is obtained.
6. Evaluation of Preconstruction Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrates during testing.

1.7 FIELD CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:

1. Humidity and Moisture: Do not install the Work of this Section under conditions that are detrimental to the application, curing and performance of the material.
2. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
3. When joint substrates are wet.
4. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
5. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

6. Ventilation: Provide sufficient ventilation wherever sealants, primers, and other similar materials are installed in enclosed spaces. Follow manufacturer's recommendations.

1.8 WARRANTY

A. Special Installer's Warranty: Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

B. Special Manufacturer's Warranty: Manufacturer agrees to furnish joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:

1. Movement of the structure caused by stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
2. Disintegration of joint substrates from causes exceeding design specifications.
3. Mechanical damage caused by individuals, tools, or other outside agents.
4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

D. Product Warranties

1. Silicone Sealant: 20 years weatherseal warranty.
2. Polyurethane: 5-year weatherseal warranty.
3. Sealants for granite, marble and limestone: 20-year non-stain warranty.

PART 2 - PRODUCTS

2.1 JOINT SEALANTS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

B. Colors of Exposed Joint Sealants: As selected by Owner’s Representative from manufacturer's full range.

C. Colors of Concealed Joint Sealants: provide the natural color which has the best overall performance characteristics.

2.2 SILICONE JOINT SEALANTS

A. Silicone, S, NS, 100/50, NT: Single-component, nonsag, plus 100 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 100/50, Use NT.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to the following:

a. Dowsil; 790 Silicone Building Sealant
b. Or equal.

B. Silicone, S, NS, 50, NT: Single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 50, Use NT.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to the following:

a. Dowsil; 756 SMS Building Sealant (cold weather application)
b. Dowsil; 791
c. Dowsil; 795
d. Dowsil; Contractors Concrete Sealant (CCS)
e. GE Construction Sealants; SCS2000 SilPruf Sealant
f. Or equal.

C. Silicone, S, NS, 35, NT: Single-component, nonsag, plus 35 percent and minus 35 percent movement capability. nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 35, Use NT.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to the following:

a. Dowsil; Contractors Weatherproofing Sealant (CWS)
b. GE Construction Sealants; SWS Sealant
c. Or equal.

D. Silicone, S, NS, 100/50, T, NT: Single-component, nonsag, plus 100 percent and minus 50 percent movement capability, traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 100/50, Uses T and NT.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to the following:

a. Pecora Corporation; 300SL
b. Dowsil; NS Parking Structure Sealant.
c. Or equal.

E. Silicone, M, SL, 100/50, T, NT: Multicomponent, self-levelling, plus 100 percent and minus 50 percent movement capability, traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type M, Class 100/50, Uses T and NT.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to the following:

a. Dowsil; Parking Structure Sealant FC or SL
b. Or equal.

F. Silicone: Single-component sealant for high temperatures.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to the following:

a. Dowsil; 736 Heat Resistant Sealant
b. Dowsil; Hi-Temp Sealant Red
c. Henkel Adhesives; Loctite SI 596
d. Tremco Incorporated; TremPro 644 HT
e. Or equal.

2.3 NONSTAINING SILICONE JOINT SEALANTS

A. Nonstaining Joint Sealants: No staining of substrates when tested according to ASTM C1248.

B. Silicone, Nonstaining, S, NS, 100/50, NT: Nonstaining, single-component, nonsag, plus 100 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 100/50, Use NT.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to the following:

a. Pecora Corporation; 890FTS.
b. Pecora Corporation; 890NST.
c. Or equal.

C. Silicone, Nonstaining, S, NS, 50, NT: Nonstaining, single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 50, Use NT.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to the following:

a. Pecora Corporation; 864NST.
b. Pecora Corporation; 895NST.

c. Or equal.

2.4 URETHANE JOINT SEALANTS

A. Urethane, S, NS, 50, NT: Single-component, nonsag, nontraffic-use, plus 50 percent and minus 50 percent movement capability, urethane joint sealant; ASTM C920, Type S, Grade NS, Class 50, Use NT.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to the following:

a. Tremco Incorporated; Dymonic 100
b. Or equal.

B. Urethane, S, NS, 35, NT: Single-component, nonsag, plus 35 percent and minus 35 percent movement capability, non-traffic-use, urethane joint sealant; ASTM C920, Type S, Grade NS, Class 5, Use NT.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to the following:

a. Bostik; Chem-Calk 915
b. Master Builders Solutions; MasterSeal NP1
c. Or equal.

C. Urethane, S, NS, 35, T: Single-component, nonsag, plus 35 percent and minus 35 percent movement capability, traffic-use, urethane joint sealant; ASTM C920, Type S, Grade NS, Class 5, Use T.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to the following:

a. Sika Corporation; Sikaflex-1a
b. Or equal.

D. Urethane, S, NS, 25, NT: Single-component, nonsag, nontraffic-use, plus 25 percent and minus 25 percent movement capability, urethane joint sealant; ASTM C920, Type S, Grade NS, Class 25, Use NT.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to the following:

a. Bostik; Chem-Calk 916 Textured.
b. Or equal.

E. Urethane, S, NS, 25, T, NT: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C920, Type S, Grade NS, Class 25, Uses T and NT.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to the following:

a. Sika Corporation; Sikaflex Textured Sealant
b. Tremco Incorporated; Vulkem 116
c. Or equal.

F. Urethane, S, P, 35, T: Single-component, pourable, plus 35 percent and minus 35 percent movement capability, traffic, urethane joint sealant; ASTM C920, Type S, Grade P, Class 35, Uses T.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to the following:

a. Tremco Incorporated; Vulkem 45SSL
b. Or equal.

G. Urethane, S, P, 25, T: Single-component, pourable, plus 25 percent and minus 25 percent movement capability, traffic-use, urethane joint sealant; ASTM C920, Type S, Grade P, Class 25, Uses T.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to the following:

a. Sika Corporation; Sikaflex-1c SL
b. Or equal.

H. Urethane, M, NS, 50, T: Multicomponent, nonsag, plus 50 percent and minus 50 percent movement capability, traffic -use, urethane joint sealant; ASTM C920, Type M, Grade NS, Class 50, Uses T.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to the following:

a. Pecora Corporation; Dynatrol II
b. Or equal.

I. Urethane, M, NS, 25, T, NT: Multicomponent, nonsag, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C920, Type M, Grade NS, Class 25, Uses T and NT.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to the following:

    a. Sika Corporation; Joint Sealants; Sikaflex 2c NS EZ Mix.
    b. Or equal.

J. Urethane, M, P, 35, T, NT: Multicomponent, pourable, plus 35 percent and minus 35 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C920, Type M, Grade P, Class 35, Uses T and NT.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to the following:

    a. Tremco Incorporated; Vulkem 445SSL.
    b. Or equal.

K. Urethane, M, P, 25, T, NT: Multicomponent, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C920, Type M, Grade P, Class 25, Uses T and NT.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to the following:

    a. Pecora Corporation; Urexpan NR 200.
    b. Tremco Incorporated; THC 900/901.
    c. Sika Corporation; Sikaflex-2c SL
    d. Or equal.

2.5 LATEX JOINT SEALANTS

A. Acrylic Latex: Acrylic latex or siliconized acrylic latex, ASTM C834, Type OP, Grade NF.

1. Products: Subject to compliance with requirements, provide the following:

    a. Bostik; Duo-Sil.
    b. GE Construction Sealants; All Weather Pro Sealant.
    c. Pecora Corporation; AVW-920; AC-20.
    d. Or equal.

2.6 MISCELLANEOUS SEALANTS

A. Flame and smoke resistant intumescent sealant:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to the following:

a. Metacaulk MC 150+ Firestop Sealant,
b. 3M Fire Barrier Caulk CP 25WB+,
c. Dowsil; Smoke Seal 800SL
d. Or equal.

2.7 JOINT FILLERS

A. Self-Expanding Cork Joint Filler: Resilient, non-extruding type pre-molded cork units; ASTM D 1752, Type III.

B. Cork Joint Filler: Resilient, non-extruding type pre-molded cork units; ASTM D 1752, Type II.

C. Closed Cell Neoprene Joint Filler: ASTM D 1056, Class SC (oil resistant and medium swell), 2 to 5 psi compression deflection.

D. Expanded Polyethylene Joint Filler: Flexible, compressible, closed-cell polyethylene of not less than 10 psi compression deflection (25 percent).

E. Closed Cell Polyurethane Joint Filler: Resilient, compressible, semi-rigid; W.R. Meadows Ceramar or A.C. Horn Closed Cell Plastic Foam Filler, Code 5401.

2.8 GASKETS

A. Hollow Neoprene Gasket: Hollow or compartmentalized neoprene extrusion, designed to withstand compression to 40 percent of normal width without extrusion from joint, and with full recovery; heavy, durable top member, suitable for long-term exposure to weather and traffic, hardness of 55 Shore A; ASTM D 2628.

B. Adhesive Closed-Cell PVC Gasket: Closed-cell, flexible, self-adhesive, non-extruding, polyvinylchloride foam gaskets; ASTM D 1667.

2.9 JOINT-SEALANT BACKING

A. Cylindrical Sealant Backings: ASTM C1330, Type C (closed-cell material with a surface skin), Type O (open-cell material), Type B (bicellular material with a surface skin) or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

B. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.10 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

1. For Security Sealant (two part):

a. Pecora Corporation; No. P-100 for non-porous substrates.
b. Pecora Corporation; No. P-75 or P-200 for porous substrates.
c. Or equal.

2. For Security Sealant (one component):

a. Pecora Corporation; No. P-100 for non-porous substrates.
b. Pecora Corporation; No. P-75 for porous substrates.
c. Master Builder’s Solutions; MasterSeal P173 and P 176 for porous or non- porous substrates.
d. Or equal.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and

approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.

2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:

    a. Concrete.
    a. Masonry.

3. Remove laitance and form-release agents from concrete.

    Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:

    a. Glass.

B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of sealant backings.
2. Do not stretch, twist, puncture, or tear sealant backings.
3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint profile per Figure 8A in ASTM C1193 unless otherwise indicated.

3.4 FIELD QUALITY CONTROL

A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:

1. Extent of Testing: Test completed and cured sealant joints as follows:

    a. Perform one test for each 1000 feet of joint length thereafter or one test per each floor per elevation.

2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C1193 or Method A, Tail Procedure, in ASTM C1521.

    a. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.

3. Inspect tested joints and report on the following:

    a. Whether sealants filled joint cavities and are free of voids.
    b. Whether sealant dimensions and configurations comply with specified requirements.
    c. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. Compare these results to determine if adhesion complies with sealant manufacturer's field-adhesion hand-pull test criteria.

4. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant material, sealant configuration, and sealant dimensions.

5. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.

B. Evaluation of Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.5 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.6 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.7 JOINT-SEALANT SCHEDULE

A. Joint-Sealant Application: Exterior joints in vertical and horizontal nontraffic surfaces, Type 1.

1. Joint Locations:

   a. Control and expansion joints in unit masonry.
   b. Joints in dimension stone cladding.
   c. Joints between different materials listed above.
   d. Perimeter joints between materials listed above and frames of doors, windows and louvers.

2. Joint Sealant:

   a. Silicone, S, NS, 100/50, NT
   b. Silicone, S, NS, 50, NT
   c. Silicone, S, NS, 35, NT
   d. Silicone, Nonstaining, S, NS, 100/50, NT
   e. Silicone, Nonstaining, S, NS, 50, NT

B. Joint-Sealant Application: Joints at sealing pipe penetrations for piping conveying materials up to 140 degrees F and fuel oil supply and fuel dispensing systems.

1. Joint Sealant: Polysulfide, M, NS, 25, T, NT.

C. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces not subject to significant movement.

1. Joint Locations:

a. Control joints on exposed interior surfaces of exterior walls.
b. Perimeter joints between interior wall surfaces and frames of interior doors and windows.
c. Joints and cracks 3/16” or less in width.

2. Joint Sealant:

a. Acrylic latex

D. Joint-Sealant Application: Concealed mastics.

1. Joint Locations:

a. Aluminum thresholds.
b. Sill plates.

2. Joint Sealant: Butyl-rubber based.

E. Joint-Sealant Application: High temperature joints over 140 degrees F.

1. Joint Locations:

a. Pipe penetrations.

2. Joint Sealant:

a. Silicone: Single-component sealant for high temperatures.

F. Joint-Sealant Application: Flame and smoke resistant joints.

1. Joint Locations:

a. Smoke partitions.

2. Joint Sealant:

a. Flame and smoke resistant intumescent sealant.

END OF SECTION 079200

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KITTINGER HALL BOILER ROOM UPGRADES
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SECTION	**DESCRIPTION**
081540	PULTRUDED FIBERGLASS REINFORCED POLYESTER (FRP) FACED DOORS AND FIBERGLASS FRAMES
085113	ALUMINUM WINDOWS
087100	DOOR HARDWARE

SECTION 081540 – PULTRUDED FIBERGLASS REINFORCED POLYESTER (FRP) FACED DOORS AND FIBERGLASS FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Pultruded fiberglass reinforced polyester (FRP) faced doors
2. Fiberglass frames for FRP doors, including frames for sidelites and transoms.
3. Installation of hardware (except surface mounted hardware).

B. Related sections include the following:

1. Division 08 Section “Hollow Metal Doors and Frames” for hollow metal frames used with pultruded fiberglass doors
2. Division 08 Section "Door Hardware."

1.2 SUBMITTALS

A. Product data including specifications, standard details, and installation recommendations for polyester faced doors and panels and fiberglass frames including test reports certifying that products have been tested and comply with performance requirements, details of core and edge construction, trim for openings, and finish.

B. Shop drawings showing fabrication and installation of polyester faced doors, panels and frames. Include elevations of door design types, details of construction, location and installation requirements of door hardware and reinforcements, and details of openings.

1. Provide schedule of doors indicating sizes, locations, and other pertinent information using same reference numbers for details and openings as those on contract drawings.

C. Samples for initial selection purposes in form of manufacturer's color charts showing full range of colors available for doors and panels.

D. Samples for Verification Purposes: Submit 6" square samples of each color of face sheet specified and 12" long sections of fiberglass frames with specified finish system applied. Where normal color and texture variations are to be expected, include 2 or more units in each set of samples showing limits of such variations.

1.4 QUALITY ASSURANCE

A. Single Source Responsibility: Provide doors and frames produced by single manufacturer for entire Project.

B. Manufacturer Qualifications: Provide product series that has produced by the manufacturer for at least five years, for similar building type and size as this project.

C. Installer's Qualifications: Firm with not less than 4 years' successful experience installing systems similar to those required.

D. Fire Performance Characteristics: Provide Class "A" fiber reinforced polyester faces with the following surface burning characteristics as determined by testing identical products per ASTM E 84 by UL or other testing and inspecting organizations acceptable to authorities having jurisdiction.

1. Flame Spread: 25 or less.
2. Smoke Developed: 450 or less.

E. Design Criteria: The construction documents are based on a specific polyester faced door and fiberglass frame system. Other manufacturers' system of similar and equivalent nature will be acceptable when, in Architect's judgement, differences do not materially detract from design concept or intended performance.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver doors cardboard-wrapped or crated to provide protection during transit and job storage. Provide additional protection to prevent damage to surface finishes.

B. Inspect doors upon delivery for damage. Minor damages may be repaired provided refinished items are equal in all respects to new work and acceptable to Architect; otherwise, remove and replace damaged items as directed.

C. Store doors and frames at building site under cover. Place units on minimum 4-inches high wood blocking. Avoid use of non-vented plastic or canvas shelters which could create humidity chamber. If cardboard wrapper on door becomes wet, remove carton immediately. Provide 1/4-inches spaces between stacked doors to promote air circulation.

D. Identify each door and frame with individual opening numbers which correlate with designation system used on shop drawings for door, frames, and hardware, using temporary, removable or concealed markings.

1.6 PROJECT CONDITIONS

A. Field Measurements: Check openings by field measurement before fabrication to ensure proper fitting of work; show measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay in work.

B. Coordinate work of this section with that specified in Section 087100 to ensure proper installation of hardware.

1.7 WARRANTY

A. Product Warranty: Provide manufacturer's standard written warranty agreeing to repair or replace polyester-faced doors which fail in materials or workmanship within time period indicated below. Warranty shall include door manufacturer's guarantee that hardware installed by factory will be installed correctly and not come loose within time period indicated below.

1. Warranty period for doors and frames and hardware installed by factory is ten years after date of Substantial Completion.
2. Warranty for painted finish on doors and frames is 3 years after date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturer/Basis of Design Product: Provide AF-100 Smooth Pultruded Fiberglass Door and AF-250 Frame by Special-Lite, Inc. or equal products by one of the following:

1. CHEM-PRUF
2. Tiger Doors a Senneca Company.

2.2 PERFORMANCE CRITERIA

A. Pultruded Fiberglass Skin.

1. Surface Burning, ASTM-E84: Flame Spread ≤ 25, Smoke Developed ≤ 450.
2. Tensile Strength, ASTM-D638: 12,300 psi.
3. Percent Fiberglass: Minimum 50%.

B. Pultruded Structural Shapes.

1. Tensile Strength, ASTM-D638: Minimum 30,000 psi.
2. Compressive Strength, ASTM-D695: Minimum 30,000 psi.
3. Flexural Strength, ASTM-D790: Minimum 30,000 psi.
4. Tensile Strength, ASTM-D638: Minimum psi.
5. Surface Burning, ASTM-E84: Flame Spread ≤ 25, Smoke Developed ≤ 450

C. Door Core:

1. Surface Burning, ASTM-E84: Flame Spread ≤ 25, Smoke Developed ≤ 450.
2. Density: ASTM-D1622: 6.0 pcf.
3. Compressive Strength: ASTM-D1621: 139 psi

2.3 DOORS

A. FRP Composite Doors: Provide 1-3/4" thick FRP faced composite fiberglass door pultruded as one monolithic panel with integral stiles, in flush design.

1. Stiles: Seamless 9/16" thick solid FRP
2. Top Rail: 6" pultruded tube profile with 1/4" wall thickness designed to fit flush and be chemically welded inside of door cavity.
3. Bottom Rail: Standard pultruded inverted U channel designed to fit flush and be chemically welded inside the door which allows doors to be field trimmed
4. Core: Polyurethane foam, minimum 6 pcf density.
5. Face Sheet: Smooth, pultruded FRP integral to construction of door.
6. Finish: Two-component flexible acrylic urethane satin topcoat, factory applied. Color as follows:

    a. FF-1: Manufacturer’s standard paint color as selected by the Architect.

7. Cutouts: Manufacture doors with cutouts as required for vision lites.
8. Provide pultruded FRP glazing stops with stainless steel fasteners
9. Basis of Design Product: Provide AF-100 Smooth Pultruded Fiberglass Door by Special-Lite, Inc. or equal product by one of the following:

    a. CHEM-PRUF
    b. Tiger Doors, a Senneca Company.

2.4 FRAMES

A. FRP Frames: Provide high-modulus pultruded structural FRP shape frames 5-3/4” deep by 2” or 4” face as indicated on Drawings, 3/16” thick, with open throat with return. Frame jambs and header shall be joined at corners using miter connections with hidden FRP angle clips and associated fasteners. Provide ¼” thick pultruded FRP reinforcing chemically welded to door frame material at hardware locations. Provide integral door stop 5/8” x 2-1/4”

1. Fabrication: Provide chemically welded frames, welded at factory.
2. Finish: Two-component flexible acrylic urethane satin topcoat, factory applied in color as follows:

    a. FF-2: Manufacturer’s standard paint color as selected by the Architect.

3. Basis of Design Product: AF-250 Frame by Special-Lite, Inc. or equal product by one of the following:

    a. CHEM-PRUF
    b. Tiger Doors, a Senneca Company

B. Hollow metal frames are specified in Division 08 Section “Hollow Metal Doors and Frames”

2.5 HARDWARE

A. Hardware is specified in Section 087100.

2.6 MISCELLANEOUS MATERIALS

A. Sealants and joint filers for joints at perimeter of frames as specified in Division 07 Section "Joint Sealants."

B. Fasteners: Type 304 stainless steel fasteners

2.7 FABRICATION

A. Factory-prefit and premachine doors for all hardware and to fit frame opening sizes indicated with the following uniform clearances and bevels:

1. Clearances: Not more than 1/8 inch at jambs and heads except between pairs of doors not more than 1/4 inch. Not more than 3/4 inch at bottom.
2. Comply with final hardware schedules and door frame shop drawings and with hardware templates.
3. Coordinate measurements of hardware mortises in frames to verify dimensions and alignment before proceeding with factory premachining.

B. Complete fabrication, assembly, installation of hardware, finishing and other work before shipment to project site. Disassemble components only as necessary for shipment and installation. Field stick framing is not acceptable.

C. Factory install vision lites and panels.

D. Install hinges and all other hardware, with the exception of any surface-applied hardware such as door closer and locksets or push/pull hardware, at the manufacturer's plant.

1. Locate hardware as indicated on final shop drawings or, if not indicated, in accordance with "Recommended Locations for Builder's Hardware on Standard Steel Doors and Frames," published by Door and Hardware Institute.

E. Maintain accurate relation of planes and angles, hairline fit contacting members.

F. Conceal fasteners where possible provide countersunk flat or oval heads for exposed screws and bolts.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and supports, with the Installer present, for compliance with requirements indicated, installation tolerances, and other conditions that affect installation of polyester faced doors. Correct unsatisfactory conditions before proceeding with the installation.

B. Examine door frames prior to hanging door:

1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with plumb jambs and level heads.
2. Reject doors with defects.

C. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Comply with manufacturer's written instructions for protecting, handling, and installing FRP doors and fiberglass framing systems. Do not install damaged components. Fit frame joints to produce hairline joints free of burrs and distortion. Rigidly secure nonmovement joints.

B. Install framing components plumb and true in alignment with established lines and grades without warp or rack of framing members.

C. Install doors and frames plumb and true in alignment with established lines and grades without warp or rack. Lubricate operating hardware and other moving parts according to hardware manufacturers' written instructions.

1. Install surface-mounted hardware according to manufacturer's written instructions using concealed fasteners to greatest extent possible.
2. Install frames with anchors appropriate for wall conditions to anchor framing to wall materials. A minimum of five anchors up to 7'- 4" on jamb members, and one additional anchor for each 12 inches over that height.

D. Construction Tolerances: Install doors and frames to comply with the following tolerances:

1. Variation from Plane: Do not exceed 1/16 inch in 12 feet of length or 1/8 inch in any total length.
2. Offset from Alignment: The maximum offset from true alignment between two identical members abutting end to end in line shall not exceed 1/16 inch.
3. Diagonal Measurements: The maximum difference in diagonal measurements shall not exceed 1/8 inch.
4. Offset at Corners: The maximum out-of-plane offset of framing at corners shall not exceed 1/32 inch.

E. Drill and tap frames and doors and apply surface-mounted hardware items. Comply with hardware manufacturer's instructions and template requirements. Use concealed fasteners wherever possible. Refer to Section 087100 for additional installation requirements.

F. Install perimeter sealant to comply with requirements of Division 07 Section "Joint Sealants," unless otherwise indicated.

3.3 ADJUSTING, CLEANING AND PROTECTION

A. Adjust operating hardware to function properly, for smooth operation without binding, and for weathertight closure.

B. Clean complete system, inside and out, promptly after installation, exercising care to avoid damage to coatings.

C. Institute protective measures required throughout remainder of construction period to ensure polyester faced doors will be without damage and deterioration, other than normal weathering, at time of acceptance.

END OF SECTION 081540

SECTION 085113 - ALUMINUM WINDOWS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes aluminum window infill components and glazing s for exterior locations.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
2. Review and discuss the finishing of aluminum windows that is required to be coordinated with the finishing of other aluminum work for color and finish matching.
3. Review, discuss, and coordinate the interrelationship of aluminum windows with other exterior wall components. Include provisions for anchoring, flashing, weeping, sealing perimeters, and protecting finishes.
4. Review and discuss the sequence of work required to construct a watertight and weathertight exterior building envelope.
5. Inspect and discuss the condition of substrate and other preparatory work performed by other trades.

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 construction details, material descriptions, glazing and fabrication methods, dimensions of individual components and profiles, hardware, and finishes for aluminum windows.
2. Include manufacturer’s installation instructions.

E. Shop Drawings: For aluminum windows.

1. Include plans, elevations, sections, hardware, accessories, insect screens, operational clearances, and details of installation, including anchor, flashing, and sealant installation.

F. Samples: Corner section for each type of window unit and for each color specified, 8 by 8 inches in size.

1. Include as part of corner section: frame, sash, and insect screen.
2. Provide manufacturer’s standard color finishes for selection.

G. Samples: One full size unit, including insect screen and hardware.

1. Provide manufacturer’s standard color finishes for selection.

H. Product Schedule: For aluminum windows. Use same designations indicated on Drawings.

I. Quality Control Submittals:

1. Qualification Data: For manufacturer and Installer.

a. Names and address of 3 similar projects that Installer has worked on during the past 5 years.

2. Product Test Reports: For each type of aluminum window, for tests performed by a qualified testing agency.
3. Field quality-control reports.
4. Sample Warranties: For manufacturer's warranties.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: A manufacturer capable of fabricating aluminum windows that meet or exceed performance requirements indicated and of documenting this performance by test reports and calculations.

B. Installer Qualifications: An installer acceptable to aluminum window manufacturer for installation of units required for this Project and have a minimum three years’ experience.

C. Label: each window unit shall have a AAMA or WDMA Certification label affixed to it.

1.5 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace aluminum windows that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Failure to meet performance requirements.
b. Structural failures including excessive deflection, water leakage, condensation, and air infiltration.
c. Faulty operation of movable sash and hardware.
d. Deterioration of materials and finishes beyond normal weathering.

e. Failure of insulating glass.

2. Warranty Period:

a. Window: 10 years from date of Substantial Completion.
b. Glazing Units: Five years from date of Substantial Completion.
c. Aluminum Finish: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Oldcastle Building Envelope, Series 3000 Thermal MultiPlane Storefront System.

B. C. Source Limitations: Obtain aluminum windows, glazing, hardware, accessories, and related components from a single manufacturer. Source Limitations: Obtain aluminum windows from single source from single manufacturer.

2.2 WINDOW PERFORMANCE REQUIREMENTS

General: Provide fixed aluminum-framed glazed assemblies capable of meeting the performance requirements indicated when installed as complete assemblies, including framing, glazing, gaskets, anchors, perimeter seals, and accessories.

A. Performance Testing: Provide fixed framing assemblies tested in accordance with ASTM E283, ASTM E330, and ASTM E331.

1. Test reports shall represent framing, glazing, and assembly configurations comparable to those required for the Project.

2. Performance requirements apply to the complete installed assembly.

A. Air Infiltration: Maximum air leakage of 0.06 cfm/sq. ft. at a static-air-pressure difference of 6.24 psf when tested according to ASTM E283.

B. Water Penetration: No uncontrolled water penetration at a minimum static-air-pressure difference of 10 psf when tested according to ASTM E331.

C. Structural Performance:

1. Provide fixed framing assemblies capable of withstanding design wind pressures indicated on the structural Drawings without permanent deformation, failure of members or anchors, glass breakage, or other detrimental effects.

2. Test framing assemblies according to ASTM E330.

3. Limit deflection of framing members to the lesser of:
   a. L/175 of the clear span; or
   b. Limits established by the insulating-glass manufacturer.

4. Design anchors, fasteners, and connections to transfer wind loads to the building structure.

D. Thermal Transmittance: Provide the complete fixed framing and glazing assembly with a maximum whole-product U-factor of 0.33 Btu/sq. ft. × h × deg F, determined according to NFRC 100.

1. Submit project-specific thermal calculations for the actual framing configuration, glass makeup, spacer, and fixed-lite sizes.

2. Where the approved energy-code documentation requires a lower U-factor, comply with the lower value.

E. Solar Heat-Gain Coefficient: Maximum whole-product SHGC of 0.40, determined according to NFRC 200.

1. Submit project-specific calculations based on the specified Guardian SunGuard SNX 62/27 glazing.

2. Where the approved energy-code documentation requires a lower SHGC, comply with the lower value.

F. Condensation Resistance: Provide framing having a Condensation Resistance Factor of not less than 63 when tested according to AAMA 1503.

G. Thermal Movement: Provide fixed framing assemblies, including anchors and perimeter connections, that accommodate thermal movements resulting from the following temperature changes without buckling, opening of joints, failure of seals, overstressing of components, or other detrimental effects:

1. Ambient Temperature Change: 120 degrees F.

2. Material-Surface Temperature Change: 180 degrees F.

H. K. Windborne-Debris Impact Resistance: Not required.

I. Sound Transmission Class (STC): Rated for not less than 26 STC when tested for laboratory sound transmission loss according to ASTM E90 and determined by ASTM E413.

J. Outside-Inside Transmission Class (OITC): Rated for not less than [22] [26] [30] <Insert rating> OITC when tested for laboratory sound transmission loss according to ASTM E90 and determined by ASTM E1332.

2.3 ALUMINUM WINDOWS

General: Provide fixed aluminum-framed glazed assemblies capable of meeting the performance requirements indicated when installed as complete assemblies, including framing, glazing, gaskets, anchors, perimeter seals, and accessories.

B. Performance Testing: Provide fixed framing assemblies tested in accordance with ASTM E283, ASTM E330, and ASTM E331.

1. Test reports shall represent framing, glazing, and assembly configurations comparable to those required for the Project.

2. Performance requirements apply to the complete installed assembly.

C. Air Infiltration: Maximum air leakage of 0.06 cfm/sq. ft. at a static-air-pressure difference of 6.24 psf when tested according to ASTM E283.

D. Water Penetration: No uncontrolled water penetration at a minimum static-air-pressure difference of 10 psf when tested according to ASTM E331.

E. Structural Performance:

1. Provide fixed framing assemblies capable of withstanding design wind pressures indicated on the structural Drawings without permanent deformation, failure of members or anchors, glass breakage, or other detrimental effects.

2. Test framing assemblies according to ASTM E330.

3. Limit deflection of framing members to the lesser of:
   a. L/175 of the clear span; or
   b. Limits established by the insulating-glass manufacturer.

4. Design anchors, fasteners, and connections to transfer wind loads to the building structure.

F. Thermal Transmittance: Provide the complete fixed framing and glazing assembly with a maximum whole-product U-factor of 0.33 Btu/sq. ft. × h × deg F, determined according to NFRC 100.

1. Submit project-specific thermal calculations for the actual framing configuration, glass makeup, spacer, and fixed-lite sizes.

2. Where the approved energy-code documentation requires a lower U-factor, comply with the lower value.

G. Solar Heat-Gain Coefficient: Maximum whole-product SHGC of 0.40, determined according to NFRC 200.

1. Submit project-specific calculations based on the specified Guardian SunGuard SNX 62/27 glazing.

2. Where the approved energy-code documentation requires a lower SHGC, comply with the lower value.

H. Condensation Resistance: Provide framing having a Condensation Resistance Factor of not less than 63 when tested according to AAMA 1503.

I. Thermal Movement: Provide fixed framing assemblies, including anchors and perimeter connections, that accommodate thermal movements resulting from the following temperature changes without buckling, opening of joints, failure of seals, overstressing of components, or other detrimental effects:

1. Ambient Temperature Change: 120 degrees F.

2. Material-Surface Temperature Change: 180 degrees F.

J. Windborne-Debris Impact Resistance: Not required.

2.4 FABRICATION

A. Provide infill aluminum window frame components in sizes indicated. Include a complete system for assembling components and anchoring windows.

B. Glaze aluminum windows in the factory.

C. Weather strip each operable sash to provide weathertight installation.

D. Weep Holes: Provide weep holes and internal passages to conduct infiltrating water to exterior.

E. Provide water-shed members above side-hinged sashes and similar lines of natural water penetration.

F. Mullions: Provide mullions and cover plates, matching window units, complete with anchors for support to structure and installation of window units. Allow for erection tolerances and provide for movement of window units due to thermal expansion and building deflections. Provide mullions and cover plates capable of withstanding design wind loads of window units.

G. Complete fabrication, assembly, finishing, hardware application, and other work in the factory to greatest extent possible. Disassemble components only as necessary for shipment and installation.

2.5 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.6 ALUMINUM FINISHES

A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

B. Class II, Clear Anodic Finish: AA-M12C22A31 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class II, clear coating 0.010 mm or thicker) complying with AAMA 611.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Verify rough opening dimensions, levelness of sill plate, and operational clearances.

C. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure weathertight window installation.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with manufacturer's written instructions for installing windows, hardware, accessories, and other components. For installation procedures and requirements not addressed in manufacturer's written instructions, comply with installation requirements in ASTM E2112.

B. Install windows level, plumb, square, true to line, without distortion or impeding thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction to produce weathertight construction.

C. Install windows and components to drain condensation, water penetrating joints, and moisture migrating within windows to the exterior.

D. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials.

3.3 FIELD QUALITY CONTROL

3.4 ADJUSTING, CLEANING, AND PROTECTION

A. Adjust operating sashes and hardware for a tight fit at contact points and weather stripping for smooth operation and weathertight closure.

B. Clean exposed surfaces immediately after installing windows. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.

1. Keep protective films and coverings in place until final cleaning.

C. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.

D. Protect window surfaces from contact with contaminating substances resulting from construction operations. If contaminating substances do contact window surfaces, remove contaminants immediately according to manufacturer's written instructions.

END OF SECTION 085113

SECTION 087100 - DOOR HARDWARE

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. Mechanical door hardware for the following:

a. Swinging doors.

B. References

1. NFPA 80 Fire Doors and Windows
2. NFPA 101 Life Safety Code.
3. Building Code of New York State.
4. ICC/ANSI A117.1-2003 Accessible and Usable Buildings and Facilities.
5. ANSI/BHMA Standard A156.1 Butts and Hinges.
6. ANSI/BHMA Standard A156.4 Door Controls – Closers.
7. ANSI/BHMA Standard A156.6 Architectural Door Trim.
8. ANSI/BHMA Standard A156.7 Template Hinge Dimensions.
9. ANSI/BHMA Standard A156.8 Door Controls – Overhead Stops and Holders.
10. ANSI/BHMA Standard A156.13 Mortise Locks and Latches Series 1000.
11. ANSI/BHMA Standard A156.16 Auxiliary Hardware.
12. ANSI/BHMA Standard A156.18 Materials and Finishes.
13. ANSI/BHMA Standard A156.22 Door Gasketing Systems.
14. ANSI/BHMA Standard A156.26 Continuous Hinges.
15. DHI - Door and Hardware Institute.
16. NAAM Standard HMMA 800-96- Hollow Metal Manufacturers Association.
17. NAAM Standard HMMA 831-97 Recommended Hardware Locations for Custom Hollow Metal Doors and Frames.
18. 2010 Standards for State and Local Government Facilities: Title II.

1.3 DEFINITIONS

A. Architectural Hardware Consultant (AHC): A Door and Hardware Institute certified expert in complex architectural openings requiring advanced knowledge of model building codes and safety standards, ADA requirements, access control knowledge and installation expertise.

B. Architectural Hardware Distributor: A company that regularly purchases architectural hardware from manufacturers and specializes in the sale, service and support of that hardware to contractors and/or end users.

C. Company Field Advisor(s): Hardware manufacturers' representatives who are certified in writing by manufacturer to be technically qualified in design, installation, and servicing of products.

D. Installation Supervisor: Designated supervisor/installer, who has a minimum of three years' experience in finish hardware installation, and is qualified and responsible to ensure approved finish hardware is installed, adjusted, and operates properly.

1.4 COORDINATION

A. Installation Templates: Distribute for doors, frames, and other work specified to be factory prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

B. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.

C. Existing Openings: Where hardware components are scheduled for application to existing construction or where modifications to existing door hardware are required, field verify existing conditions and coordinate installation of door hardware to suit opening conditions and to provide proper door operation.

1.5 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

B. Keying Conference: Conduct conference at Project site

1. Conference participants shall include Installer's Architectural Hardware Consultant and Owner.
2. Incorporate conference decisions into keying schedule after reviewing door hardware keying system including, but not limited to, the following:

    a. Flow of traffic and degree of security required.
    b. Preliminary key system schematic diagram.
    c. Address for delivery of keys.

1.6 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.

E. Samples: For each exposed product in each finish specified, in manufacturer's standard size.

1. Tag Samples with full product description to coordinate Samples with door hardware schedule.

F. Samples for Initial Selection: For each type of exposed finish.

G. Samples for Verification: For each type of exposed product, in each finish specified.

1. Sample Size: Full-size units or minimum 2-by-4-inch Samples for sheet and 4-inch long Samples for other products.

a. Full-size Samples will be returned to Contractor. Units that are acceptable and remain undamaged through submittal, review, and field comparison process may, after final check of operation, be incorporated into the Work, within limitations of keying requirements.

2. Tag Samples with full product description to coordinate Samples with door hardware schedule.

H. Door Hardware Schedule: Prepared by or under the supervision of Installer's Architectural Hardware Consultant. Coordinate door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

1. Submittal Sequence: Submit door hardware schedule concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate the fabrication of other work that is critical in Project construction schedule.
2. Format: Use same scheduling sequence and format and use same door numbers as in door hardware schedule in the Contract Documents.
3. Content: Include the following information:

a. Identification number, location, hand, fire rating, size, and material of each door and frame.
b. Locations of each door hardware set, cross-referenced to Drawings on floor plans and to door and frame schedule.
c. Complete designations, including name and manufacturer, type, style, function, size, quantity, function, and finish of each door hardware product.
d. Description of electrified door hardware sequences of operation and interfaces with other building control systems.

e. Fastenings and other installation information.
f. Explanation of abbreviations, symbols, and designations contained in door hardware schedule.
g. Mounting locations for door hardware.
h. List of related door devices specified in other Sections for each door and frame.

I. Keying Schedule: Prepared by or under the supervision of Installer's Architectural Hardware Consultant, detailing Owner final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations that are coordinated with the Contract Documents.

J. Qualification Data: For Installer and Architectural Hardware Consultant.

K. Product Certificates: For each type of electrified door hardware.

1. Certify that door hardware for use on each type and size of labeled fire-rated doors complies with listed fire-rated door assemblies.

L. Product Test Reports: For compliance with accessibility requirements, for tests performed by manufacturer and witnessed by a qualified testing agency, for door hardware on doors located in accessible routes.

M. Field quality-control reports.

N. Sample Warranty: For special warranty.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of door hardware to include in maintenance manuals.

B. Schedules: Final door hardware and keying schedule.

1.8 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1.9 QUALITY ASSURANCE

A. Installer Qualifications: Supplier of products and an employer of workers trained and approved by product manufacturers and of an Architectural Hardware Consultant who is available during the course of the Work to consult Contractor and Owner about door hardware and keying.

1. Warehousing Facilities: In Project's vicinity.
2. Scheduling Responsibility: Preparation of door hardware and keying schedule.

3. Engineering Responsibility: Preparation of data for electrified door hardware, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.

B. Architectural Hardware Consultant Qualifications: A person who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project and who is currently certified by DHI as an Architectural Hardware Consultant (AHC) and an Electrified Hardware Consultant (EHC) or Architectural Openings Consultant (AOC).

C. Company Field Advisors: Employ advisor(s) for continuous hinges, door bolts, mortise locksets, surface overhead stops, door closers, and gaskets

D. Installation Supervisor: Employ a qualified Installation Supervisor who will be responsible to ensure approved finished hardware is installed, adjusted and operates properly.

E. Pre-submittal Conference: Before Finish Hardware Submittals are written for submission, the Owner will call a teleconference to review Finish Hardware Submittal requirements including but not limited to format, cover sheet, headings, hardware sets, level of detail, installation notes, description of operation, keying, and product data sheets. The Contractor, the Finish Hardware Distributor, the Finish Hardware Detailer, and consulting hardware designer, and OGS Designers shall attend. The OGS Finish Hardware Reviewer shall conduct the conference.

F. On-Site Pre-installation Conference: Before finish hardware installation begins, the Owner will call a conference at the site to review finished hardware Specifications, approved Finish Hardware Submittals, and discuss requirements for the Work, including:

1. Hardware delivery and storage.

2. Hardware labeling by door number.

3. Hardware locations.

4. Potential location conflicts.

5. Hardware installation sequence and responsibility.

6. Required accessories and fasteners.

7. Continuous hinge installation.

8. Surface overhead stops and closer template and adjustments.

9. Special tools and maintenance items.

10. Hardware Closeout requirements.

11. Hardware Warranties.

G. Pre-installation Conference Attendance: The Construction Contractor, Company Field Advisors, authorized Finish Hardware Installers, and the Finish Hardware Distributor's Architectural Hardware Consultant shall attend the conference. OGS's Finish Hardware Reviewer conducts the meeting. OGS designers and facility personnel may attend. The Company Field Advisors will present installation instruction and advice.

H. Pre-Benchmark-Construction Meeting: Prior to the construction of the mock-up, a meeting will be held at the site to review the requirements and discuss the intent of the mock-up. The meeting will be scheduled by the Owner and conducted by the Hardware Designer. The meeting shall be attended by the Owner, the Hardware Designer, the Contractor's onsite foreman, the person supervising this phase of the Work (if different), and the person (people) performing the work.

J. Uniformity of Hardware and Single Source Responsibility: For each kind of hardware provide product(s) of a single manufacturer.

K. Size Variations: Manufacturers' products may vary slightly from sizes specified except where minimum size or thickness is specified.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site.

B. Tag each item or package separately with identification coordinated with the final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package.

C. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.

D. Deliver keys to Owner by registered mail or overnight package service.

1.11 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

   a. Structural failures including excessive deflection, cracking, or breakage.
   b. Faulty operation of doors and door hardware.
   c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.

2. Manufacturer's Warranty: Ten-year minimum warranty for door closers.

3. Manufacturer's Warranty: Three years minimum for locksets

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain each type of door hardware from single manufacturer.

1. Provide electrified door hardware from same manufacturer as mechanical door hardware unless otherwise indicated. Manufacturers that perform electrical modifications and that are listed by a testing and inspecting agency acceptable to authorities having jurisdiction are acceptable.

2.2 PERFORMANCE REQUIREMENTS

A. Fire-Rated Door Assemblies: Where fire-rated doors are indicated, provide door hardware complying with NFPA 80 that is listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.

B. Means of Egress Doors: Latches do not require more than 15 lbf to release the latch. Locks do not require use of a key, tool, or special knowledge for operation.

C. Accessibility Requirements: For door hardware on doors in an accessible route, comply with the DOT's "ADA Standards for Transportation Facilities"

1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf.
2. Comply with the following maximum opening-force requirements:

    a. Interior, Non-Fire-Rated Hinged Doors: 5 lbf applied perpendicular to door.
    b. Sliding or Folding Doors: 5 lbf applied parallel to door at latch.
    c. Fire Doors: Minimum opening force allowable by authorities having jurisdiction.

3. Bevel raised thresholds with a slope of not more than 1:2. Provide thresholds not more than 1/2 inch high.
4. Adjust door closer sweep periods so that, from an open position of 90 degrees, the door will take at least 5 seconds to move to a position of 12 degrees from the latch.
5. Adjust spring hinges so that, from an open position of 70 degrees, the door will take at least 1.5 seconds to move to the closed position.

2.3 HINGES

A. Hinges: BHMA A156.1. Provide template-produced hinges for hinges installed on hollow-metal doors and hollow-metal frames.

2.4 CONTINUOUS HINGES

A. Continuous Hinges: BHMA A156.26; minimum 0.120-inch thick, hinge leaves with minimum overall width of 4 inches; fabricated to full height of door and frame and to template screw locations; with components finished after milling and drilling are complete.

B. Continuous, Gear-Type Hinges: Extruded-aluminum, pinless, geared hinge leaves joined by a continuous extruded-aluminum channel cap; with concealed, self-lubricating thrust bearings.

2.5 MECHANICAL LOCKS AND LATCHES

A. Lock Functions: As indicated in door hardware schedule.

B. Lock Throw: Comply with testing requirements for length of bolts required for labeled fire doors, and as follows:

1. Bored Locks: Minimum 1/2-inch latchbolt throw.
2. Mortise Locks: Minimum 3/4-inch latchbolt throw.
3. Deadbolts: Minimum 1.25-inch bolt throw.

C. Lock Backset: 2-3/4 inches unless otherwise indicated.

D. Lock Trim:

1. Description: As indicated on Drawings
2. Levers: Cast.Escutcheons (Roses): Cast
3. Dummy Trim: Match lever lock trim and escutcheons.

E. Strikes: Provide manufacturer's standard strike for each lock bolt or latchbolt complying with requirements indicated for applicable lock or latch and with strike box and curved lip extended to protect frame; finished to match lock or latch.

1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
3. Aluminum-Frame Strike Box: Manufacturer's special strike box fabricated for aluminum framing.
4. Rabbet Front and Strike: Provide on locksets for rabbeted meeting stiles.

F. Mortise Locks: BHMA A156.13; stamped steel case with steel or brass parts; Series 1000.

2.6 AUTOMATIC AND SELF-LATCHING FLUSH BOLTS

A. Automatic Flush Bolts: BHMA A156.3, Type 25; minimum 3/4-inch throw; with dust-proof strikes; designed for mortising into door edge

B. Self-Latching Flush Bolts: BHMA A156.3, Type 27; minimum 3/4-inch throw; with dust-proof strikes; designed for mortising into door edge

2.7 LOCK CYLINDERS

A. Lock Cylinders: Tumbler type, constructed from brass or bronze, stainless steel, or nickel silver. Provide cylinder from same manufacturer of locking devices.

B. Construction Master Keys: Provide cylinders with feature that permits voiding of construction keys without cylinder removal. Provide 10 construction master keys.

C. Construction Cores: Provide construction cores that are replaceable by permanent cores. Provide 10 construction master keys.

2.8 KEYING

A. Keying System: Factory registered, complying with guidelines in BHMA A156.28, appendix. Provide one extra key blank for each lock. Incorporate decisions made in keying conference.

1. Grand Master Key System: Change keys, a master key, and a grand master key operate cylinders.

    a. Provide three, cylinder change keys and five each of master and grand master keys.

2. Existing System:

    a. Master key or grand master key locks to existing system.

B. Keys: Nickel silver

1. Stamping: Permanently inscribe each key with a visual key control number and include the following notation:

    a. Notation: Information to be furnished by Owner.

2.9 SURFACE CLOSERS

A. Surface Closers: BHMA A156.4; rack-and-pinion hydraulic type with adjustable sweep and latch speeds controlled by key-operated valves and forged-steel main arm. Comply with manufacturer's written instructions for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.

2.10 MECHANICAL STOPS AND HOLDERS

A. Wall- and Floor-Mounted Stops: BHMA A156.16.

2.11 OVERHEAD STOPS AND HOLDERS

A. Overhead Stops and Holders: BHMA A156.8.

2.12 DOOR GASKETING

A. Door Gasketing: BHMA A156.22; with resilient or flexible seal strips that are easily replaceable and readily available from stocks maintained by manufacturer.

B. Maximum Air Leakage: When tested according to ASTM E283 with tested pressure differential of 0.3-inch wg, as follows:

1. Smoke-Rated Gasketing: 0.3 cfm/sq. ft. of door opening.
2. Gasketing on Single Doors: 0.3 cfm/sq. ft. of door opening.
3. Gasketing on Double Doors: 0.50 cfm per ft. of door opening.

2.13 THRESHOLDS

A. Thresholds: BHMA A156.21; fabricated to full width and depth of opening indicated.

2.14 FABRICATION

A. Manufacturer's Nameplate: Do not provide products that have manufacturer's name or trade name displayed in a visible location except in conjunction with required fire-rating labels and as otherwise approved by Owner.

1. Manufacturer's identification is permitted on rim of lock cylinders only.

B. Base Metals: Produce door hardware units of base metal indicated, fabricated by forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness. Furnish metals of a quality equal to or greater than that of specified door hardware units and BHMA A156.18.

C. Fasteners: Provide door hardware manufactured to comply with published templates prepared for machine, wood, and sheet metal screws. Provide screws that comply with commercially recognized industry standards for application intended, except aluminum fasteners are not permitted. Provide Phillips flat-head screws with finished heads to match surface of door hardware unless otherwise indicated.

1. Concealed Fasteners: For door hardware units that are exposed when door is closed, except for units already specified with concealed fasteners. Do not use through bolts for

installation where bolt head or nut on opposite face is exposed unless it is the only means of securely attaching the door hardware. Where through bolts are used on hollow door and frame construction, provide sleeves for each through bolt.

2. Fire-Rated Applications:

    a. Wood or Machine Screws: For the following:

        1) Hinges mortised to doors or frames
        2) Strike plates to frames.
        3) Closers to doors and frames.

    b. Steel Through Bolts: For the following unless door blocking is provided:

        1) Surface hinges to doors.
        2) Closers to doors and frames.
        3) Surface-mounted exit devices.

3. Spacers or Sex Bolts: For through bolting of hollow-metal doors.
4. Gasketing Fasteners: Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.

2.15 FINISHES

A. Provide finishes complying with BHMA A156.18 as indicated in door hardware schedule.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance of the Work.

B. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Steel Doors and Frames: For surface-applied door hardware, drill and tap doors and frames according to ANSI/SDI A250.6.

B. Wood Doors: Comply with door and hardware manufacturers' written instructions.

3.3 INSTALLATION

A. Mounting Heights: Mount door hardware units at heights indicated on Drawings unless otherwise indicated or required to comply with governing regulations.

1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
2. Custom Steel Doors and Frames: HMMA 831.
3. Wood Doors: DHI's "Recommended Locations for Architectural Hardware for Wood Flush Doors."

B. Install each door hardware item according to the manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work. Do not install surface-mounted items until finishes have been completed on the substrates involved.

1. Set the units level, plumb, and true to the line and location. Adjust and reinforce the attachment substrates as necessary for proper installation and operation.
2. Drill and countersink units that are not factory-prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.

C. Hinges: Install types and in quantities indicated in door hardware schedule, but not fewer than the number recommended by manufacturer for application indicated or one hinge for every 30 inches of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.

D. Lock Cylinders: Install construction cores to secure building and areas during construction period.

1. Replace construction cores with permanent cores as indicated in keying schedule or directed by Owner.

E. Thresholds: Set thresholds for exterior doors and other doors indicated in full bed of sealant complying with requirements specified in Section 079200 "Joint Sealants."

F. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they will impede traffic.

G. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.

1. Do not notch perimeter gasketing to install other surface-applied hardware.

H. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.

I. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.

3.4 FIELD QUALITY CONTROL

A. Independent Architectural Hardware Consultant: Owner will engage a qualified independent Architectural Hardware Consultant to perform inspections and to prepare inspection reports.

1. Independent Architectural Hardware Consultant will inspect door hardware and state in each report whether installed work complies with or deviates from requirements, including whether door hardware is properly installed and adjusted.

3.5 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

1. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.
2. Electric Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.

3.6 CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by door hardware installation.

B. Clean operating items as necessary to restore proper function and finish.

C. Provide final protection and maintain conditions that ensure that door hardware is without damage or deterioration at time of Substantial Completion.

3.7 MAINTENANCE SERVICE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions for the Owner continued adjustment, maintenance, and removal and replacement of door hardware.

3.8 DEMONSTRATION

A. Train Maintenance personnel to adjust, operate, and maintain door hardware.

3.9 DOOR HARDWARE SCHEDULE

B. Set 1- Exterior

1. Continuous Hinge: 1ea. Marker FM300 HT x marked “Top” x CP Torx x Tack Welded top / bottom pins x 630.
2. Exit Device: 1 ea. VonDuprin CD 3547 NL-OP x Torx x 630
3. Cylinders: 1 ea. Best 1E74 Mortise Cylinders to suit CD Function
4. Cylinders: 1 ea. Best 12E Rim Cylinders to suit NL Function
5. Closer: 1ea. LCN 4210 EDA x ST-3456 x SRI x CP Torx x 689
6. Overhead Stop: 1ea. Glynn Johnson 810S Series x thru-bolt x CP Torx x 630**.**
7. Perimeter Seal: 1 Set National Guard 5075C x 630
8. Door Sweep: 1 ea. National Guard 200N x 630
9. Threshold: 1 ea. National Guard 425 AL x DW (Coordinate Jamb Depth)

END OF SECTION 087100

SUNY ERIE COMMUNITY COLLEEGE NORTH CAMPUS
KITTINGER HALL BOILER ROOM UPGRADES
DIVISION 09
FINISHES SPECIFICATIONS
PAGE 1

SECTION	**DESCRIPTION**
092216.23	GYPSUM BOARD SHAFT WALL ASSEMBLIES
096723	RESINOUS FLOORING
099123	INTERIOR PAINTING

SECTION 092116.23 - GYPSUM BOARD SHAFT WALL ASSEMBLIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Gypsum board shaft wall assemblies.

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 component of gypsum board shaft wall assembly.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and support them on risers on a flat platform to prevent sagging.

1.5 FIELD CONDITIONS

A. Environmental Limitations: Comply with gypsum-shaftliner-board manufacturer's written instructions.

B. Do not install finish panels until installation areas are enclosed and conditioned.

C. Do not install panels that are wet, moisture damaged, or mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, and irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E119 by an independent testing agency.

B. STC-Rated Assemblies: Provide materials and construction identical to those of assemblies tested according to ASTM E90 and classified according to ASTM E413 by a testing and inspecting agency.

2.2 GYPSUM BOARD SHAFT WALL ASSEMBLIES

A. Fire-Resistance Rating: 1 hour.

B. STC Rating: 51, minimum.

C. Gypsum Shaftliner Board:

1. Type X: ASTM C1396; manufacturer's proprietary fire-resistive liner panels with paper faces, 1 inch thick, with double beveled long edges.
2. Moisture- and Mold-Resistant Type X: ASTM C1396; manufacturer's proprietary fire-resistive liner panels with ASTM D3273 mold-resistance score of 10 as rated according to ASTM D3274, 1 inch thick, and with double beveled long edges.
3. Moisture- and Mold-Resistant, Fiberglass-Mat Faced: ASTM C1658; manufacturer's proprietary fire-resistive liner panels with ASTM D3273 mold-resistance score of 10 as rated according to ASTM D3274, 1 inch thick, and with double beveled long edges.

D. Non-Load-Bearing Steel Framing, General: Complying with ASTM C645 requirements for metal unless otherwise indicated and complying with requirements for fire-resistance-rated assembly indicated.

E. Studs: Manufacturer's standard profile for repetitive, corner, and end members as follows:

1. Depth: 4 inches.
2. Minimum Base-Metal Thickness: 0.030 inch.

F. Runner Tracks: Manufacturer's standard J-profile track with manufacturer's standard long-leg length, but at least 2 inches long and matching studs in depth.

1. Minimum Base-Metal Thickness: **Matching steel studs**.

G. Firestop Tracks: Top runner manufactured to allow partition heads to expand and contract with movement of the structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.

2.3 AUXILIARY MATERIALS

A. Provide auxiliary materials that comply with shaft wall manufacturer's written instructions.

B. Trim Accessories: Cornerbead, edge trim, and control joints of material and shapes as specified in [**Section 092900 "Gypsum Board"**] [**Section 092613 "Gypsum Veneer Plastering"**] that comply with gypsum board shaft wall assembly manufacturer's written instructions for application indicated.

C. Steel Drill Screws: ASTM C1002 unless otherwise indicated.

D. Track Fasteners: Power-driven fasteners of size and material required to withstand loading conditions imposed on shaft wall assemblies without exceeding allowable design stress of track, fasteners, or structural substrates in which anchors are embedded.

1. Expansion Anchors: Fabricated from corrosion-resistant materials, with allowable load or strength design capacities calculated according to ICC-ES AC193 and ACI 318 greater than or equal to the design load, as determined by testing per ASTM E488 conducted by a qualified testing agency.
2. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with allowable load capacities calculated according to ICC-ES AC70, greater than or equal to the design load, as determined by testing per ASTM E1190 conducted by a qualified testing agency.

E. Reinforcing: Galvanized-steel reinforcing strips with 0.033 minimum thickness of base metal (uncoated).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, or mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install gypsum board shaft wall assemblies to comply with requirements of fire-resistance-rated assemblies indicated and manufacturer's written installation instructions.

B. Do not bridge building expansion joints with shaft wall assemblies; frame both sides of expansion joints with furring and other support.

C. Install supplementary framing in gypsum board shaft wall assemblies around openings and as required for blocking, bracing, and support of gravity and pullout loads of fixtures, equipment, services, heavy trim, furnishings, wall-mounted door stops, and similar items that cannot be supported directly by shaft wall assembly framing.

D. Penetrations: At penetrations in shaft wall, maintain fire-resistance rating of shaft wall assembly by installing supplementary steel framing around perimeter of penetration and fire protection behind boxes containing wiring devices, elevator call buttons and floor indicators, and similar items.

E. Isolate perimeter of gypsum panels from building structure to prevent cracking of panels while maintaining continuity of fire-rated construction.

F. Firestop Tracks: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.

G. Control Joints: Install control joints according to ASTM C840 while maintaining fire-resistance rating of gypsum board shaft wall assemblies.

H. Sound-Rated Shaft Wall Assemblies: Seal gypsum board shaft walls with acoustical sealant at perimeter of each assembly where it abuts other work and at joints and penetrations within each assembly.

I. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

3.3 PROTECTION

A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

B. Remove and replace panels that are wet, moisture damaged, or mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, and irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 092116.23

SECTION 096723 - RESINOUS FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes decorative resinous flooring systems.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.3 INFORMATIONAL SUBMITTALS

A. Material certificates.

B. Material test reports.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer’s authorized representative who is trained and approved for installation of flooring systems required for this Project.

B. Source Limitations: Obtain primary resinous flooring materials, including primers, resins, hardening agents, grouting coats, and topcoats, from single source from single manufacturer. Provide secondary materials, including patching and fill material, joint sealant, and repair materials, of type and from source recommended by manufacturer of primary materials.

C. Mockups: Apply mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Apply full-thickness mockups on 48-inch- (1200-mm-) square floor area selected by Architect.

    a. Include 48-inch (1200-mm) length of integral cove base with inside and outside corner.

2. Simulate finished lighting conditions for Architect's review of mockups.

3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

D. Preinstallation Conference: Conduct conference at Project site.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Comply with resinous flooring manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting resinous flooring application.

B. Lighting: Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during resinous flooring application.

C. Close spaces to traffic during resinous flooring application and for not less than 24 hours after application unless manufacturer recommends a longer period.

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. Dur-A-Flex, Inc.
2. Epoxy Systems, Inc.
3. Sherwin-Williams Company; General Polymers.
4. Stonhard, Inc.

2.2 MATERIALS

A. VOC Content of Liquid-Applied Flooring Components: Not more than 100 g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

B. Low-Emitting Materials: Flooring system shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.3 DECORATIVE RESINOUS FLOORING

A. Resinous Flooring: Abrasion-, impact- and chemical-resistant, decorative-aggregate-filled, epoxy-resin-based, monolithic floor surfacing designed to produce a seamless floor and integral cove base.

B. System Characteristics:

1. Color and Pattern: As selected by Architect from manufacturer's full range.
2. Wearing Surface: Textured for slip resistance.
3. Overall System Thickness: 1/4 inch (6.4 mm) to 1/2 inch (12.8mm)

C. Body Coats:

1. Resin: Epoxy.
2. Formulation Description: 100 percent solids.
3. Application Method: Troweled or screeded.

    a. Thickness of Coats: 1/4 inch (6.4 mm).
    b. Number of Coats: One.

4. Aggregates: Manufacturer’s standard.

D. Topcoat: Sealing or finish coats.

1. Resin: Single component acrylate co-polymer dispersion
2. Formulation Description: 100 percent solids.
3. Type: Clear.
4. Finish: Matte.
5. Number of Coats: One..

E. System Physical Properties: Provide a resinous flooring system with the following minimum physical property requirements when tested according to test methods indicated:
1. Compressive Strength: 10,000 psi per ASTM C 579 (after 7 days). Sweets
2. Tensile Strength: 1,750 psi per ASTM C 307. Sweets
3. Flexural Modulus of Elasticity: 2.0 x 10^6 psi per ASTM C 580. Sweets
4. Water Absorption: 0.2 percent per ASTM C 413. Sweets
5. Coefficient of Thermal Expansion: 1.5 x 10^{-5} in./in./°C per ASTM C 531. Sweets
6. Slip Resistance / Coefficient of Friction: 0.83 dry and 0.66 wet (slip resistance index) per ASTM F 1679. Sweets
7. Impact Resistance: Greater than 160 in.-lbs. per ASTM D 2794, with no chipping, cracking, or delamination. Sweets
8. Heat Resistance Limitation: 140°F (60°C) continuous exposure and 200°F (93°C) intermittent spills, per manufacturer's published limits. Sweets
9. Abrasion Resistance: 0.1-gram maximum weight loss per ASTM D 4060 (CS-17 wheel, 1,000-g load, 1,000 cycles). Sweets
10. Critical Radiant Flux: 0.45 W/sq. cm or greater per NFPA 253.
11. Hardness: 85 to 90, Shore D per ASTM D 2240. Sweets
12. Bond Strength: Exceeds tensile strength of concrete substrate; 100 percent concrete failure per ACI 503R.Retain paragraph below to establish criteria for chemical resistance. If retaining, and if criteria apply only to system's topcoat, revise to suit Project.

2.4 ACCESSORIES

A. Primer: Type recommended by manufacturer for substrate and body coats indicated.

1. Formulation Description: 100 percent solids.

B. Reinforcing Membrane: Flexible resin formulation that is recommended by manufacturer for substrate and primer and body coats indicated and that prevents substrate cracks from reflecting through resinous flooring.

1. Formulation Description: 100 percent solids.

a. Provide fiberglass scrim embedded in reinforcing membrane.

C. Patching and Fill Material: Resinous product of or approved by resinous flooring manufacturer and recommended by manufacturer for application indicated.

PART 3 - EXECUTION

3.1 PREPARATION

A. Concrete Substrates: Provide sound concrete surfaces free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants incompatible with resinous flooring.

1. Roughen concrete substrates as follows:

a. Shot-blast surfaces with an apparatus that abrades the concrete surface, contains the dispensed shot within the apparatus, and recirculates the shot by vacuum pickup.
b. Comply with ASTM C 811 requirements unless manufacturer's written instructions are more stringent.

2. Repair damaged and deteriorated concrete according to resinous flooring manufacturer's written instructions.
3. Verify that concrete substrates are dry and moisture-vapor emissions are within acceptable levels according to manufacturer's written instructions.

a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with application of resinous flooring only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) of slab area in 24 hours.
b. Perform plastic sheet test, ASTM D 4263. Proceed with application only after testing indicates absence of moisture in substrates.
c. Perform relative humidity test using in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.

4. Alkalinity and Adhesion Testing: Verify that concrete substrates have pH within acceptable range. Perform tests recommended by manufacturer. Proceed with application only after substrates pass testing.

B. Resinous Materials: Mix components and prepare materials according to resinous flooring manufacturer's written instructions.

C. Use patching and fill material to fill holes and depressions in substrates according to manufacturer's written instructions.

D. Treat control joints and other nonmoving substrate cracks to prevent cracks from reflecting through resinous flooring according to manufacturer's written instructions.

3.2 APPLICATION

A. General: Apply components of resinous flooring system according to manufacturer's written instructions to produce a uniform, monolithic wearing surface of thickness indicated.

1. Coordinate application of components to provide optimum adhesion of resinous flooring system to substrate, and optimum intercoat adhesion.
2. Cure resinous flooring components according to manufacturer's written instructions. Prevent contamination during application and curing processes.
3. At substrate expansion and isolation joints, comply with resinous flooring manufacturer's written instructions.

B. Apply primer over prepared substrate at manufacturer's recommended spreading rate.

C. Apply reinforcing membrane to substrate cracks.

D. Integral Cove Base: Apply cove base mix to wall surfaces before applying flooring. Apply according to manufacturer's written instructions and details including those for taping, mixing, priming, troweling, sanding, and topcoating of cove base. Round internal and external corners.

1. Integral Cove Base: 6 inches (150 mm).

E. Apply self-leveling slurry body coats in thickness indicated for flooring system.

1. Broadcast aggregates at rate recommended by manufacturer and, after resin is cured, remove excess aggregates to provide surface texture indicated.

F. Apply troweled or screeded body coats in thickness indicated for flooring system. Hand or power trowel and grout to fill voids. When cured, remove trowel marks and roughness using method recommended by manufacturer.

G. Apply grout coat, of type recommended by resinous flooring manufacturer, to fill voids in surface of final body coat and to produce wearing surface indicated.

H. Apply topcoats in number indicated for flooring system and at spreading rates recommended in writing by manufacturer.

I. Protect resinous flooring from damage and wear during the remainder of construction period.

END OF SECTION 096723

SECTION 099123 - INTERIOR PAINTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes surface preparation and the application of paint systems on one or more of the following interior substrates:

1. Concrete.
2. Concrete masonry units (CMUs).
3. Steel and iron.
4. Gypsum board.

B. Work under this Contract shall also include, but not necessarily be limited to:

1. Labor, materials, tools and other equipment, services and supervision required to complete all interior painting and decorating work as indicated on Finish Schedules and to the full extent of the drawings and specifications.
2. Moisture testing of substrates.
3. Surface preparation of substrates as required for acceptance of paint, including cleaning, small crack repair, patching, caulking, and making good surfaces and areas to the limits defined under MPI Architectural Painting Manual preparation requirements.
4. Specific pre-treatments noted herein or specified in the MPI Architectural Painting Manual.
5. Sealing / priming surfaces for painting in accordance with MPI Architectural Painting Manual requirements.
6. Provision of safe and adequate ventilation as required over and above temporary ventilation supplied by others, where toxic and/or volatile / flammable materials are being used.

C. Related Requirements:
1. Section 051200 "Structural Steel" for shop priming metal fabrications.

D. Refer to drawings and schedules (e.g., Finish Schedule) for type, location and extent of interior painting required.

1.2 REFERENCES

A. Master Painters Institute Inc., MPI Architectural Painting Manual. www.specifypaint.us.

1.3 DEFINITIONS

A. MPI Gloss Level 1 (Matte or Flat): Not more than five units at 60 degrees and 10 units at 85 degrees, according to ASTM D523.

B. MPI Gloss Level 2 (Velvet): Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D523.

C. MPI Gloss Level 3 (Eggshell): 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D523.

D. MPI Gloss Level 4 (Satin): 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D523.

E. MPI Gloss Level 5 (Semi-Gloss): 35 to 70 units at 60 degrees, according to ASTM D523.

F. MPI Gloss Level 6 (Gloss): 70 to 85 units at 60 degrees, according to ASTM D523.

G. MPI Gloss Level 7 (High Gloss): More than 85 units at 60 degrees, according to ASTM D523.

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. Painting Schedule: Cross-referenced Painting Schedule listing all interior substrates to be painted and specified finish paint type designation; product name and manufacturer, recommended primers and product numbers, and finish paint color designation for each substrate to be painted.

1. Designate interior substrates by building name and number, floor, room name and number, and surface to be painted.

E. Product Data: For each type of product. Include preparation requirements and application instructions.

1. Include Printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
2. Indicate VOC content.
3. Manufacturer’s standard colors in the form of actual fan decks.

F. Samples for Initial Selection: For each type of topcoat product.

G. Samples for Verification: For each type of paint system and in each color and gloss of topcoat.

1. Submit Samples on rigid backing, 8 inches square.
2. Apply coats on Samples in steps to show each coat required for system.
3. Label each coat of each Sample.
4. Label each Sample for location and application area.

H. Contractor's Qualifications: Submit documentation demonstrating compliance with requirements in Quality Assurance Article.

1.5 QUALITY ASSURANCE

A. Volatile Organic Compounds (VOCs) Regulatory Requirements: Chapter III of Title 6 of the official compilation of Codes, Rules and Regulations of the State of New York (Title 6 NYCRR), Part 205 Architectural Surface Coatings.

1. Certificate of Compliance: List of each paint product to be delivered and installed. List shall include written certification stating that each paint product listed complies with the VOC regulatory requirements in effect at the time of job site delivery and installation.

B. Contractor shall have a minimum of five (5) years proven satisfactory experience and shall show proof before commencement of work that he will maintain a qualified crew of painters throughout the duration of the work. When requested by the Owner, Contractor shall provide a list of the last three comparable repainting jobs including, name, location, specifying authority / project manager, start / completion dates and value of the work.

C. All materials, preparation and workmanship shall conform to the standards contained in the latest edition of the Master Painters Institute (MPI) Architectural Painting Manual (herein referred to as the MPI Manual).

D. The painting contractor shall receive written confirmation of the specific surface preparation procedures and primers used for all fabricated steel items from the fabricator / supplier to ascertain appropriate and manufacturer compatible finish coat materials to be used before painting such work.

E. Compatibility of Paint Materials: Primers and intermediate paints shall be products manufactured or recommended by the finish paint manufacturer.

1.6 REGULATORY REQUIREMENTS

A. Conform to workplace safety regulations for storage, mixing, application and disposal of all paint related materials to requirements of those authorities having jurisdiction.

B. To reduce the amount of contaminants entering waterways, sanitary / storm drain systems or into the ground the following procedures shall be strictly adhered to:

1. Retain cleaning water for water-based materials to allow sediments to be filtered out. In no case shall equipment be cleaned using free draining water.
2. Retain cleaners, thinners, solvents and excess paint and place in designated containers and ensure proper disposal.
3. Return solvent and oil-soaked rags used during painting operations for contaminant recovery, proper disposal, or appropriate cleaning and laundering.
4. Dispose of contaminants in an approved legal manner in accordance with hazardous waste regulations.

5. Empty paint cans are to be dry prior to disposal or recycling (where available).
6. Close and seal tightly partly used cans of materials including sealant and adhesive containers and store protected in well-ventilated fire safe area at moderate temperature.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver painting materials in sealed, original labeled containers bearing manufacturer's name, brand name, type of paint or coating and color designation, standard compliance, materials content as well as mixing and/or reducing and application requirements.

B. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

C. Where toxic and/or volatile / explosive / flammable materials are being used, provide adequate fireproof storage lockers and take necessary precautions and post adequate warnings (e.g. no smoking) as required.

D. Take necessary precautionary and safety measures to prevent fire hazards and spontaneous combustion and to protect the environment from hazard spills. Materials that constitute a fire hazard (paints, solvents, drop clothes, etc.) to be stored in suitable closed and rated containers or removed from the site on a daily basis.

E. Comply with requirements of authorities having jurisdiction, regarding the use, handling, storage and disposal of hazardous materials.

1.8 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 75 deg F.

B. Do not apply paints when relative humidity exceeds 75 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

C. Perform no painting work unless a minimum lighting level of 323 Lux (30-foot candles) is provided on surfaces to be repainted.

D. Apply paint only to dry, clean, and adequately prepared surfaces in areas where dust is no longer generated by construction activities such that airborne particles will not affect the quality of finished surfaces.

E. The following items are not to be painted unless otherwise specified, noted or directed:

1. Exposed stainless steel, chrome, copper, bronze, brass, and aluminum.
2. Steel to be encased in cast-in-place concrete.

3. Top flanges of structural beams and girders in composite concrete-steel construction.
4. Factory prefinished items.
5. Exposed structural wood floor joists, subflooring, rafters, roof sheathing and other framing lumber.
6. Galvanized items not exposed in finished spaces.

1.9 MAINTENANCE MATERIALS

A. Except as noted below, provide a minimum of 1 gallon of each type and color of paint from same production run (batch mix) used in unopened cans, properly labeled and identified. Store where directed.

1. Paint Type IAL-1: One gallon, each type.
2. Paint Types IAL-2: One gallon, each type.
3. Other Paint Types: One gallon, each type.

PART 2 - PRODUCTS

2.1 PAINT MATERIALS, GENERAL

A. MPI Standards: Provide products complying with MPI standards indicated and listed in its "MPI Approved Products List."

B. Material Compatibility:

1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, provide products recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.

C. Mechanical, Electrical, and Plumbing Components Colors: Provide paint colors shown on contract drawings or to be selected by the Director from finish paint manufacturers available color selections.

1. Approved finish paint manufacturers to match designated colors of other manufacturers where colors are shown on contract documents.
2. Safety Colors: Industry Standard ANSI Safety Colors.
3. Fire Protection Systems: Paint exposed piping, and handles of valves serving the system as specified below:

    a. Sprinkler Systems: Red piping, and green valve handles.
    b. Standpipe Systems: Red piping, and red valve handles.
    c. Combination Sprinkler/Standpipe Systems: Red piping, and yellow valve handles.

4. Do not paint equipment with factory finish paint.

5. Color Coding: Apply exposed insulated and uninsulated piping finish paints in the following colors when piping is located in the following applicable rooms or spaces:

   a. Applicable Rooms and Spaces: Boiler Room.
   b. Color code as follows:

      1) Air, Compressed: Safety Green.
      2) Air, Control: Safety Green.
      3) Air, Medical: Safety yellow.
      4) Ammonia, Gas and Liquid: Safety Yellow.
      5) Brine: Safety Green.
      6) Carbon Dioxide: Safety Red.
      7) Dangerous Materials: Safety Yellow.
      8) Engine Exhausts: Safety Yellow.
      9) Flue Gases: Safety Yellow.
      10) Gas, Natural and Manufactured: Safety Yellow.
      11) Gasoline: Safety Yellow.
      12) Glycol and Glycol/Water Mixtures: Safety Yellow.
      13) Nitrous Oxide: Safety Blue.
      14) Oils, Fuel and Lubrications: Safety Yellow.
      15) Oxygen: Safety Green.
      16) Pneumatic Tube System s: Safety Green.
      17) Refrigerants: Safety Yellow.
      18) Sewers, Storm and Sanitary: Safety Yellow.
      19) Steam; Supply, Condensate Return and Exhaust: Safety Yellow.
      20) Vacuum: Safety Green.
      21) Vent, Atmospheric: Safety Green.
      22) Water, Up to 140 Degrees Fahrenheit: Safety Green.
      23) Water, 141 Degrees and Above: Safety Yellow.

   c. Other Colors:

      1) Exposed Ductwork: Gray.
      2) Insulated and Uninsulated Equipment: Gray.

2.2 PAINT MATERIAL MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Benjamin Moore and Co., 51 Chestnut Ridge Rd., Montvale, NJ 07645, (201) 573-9600.
2. ICI Dulux Paints, 4000 Dupont Cr., Louisville, KY 40207, (800) 984-5444.PPG Architectural.
3. PPG Architectural Finishes, One PPG Plaza, Pittsburgh, PA 15272, (800) 441-9695.
4. Sherwin-Williams Co., Cleveland, OH 44101, (800) 321-8194.

B. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include but are not limited to products listed in the Interior Painting Schedule for the paint category indicated.

2.3 PAINT MATERIALS

A. Primers and Sealers:

1. Type ARP: Primer, alkali resistant, water based, MPI #3. Provide one of the following:

    a. Benjamin Moore: Ultra Spec Masonry Int/Ext 100 Acylic Sealer.
    b. PPG Architectural: Perma-Crete Interior/Exterior Alkali Resistant Primer.
    c. Sherwin-Williams: PrepRite ProBlock Interior/Exterior Latex Primer/Sealer.
    d. Or equal.

2. Type LBF: Block filler, latex, interior/exterior, MPI #4. Provide one of the following:

    a. Benjamin Moore: Ultra Spec Hi-Build Masonry Block Filler.
    b. PPG Architectural: Speedhide Int./Ext. Masonry Hi Fill Latex Block Filler.
    c. Sherwin-Williams: Pro Industrial Heavy Duty Block Filler.
    d. Or equal.

B. Water-Based Paints:

1. Type IAL-1: Latex, Interior, Flat, (Gloss Level 1) MPI #53. Provide one of the following:

    a. Benjamin Moore & Co.: Super Hide Zero VOC Interior Flat.
    b. PPG Architectural: Speedhide Pro EV Zero VOC Latex Flat.
    c. Sherwin-Williams: SuperPaint Interior Latex Flat.
    d. Or equal.

2. Type IAL-2: Latex, Interior, (Gloss Level 3) MPI #52. Provide one of the following:

    a. Benjamin Moore & Co.: Super Hide Zero VOC Interior Low Eggshell.
    b. PPG Architectural: Speedhide Zero Interior Satin.
    c. Sherwin-Williams: ProMar 200 Zero VOC Interior Latex Eg-Shel.
    d. Or equal.

3. Type IAL-3: Latex, Interior, Semigloss, (Gloss Level 5). MPI #54. Provide one of the following:

    a. Benjamin Moore & Co.: Ultra Spec 500 Interior Semi-Gloss.
    b. PPG Architectural: Speedhide Zero Interior Semi-Gloss.
    c. Sherwin-Williams: ProMar 200 Zero VOC Interior Latex Semi-Gloss.
    d. Or equal.

C.

D. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

1. Concrete: 12 percent.
2. Fiber-Cement Board: 12 percent.
3. Masonry (Clay and CMUs): 12 percent.
4. Wood: 15 percent.
5. Gypsum Board: 12 percent.
6. Plaster: 12 percent.

E. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.

F. Plaster Substrates: Verify that plaster is fully cured.

G. Spray-Textured Ceiling Substrates: Verify that surfaces are dry.

H. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.

I. Proceed with coating application only after unsatisfactory conditions have been corrected.

1. Application of coating indicates acceptance of surfaces and conditions.

2.4 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.

E. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceeds that permitted in manufacturer's written instructions.

F. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

2.5 APPLICATION

A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."

1. Use applicators and techniques suited for paint and substrate indicated.
2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.

B. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

C. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

D. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:

1. Paint the following work where exposed in equipment rooms:

a. Equipment, including panelboards
b. Uninsulated metal piping.
c. Uninsulated plastic piping.
d. Pipe hangers and supports.
e. Metal conduit.
f. Plastic conduit.
g. Tanks that do not have factory-applied final finishes.
h. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.

2. Paint the following work where exposed in occupied spaces:

a. Equipment, including panelboards.
b. Uninsulated metal piping.
c. Uninsulated plastic piping.

d. Pipe hangers and supports.
e. Metal conduit.
f. Plastic conduit.
g. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
h. Other items as directed by Owner.

3. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces.

2.6 FIELD QUALITY CONTROL

A. Dry Film Thickness Testing: The Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.

1. Contractor shall touch up and restore painted surfaces damaged by testing.
2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

2.7 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Owner, and leaving in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

2.8 SURFACES, GENERAL

A. Surfaces: Unless otherwise specified or shown on the drawings, paint surfaces as follows:

1. Interior Surfaces:

a. Ceilings: Paint Type IAL-1 except as noted below:

1) Paint Type IAL-2

b. Walls: Paint Type IAL-2 except as noted below:

1) Paint Type IAL-3.

c. Doors, Windows, Frames and Trim: Paint Type IAL-3 except as noted below:

1) Use Paint Type IAL-4 where walls are Paint Type IAL-3

2. Unless otherwise noted, paint interior unremovable and exposed wall and ceiling air supply and return grilles; plumbing pipes; electrical panel and fuse boxes, raceways and conduits; heating convector cabinets, radiators, radiator cabinets, unit heaters, and similar existing and installed devices and equipment by other trades.

a. Paint to match adjacent wall or ceiling surfaces.
b. Paint exposed surfaces when any part of the surface is on or within 8 inches of ceiling or wall surface to be painted.
c. Paint visible interior surfaces behind grilles, guards and screens.

3. Doors and Frames: Unless otherwise noted, paint doors and frames the same color in the next highest gloss as adjacent wall surfaces.

a. Where walls are not the same color on both sides of a door frame, change color at the inside corner of the frame stop.
b. Prime and finish paint door faces and edges before installation.

1) Paint door edges the same paint type color as the exterior side of the door.

c. Do not paint door components which are clearly not intended to be painted such as non-ferrous hardware, frame mutes, and weather stripping.
d. Do not allow doors and frames to touch until paint is thoroughly dry on both surfaces.

4. Do not paint glazing, factory finished surfaces, finish hardware and similar items clearly not intended to be painted.

END OF SECTION 099123

SUNY ERIE COMMUNITY COLLEGE NORTH CAMPUS
KITTINGER HALL BOILER ROOM UPGRADES
DIVISION 22
PLUMBING SPECIFICATIONS
PAGE 1

SECTION **DESCRIPTION**

220010 - BASIC PLUMBING REQUIREMENTS

220502 - PLUMBING PIPING SYSTEMS AND ACCESSORIES

220523 - GENERAL DUTY VALVES FOR PLUMBING PIPING

220553 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

220580 - PLUMBING PUMPS

220700 - PLUMBING INSULATION

220801 - DOMESTIC WATER SYSTEMS BALANCING

220901 - ELECTRIC WIRING FOR PLUMBING SYSTEMS

221100 - FACILITY WATER DISTRIBUTION

221600 - FACILITY NATURAL GAS SYSTEMS

223000 - PLUMBING EQUIPMENT

223400 - FUEL-FIRED DOMESTIC WATER HEATERS

SECTION 220010 - BASIC PLUMBING REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. All drawings and general provisions of Contract, including all General and Supplementary Conditions, Division 1 Specification Sections, and Instructions to Bidders apply to this section and all other sections of Division 22.

1.2 SCOPE OF WORK

A. Include in bid all labor, materials, tools, plant, transportation, excavation, equipment, insurance, temporary protection, permits, taxes and all necessary and related items required to provide complete and operational systems shown and described.

B. References to Codes and Standards called for in the Contract Documents mean the latest edition, amendment and revisions to the codes and standards in effect on the date of these Contract Documents.

C. Minimum composition requirements and/or installation methods for the following materials and work are included in this section:

1. Miscellaneous Supports.
2. Fire Stopping.
3. Flashing and Sealing.
4. Cutting and Patching.

D. Contract shall include, but not be limited to:

1. Plumbing.

1.3 REGULATIONS AND CODE COMPLIANCE

A. All work and materials shall conform to and be installed, inspected and tested in accordance with the governing rules and regulations of federal, state and local governmental agencies.

B. The following is a list of Codes and Standards that will apply to this project:

1. 2025 Building Code of New York State (BCNYS).
2. 2025 Existing Building Code of New York State (EBCNYS).
3. 2025 Energy Conservation Construction Code New York State (ECCCNYS).
4. ASHRAE Standard 90.1-2025, Energy Standard for Buildings Except Low-Rise Residential Buildings.
5. 2025 Plumbing Code of New York State (PCNYS).
6. 2025 Fuel Gas Code of New York State (FGCNYS).
7. New York State Department of Labor Rules and Regulations.
8. New York State Department of Health.
9. Federal Occupational Safety and Health Administration - OSHA.

10. National Life Safety Code, NFPA 101.
11. National Electrical Code, NFPA 70.
12. Local Codes and Ordinances for Williamsville, NY.
13. NEMA Standards.
14. Underwriters Laboratory (UL).
15. Factory Mutual and/or Owner's Insurance Carrier.
16. National Fire Protection Association (NFPA) - All chapters.

1.4 LICENSING & PERMITS

A. The Contractor shall hold a license to perform the work as issued by the State of New York.

B. Apply for and obtain all required permits and inspections, include costs for all fees and charges within bid.

C. Refer to General Conditions of the Contract for additional requirements.

1.5 GLOSSARY

ACI	American Concrete Institute
ADA	Americans with Disabilities Act
AGA	American Gas Association
AGCA	Associated General Contractors of America, Inc.
AIA	American Institute of Architects
AISC	American Institute of Steel Construction
AMCA	Air Moving and Conditioning Association
ANSI	American National Standards Institute
ARI	Air-Conditioning and Refrigeration Institute
ASHRAE	American Society of Heating, Refrigeration and Air-Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASPE	American Society of Plumbing Engineers
ASTM	American Society for Testing Materials
AWSC	American Welding Society Code
AWWA	American Water Works Association
EIA	Electronic Industries Association
FCC	Federal Communications Commission
FM	Factory Mutual Insurance Company
IEEE	Institute of Electrical and Electronics Engineers
IRI	Industrial Risk Insurers
ISO	International Standards Organization
NEC	National Electrical Code
NEMA	National Electrical Manufacturers' Association
NESC	National Electrical Safety Code
NFPA	National Fire Protection Association
NYBFU	New York Board of Fire Underwriters
NYS/DEC	New York State Department of Environmental Conservation
NYS/UFBC	New York State Uniform Fire Prevention and Building Code
OSHA	Occupational Safety and Health Administration
SHI	Steel Boiler Institute

SMACNA	Sheet Metal and Air Conditioning Contractors National Association
TIA	Telecommunications Industry Association
UFPO	Underground Facilities Protective Organization
UL	Underwriter's Laboratories, Inc.

1.6 DEFINITIONS

Approved / Approval	Written permission to use a material or system.
As Called For	Materials, equipment including the execution specified/shown in the contract documents.
Code Requirements	Minimum requirements.
Concealed	Work installed in pipe and duct shafts, chases or recesses, inside walls, above ceilings, in slabs or below grade.
Design Equipment	Refer to the article, BASIS OF DESIGN.
Design Make	Refer to the article, BASIS OF DESIGN.
Equal or Equivalent	Equally acceptable as determined by Owner's Representative
Exposed	Work is not identified as concealed.
Final Acceptance	Owner acceptance of the project from Contractor upon certification by Owner's Representative.
Furnish	Supply and deliver to installation location.
Furnished by Others	Receive delivery at job site or where called for and install.
Inspection	Visual observations by Owner's site Representative.
Install	Mount and connect equipment and associated materials ready for use.
Labeled	Refers to classification by a standards agency.
Make	Refer to the article, BASIS OF DESIGN.
Or Approved Equal	Approved equal or equivalent as determined by Owner's Representative.
Owner's Representative	The Prime Professional
Prime Professional	Architect or Engineer having a contract directly with the Owner for professional services.
Provide	Furnish, install and connect ready for use.
Relocate	Disassemble, disconnect, and transport equipment to new locations, then clean, test, and install ready for use.
Replace	Remove and provide new item.
Review	A general contractual conformance check of specified products.
Rough-in	Pipe, duct, conduit, equipment layout and installation.
Satisfactory	As specified in contract documents.
Site Representative	Construction Manager or Owner's Inspector at the work site.

Refer to General Conditions of the Contract for additional definitions.

1.7 BASIS OF DESIGN

A. The contract documents are prepared on basis of one manufacturer as "design equipment," even though other manufacturers' names are listed as acceptable makes. If Contractor elects to use one of the listed makes other than "design equipment," submit detailed drawings, indicating proposed installation of equipment. Contractor shall make all necessary field measurements and investigations to assure that the equipment and assemblies will meet contract requirements. Show maintenance clearances, service removal space required, and other pertinent revisions to the design arrangement. Make required changes in work of all other trades, at no increase in any contract. Provide larger motors, electrical feeders, circuit breakers, equipment, additional control devices, valves, fittings and other miscellaneous equipment required for proper operation, and assume responsibility for proper location of roughing and connections by other trades. Remove and replace door frames, walls ceilings or floors required to install other than design make equipment. If revised arrangement submittal is rejected, revise and resubmit specified "design equipment" item which conforms to contract documents.

1.8 INTENT OF DRAWINGS

A. The drawings are diagrammatic, unless detailed dimensioned drawings are included. Drawings show approximate locations of equipment, and fixtures. Exact locations are subject to the approval of the Owner's Representative.

1.9 ELECTRONIC CAD DRAWING FILES

A. The Engineer may provide the Contractor with AutoCAD .dwg or MicroStation .dgn format files for this project with the understanding that these CAD files shall be used for reference purposes only, and not as shop drawings or as-built documents. It is the Contractors' responsibility to provide detailed, coordinated shop drawings and documentation prior to installation. The purpose of the Contractors' coordination shop drawings is to account for all trades and field conditions and identify any conflicts that shall be resolved prior to installation.

B. Any additional cost for changes due to conflicts as a result of the Contractors' failure to provide properly coordinated documents will be the responsibility of the Contractors and not of the Engineer.

C. A request must be made in writing to the Engineer with the requested individual files. The contractor will then be sent a CAD Release Form and must sign the form to obtain electronic drawings.

1.10 QUALITY ASSURANCE

A. Manufacturers of equipment shall be firms regularly and currently engaged in the production of equipment and accessories provided. The design and size of each item of equipment provided for this project needs to have been in satisfactory and efficient operation on at least three (3) installations for not less than three (3) years.

B. Suppliers of equipment must have factory trained and authorized personnel for the service of all equipment provided.

C. Apply and install materials, equipment, and specialties in accordance with manufacturer's written instructions. Conflicts between the manufacturer's instructions and the contract documents shall be referred to the Owner's Representative for resolution.

D. The contractor shall engage the services of a qualified installer for the installation and application of joint sealers, flashing, access panels, cutting and patching.

E. All work shall be done in a neat and workmanlike manner. All methods of construction, details of workmanship, which are not specifically described or indicated in the contract documents, shall be subject to the control and approval of the Owner's Representative. Equipment and materials shall be of the quality and manufacture indicated. The equipment specified is based upon the acceptable manufacturers listed. Where "approved equal" is stated, equipment shall be equivalent in every way to that of the equipment specified and subject to approval.

PART 2 - PRODUCTS

2.1 EQUIPMENT AND MATERIAL MINIMUM REQUIREMENTS

A. Provide Materials That Meet the Following Minimum Requirements:

1. Materials shall have a flame spread rating of 25 or less and a smoke developed rating of 50 or less, in accordance with NFPA 255.
2. All equipment and material for which there is a listing service shall bear a UL label.
3. Potable water systems and equipment shall be built according to AWWA Standards.
4. Gas-fired equipment and system shall meet AGA Regulations and shall have AGA/CSA label.
5. Electrical equipment and systems shall meet UL Standards and requirements of the N.E.C. This listing requirement applies to the entire assembly. Any modifications to equipment to suit the intent of the specifications shall be performed in accordance with these requirements.
6. All materials, unless otherwise specified, shall be new and be the standard products of the manufacturer. Used equipment or damaged material will be rejected.
7. The listing of a manufacturer as "acceptable" does not indicate acceptance of a standard or catalogued item of equipment. All equipment and systems must conform to the Specifications.

2.2 SUBSTITUTIONS

A. The Materials, products and equipment described in the Bidding Documents establish a standard of required quality, functions, dimensions and appearance that must be met by any proposed substitution.

B. Proposed substitutions must be submitted in writing to the Architect and Engineer a minimum of ten (10) days prior to the date for receipt of Bids.

1. Each request shall include the name of the proposed material or equipment being substituted, cut sheets, installation drawings, performance and test data, warranties and location of three (3) similar installations with reference names of Owner or Facility personnel responsible for maintaining equipment.

2. At that time, the equipment will be evaluated and if determined to be acceptable an Addendum will be issued to all bidders.

C. Requests for substitution shall be made only by a Bidder. Requests for substitution from sales representatives, vendors or suppliers are unacceptable and will not be considered.

2.3 FACTORY-ASSEMBLED PRODUCTS

A. Provide maximum standardization of components to reduce spare part requirements.

B. Manufacturers of equipment assemblies which include components made by others shall assume complete responsibility for final assembled unit.

1. All components of an assembled unit need not be products of same manufacturer.
2. Constituent parts which are alike shall be product of a single manufacturer.
3. Components shall be compatible with each other and with the total assembly for intended service.
4. Contractor shall guarantee performance of assemblies of components, and shall repair or replace elements of the assemblies as required to deliver specified performance of the complete assembly.

C. Components of equipment shall bear manufacturer's name or trademark, model number and serial number on a name plate securely affixed in a conspicuous place, or cast integral with, stamped or otherwise permanently marked upon the components of the equipment.

D. Major items of equipment which serve the same function must be the same make and model. Exception will be permitted if performance requirements cannot be met.

2.4 COMPATIBILITY OF RELATED EQUIPMENT

A. Equipment and materials installed shall be compatible in all respects with other items being furnished and with existing items so that a complete and fully operational system will result.

2.5 SPECIAL TOOLS

A. If any part of equipment requires a special tool for assembly, adjustment or maintenance thereof and such tool is not readily available on commercial tool market, it shall be furnished by the Contractor.

2.6 LIFTING ATTACHMENTS

A. Provide equipment with suitable lifting attachments to enable equipment to be lifted in its normal position. Lifting attachments shall withstand any handling conditions that might be encountered without bending or distortion of shape, such as rapid lowering and braking of load.

2.7 MISCELLANEOUS SUPPORTS

A. Metal bars, plates, tubing, etc. shall conform ASTM standards:

1. Steel plates, shapes, bars, and grating - ASTM A 36

2. Cold-Formed Steel Tubing - ASTM A 500
3. Hot - Rolled Steel Tubing - ASTM A 501
4. Steel Pipe - ASTM A 53, Schedule 40, welded.

B. Metal Fasteners shall be Zinc-coated (type, grade and class as required)

2.8 CONCRETE BASES

A. Provide concrete bases for all floor mounted equipment. Provide 3,000 lb. concrete, chamfer edges, trowel finish, and securely bond to floor by roughening slab and coating with cement grout. Bases 4" high (unless otherwise indicated); shape and size to accommodate equipment. Set anchor bolts in sleeves before pouring and after anchoring and leveling, fill equipment bases with grout.

2.9 FIRE STOPPING

A. Fire-stopping for Openings Through Fire and Smoke Rated Walls and Floor Assemblies shall be listed or classified by an approved independent testing laboratory for "Through-Penetration Fire-Stop Systems." The system shall meet the requirements of "Fire Tests of Through-Penetration Fire-Stops" designated ASTM E814.

B. Acceptable Manufacturers:

1. Dow Corning Fire-Stop System Foams and Sealants.
2. Nelson Electric Fire-Stop System Putty, CLK and WRP.
3. Thomas & Betts - S-100 FS500/600,
4. Carborundum Fyre Putty.

PART 3 - EXECUTION

3.1 SHOP DRAWINGS/PRODUCT DATA/SAMPLES

A. Submit Shop Drawings on all items of equipment and materials to be furnished and installed. Submission of Shop Drawings and samples shall be accompanied by a transmittal letter, stating name of project and contractor, number of drawings, titles, and other pertinent data called for in individual sections.

B. Shop drawings shall be dated and contain the following information. Incomplete submittals will not be accepted. Number each submittal.

1. Name of project.
2. Name of prime professional.
3. Name of prime contractor.
4. Description or names of equipment, materials and items; and complete identification of locations at which materials or equipment are to be installed.

C. All products specified in an individual Division 22 section shall be submitted at the same time.

D. Indicate deviations from contract requirements on Letter of Transmittal.

E. Corrections or comments made on the Shop Drawings during the review do not relieve Contractor from compliance with requirements of the drawings and specifications. The Contractor is responsible for confirming and correcting all quantities; checking electrical characteristics and dimensions; selecting fabrication processes and techniques of construction; coordinating his work with that of all other trades; and performing his work in a safe and satisfactory manner.

3.2 COORDINATION DRAWINGS

A. Before construction work commences, Contractors for all trades shall submit Coordination Drawings in the form of color-coded paper drawings or electronic files (dwg or rvt) not less than 3/8" = 1'-0" scale. Coordination Drawings are required throughout all areas for all trades. These drawings shall identify and show resolutions of trade conflicts. Mechanical Equipment Rooms shall be drawn early in the Coordination Drawing process, simultaneous with all other congested areas. Prepare Coordination Drawings As Follows:

1. HVAC Contract will prepare the base plan Coordination Drawings showing all ductwork and all pertinent piping and equipment. These drawings may be AutoCAD or Revit format of the required ductwork Shop Drawings. The drawings shall be coordinated with cable tray, lighting fixtures, sprinklers, air diffusers, other ceiling mounted items, ceiling heights, structural work, maintenance clearances, electric code clearance, reflected ceiling plans, and other contract requirements. Re-position proposed locations of work after coordination drawing review by the Construction Manager and the Architect. Provide adjustments to exact size, location and offsets of ducts, pipes, conduit, etc., to achieve reasonable appearance objectives. Provide these adjustments as part of Base Bid Contracts. Minor revisions need not be redrawn.
2. HVAC Contract will provide AutoCAD or Revit files and prints and submit the base plan to all major trades' Contractors.
3. Electrical, Plumbing and Fire Protection Contracts will draft location of piping, raceways, cable trays, light fixtures and equipment on the base plan, such hat a complete coordination of all trades is represented and areas of conflict and recommended resolutions are noted.
4. Do not install any equipment, equipment foundations, raceways, cable tray, lighting or cabling until Coordination Drawings have been approved. Failure to receive approval prior to installation of the aforementioned items, will put the risk on the contractor to remove and reinstall at the engineer’s discretion. Additional time spent by the engineer in the field reviewing construction progress due to not receiving coordination drawings prior, will be considered an additional service by the consultant, which shall be paid by the contractor and deducted from any moneys owed to the contractor. The consultant’s hourly rate will apply.

3.3 PROTECTION OF PERSONS AND PROPERTY

A. Contractor shall assume responsibility for Construction Safety at all times and provide, as part of contract, all trench or building shoring, scaffolding, shielding, dust/fume protection, mechanical/electrical protection, special grounding, safety railings, barriers, and other safety feature required to provide safe conditions for all workmen and site visitors.

3.4 EXISTING SYSTEMS AND CONDITIONS

A. Prior to beginning work inspect and test all existing systems that will be affected by the work in this contract. Provide a report to the Owner indicating any problems or defects found. If no problems or system defects are submitted, the contractor shall be responsible for correcting problems found at the completion of the project that are determined to be caused by the work of this contract.

B. Inspect the entire work area for defects in the existing construction such as scratches, holes etc. Submit a complete list and photographs of existing damage, to the Owner prior to beginning work. If existing damage is not documented the contractor shall repair all damage to like new condition, which is determined to have been caused by the work in this contract.

C. The Owner's representative shall determine if the contractor has damaged existing systems or construction and approve the repairs.

3.5 ASBESTOS RECOGNITION AND PRECAUTIONS

A. The contractor shall be responsible for coordination of all required removal work, coring, cutting and patching with the Owner's asbestos management plan. Prior to performing such work identify areas containing asbestos, notify the Owner so that they may make arrangements for abatement and/or containment prior to work proceeding. The contractor shall be responsible for cleaning all areas where asbestos is released due to the failure to coordinate with the asbestos management plan. Refer to Division 1 sections for further requirements.

B. The disturbance or dislocation of asbestos-containing materials causes asbestos fibers to be released into the building's atmosphere, thereby creating a health hazard to workmen and building occupants. Consistent with Industrial Code Rule 56 and the content of recognized asbestos-control work, the Contractor shall apprise all of his workers, supervisory personnel, subcontractors, Owner and Consultants who will be at the job site of the seriousness of the hazard and of proper safeguards and work procedures which must be followed, as described in New York State Department of Labor Industrial Code Rule 56.

C. Refer to Division 2 Sections for further requirements.

3.6 REMOVALS

A. Where existing equipment removals are called for, submit complete list to Owner's Representative. All items that Owner wishes to retain that do not contain asbestos material shall be delivered to location directed by Owner. Items that Owner does not wish to retain shall be removed from site and legally disposed of. Removal and disposal of material containing asbestos shall be in accordance with Federal, State and Local law requirements. Where equipment is called for to be relocated, Contractor shall carefully remove, clean and recondition, then reinstall. Remove all abandoned piping, wiring, equipment, tubing, supports, fixtures, etc. Visit each room, crawl spaces and roofs to determine total Scope of Work.

B. Completely remove all piping, conduit, controls, and other devices associated with the equipment not to be reused in the new work. This includes all pipe, valves, fittings, insulation, conduit, panels, and all hangers, including the top connection and any fastenings to building structural systems. Seal all openings, after removal of equipment, pipes, conduits and other penetrations in roof, walls, floors, in an approved manner and in accordance with plans and specifications where specifically covered. Structural integrity of the building system shall be maintained. Reference shall also be made to the architectural, structural, mechanical, site, and electrical drawings and specifications for additional facilities to be demolished or handled.

C. Ream pipes after cutting and clean before installing. Cap or plug equipment and pipe openings during construction.

D. The shutting down of the existing Plumbing systems shall be properly coordinated with the Owner. Provide the necessary personnel in shutting down the systems as necessary to facilitate the intended work. Water and glycol systems shall be fully drained prior to any removals. The Contractor shall propose to the Owner the points of isolation of the system to minimize the duration of the shutdown for draining, performing the necessary work and refilling of the system. Systems containing a glycol solution shall be drained in a manner to collect the solution in containers for storage or disposal. Glycol solution not utilized for refilling the systems upon completion of work shall be removed from the site and properly disposed of in a legal manner by the Contractor. Upon completion of removals and new work, the Contractor shall refill and vent the systems to return the systems back to their original operation condition.

3.7 FREEZING AND WATER DAMAGE

A. Take all necessary precautions with equipment, systems and building to prevent damage due to freezing and/or water damage. Repair or replace, at no change in contract, any such damage to equipment, systems and building. Perform first seasons winterizing in presence of Owner's operating staff.

3.8 ROUGH-IN

A. Due to small scale of Drawings, it is not possible to indicate all offsets, fittings, changes in elevation, etc. Verify final locations for rough-ins with field measurements and with the equipment being connected. Verify exact location and elevations at work site prior to any rough in work. **DO NOT SCALE PLANS**. If field conditions, details, changes in equipment or shop drawing information require a significant change to the original documents, contact the Owner’s representative for approval before proceeding.

B. All equipment locations shall be coordinated with other trades to eliminate interference with required clearances for equipment maintenance and inspections.

1. Coordinate work with other trades and determine exact routing of all duct, pipe, conduit, etc., before fabrication and installation. Coordinate with Architectural Drawings. Verify with Owner's Representative exact location and mounting height of all equipment in finished areas, such as thermostats, fixtures, communication and electrical devices, including panels. Coordinate all work with the architectural reflected ceiling plans and/or existing Architecture. Mechanical and electrical drawings show design arrangement only for Diffusers, grilles, registers, air terminals, lighting fixtures, sprinklers, speakers and other items. Do not rough-in-contract work without reflected ceiling location plans.

2. Before roughing for equipment furnished by Owner or in other contracts, obtain from Architect and other Contractors, approved roughing drawings giving exact location for each piece of equipment. Do not "rough in" services without final layout drawings approved for construction. Cooperate with other trades to ensure proper location and size of connections to ensure proper functioning of all systems and equipment. Obtain written authorization from the Owner's representative or other contractor for any "rough ins" that, due to project schedule, are required before approved coordination drawings are available. Any work installed without written authorization or approved coordination drawings, causing a conflict will be relocated by this contractor at no expense to the Owner.
3. For equipment and connections provided in this contract, prepare roughing drawings as follows:

    a. Existing equipment being relocated: Measure the existing equipment and prepare drawings for installation in new location.
    b. New equipment: Obtain equipment roughing drawings and dimensions, then prepare rough-in drawings.

4. Where more than one trade is involved in an area, space or chase, all shall cooperate and install their own work to utilize the space equally between them in proportion to their individual requirements. In general, ductwork shall be given preference except where grading of piping becomes a problem, followed by piping then electrical wiring. If, after installation of any equipment, piping, ducts, conduit, and boxes, it is determined that ample maintenance and passage space has not been provided, rearrange work and/or furnish other equipment as required for ample maintenance space. Any changes in the size or location of the material or equipment supplied, which may be necessary in order to meet field conditions or in order to avoid conflicts between trades, shall be brought to the immediate attention of the Owner's Representative and approval received before such alterations are made.

C. Provide easy, safe, and code mandated clearances at controllers, motor starters, valve access, and other equipment requiring maintenance and operation. Contractor shall relocate existing work in the way of new construction. VISIT SITE BEFORE BIDDING TO DETERMINE SCOPE OF WORK. Provide new materials, including new piping and insulation for relocated work.

3.9 CUTTING AND PATCHING

A. Each trade shall include their required cutting and patching work unless shown as part of the General Construction work on the architectural drawings. Refer to "General Conditions of the Contract for Construction," for additional requirements. Cut and drill from both sides of walls and/or floors to eliminate splaying. Patch, cut or abandoned holes left by removals of equipment or fixtures. Patch adjacent existing work disturbed by installation of new work including insulation, walls and wall covering, ceiling and floor covering, other finished surfaces. Patch openings and damaged areas equal to existing surface finish. Cut openings in prefabricated construction units in accordance with manufacturer's instructions.

3.10 CONCEALMENT

A. Conceal all contract work above ceilings and in walls, below slabs, and elsewhere throughout building. If concealment is impossible or impractical, notify Owner's Representative before starting that part of the work and install only after his review. In areas with no ceilings, install only after Owner's Representative reviews and comments on arrangement and appearance.

3.11 CHASES

A. New Construction:

1. Certain chases, recesses, openings, shafts, and wall pockets will be provided as part of "General Building Construction Plans and Specifications." Mechanical and Electrical Trades work shall provide all other openings required for their contract work.
2. Check Architectural and Structural Design and Shop Drawings to verify correct size and location for all openings, recesses and chases in general building construction work.
3. Assume responsibility for correct and final location and size of such openings.
4. Rectify improperly sized, improperly located or omitted chases or openings due to faulty or late information or failure to check final location.
5. Provide 18-gauge galvanized sleeves and inserts. Extend all sleeves 2 inches above finished floor. Set sleeves and inserts in place ahead of new construction, securely fastened during concrete pouring. Correct, by drilling, omitted or improperly located sleeves. Assume responsibility for all work and equipment damaged during course of drilling. Firestop all unused sleeves.
6. Provide angle iron frame where openings are required for contract work, unless provided by General Construction Contractor.

B. In Existing Buildings:

1. Drill holes for floor and/or roof slab openings.
2. Multiple pipes smaller than 1" properly spaced and supported may pass through one 6" or smaller diameter opening.
3. Seal voids in fire rated assemblies with a fire-stopping seal system to maintain the fire resistance of the assembly. Provide 18-gauge galvanized sleeves at fire rated assemblies. Extend sleeves 2 inches above floors.
4. In wall openings, drill or cut holes to suit. Provide 18-gauge galvanized sleeves at shafts and fire rated assemblies. Provide fire-stopping seal between sleeves and wall in drywall construction. Provide fire-stopping similar to that for floor openings.

3.12 FIRE-STOPPING

A. Fire-stopping for Openings Through Fire and Smoke Rated Wall and Floor Assemblies:

1. Provide materials and products listed or classified by an approved independent testing laboratory for "Through-Penetration Fire-Stop Systems." The system shall meet the requirements of "Fire Tests of Through-Penetration Fire-Stops" designated ASTM E814.
2. Provide fire-stop system seals at all locations where piping, tubing, conduit, electrical busways/cables/wires, and similar utilities pass through or penetrate fire rated wall or floor assembly. Provide fire-stop seal between sleeve and wall for drywall construction.

3. The minimum required fire resistance ratings of the wall or floor assembly shall be maintained by the fire-stop system. The installation shall provide an air and watertight seal.
4. The methods used shall incorporate qualities, which permit the easy removal or addition of electrical conduits or cables without drilling or use of special tools. The product shall adhere to itself to allow repairs to be made with the same material and permit the vibration, expansion and/or contraction of any items passing through the penetration without cracking, crumbling and resulting reduction in fire rating.
5. Apply fire stopping within the temperature and humidity limits permitted by the manufacturer.
6. Provide rigid steel sleeves where non-armored cables pass through fire rated walls and barriers.

3.13 FLASHING AND SEALING

A. Opening through roofs shall be flashed in manner not to affect roof guarantee or bond. Engage qualified Roofing Contractor licensed by the Roofing manufacturer, as part of contract. Provide non-ferrous flashing pieces, skirts, hoods and collars as required to make pipes, conduits, and other penetrations watertight. Where curbs are called for with respect to rectangular openings in new roofs, flashing will be done by others unless specifically indicated otherwise. Caulk and waterproof with additional material so as to seal airtight and watertight.

B. Apply all flashing and sealers within the temperature and humidity limits permitted by the manufacturer.

3.14 SUPPORTS

A. Provide required supports, beams, angles, hangers, rods, bases, braces, and other items to properly support contract work. Supports shall meet the approval of the Owner's Representative. Modify studs, add studs, add framing, or otherwise reinforce studs in metal stud walls and partitions as required to suit contract work. If necessary, in stud walls, provide special supports from floor to structure above. For Precast Panels/Planks and Metal Decks, support plumbing work as determined by manufacturer and Owner's Representative. Provide heavy gauge steel mounting plates for mounting contract work. Mounting plates shall span two or more studs. Size, gauge, and strength of mounting plates shall be sufficient for equipment size, weight, and desired rigidity.

3.15 PAINTING

A. This Contract Includes the following:

1. Painting for all cut and patch work performed as part of Division 22 contract.
2. Painting required for touch-up of surfaces damaged due to the installation of division 22 work.
3. Painting as required to repair finish of equipment furnished.
4. Refer to Division 9 Sections for general description of materials and methods.
5. Painting as called for on Division 22 Drawings.

3.16 ADDITIONAL ENGINEERING SERVICES

A. In the event that the Consultant is required to provide additional engineering services as a result of substitution of equivalent materials or equipment by the Contractor, or changes by the Contractor in dimension, weight, power requirements, etc., of the equipment and accessories furnished, or if the Consultant is required to examine and evaluate any changes proposed by the Contractor for the convenience of the Contractor, then the Consultant's expenses in connection with such additional services shall be paid by the Contractor and may be deducted from any moneys owed to the Contractor.

B. In the event that the Consultant is required to provide additional engineering services as a result of Contractor's errors, omissions or failure to conform to the requirements of the Contract Documents, or if the Consultant is required to examine and evaluate any changes proposed by the Contractor solely for the convenience of the Contractor, then the Consultant's expense in connection with such additional services shall be paid by the Contractor and may be deducted from any moneys owed to the Contractor.

C. In the event the Consultant is required to initiate design changes due to failure of the contractor to properly coordinate with the construction schedule, and / or other trades, then the Consultant’s hourly rate and expenses in connection with such additional services shall be paid by the Contractor and shall be deducted from any moneys owned to the Contractor.

3.17 ALL TRADES TEMPORARY HEAT

A. Refer to the Standard General Conditions of the Contract for Construction and Supplemental General Conditions.

3.18 TEMPORARY FACILITIES

A. Refer to the standard General Conditions of the contract for Construction and Supplemental General Conditions.

1. Continuity of operation of existing facilities will require temporary installation or relocation of equipment and piping.
2. All piping and equipment shall be properly supported, sloped to drain, operate without excessive stress, and shall be insulated where injury can occur to personnel by contact with operating facilities.
3. Temporary facilities and piping shall be completely removed and any openings in structures sealed. Provide necessary blind flanges and caps to seal open piping remaining pressurized.

3.19 CLEANING

A. It is the Contractor's responsibility to keep clean all equipment and fixtures provided under this contract for the duration of the project. Each trade shall keep the premises free from an accumulation of waste material or rubbish caused by his operations. The facilities require an environment of extreme cleanliness, and it is the Contractor's responsibility to adhere to the strict regulations regarding procedures on the existing premises. After all tests are made and installations completed satisfactorily:

1. Thoroughly clean entire installation, both exposed surfaces and interiors.
2. Remove all debris caused by work.
3. Remove tools, surplus, materials, when work is finally accepted.

3.20 PLUMBING EQUIPMENT CONNECTIONS

A. Provide complete plumbing connections to all plumbing equipment. Provide control connections to equipment where indicated on the drawings. Provide valves on piping ahead of each piece of equipment.

B. Provide all piping, trim, accessories and connections as required for proper equipment operation of Equipment provided by this contract, Owner-Furnished Equipment and Equipment furnished by other contracts,

C. Refer to Manufacturer's drawings/specifications for requirements of special equipment. Verify connection requirements before bidding and confirm prior to roughing.

3.21 PLUMBING INSTALLATIONS

A. All installations shall comply with the following requirements:

1. Coordinate plumbing systems, equipment, and materials installation with other building components. Be responsible for any changes in openings and locations necessitated by the equipment installed.
2. The Architect shall control the placement of all wall and ceiling mounted plumbing equipment and devices in all rooms with the exception of mechanical and electrical equipment rooms. When drawing details are not available, consult with the Architects representative for actual location.
3. Verify all dimensions with field measurements.
4. Arrange for all chases, slots and openings in other building components, which are not indicated on drawings, to allow for plumbing installations.
5. Coordinate the installation of required supporting devices and sleeves to be set in poured-in-place concrete and other structural components, as they are constructed.
6. Coordinate ordering and installation of all equipment with long lead times or having a major impact on work by other trades so as not to delay the job or impact the construction schedule.
7. Where mounting heights are not detailed or dimensioned, install systems, materials and equipment to provide the maximum headroom possible.

8. Install systems, materials and equipment to conform with approved submittal data, including coordination drawings, to greatest extent possible. Conform to arrangements indicated by the Contract Documents, recognizing that portions of the work are shown only in diagrammatic form. Where coordination requirements conflict with individual system requirements, refer the conflict to the Architect.
9. Store Materials on dry base, at least 6" above-ground or floor. Store so as not to interfere with other work or obstruct access to buildings or facilities. Provide waterproof/windproof covering. Remove and provide special storage for items subject to moisture damage. Protect against theft or damage from any cause. Replace items stolen or damaged, at no cost to Owner.
10. Set all equipment to accurate line and grade, level all equipment and align all equipment components.
11. All tolerances in alignment and leveling, and the quality of workmanship for each stage of work shall be as required by the manufacturer and subject to approval by the Owner's representative.
12. All finished equipment surfaces damaged during construction shall be brought to "as new" condition by touch up or repainting. Any rust shall be removed and primed prior to repainting.
13. Provide all scaffolding, rigging, hoisting and services necessary for erection and delivery of equipment and apparatus furnished into the premises. These items shall be removed from premises when no longer required.
14. No plumbing equipment shall be hidden or covered up prior to inspection by the Owner's representative. All work that is determined to be unsatisfactory shall be corrected immediately.
15. All plumbing work shall be installed level and plumb, parallel and perpendicular to other building systems and components.
16. Conceal all contract work above ceilings and in walls, below slabs, and elsewhere throughout building. If concealment is impossible or impractical, notify Owner's Representative before starting that part of the work and install only after his approval. In areas with no ceilings, install only after Owner's Representative reviews and comments on arrangement and appearance.

3.22 CONTINUITY OF SERVICES

A. The building will be in use during construction operations. Maintain existing systems in operation within all rooms of building at all times. Refer to "General Conditions of the Contract for Construction" for temporary facilities for additional contract requirements. Schedules for various phases of contract work shall be coordinated with all other trades and with Owner's Representative. Provide, as part of contract, temporary plumbing and electrical connections and relocation as required to accomplish the above. Obtain approval in writing as to date, time, and location for shut-down of existing facilities or services.

3.23 START UP AND OWNER INSTRUCTIONS

A. Before acceptance of the work, furnish necessary skilled labor to operate all systems by seasons. Instruct the Owner's designated personnel on the proper operation and maintenance of systems and equipment. Obtain written acknowledgment from person instructed prior to acceptance repeat the instructions if asked to do so. Contractor is fully responsible for systems until acceptance, even though operated by Owner's personnel, unless otherwise agreed in writing. Provide operating, maintenance and starting precautions and procedures to be followed by the Owner for operating systems and equipment. Mount the instruction in clear plastic holder on or adjacent to the equipment.

B. Where supervision by a manufacturer is called for, provide manufacturer's certified technician or engineer to supervise the startup, testing and adjustment of the equipment or system. Where two or more manufacturers are involved (i.e., variable frequency drive and pumps) both manufacturers shall be present at start up. The manufacturer shall provide a written report detailing the testing and start-up including problems that occurred and their method of resolution.

C. Refer to Division 1 Sections for additional requirements.

3.24 OPERATION AND MAINTENANCE MANUALS

A. Provide Operation and Maintenance Manuals. Include one copy each of approved Shop Drawings, wiring diagrams, piping diagrams, spare parts lists, as-built drawings and manufacturer's instructions. Include typewritten instructions, describing equipment, starting/operating procedures, emergency operating instructions, seasonal changeover, freeze protection, precautions and recommended maintenance procedures. Include name, address, and telephone number of supplier manufacturer Representative and service agency for all major equipment items. Bind above items in a three ring binder with name of project on the cover. Deliver to Owner's Representative before request for acceptance.

3.25 RECORD DOCUMENTS

A. Prepare and provide record documents in accordance with Division 1 Sections. In addition to those requirements provide the following:

1. Utilities below floors, slabs and grade: During construction, maintain accurate records of all final locations and inverts for all services inside and outside of the buildings, beneath grade and below floors.
2. Take dimensions from a given fixed benchmark, such as the corner of a building, and neatly and clearly indicate same on Record Drawings.
3. Provide Record Drawings for all Contract Work.
4. Incorporate all field changes, change orders and other modifications into the final Record Drawings.

END OF SECTION

SECTION 220502 - PLUMBING PIPING SYSTEMS AND ACCESSORIES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide labor, materials, equipment and services to perform operations required for the complete installation and related Work as required in Contract Documents.

1.2 SUBMITTALS

A. Schedule of all pipe materials, fittings and connections to be utilized on this Project.

1. Pipe and fitting material data sheets identifying compliance with specified approvals and listings.

B. Welder qualification data:

1. Submit copies of welder certifications. Qualifications must be current. Maintain copies of certifications at the job site.
2. Evidence of Continuity: If qualification test is more than 6 months old, provide record of welding continuity. Record of welding continuity shall include the name of welder and name of employer.

a. Record of welding continuity shall show the welder in question has performed welding without a 6 month span on inactivity since the date that the welder qualification test was passed.

PART 2 - PRODUCTS

2.1 GENERAL

A. All piping and fittings used on this Project shall be new and marked with manufacturer's name; and shall comply with all applicable ASTM and ANSI Standards.

B. All water distribution pipe and fittings shall conform to NSF-61.

C. All drinking water system components, including pipe and fittings, shall conform to NSF-372.

2.2 STEEL PIPING AND FITTINGS

A. Pipe: ASTM A53, or ASTM A106 seamless, Schedule 40 weight; black finish as called for; ends chamfered for welding, threaded for screwed (threaded) connections.

B. Fittings: Same material and pressure class as adjoining pipe.

1. Welded fittings: Factory forged, seamless construction, butt weld type, chamfered ends. Where branch connections are two or more sizes smaller than main size, use of "Weldolets," "Thredolets" or "Sockolets" acceptable. Mitered elbows, "shaped" nipples, and job fabricated reductions not acceptable. Socket weld type, 2000 psi wp, where called for.
2. Threaded fittings: Malleable iron, black or galvanized finish as called for.

C. Joints and Connections:

1. Threaded connections:

a. Unions: ASA malleable cast iron, bronze to iron seat, 300 lb. wwp; for sizes 2 inch and smaller.
b. Flanges: Cast iron companion type; for sizes 2-1/2 inch and larger.

2. Welded connections:

a. Flanges: Welding neck type. Slip-on type not to be provided except where called for.

D. Gauge And Instrument Connections: Nipples and plugs for adapting gauges and instruments to piping system shall be IPS brass.

2.3 COPPER PIPE AND SOLDER FITTINGS

A. Pipe, Above ground: Hard temper, ASTM B88; Type L, as called for. Soft temper only as called for. Plans show copper tube sizes.

B. Copper is not allowed for urinal waste (above or below ground).

C. Tees, Elbows, Reducers: Wrought copper; solder end connections; ASME B16.22; ASTM B828.

1. Cast copper alloy fittings are prohibited for medical vacuum piping systems.

D. Unions And Flanges:

1. 2 inch and smaller: Unions, solder type, wrought copper, ground joint, 150 lb. swp.
2. 2-1/2 inch and larger: Flanged, wrought copper, companion type, ASME drilled, solder connection, 150 lb. swp.

E. Solder Materials: No-lead solder, using alloys made from tin, copper, silver and nickel.

1. No-lead solder and flux shall comply with requirements of NSF-372, ASTM B813, ASTM B32.
2. Make: Harris "Bridgit", Lucas-Milhaupt Warwick "Silverbright 100", Canfield Technologies "100% Watersafe".

2.4 SPECIAL FITTINGS

A. Copper To Cast Iron: Cast bronze, cast iron to sweat adapter.

B. Copper To Steel Piping:

1. Cast bronze copper to iron male or female adapter with shoulder for drainage piping only.
2. Dielectric pipe fittings.

2.5 DIELECTRIC PIPE FITTINGS

A. Tensile strength, ASME B16.8, union 250 psi, or flange design, 175 psi, pressure rating, at 210 Deg. F, threaded or solder joint, constructed to prevent gasket from squeezing into internal opening.

B. Acceptable Manufacturer: Epco, Capitol Manufacturing, Watts, or approved equal.

2.6 HANGERS, INSERTS AND SUPPORTS

A. Hangers, Inserts, Clamps: Anvil International, Carpenter & Patterson, Cooper B-Line, PHD Manufacturing.

B. Hangers:

1. Adjustable, wrought malleable iron or steel. Copper plated or PVC coated where in contact with copper piping. Cadmium plated or galvanized for non-copper piping.
2. Adjustable ring type where piping is installed directly on hanger for piping 3 inch and smaller.
3. Adjustable steel clevis type for piping 4 inch and larger.
4. Nuts and rods with electroplated zinc or cadmium (0.005 inch minimum) finish.

C. Spacing Schedule:

1. Pipe Hangers:

a. Plumbing Piping: Hanger spacing shall comply with Section 308 and Table 308.5 of the 2020 Plumbing Code of New York State (PCNYS).
b. Fuel Gas Piping: Hanger spacing shall comply with Section 407, Section 415 and Table 415.1 of the 2020 Fuel Gas Code of New York State (FGCNYS).

2. Cast-iron pipe: Each horizontal joint, 5-feet maximum O.C.

D. Cast Iron No-Hub Supports:

1. In accordance with manufacturers recommendations.

2. Vertical piping supported at each stack base and at each floor. Freestanding vertical pipe should be adequately staked or braced during construction to maintain alignment. Bases of stacks shall be supported on concrete, brick laid in cement mortar, metal brackets attached to the building construction or by other methods approved by the Owner's Representative.
3. Horizontal piping supported within 24 inch each side of the coupling joint at 10 foot intervals for 10 foot pipe lengths and at 5 foot intervals for 5 foot pipe lengths. Supports or hangers placed to maintain alignment and grade with provision made to prevent shear. Greater than 3 inch diameter pipe braced at changes of direction to prevent horizontal movement.

E. Piping systems with material not listed above, supported and protected in accordance with manufacturer's recommendations.

F. Supports:

1. For weights under 1000 lbs.: "Drill-In" inserts equal to Phillips "Red Head" "U" Channel, beam clamps or other structurally reviewed support. The factor of safety shall be at least four. Follow manufacturer's recommendations.
2. For weights above 1000 lbs.: Drill through floor slabs and provide flat flush plate welded to top of rod or provide additional "Drill-In" inserts and hangers to reduce load per hanger below 1000 lbs.
3. For metal decks: Drill hole through for hanger rods and imbed a welded plate in concrete or use Phillips "Red Head" devices designed for this application, with a safety factor of four.

G. Trapeze Hangers:

1. Hangers shall be supported with rod sized with a safety factor of four.
2. May be manufactured type "U" shaped channel, or suitable angle iron or channel.
3. Securely fasten piping to trapeze with "U" bolt or straps, dissimilar metals shall not touch, use isolation gaskets.
4. Acceptable Manufacturer: Globestrut, Kindorf, Unistrut, B-Line, or approved equal.

H. Pipe Insulation Shields:

1. Galvanized steel shields, minimum 180° arc, unless otherwise indicated. MSS SP-58 Type 40.
2. Shields for use with hangers and supports per the following schedule:

Pipe Size	Shield Length	Shield Gauge
1/2" – 3”	12”	18
4”	12”	16
5” – 6”	18”	16

2.7 ROOF SUPPORTS FOR NATURAL GAS PIPING

A. Pillow block pipe support stand with polycarbonate base and stainless steel threaded rods, nuts, roller-bearing and shaft, aluminum pipe strap. Pillow block spacers as needed to raise pipe above roof. Support stand and spacers shall include the following:

1. Rounded edges to prevent damage to roof membrane.
2. Drainage ports to prevent ponding.

B. Make: Miro Industries, or approved equivalent. Contractor shall determine finished mounting height above roof surface for proper ordering of support stands.

1. Pipe sizes 1-1/2” and smaller: Miro Industries, model 1.5 + Spacer + Pipe Strap.
2. Pipe sizes 2” and 3”: Miro Industries series 3-RAH, with pipe strap.
3. Pipe size 4”: Miro Industries series 5-RAH, with pipe strap.
4. Pipe size 6”: Miro Industries series 6-RAH, with pipe strap.

2.8 PIPING ACCESSORIES

A. Escutcheon Plates: Steel or cast iron polished chrome, split hinge type with setscrew, high plates where required for extended sleeves. Chrome plated in finished areas and at plumbing fixtures.

B. Cleanout plugs, bushings, nipples, required for instruments and gauges to be brass.

C. Pipe Roll Stand: Cast iron roll stand. Make: Advanced Thermal Systems, Carpenter and Patterson, ITT Grinnell, Pipe Shields.

2.9 SLEEVES

A. Standard Type:

1. Schedule 40 black steel pipe sleeves, two pipe sizes larger than the pipe, for structural surfaces.
2. Sheet metal sleeves for nonstructural surfaces and existing construction. Sheet metal sleeves shall be 18-gauge minimum and braced to prevent collapsing.

2.10 SEALING ELEMENTS

A. Waterproof Type:

1. Exterior walls, below grade, and above basement or vault floor: Synthetic rubber material with zinc plated bolts.
2. Design Equipment: Garlock "Link-Seal".
3. Acceptable Manufacturers: Garlock, Flexicraft, or Roxtec.

2.11 FIRESTOP SYSTEM FOR OPENINGS THROUGH FIRE RATED WALL FLOOR ASSEMBLIES

A. Materials for firestopping seals shall be listed by an approved independent testing laboratory for "Through-Penetration Firestop Systems". The system shall meet the standard fire test for Through-Penetration Firestop Systems designated ASTM E814.

B. Firestop system seals shall be provided at locations where piping pass through fire rated wall, floor/ceiling, or ceiling/roof assembly.

C. Minimum required fire resistant ratings of the assembly shall be maintained by the Firestop System. Installation shall conform to the manufacturer's recommendations and other requirements necessary to meet the testing laboratory's listing for the specific installation.

2.12 PIPING MATERIALS AND SCHEDULE

A. See Exhibit P1, "Plumbing Piping Materials", at end of this Section for general plumbing piping systems.

B. See Exhibit P2, “Fuel Systems Piping Materials”, at end of this Section for natural gas piping systems.

PART 3 - EXECUTION

3.1 EQUIPMENT AND SYSTEMS

A. Install equipment and systems in accordance with provisions of each applicable Section of these Specifications, and Local/State Codes/Regulations having jurisdiction.

B. Accurately establish grade and elevation of piping before setting sleeves.

C. Install piping without springing or forcing (except where specifically called for), making proper allowance for expansion and anchoring.

D. Arrange piping at equipment with necessary offsets, unions, flanges, and valves, to allow for easy part removal and maintenance.

E. Offset piping and change elevation as required to coordinate with other Work. Avoid contact with other mechanical or electrical systems. Make changes in direction and branch connections with fittings.

F. Provide adequate means of draining and venting units, risers, circuits and systems.

G. Conceal piping unless otherwise called for. Do not install valves, unions and flanges in inaccessible locations.

H. Ream pipes after cutting and clean before installing. Cap or plug equipment and pipe openings during construction.

I. Install piping parallel with lines of building, properly spaced to provide clearance for insulation.

J. Materials within a system and between systems shall be consistent. If this is not possible, install dielectric fittings.

3.2 HANGERS, INSERTS AND SUPPORTS

A. Piping shall not be supported by wires, band iron, chains, or from other piping, nor by vertical expansion bolts. Support piping with individual hangers from concrete inserts, welded supports, or beam clamps of proper configuration and loading design requirements for each location; replace if not suitable. Follow manufacturer's safe loading recommendations. Suspend with rods of sufficient length for swing, using proper diameter rod for pipe size.

B. Provide additional structural steel members, having one coat rustproof paint, where required for proper support.

C. Provide oversized hangers where insulation/supports must pass between pipe and hanger.

1. Provide pipe insulation shield at all points of support for insulated piping. Center shields on all hangers and supports outside of insulation. Install shields in manner to prevent cutting or puncturing insulation jacket.

D. Provide continuous support or extra supports for plastic pipe per manufacturer's requirements.

E. Hangers, when attached to joists, shall only be placed at the top or bottom chord panel point. Only concentric type hangers are permissible; "C" type not permitted on joists.

F. Provide riser clamps for each riser at each floor.

G. Use trapeze hangers where a group of piping can be installed.

H. Roof supports for Natural Gas Piping:

1. Install supports in accordance with manufacturer’s installation instructions.
2. Adjust height of each support to achieve proper height and level before installing natural gas pipe.
3. Secure natural gas pipe to roof support with pipe strap.
4. Make final adjustments to provide even distribution of load on all supports.

3.3 PIPE CONNECTIONS

A. No-Lead Solder Connections: Nonacid flux; clean off excess flux and solder. Solder and flux shall comply with requirements of NSF-372.

B. Threaded Connections: Clean out tapering threads, made up with pipe dope; screwed until tight connection. Pipe dope must be specifically selected for each application.

C. Dielectric Pipe Fittings: Protect fittings from excessive heat.

3.4 WELDING

A. Welding shall be performed in compliance with the welding procedure specifications prepared

by the National Certified Pipe Welding Bureau.

B. Welding shall be fabricated by a certified welder. Welder shall be certified by recognized certification and testing agencies for pipeline welding in accordance with one of the following standards:

1. API 1104, Welding of Pipelines and Related Facilities.
2. ASME Boiler and Pressure Vessel Code (BPVC) Section IX – Welding, Brazing and Fusing Qualifications.

C. Use full length pipe where possible; minimum distance between welds shall be 18 inch on straight runs. Welds must be at least full thickness of pipe with inside smooth and remove cutting beads, slag and excess material at joints; chamfer ends. Minimum gap 1/8 inch, maximum 1/4 inch, for butt welds. Overlaps on position and bench welds to be not less than 3/4 inch. One internal pass and one external pass minimum required on slip-on flanges.

1. Eliminate valleys at center and edges of each weld.
2. Welding procedure will ensure elimination of unsound or unfused metals, cracks, oxidation, blow-holes and non-metallic inclusions.

D. Do not apply heat to rectify distorted pipe due to concentrated welding; replace distorted pipe.

E. Welding is prohibited in existing building except in following areas:

1. Mechanical Rooms.
2. Boiler Rooms.
3. Roofs.

F. When welding galvanized pipe, apply cold galvanizing on joint following welding.

3.5 SLEEVES

A. Provide for pipes passing through floors, walls or ceilings. Not required for existing floors that are core-drilled, except where floor is waterproofed. Extend 1/8 inch above finished floor in finished areas. In above grade Mechanical Rooms and other areas with floor drains, use steel pipe sleeves 2 inch above floor.

B. Use steel pipe sleeves in bearing wall, structural slabs, beams and other structural surfaces, and where called for.

C. Sleeves shall be as small as practical, consistent with insulation, so as to preserve fire rating.

D. Fill abandoned sleeves with concrete.

3.6 SLEEVE PACKING

A. Seal Void Space At Sleeves As Follows:

1. Interior locations: Firmly pack with fiberglass and caulk.
2. Cored holes: Use sealing element.
3. Fire rated, partitions and floor slabs: Use fire rated sealing elements, materials and methods.
4. Waterproofed floors: Use waterproof sealing element, device or compound.

3.7 ESCUTCHEON PLATES

A. Provide polished chrome escutcheon plates for all exposed piping passing through floors, walls or ceilings, in all rooms except in Boiler, Fan and Mechanical Rooms.

3.8 TESTS

A. Refer to other Division 22 Sections for testing of Plumbing Systems.

3.9 PIPE LINE SIZING

A. Pipe sizes called for are to be maintained. Pipe size changes made only as reviewed by Owner's Representative. Where discrepancy in size occurs, the larger size shall be provided.

EXHIBIT "P1" – PLUMBING PIPING MATERIALS
(Notes at end of Exhibit "P1")

SERVICE	PIPE MATERIALS	FITTINGS	CONNECTIONS
Domestic water interior/hot, cold and circulating 3" and smaller	Type L copper	Wrought copper	No-lead solder
Indirect waste	Type L copper, Type DWV copper	Wrought copper	No-lead solder

EXHIBIT "P2" – FUEL SYSTEMS PIPING MATERIALS
(Notes at end of Exhibit "P2")

SERVICE	PIPE MATERIALS	FITTINGS	CONNECTIONS
Natural gas (exterior above grade) SEE NOTE 1	Schedule 40, black steel, paint with 3 coats	2" and smaller malleable; 2-1/2" and over butt welded. Paint fittings with 3 coats	Threaded and welded
Natural gas, gas vent (interior)	Schedule 40, black steel	2" and smaller malleable; 2-1/2" and over butt welded	Threaded and welded

NOTES FOR EXHIBIT “P2”:

NOTE 1: Exposed exterior natural gas: For steel pipe, one coat of alkyd primer and two coats of exterior acrylic latex gloss enamel. Color as selected by Owner or Architect. Apply paint in accordance with manufacturer's directions. Remove spilled and splattered paint from all surfaces.

END OF SECTION

SECTION 220523 - GENERAL DUTY VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide labor, materials, equipment and services to perform operations required for the complete installation and related Work as required in Contract Documents.

1.2 SUBMITTALS

A. All valves and accessories listed under "Part 2 – Products" of this Section.

1. Submit cut sheets, specifications and dimensioned drawings.
2. Submit compliance with ANSI/NSF-372 for valves intended to supply drinking water.

PART 2 - PRODUCTS

2.1 VALVES - GENERAL

A. Valves shall have following requirements:

1. Working pressure stamped or cast on bodies per MSS SP-25.
2. Stem packing serviceable without removing valve from line and shall be free of asbestos.
3. Valves supplying drinking water shall comply with requirements of ANSI/NSF-61 and ANSI/NSF-372.

B. Makes:

1. Check valves: Jomar, Milwaukee, Nibco, Watts.
2. Ball valves: Apollo (Conbraco), Jomar, Milwaukee, Nibco, Watts.
3. Balance valves: Bell & Gossett, Jomar, Watts, or approved equal.
4. Gas valves: Homestead, Jomar, Nordstrom (Flowserve Corp.), Resun (R&M Energy Systems), Watts.
5. To establish a standard of quality and identify features, certain manufacturer's numbers are given in the following paragraphs.

2.2 CHECK VALVES

A. Swing check valves:

1. 2½ inch and 3 inch: Bronze, threaded bonnet, 200 wwp. Threaded ends, Milwaukee UP509. Solder ends, Milwaukee UP1509. Provide in horizontal positions only.
2. 2 inch and smaller: Bronze, 200 wwp. Threaded ends, Nibco T-413-Y-LF. Solder ends, Nibco S-413-Y-LF. Provide in horizontal positions only.

2.3 BALL VALVES

A. 2 inch and smaller: Lead-free brass body with Type 316 stainless steel ball and stem, full port opening, teflon seats, end entrance, 600 #WOG, 150 #WSP. Threaded ends, Watts LFFBV-3C-SS. Solder (sweat) ends, Watts LFFBVS-3C-SS.

1. Valve shall have separate packing nut and handle nut.

B. 2½ inch to 4 inch: Lead-free bronze body with Type 316 stainless steel ball and stem, full port opening, teflon seats, end entrance, 400 #WOG, 125 #WSP. Threaded ends, Watts LFB6080G2-SS. Solder (sweat) ends, Watts LFB6081G2-SS.

1. Valve shall have separate packing nut and handle nut.

2.4 BALANCE VALVES

A. Lead-free brass body with stainless steel ball. Body shall have 1/4" NPT tapped drain port.

B. Calibrated balance valve with provisions for connecting a portable differential pressure meter suitable as a service valve. Meter connections shall have built-in check valves. Valves shall have memory stop feature with an integral pointer to register degree of valve opening. Valve shall have internal seals.

C. Balance valves sizes shall be based upon gpm range rather than pipe size.

Balance Valve Size	GPM Range
1/2”	up to 2.5
3/4”	2.5 - 4.5
1”	4.5 - 10
1-1/4”	10 - 15
1-1/2”	15 - 30
2”	30 - 60
2-1/2”	60 - 100
3”	100 - 180

D. Design equipment: Bell & Gossett "Circuit Setter Plus", model CB-xx-LF Series; Watts Series LFCSM-61-S, or approved equal.

2.5 VALVES FOR GAUGES AND INSTRUMENTS

A. 1/4 inch size: Stainless steel body, seat and stem. Rated for 6000 psi (maximum) and 200 Deg. F (maximum). Trerice 735 Series needle valve.

2.6 GAS VALVES

A. 2 inch and smaller: Brass body, threaded ends, full port ball valve, UL listed, CSA approved to 0.5 psig and 5 psig. Watts FBV-3C.

B. 2½ inch and larger: Manual actuated with lever actuators, short pattern, lubricated plug type, 200 lb. WOG, flanged, UL listed and CSA approved. Homestead Figure 612.

2.7 HOSE THREAD DRAIN VALVES

A. Lead-free copper silicon alloy body with 2-piece full port brass ball valve. Female NPT x 3/4 inch hose end, brass cap with polypropylene tether chain, 600 #WOG. Watts LFFBVS-3C-CC.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:

1. Provide valves of type called for and where required to service equipment and fixtures.
2. Use extreme care and caution when soldering valve connections to piping to prevent valve seat damage. Apply heat with the flame directed away from the center of the valve body. Inspect all valves after soldering, tighten valve packing nut and make adjustments if required to ensure valve operates properly. Replace all damaged valves.
3. Provide valves at major building and system sections, and where shown on Contract Drawings.
4. Provide extended stem on insulated valves so valve handle is outside of insulation.
5. Locate valves with stems at, or above, horizontal positions and swing check valves in horizontal position only.
6. Ball valves shall be used for water service through 4 inch, unless otherwise noted.
7. Install balance valves as recommended by the manufacturer; provide recommended pipe diameter clearance upstream and downstream from each balance valve provided.
8. Provide hose threaded drain valves at all low points, strainers, equipment, and as called for.

END OF SECTION

SECTION 220553 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide labor, materials, equipment and services as required for the complete installation designed in Contract Documents.

1.2 QUALIFICATIONS

A. All identification devices shall comply with ANSI A13.1 for lettering size, length of color field, colors, and viewing angles.

1.3 SUBMITTALS

A. Submit product data for each identification material and device, and for all items specified under “Part 2 - Products” of this Section.

B. Submit valve schedule for all piping systems typewritten on 8 1/2 inch x 11 inch paper, indicating code number, location and valve function. Submit with O&M Manuals.

C. Submit schedule of piping, equipment and valve identification for review before labeling. Confirm naming/numbering is consistent with Owner’s naming/numbering convention prior to labeling.

1.4 ACCEPTABLE MANUFACTURERS

A. Brady Co., Brimar Industries, Craftmark, Seton, or approved equal.

PART 2 - PRODUCTS

2.1 GENERAL

A. Provide manufacturer's products of categories and types required for each application.

2.2 PIPING IDENTIFICATION

A. Pipe Labels (Inside buildings):

1. Piping/Insulation with outside diameter of 5-7/8 inches and less: Provide acrylic plastic wrap-around type markers with directional flow arrows, UV resistance and legend printed four (4) times for 360° visibility. Make: Seton “Setmark” snap-on wrap around type pipe markers.
2. Piping/Insulation with outside diameter of 6 inches and greater: Provide acrylic plastic strap-on type markers with directional flow arrows, UV resistance and legend printed two (2) times minimum. Make: Seton “Setmark” strap-on wrap around type pipe markers.

B. Pipe labels shall conform to the following identification table:

PIPE SERVICE	IDENTIFICATION/LABEL
Domestic Cold Water	DOMESTIC COLD WATER
105ºF, 110ºF, or 120ºF Domestic Hot Water	DOMESTIC HOT WATER
140ºF Domestic Hot Water	140 DOMESTIC HOT WATER
105ºF, 110ºF, or 120ºF Domestic Hot Water Re-circulation	DOMESTIC HOT WATER RETURN
140ºF Domestic Hot Water Re-circulation	140 DOMESTIC HOT WATER RETURN
Natural Gas	NATURAL GAS
Indirect Waste	INDIRECT WASTE

2.3 VALVE IDENTIFICATION

A. Valve Tags:

1. Standard brass valve tags, 2" diameter with 1/2" high numerals. Identify all plumbing services with 1/4" letters above the valve number ("PLBG."). Attach to valves using brass "jack" chain and brass "S" hook. Make: Seton Style No. M4507 tags, Style No. 16182 chain and Style No. 16195, 6 and 7 No. hooks.

B. Valve Chart:

1. Provide valve chart for all valves provided as a part of this project. Frame and place under clear glass. Hang in Mechanical Room or in location as directed by the Owner.

PART 3 - EXECUTION

3.1 GENERAL

A. Provide valve tags for all valves provided on project. Provide a valve tag chart for all valves provided on the project.

B. Provide piping identification with directional flow arrows for all piping provided on project.

1. Provide labels on straight runs of piping at 15'-0" intervals, minimum.
2. Provide labels where piping enters and leaves a partition, wall, floor or ceiling.

END OF SECTION

SECTION 220580 - PLUMBING PUMPS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide labor, materials, equipment and services to perform operations required for the complete installation and related Work as required in Contract Documents.

1.2 SUBMITTALS

A. All items specified under “Part 2 - Products” of this Section.

PART 2 - PRODUCTS

2.1 DOMESTIC HOT WATER RE-CIRCULATION SYSTEM PUMP (HWRS-P-1)

A. All stainless-steel pump housing. The capacity is located on the schedule on the drawings. Motor shall have built-in thermal overload protection.

B. Design of Design: Grundfos Magna 3.

C. Acceptable Manufacturer’s: Armstrong, Bell & Gossett, Grundfos or Taco.

D. Pump shall have the following features and accessories:

1. Aquastat controller.
2. ECM Motor

PART 3 - EXECUTION

3.1 CIRCULATING PUMPS

A. Install pumps in accordance with manufacturer’s installation instructions.

B. Install in horizontal position.

C. Install isolation valve in pump inlet. Install check and balancing valve and pressure gauge in pump outlet.

END OF SECTION

SECTION 220700 - PLUMBING INSULATION

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide labor, materials, equipment and services to perform operations required for the complete installation and related Work as required in Contract Documents.

B. Plumbing insulation shall comply with the requirements of the 2025 Energy Conservation Construction Code (ECCCNYS).

1.2 SUBMITTALS

A. All items listed under "Part 2 – Products" of this Section.

1. Submit manufacturer's data sheets.

B. Schedule of all insulation applications for this project.

PART 2 - PRODUCTS

2.1 GENERAL

A. Insulation, Jackets, Adhesives, And Coatings, Shall Comply With The Following:

1. Treatment of jackets or facings for flame and smoke safety must be permanent. Water soluble treatments not permitted.
2. Insulation, including finishes and adhesives on the exterior surfaces of pipes, and equipment, shall have a flame spread rating of 25 or less and a smoke developed rating of 50 or less; as tested by ASTM E84 (NFPA 255) and UL 723 methods.
3. Asbestos or asbestos bearing materials are prohibited.

2.2 PIPE INSULATION (RIGID TYPE)

A. Preformed rigid sectional pipe covering, 4 lb. nominal density fiberglass; ASTM C547, Class 1. White Kraft outer surface bonded to aluminum foil and reinforced with fiberglass yarn.

B. Maximum thermal conductivity (k), in units of Btu/sq. ft. hr. ºF/in.:

Fluid Operating Temperature	Max. Thermal Conductivity	Mean Rating Temperature
40° F - 60° F	0.27	75° F
105° F - 140° F	0.28	100° F
Greater than 140° F	0.29	125° F

2.3 PLASTIC JACKETING

A. PVC jacket, UV-resistant, 20 mill thickness; ASTM D1784, Class 14253-C. Solvent adhesive welded joints.

2.4 MAKE

A. Fiberglass: Certainteed, Knauf, Johns Manville, Owens-Corning, or approved equal.

B. Adhesives: Childers, Foster Products, Tremco; numbers designate quality of adhesive.

2.5 MATERIALS AND SCHEDULES

A. See Exhibits at the end of this section.

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

A. Provide Thermal Insulation:

1. Insulation is required on piping unless otherwise called for.
2. Install insulation only on clean, dry surfaces and after work has been tested.
3. Install insulation on cold surfaces with continuous unbroken vapor seal.
4. Exposed surfaces shall be white.
5. Pipes shall be individually insulated.

B. Do not cover inspection stampings, openings, petcocks, handholes, manholes, access doors, plugged outlets, air vents, plugged openings or petcocks.

C. Install insulation, accessories, coverings and jackets in accordance with manufacturer's installation instructions.

3.2 PIPE INSULATION

A. Insulate piping systems including fittings, valves, flanges, unions, strainers, and other attachments installed in piping system, whether exposed or concealed.

B. Piping In Exterior Walls, Spaces, Overhangs, Attics, and Or Where Subject To Freezing: Insulate pipe with double the thickness called for.

1. Piping In Wall Chases: In addition to the above, pack chase with loose glass fiber insulation.

C. Plumbing Equipment:

1. Install insulation on exposed hot and cold plumbing piping.
2. Insulation is not required on valves, strainers and threaded piping, 1 inch and smaller.

D. Joints In Section Pipe Covering Made As Follows:

1. Standard: Longitudinal laps and butt joint sealing strips cemented with Foster 85-20 or factory applied pressure sensitive adhesive lap seal. Stapled with outward clinching staples.
2. Vapor barrier: For cold services, Longitudinal laps and 4 inch vapor barrier strip at butt joints shall be sealed with white Foster 85-20. Seal ends of pipe insulation at valves, flanges, and fittings with white Foster 85-20.

E. Pipe Insulation Shields:

1. Refer to Section 220502, Plumbing Piping Systems and Accessories, for requirements.
2. Provide pipe insulation shield at all points of support for insulated piping. Center shields on all hangers and supports outside of insulation. Install shields in manner to prevent cutting or puncturing insulation jacket.

F. Fittings, Valves And Flanges:

1. Hot and cold water:

a. Concealed: Insulating cement of the same thickness as adjacent pipe insulation. Cold water to be vapor sealed with Foster 30-36 "Seal-Fas".
b. Exposed: Premolded fitting covers of the same material and thickness as the adjacent pipe insulation and finished with glass cloth applied and coated with Foster 30-36 "Seal-Fas."

2. Optional: In lieu of the standard method above, the Contractor has the option of using Zeston, Ceel-Co, or Proto. Tape all joints at covers.

a. Fitting covers shall have fiberglass insulation inserts from the factory. Insulation inserts shall have 1.5 pcf minimum density; ASTM C553, Type III.
b. PVC fitting covers shall be UV-resistant.

3.3 RECOVERING

A. Field apply 6 oz. white glass cloth, cemented and applied over standard jacket. Properly cut at fittings to avoid wrinkles and coat with Foster 30-36. Leave ready for painting. Provide as called for.

3.4 EXISTING INSULATION

A. Patch existing insulation damaged during the course of the work.

3.5 EXISTING WORK

A. Insulate existing piping and equipment as called for on the Contract Drawings. Insulation material and thickness shall comply with Exhibits in this Section.

EXHIBIT "I" - PIPE INSULATION MATERIALS

SERVICE	INSULATION MATERIAL	PIPE SIZE	INSULATION THICKNESS	REMARKS
Domestic cold water	Glass fiber	1-1/2" and larger 1-1/4" and smaller	1" 1/2"	
Domestic hot water (up to 140º)	Glass fiber	1-1/2" and larger 1-1/4" and smaller	1-1/2" 1"	
Domestic hot water return (up to 140º)	Glass fiber	1-1/2" and larger 1-1/4" and smaller	1-1/2” 1"	

END OF SECTION

SECTION 220801 - DOMESTIC WATER SYSTEMS BALANCING

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide labor, materials, equipment and services to perform operations required for complete adjusting and balancing Work as required in Contract Documents.

1.2 SUBMITTALS

A. Provide information in report form listing items required by the Project specifications. Report shall be typed, and three copies submitted for review. Results shall be guaranteed. Contractor shall be subject to recall to site to verify report information before acceptance of the report by the Owner's Representative.

B. Report format shall consist of the following:

1. Title sheet with job name, contractor, engineer, date, balance contractor's name, address, telephone number and contact person's name and the balancing technician's name.

1.3 QUALIFICATIONS

A. Follow procedures and methods published by one or more of the following:

1. Individual manufacturer requirements and recommendations.

B. Maintain qualified person at project for system operation, trouble shooting and perform mechanical adjustments in conjunction with balancing procedure.

C. Balancing contractor shall be current member of AABC or NEBB.

1.4 GENERAL REQUIREMENTS

A. Before concealment of systems visit the job site to verify and advise on type and location of balancing devices and test points. Make changes as required to balancing facilities.

B. Place systems in satisfactory operating condition.

1. Adjusting and balancing shall be accomplished as soon as the systems are complete and before Owner takes possession.
2. Prior to balancing, adjust balancing devices for full flow; fill, vent and clean plumbing systems. Replace temporary strainers.
3. Initial adjustment and balancing to quantities as called for, or as directed by the Engineer, to satisfy job conditions.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Provide tools, ladders, recording meters, gauges, thermometers, velometers, anemometers, inclined gauge manometers, magnehelic gauges, amprobes, voltmeters, and tachometers required. Instruments used shall be accurately calibrated as per AABC or NEBB requirements.

PART 3 - EXECUTION

3.1 PREPARATION

A. Examine Bid Documents and notify Owner's Representative of any questions regarding balancing, within thirty days after receipt of bid and prior to starting work.

3.2 WATER SIDE

A. Test, adjust and record the following:

1. Hot Water Re-circulating and Circulation Pumps:

    a. Check rotation.
    b. GPM.
    c. Running suction pressure.
    d. Running discharge pressure.
    e. Running load amps.
    f. RPM – motor.
    g. Complete nameplate motor and pump.

2. Domestic Hot Water Re-circulation System Balancing Valves:

    a. Balance every valve to GPM noted on the Drawings.

END OF SECTION

SECTION 220901 - ELECTRIC WIRING FOR PLUMBING SYSTEMS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide labor, materials, equipment and services to perform operations required for the complete installation and related Work as required in Contract Documents.

B. Provide "control" wiring circuits for equipment and associated control devices. Control wiring includes 120 volt and lower wiring for control signals directing equipment operation.

C. Provide certain "power" wiring as called for. Power wiring includes 120 volt and higher branch circuit wiring required for equipment operation.

D. Assistance, as required, and coordination with Division 26, "Electric".

1.2 QUALIFICATIONS

A. Wiring installed in compliance with NEC, local governing codes, and applicable requirements of Division 26, "Electric".

B. Wiring installed only by qualified electricians.

1.3 COORDINATION

A. Provide complete wiring diagrams for equipment and systems. Deliver wiring diagrams to proper parties in time for roughing of conduit, equipment connections, and avoid delay in construction schedule. Wiring diagrams and roughing information to clearly indicate items to be mounted and/or wired as part of the work of Division 26, "Electric".

PART 2 - PRODUCTS

2.1 WIRING MATERIALS

A. Refer to Division 26 "Electric" for information regarding conduit, wire, insulation, wiring devices and methods.

PART 3 - EXECUTION

3.1 GENERAL

A. Check electrical wiring pertaining to equipment for completeness and correctness of connections. Correct any misapplied motor and/or motor starter, improper thermal overload device, or device which fails to function and resultant damage, whether due to incorrect connections or improper information on wiring diagrams.

3.2 WIRING FOR CONTROL SYSTEMS

A. Provide control wiring for equipment.

B. Wiring circuits shall be in conduit. Rigid type below slabs, wet locations, exposed to weather and hazardous locations. EMT in dry, non-hazardous locations for concealed or exposed work. Provide 18 inch maximum length flexible, jacketed conduit at motors and devices subject to vibration. Conduit supported on 5 foot centers. Do not attach directly to hot surfaces, piping, or ductwork.

C. Control wiring shall be in separate conduit from power wiring.

D. Provide green grounding wire circuits from starter, and run ground wire through conduit to each remote auxiliary relay, pushbutton station, remote panel, or other device with potentials in excess of 50 volts contained within. Size ground wire per NEC.

E. Furnish pushbutton stations, pilot lights, selector switches, auxiliary starter contacts, and other devices required for functions specified.

END OF SECTION

SECTION 221100 - FACILITY WATER DISTRIBUTION

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide labor, materials, equipment and services to perform operations required for the complete installation and related Work as required in Contract Documents.

1.2 QUALITY ASSURANCE

A. Follow all requirements, recommendations and appendices of the following publications, codes, standards, and listings:

1. New York State Health Department: Cross Connection Control Manual.
2. 2025 Plumbing Code of New York State (PCNYS).
3. ANSI/NSF-61, Drinking Water System Components – Health Effects.
4. ANSI/NSF-372, Drinking Water System Components – Lead Content.

1.3 SUBMITTALS

A. All items specified under “Part 2 - Products” of this Section.

1. Backflow Preventers: Include pressure drop curves, dimensions, FCCCHR approvals.

B. Written certification for domestic water system tests. Submit with O&M Manuals.

C. Executed form DOH-1013 for each backflow preventer provided on project. Provide original forms to Engineer.

PART 2 - PRODUCTS

2.1 DOMESTIC WATER SYSTEMS PIPING

A. Refer to Section 220502, “Plumbing Piping Systems and Accessories” for piping materials.

2.2 BACKFLOW PREVENTERS

A. General:

1. Backflow preventers shall be on the current edition of the List of Approved Backflow Prevention Assemblies generated by USC Foundation for Cross-Connection Control and Hydraulic Research (FCCCHR).
2. Backflow preventers shall comply with requirements of NSF-372.
3. All devices shall have stainless steel nuts and bolts and stainless steel internal parts.
4. Backflow preventers shall be easily removed from line for service; flanges or unions on each side of device.

5. Backflow preventers shall have four lead-free test cocks, strainer and resilient seated isolation valves. Provide one test cock on the inlet side of the upstream valve.
6. By-passes around backflow preventers are prohibited.
7. Acceptable manufacturers: Conbraco, Watts, Wilkins/Zurn, or approved equal.

B. Reduced pressure zone (RPZ) type:

1. Relief air shall not enter the same opening in the device as the relief water discharge.

2. Provide drain assembly from each device with air gap fitting, and full size indirect waste line to the nearest floor drain or to the exterior.
3. Provide Type D shock absorber on outlet side of device (refer to Section 223000).
4. Sizes 1/2 inch through 2 inches:

   a. Lead-free cast copper silicon alloy, or lead-free bronze body.
   b. Quarter-turn ball valves, lead free.
   c. Bronze strainer, lead-free.
   d. Make: Watts LF009-S-QT Series.

PART 3 - EXECUTION

3.1 GENERAL

A. Installation shall conform to Article 1.2 of this section and shall be provided in a workmanlike manner as determined by the Owner's Representative and the Contract Specifications.

3.2 BACKFLOW PREVENTERS

A. Install backflow preventers in accordance with manufacturer’s installation requirements, and in accordance with written requirements by the New York State Department of Health.

B. Provide supports for backflow preventers; do not support device from adjacent piping.

3.3 PIPING

A. Run all water piping slightly off level to low points. Provide drain valves and caps at all low points in the domestic water system.

B. Provide water hammer arrestors where shown or specified. Provide water hammer arrestors where solenoid or quick closing valves are installed. Refer to Section 223000, “Plumbing Equipment”.

C. Branch headers serving flush valves and fixtures shall be run full size to the last fixture being served unless otherwise noted.

D. All exposed water piping in kitchens shall be chrome plated brass from insulation to fixture or equipment connection.

E. All exposed water piping under fixtures shall be chrome plated brass.

F. Provide dielectric pipe fittings when connecting systems of dissimilar metals. Refer to Section 220502, “Plumbing Piping Systems and Accessories”.

G. Supply piping to all fixtures, faucets, shower accessories, hydrants and flush valves shall be anchored to prevent movement. Provide additional structural members and supports as required.

3.4 ASBESTOS PIPE

A. General: Existing water main piping and/or pipe insulation may contain asbestos. Cutting, drilling or other disturbance of this material shall be conducted as specified by New York State Department of Labor, Industrial Code Rule No. 56 "Asbestos". The methods and procedures specified in New York State Department of Labor, Industrial Code Rule 56 shall constitute minimum measures and shall in no way relieve the Contractor of sole responsibility for the means, methods, techniques, sequences or safety measures taken in connection with the work.

3.5 STERILIZATION

A. Provide sterilization of water piping in accordance with all requirements of the New York State Health Department, Public Water Supply Guides, Division of Sanitary Engineering, Bureau of Public Water Supply.

3.6 TESTS AND FLUSHING

A. Provide all necessary items to complete proper testing of all domestic water piping. Isolate existing systems as required.

B. Piping Supplying Domestic Water: Test at 125 psi hydrostatic pressure for two hours. All tests shall be witnessed by Engineer or Owner’s Representative.

C. A successful air test is not acceptable as the final test; however, the Division 22 contractor shall provide interim air testing of piping as construction progresses.

D. Make all leaks tight. No caulking of leaks shall be permitted. Remove and replace all defective fittings, piping and connections.

E. Collect bacteriological test samples after testing and flushing is complete. A minimum of two (2) samples shall be taken. Locations of samples shall be designated by the Owner’s Representative. Collect samples in sterile bottles and send to NYS DOH approved laboratory for analysis.

1. Submit sample test results to Owner’s Representative.
2. Contractor shall disinfect, flush and re-test domestic water piping until sample test results are satisfactory.

F. Pay all costs of tests. Perform all tests in a safe manner. Remove all discharged water resulting from testing procedures.

G. Certify in writing that all required domestic water tests have been conducted and successfully completed. Submit all certifications to the Owner's Representative.

H. Test all backflow preventers provided on project. Fill out DOH-1013 test form for each device and submit to Engineer.

END OF SECTION

SECTION 221600 - FACILITY NATURAL GAS SYSTEMS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide labor, materials, equipment and services to perform operations required for the complete installation and related Work as required in Contract Documents.

1.2 QUALITY ASSURANCE

A. Follow all requirements, recommendations and appendices of the following publications, codes, standards, and listings:

1. 2025 Fuel Gas Code of New York State (FGCNYS).
2. 2025 Building Code of New York State (BCNYS).
3. American Gas Association (AGA).

1.3 SUBMITTALS

A. Provide submittals for all items specified under “Part 2 – Products” of this Section.

B. Welder qualification data:

1. Submit copies of welder certifications. Qualifications must be current. Maintain copies of certifications at the job site.
2. Evidence of Continuity: If qualification test is more than 6 months old, provide record of welding continuity. Record of welding continuity shall include the name of welder and name of employer.

    a. Record of welding continuity shall show the welder in question has performed welding without a 6 month span on inactivity since the date that the welder qualification test was passed.

C. Submit written certification for natural gas system tests. Submit with O&M Manuals.

PART 2 - PRODUCTS

2.1 SERVICE

A. Installation by Local Utility Company.

2.2 PIPING

A. Interior and Exterior:

1. Refer to Section 220502, "Plumbing Piping Systems and Accessories," for piping materials and requirements.

2.3 VALVES

A. Refer to Section 220523, "General Duty Valves for Plumbing Piping" for valve requirements.

PART 3 - EXECUTION

3.1 GAS PIPING

A. General:

1. Make arrangements with Local Utility Company for adjustments and modifications to existing service, meter and regulator. PAY ALL COSTS.
2. Gas piping is prohibited from penetrating building foundation walls at any point below grade per the 2025 FGCNYS. Gas piping shall enter and exit a building above grade.

B. Welding Steel Pipe:

1. Welding shall be fabricated by a certified welder. Welder shall be certified by recognized certification and testing agencies for pipeline welding in accordance with one of the following standards:

    a. API 1104, Welding of Pipelines and Related Facilities.
    b. ASME Boiler and Pressure Vessel Code (BPVC) Section IX – Welding, Brazing and Fusing Qualifications.

2. Use full length pipe where possible; minimum distance between welds shall be 18 inch on straight runs. Welds must be at least full thickness of pipe with inside smooth and remove cutting beads, slag and excess material at joints; chamfer ends. Minimum gap 1/8 inch, maximum 1/4 inch, for butt welds. Overlaps on position and bench welds to be not less than 3/4 inch. One internal pass and one external pass minimum required on slip-on flanges.

    a. Eliminate valleys at center and edges of each weld.
    b. Welding procedure will ensure elimination of unsound or unfused metals, cracks, oxidation, blow-holes and non-metallic inclusions.

3. Do not apply heat to rectify distorted pipe due to concentrated welding; replace distorted pipe.

C. Exterior, Above Grade:

1. Steel Pipe:

    a. Piping shall be coated or protected and maintained to minimize corrosion. Refer to Section 220502, "Plumbing Piping Systems and Accessories," for requirements.

D. Interior, Above Grade:

1. Pitch piping up in direction of flow, install 6 inch long drip legs at low points, or as indicated on Contract Drawings.

3.2 ARRANGEMENTS

A. Provide for application to, and approval from, Local Utility Company for connection to gas main, and pay costs.

1. Refer to Article “Utility Company Services” in Section 220010, “Basic Plumbing Requirements” for additional requirements.

B. Provide sleeves where required for gas service. Coordinate requirements with Local Utility Company.

C. Maximum gas pressure inside building: 1/2 psig (14” w.c.).

3.3 GAS PIPING TESTS

A. Provide necessary items to complete proper testing of natural gas piping systems.

B. Perform tests as required by Local Utility Company and in accordance with the 2020 FGCNYS. Tests shall be witnessed by Owner’s Representative. Make arrangements and pay costs.

C. Interior and exterior gas piping tests:.

1. Test pressure and duration: 1.5 times the maximum working pressure, but not less than 3 psig, for one hour.

a. Test medium shall be air or nitrogen. Oxygen is prohibited as testing medium.
b. Contractor may provide interim air testing of piping as construction progresses.

2. Tests shall be performed before connection to appliances and equipment.

D. Provide written certification that tests have been conducted and satisfactorily completed. Submit to Owner's Representative.

END OF SECTION

SECTION 223000 - PLUMBING EQUIPMENT

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide labor, materials, equipment and services to perform operations required for the complete installation and related Work as required in Contract Documents.

1.2 SUBMITTALS

A. Submit shop drawings for all items specified under “Part 2 - Products” of this Section.

PART 2 - PRODUCTS

2.1 WATER HAMMER ARRESTORS / SHOCK ABSORBERS (SA)

A. Devices must meet or exceed requirements of the Plumbing and Drainage Institute Standard PDI - WH 201 and ASSE Standard 1010.

B. Types of devices listed by the Contract Documents shall be based on the P.D.I. system corresponding to the following N.Y.S. water fixture unit ranges:

1. Type A - 1 through 11 fixture units.
2. Type B - 12 through 32 fixture units.
3. Type C - 33 through 60 fixture units.
4. Type D - 61 through 113 fixture units.
5. Type E - 114 through 154 fixture units.
6. Type F - 155 through 330 fixture units.

C. All stainless steel construction, casing and bellows; male IPS inlet. Make: Zurn “Shoktrol”, Z-1700 Series.

D. Acceptable Water Hammer Arrestor / Shock Absorber manufacturers: Jay R. Smith, Josam, Precision Plumbing Products, Wade or Zurn.

2.2 THERMOMETERS - DOMESTIC WATER (T)

A. Adjustable multi-angle type, 9” scale size, 3-1/2 inch stem length, brass well, scale calibrated in 2° divisions from 30° F to 240° F for domestic hot water, 0° F to 120° F for domestic cold water. Make: Weksler Thermometer Cat. No. AS5H-9.

B. Acceptable thermometer manufacturers: American, Ashcroft, Weiss or Weksler.

2.3 PRESSURE GAUGES - DOMESTIC WATER (P)

A. 4-1/2 inch diameter dial pressure gauge with stainless steel case and plastic lens, range: 0 to 160 psi. Provide bar stock needle valve inline ahead of gauge. Make: Weksler Type EA14.

B. Acceptable pressure gauge manufacturers: American, Ashcroft, Weiss or Weksler.

2.4 TEMPERATURE MIXING VALVE

A. Control Valve Mixing 140°F hot water with 40°F cold water to obtain a tempered outlet temperature of 110°F, with cold water bypass. Mixing valve shall be pressure independent hi/lo thermostatic mixing valve. Provide valve with the following:

1. Surface mounted stainless steel cabinet, 16-gauge body and 14-gauge door with cylinder lock. Turn keys over to Owner.
2. Mixing valve with 1 ¼" inch inlets and 1 ¼" inch outlet. Rated for flow of 37 gpm at **5 p**si pressure drop.
3. Combination strainer check stops with union inlet.
4. Two volume control/shutoff valves, horizontal stem dial thermometer, fittings, nipples and escutcheon plates.
5. Chrome plated mixing valve and trim.

B. Mixing valve shall be lead-free and ASSE 1017 compliant.

C. Make: Powers Series LFMM433, Symmons, or approved equal.

PART 3 - EXECUTION

3.1 EQUIPMENT CONNECTIONS

A. Plumbing Contractor Shall:

1. Provide all roughing and final water, waste, gas and/or vent connections to all fixtures and equipment requiring same as called for by the Contract Documents.
2. Refer to the Contract Documents for roughing schedules, equipment and lists indicating scope of connections required.
3. Provide loose key stops, P-traps, tailpieces, adapters, gas valves and all necessary piping, fittings and connections from roughing point to fixtures and equipment.
4. Provide for installation of sinks, faucets, outlets, traps, tailpieces, etc. furnished by an Equipment or Casework Contractor. These items shall be delivered in easily identified cartons, to the proper room for the Division 22 Contractor's installation.
5. Install controls and devices furnished by others as noted on the Construction Documents.
6. Provide cold water line with reduced pressure zone backflow prevention devices at locations noted on the Construction Documents. Continuation of piping downstream from devices by others when noted.
7. Provide relief valve discharge piping from equipment relief valves to floor drains, mop service sinks or exterior.

3.2 SHOCK ABSORBERS

A. Provide shock absorbers in the vertical position.

B. Provide a ball valve between each shock absorber and the line being served.

C. Provide shock absorbers where shown or specified. Provide shock absorbers where solenoid valves or quick closing valves are installed.

3.3 THERMOMETERS

A. Provide where called for and where shown. Adjust each thermometer so face is easily visible.

3.4 PRESSURE GAUGES

A. Provide where called for and where water service enters building. Provide bar stock needle valve on each gauge line.

3.5 TEMPERATURE MIXING VALVE

A. Provide temperature mixing valve where shown on Contract Drawings. Install mixing valve and cabinet in accordance with manufacturer's written instructions.

1. Secure cabinet to walls using fasteners suitable for wall material and construction.

B. Provide 2 foot deep heat trap on hot water supply pipe ahead of connection to mixing valve. Refer to detail on Construction Documents.

END OF SECTION

SECTION 223400 - FUEL-FIRED DOMESTIC WATER HEATERS

PART 1 – GENERAL

1.1 WORK INCLUDED

A. Provide labor, materials, equipment and services to perform operations required for the complete installation and related Work as required in Contract Documents.

1.2 SUBMITTALS

A. Submit shop drawings for all items, including accessories, specified under "Part 2 - Products" of this Section.

B. Submit the following information relating to water heating equipment:

1. Instruction and maintenance manuals for all water heaters.
2. Warrantees for all water heating equipment.
3. Tank and lining instruction manuals, guarantee and warranty.
4. Wiring diagrams for water heating equipment and all related controls (aquastats, flow switches, pumps, etc.).
5. Maintenance instructions for all related pumps serving water heating systems.

C. Submit system start-up report.

1. Report shall include list of any deficiencies in the installation and/or operation of the system.

1.3 QUALITY ASSURANCE

A. Follow all requirements, recommendations and appendices of the following publications, Codes, standards and listings:

1. 2025 Plumbing Code of New York State (PCNYS).
2. 2025 Fuel Gas Code of New York State (FGCNYS).
3. 2025 Energy Conservation Construction Code (ECCCNYS).
4. ASHRAE/IESNA 90.1, Energy Standard for Buildings Except Low-Rise Residential Buildings.
5. ANSI/NSF-61, Drinking Water System Components – Health Effects.
6. ANSI/NSF-372, Drinking Water System Components – Lead Content.
7. UL 1738, Venting Systems for Gas-Burning Appliances, Categories II, III and IV.

B. All storage tanks, heaters, expansion tanks and related devices shall be ASME rated.

PART 2 – PRODUCTS

2.1 GAS FIRED WATER HEATERS

A. Tank Type, High Efficiency, Condensing

1. Water Heater shall be natural gas fired, CSA certified, seamless glass-lined tank design, low NOx emissions (≤ 20 ppm).

    a. ASME Construction: 160 psi maximum working pressure.

2. Water heater ratings: Refer to Schedule of Drawings.
3. Water heater shall have submersible helical or triple pass heat exchanger. Heat exchanger shall be glass-lined design.
4. Burner for water heater shall be down-fired, top mounted, modulating. Burner equipped with electronic spark ignition.
5. Water heater shall be provided with powered non-sacrificial anodes for cathodic protection, factory furnished ASME temperature and pressure relief valve, and a brass drain valve.
6. Water heater shall be insulated. The outer jacket shall have a baked enamel finish over a bonderized undercoating.
7. Controls for water heater shall be an LCD display with touch screen or key pad.
8. Water heater tank shall have a 3 year limited warranty.
9. Heater shall be vented with UL-1738 compliant PVC, rigid Polypropylene or AL29-4C stainless steel pipe and fittings. Intake and exhaust pipe size as noted on the Contract Drawings.
10. Refer to the Contract Drawings for location and details of water heater arrangements.
11. Acceptable manufacturers: A.O. Smith, Bradford-White, Lochinvar, Ruud, or approved equal.

2.2 WATER HEATER AND STORAGE TANK PROTECTIVE VALVES

A. Temperature and Pressure Relief, Water Heater:

1. Temperature and pressure relief valve furnished by water heater manufacturer. Contractor shall install this relief valve.

2.3 DOMESTIC WATER HEATING SYSTEM EXPANSION TANK

A. Steel tank with factory applied finish, heavy duty Butyl diaphragm, 150 psig maximum working pressure, 200°F maximum operating temperature, ASME rated.

B. Tank capacity: 34 gallon tank volume, 10 gallon acceptance volume..

1. Charge tank to static pressure in the field.

C. Make: Amtrol Therm-X-Trol, model ST-70VC.

D. Acceptable manufacturers: Amtrol, John Wood Co., Watts, or approved equal.

2.4 DOMESTIC HOT WATER SYSTEM ACCESSORIES

A. Thermometers and Pressure Gauges: As specified in Section 223000, "Plumbing Equipment".

B. Temperature Mixing Valve: As specified in Section 223000, "Plumbing Equipment". ASSE 1017 compliant.

C. Drain Valves: As specified in Section 220523, "General Duty Valves for Plumbing Piping".

D. Hot Water Re-Circulation System Pumps: As specified in Section 220580, "Plumbing Pumps".

E. Provide all control wiring and 120 volt circuits for heater and system control and operation. Provide all control wiring for aquastats, flow switches, pumps and domestic hot water system control devices.

1. Refer to Section 220901, "Electric Wiring for Plumbing Systems".

F. Provide all intake and exhaust piping and risers required for heater(s). Termination of piping shall be per the manufacturer's installation instructions, and the 2025 FGCNYS. Piping shall be compliant with UL-1738.

1. Provide concentric vent kit for intake and exhaust as recommended by the water heater manufacturer.
2. Intake and exhaust piping shall be rigid. Flexible vent piping is prohibited.

G. Condensate neutralizer: As recommended by manufacturer.

PART 3 - EXECUTION

3.1 WATER HEATERS

A. General:

1. Install water heaters where shown on Contract Drawings and in accordance with manufacturer's installation instructions.
2. Install water heaters on a 4 inch high concrete housekeeping pad.

a. Secure water heater supports to concrete pad with suitable anchor bolts.

3. Install water heaters level and plumb.
4. Install water heater accessories in accordance with manufacturers' installation instructions.
5. Provide required clearance space for equipment access and for servicing, without disturbing installed equipment and piping.

B. Division 22 (Plumbing) Contractor shall:

1. Provide all connections, accessories, controls, wiring and devices required for proper system operation.

2. Provide intake and exhaust pipes from heater and as shown on Contract Drawings, including terminations above roofs.

    a. Intake and exhaust piping shall be compliant with UL-1738.
    b. Termination of intake and exhaust piping shall be in accordance with manufacturer's installation instructions, and per 2025 FGCNYS.

3. Provide condensate neutralizer to condensate tubing from heater. Route discharge to nearest floor drain, or as indicated on Contract Drawings.
4. Provide installation manuals and warranties in O&M Manuals.
5. Install all water heaters so they can be fully drained and shut down.
6. Coordinate with Division 26 contractor regarding disconnects and power requirements.

3.2 TEMPERATURE AND PRESSURE RELIEF VALVES

A. Install temperature and pressure relief valves in accordance with manufacturer’s installation instructions.

B. Pipe all devices full size to nearest floor drain, or as indicated on Contract Drawings.

3.3 DOMESTIC WATER HEATING SYSTEM EXPANSION TANK

A. Install domestic water heating system expansion tank where shown on Contract Drawings and in accordance with manufacturer’s installation instructions.

B. Install expansion tank level and plumb. Install expansion tank so that it can be fully drained and shut down.

C. Charge expansion tank to static pressure in the field.

3.4 SYSTEM START UP

A. Provide start up services of factory trained technician to inspect installation based on factory recommendations. Inspect installation for correct piping configuration, venting and fuel supply.

1. Any deficiencies identified by the factory technician shall be corrected and/or repaired by the installing contractor.
2. If corrections and/or repairs cannot be completed while factory technician is on site, installing contractor shall be responsible for payment of follow-up inspections and services of the factory technician.

B. Start up technician to adjust controls and safety devices for proper operation of system, and balance water flow through heater(s) for proper temperature differential based on manufacturer’s recommendations.

1. Verify proper pump size and pump operation for heater(s) and circulation pump(s).

C. Start up report, in writing, shall be submitted to the Owner's Representative and the engineer with the minimum following information:

1. Temperature differential across heater(s).
2. Gas pressure at control string inlet.
3. Gas pressure at burner(s).
4. Draft reading, if applicable.
5. Temperature setting – heater output controls.
6. Temperature setting – storage tank(s).
7. Temperature setting – high limit(s).
8. Temperature setting – return line aquastat(s).
9. Mixed outlet temperature.
10. Supply voltage.
11. Proper air charge at thermal expansion tank.
12. Relief valve settings and type at heater(s) and tank(s).

D. Advise, in writing, any deficiencies in the installation, and/or operation of the system.

3.5 TRAINING

A. Provide a minimum of 8 hours for instruction to Owner's personnel on system operation and maintenance.

END OF SECTION

SUNY ERIE COMMUNITY COLLEGE NORTH CAMPUS
KITTINGER HALL BOILER ROOM UPGRADES
DIVISION 23
MECHANICAL SPECIFICATIONS
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SECTION 230010 - BASIC MECHANICAL REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. All drawings and general provisions of Contract, including all General and Supplementary Conditions, Division 1 Specification Sections, and Instructions to Bidders apply to this section and all other sections of Division 23.

B. Section 019113 - Commissioning Requirements

1.2 SCOPE OF WORK

A. All portions of the work shown in the construction documents shall be bid by the Mechanical Contractor. Responsibility for performance of subcontractors and trades as lower tier contracts, such as electrical, shall be included as part of the Mechanical Contractor's scope of work.

B. Include in bid all labor, materials, tools, plant, transportation, excavation, equipment, insurance, temporary protection, permits, taxes, services and all necessary and related items required to provide complete and operational systems shown and described.

C. References to codes and standards called for in the Contract Documents mean the latest edition, amendment and revisions to the codes and standards in effect on the date of these Contract Documents.

D. Minimum composition requirements and/or installation methods for the following materials and work are included in this section:

1. Miscellaneous Supports
2. Access Doors and Panels
3. Fire Stopping
4. Cutting and Patching

E. Contract shall include, but not be limited to:

1. HVAC, including:
    a. Temperature controls
    b. Plumbing
2. General Contracting
3. Electrical

1.3 REGULATIONS AND CODE COMPLIANCE

A. All work and materials shall conform to and be installed, inspected and tested in accordance with the governing rules and regulations of federal, state and local governmental agencies having jurisdictional authority. In the event of conflict between these contract documents and the governing rules, regulations, and codes, the most stringent standards shall apply as directed by the Engineer and/or Authorities having jurisdiction.

B. Codes and standards that apply to this project include, but are not limited to:

1. 2025 Building Code of New York State (BCNYS)
2. 2025 Existing Building Code of New York State (EBCNYS)
3. 2025 Energy Conservation Construction Code of New York State (ECCCNYS)
4. 2025 Fire Code of New York State (FCNYS)
5. 2025 Fuel Gas Code of New York State (FGCNYS)
6. 2025 Mechanical Code of New York State (MCNYS)
7. 2025 Plumbing Code of New York State (PCNYS)
8. ASHRAE Standard 90.1-2016, Energy Standard for Buildings Except Low-Rise Residential Buildings.
9. New York State Department of Labor Rules and Regulations.
10. New York State Department of Health Regulations.
11. Federal Occupational Safety and Health Administration (OSHA) Regulations
12. Local Codes and Ordinances for Amherst, NY, Erie County
13. Factory Mutual and/or Owner's Insurance Carrier
14. New York Board of Fire Underwriters.

1.4 LICENSING & PERMITS

A. The Contractor shall hold a license all necessary licenses to perform the scope of work at the project location.

B. Apply for and obtain all required permits and inspections, include costs for all fees and charges within bid.

C. Refer to General Conditions of the Contract for additional requirements.

1.5 GLOSSARY

ADA	Americans with Disabilities Act
AGA	American Gas Association
AGCA	Associated General Contractors of America, Inc.
AIA	American Institute of Architects
AISC	American Institute of Steel Construction
AMCA	Air Moving and Conditioning Association
ANSI	American National Standards Institute
ARI	Air-Conditioning and Refrigeration Institute
ASHRAE	American Society of Heating, Refrigeration and Air-Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing Materials

AWSC	American Welding Society Code
EIA	Electronic Industries Association
FCC	Federal Communications Commission
FM	Factory Mutual Insurance Company
GAP	Global Asset Protection
IEEE	Institute of Electrical and Electronics Engineers
IRI	Industrial Risk Insurers
ISO	International Standards Organization
NEC	National Electrical Code
NEMA	National Electrical Manufacturers' Association
NESC	National Electrical Safety Code
NFPA	National Fire Protection Association
NYS/DEC	New York State Department of Environmental Conservation
NYS/UFBC	New York State Uniform Fire Prevention and Building Code
OSHA	Occupational Safety and Health Administration
SMACNA	Sheet Metal and Air Conditioning Contractors National Association
UL	Underwriter's Laboratories, Inc.

1.6 DEFINITIONS

Approved / Approval	Written permission to use a material or system.
As Called For	Materials, equipment including the execution specified/shown in the contract documents.
Code Requirements	Minimum requirements.
Concealed	Work installed in pipe and duct shafts, chases or recesses, inside walls, above ceilings, in slabs or below grade.
Design Equipment	Refer to the article, BASIS OF DESIGN
Design Make	Refer to the article, BASIS OF DESIGN.
Equal or Equivalent	Equally acceptable as determined by Owner’s Representative
Exposed	Work not identified as concealed.
Final Acceptance	Owner acceptance of the project from Contractor upon certification by Owner's Representative.
Furnish	Supply and deliver to installation location.
Furnished by Others	Receive delivery at job site or where called for and install.
Inspection	Visual observations by Owner's Site Representative.
Install	Mount and connect equipment and associated materials ready for use.
Labeled	Refers to classification by a standards agency.
Make	Refer to the article, BASIS OF DESIGN.
Or Approved Equal	Approved equal or equivalent as determined by Owner’s Representative.
Owner’s Representative	The Prime Professional, Construction Management, or other entity contractually authorized by the Owner for the services referenced.
Prime Professional	Architect / Architectural Entity or Engineer / Engineering Entity having a contract directly with the Owner for professional services.

Professional Engineer	Individual or Entity licensed to perform Engineering services in the State of New York
Provide	Furnish, install and connect ready for use.
Relocate	Disassemble, disconnect, and transport equipment to new locations, then clean, test, and install ready for use
Replace	Remove and provide new item.
Review	A general contractual conformance check of specified products.
Roughing	Pipe, duct, conduit, equipment layout and installation.
Satisfactory	As specified in contract documents.
Site Representative	Construction Manager or Owner's Inspector at the work site.

Refer to General Conditions of the Contract for additional definitions.

1.7 BASIS OF DESIGN

A. The contract documents are prepared on the basis of one manufacturer as "design equipment," even though other manufacturers' names are listed as acceptable makes.

B. Where equipment other than design equipment is to be considered, submit detailed drawings, indicating proposed installation of equipment. Contractor shall make all necessary field measurements and investigations to assure that the equipment and assemblies will meet contract requirements. Show maintenance clearances, service removal space required, and other pertinent revisions to the design arrangement.

C. Contractor shall provide changes in work of all other trades at no increase in any contract. Provide larger motors, electrical feeders, circuit breakers, equipment, additional control devices, valves, fittings and other miscellaneous equipment required for proper operation, and assumes responsibility for proper location of roughing and connections by other trades. Remove and replace door frames, access doors, walls, ceilings or floors required to install other than design make equipment.

D. Contractor shall retain the ultimate responsibility for function of equipment and materials which are not the basis of design for the contract documents. If revised arrangement submittal is rejected, revise and resubmit specified "design equipment" item which conforms to contract documents.

1.8 INTENT OF DRAWINGS

A. The drawings are diagrammatic, unless detailed dimensioned drawings are included. Drawings show approximate locations of equipment, and fixtures. Exact locations are subject to the approval of the Owner's Representative.

B. In the event of conflict between the drawings and specifications, or discrepancies within either, this shall be brought to the attention of the Engineer for resolution prior to submission of bids. In the event that the contractor fails to note these discrepancies prior to submission of bids or in writing within their bid submission, the Engineer shall resolve the discrepancy such that the design intent is provided. The contractor shall provide all labor, materials and equipment to correct the installation deficiencies as defined by the Engineer.

1.9 ELECTRONIC CAD DRAWING FILES

A. The Engineer may provide the Contractor with AutoCAD .dwg or MicroStation 'dgn' format files for this project with the understanding that these CAD files shall be used for reference purposes only, and not as shop drawings or as-built documents. It is the Contractors' responsibility to provide detailed, coordinated shop drawings and documentation prior to installation. The purpose of the Contractors' coordination shop drawings is to account for all trades and field conditions and identify any conflicts that shall be resolved prior to installation.

B. Any additional cost for changes due to conflicts as a result of the Contractors' failure to provide properly coordinated documents will be the responsibility of the Contractors and not of the Engineer.

C. If the Contractor requests electronic CAD files from the Engineer and this request is granted, the Contractor shall submit application to the Engineer identifying each drawings to process the request.

1.10 QUALITY ASSURANCE

A. Manufacturers of equipment shall be firms regularly and currently engaged in the production of equipment and accessories provided. The design and size/capacity of each item of equipment provided for this project needs to have been in satisfactory and efficient operation on at least three (3) installations for not less than three (3) years.

B. Suppliers of equipment must have factory trained and authorized personnel for the service of all equipment provided.

C. Apply and install materials, equipment, and specialties in accordance with manufacturer's written instructions. Conflicts between the manufacturer's instructions and the contract documents shall be referred to the Owner's Representative for resolution.

D. The contractor shall engage the services of a qualified installer for the installation and application of joint sealers, flashing, access panels, cutting and patching.

E. All work shall be done in a neat and workmanlike manner. All methods of construction or details of workmanship, not specifically described or indicated in the contract documents, shall be subject to the control and approval of the Owner's Representative. Equipment and materials shall be of the quality and construction indicated. The equipment specified is based upon the acceptable manufacturers listed. Where "approved equal" is stated, equipment shall be equivalent in every way to that of the equipment specified and subject to approval.

F. In the absence of specific information within other sections of this project manual, all work of this project shall be provided with a one year labor and materials warranty against defects in equipment, materials and workmanship, starting from the date of project substantial completion.

PART 2 - PRODUCTS

2.1 EQUIPMENT AND MATERIAL MINIMUM REQUIREMENTS

A. Provide materials that meet the following minimum requirements:

1. Materials shall have a flame spread rating of 25 or less and a smoke developed rating of 50 or less, in accordance with NFPA 255.
2. All equipment and material for which there is a listing service shall bear a UL label.
3. Gas-fired equipment and systems shall meet AGA Regulations and shall have an AGA label
4. Electrical equipment and systems shall meet UL Standards and requirements of the NEC. This listing requirement applies to the entire assembly. Any modifications to equipment to suit the intent of the specifications shall be performed in accordance with UL Standards and the requirements of the NEC.
5. Communications equipment shall meet all FCC Regulations
6. All materials, unless otherwise specified, shall be new and be the standard products of the manufacturer. Used equipment or damaged material will be rejected.
7. The listing of a manufacturer as “acceptable” does not indicate acceptance of a standard or catalogued item of equipment. All equipment and systems must conform to the Specifications.

2.2 SUBSTITUTIONS

A. The materials, products and equipment described in the Bidding Documents establish a standard of required quality, functions, dimensions and appearance that must be met by any proposed substitution.

B. Proposed substitutions must be submitted in writing to the Architect and Engineer a minimum of ten (10) days prior to the date for receipt of Bids. Each request shall include the name of the proposed material, product or equipment being substituted, cut sheets, installation drawings, performance and test data, warranties and location of three (3) similar installations with reference names of owner or facility personnel responsible for maintaining equipment. At that time the equipment or will be evaluated and if determined to be acceptable an Addendum will be issued to all bidders. Failure to follow the guidelines described above may result in equipment being rejected at submittal based solely on failure to follow the above guidelines.

C. Approval by the Architect and/or Engineer to proceed with a substitution does not relieve the contractor from meeting all of the dimensional requirements and maintaining the full functionality and performance of the material, product or equipment used as the basis of design.

D. Electrical Design Changes Due to Mechanical Substitutions – It shall be the responsibility of all Contractors to transmit all changes of electrical characteristics to the Electrical Contractor which result from any substitutions PRIOR to starting any work. Any and all extra charges by the Electrical Contractor due to these changes are to be paid by the Contractor making the change.

E. Requests for substitution shall be made only by a Bidder. Requests for substitution from sales representatives, vendors or suppliers are unacceptable and will not be considered.

2.3 FACTORY-ASSEMBLED PRODUCTS

A. Provide maximum standardization of components to reduce spare part requirements.

B. Manufacturers of equipment assemblies which include components made by others shall assume complete responsibility for final assembled unit.

1. All components of an assembled unit need not be products of the same manufacturer.
2. Constituent parts which are alike shall be products of a single manufacturer.
3. Components shall be compatible with each other and with the total assembly for intended service.
4. Contractor shall guarantee performance of assemblies of components and shall repair or replace elements of the assemblies as required to deliver specified performance of the complete assembly.

C. Components of equipment shall bear the manufacturer's name or trademark, model number and serial number on a name plate securely affixed in a conspicuous place, or cast integral with, stamped or otherwise permanently marked upon the components of the equipment.

D. Major items of equipment which serve the same function must be the same make and model. Exception will be permitted if performance requirements cannot be met.

2.4 COMPATIBILITY OF RELATED EQUIPMENT

A. Equipment and materials installed shall be compatible in all respects with other items being furnished and with existing items so that a complete and fully operational system will result.

2.5 SPECIAL TOOLS

A. If any part of equipment requires a special tool for assembly, adjustment or maintenance thereof and such tool is not readily available in the commercial tool market, it shall be furnished by the Contractor as required for the duration of the project and turned over to the Owner in serviceable condition upon completion of the scope of work. Contractor shall obtain written sign off by the Owner certifying that the Owner is in receipt of such tools.

2.6 SAFETY GUARDS

A. Provide guards on all shafts and couplings and all V-belt and sheave assemblies to prevent damage to equipment and injury to personnel.

2.7 LIFTING ATTACHMENTS

A. Provide equipment with suitable lifting attachments to enable equipment to be lifted in its normal position. Lifting attachments shall withstand any handling conditions that might be encountered without bending or distortion of shape, such as rapid lowering and braking of load.

2.8 MISCELLANEOUS SUPPORTS

A. Metal bars, plates, tubing, etc. shall conform ASTM standards:

1. Steel plates, shapes, bars, and grating - ASTM A 36
2. Cold-Formed Steel Tubing - ASTM A 500
3. Hot - Rolled Steel Tubing - ASTM A 501
4. Steel Pipe - ASTM A 53, Schedule 40, welded

B. Metal fasteners shall be zinc-coated (type, grade and class as required).

2.9 ACCESS DOORS AND PANELS

A. Steel access doors and frames shall be factory fabricated and assembled units, complete with attachment devices and fasteners ready for installation. Joints and seams shall be continuously welded steel, with welds ground smooth and flush.

B. Provide access doors at all locations where equipment access for service, repair, and/or adjustment may be required. This shall include access to all air balance dampers. (In lieu of access to air balance dampers above hard ceilings or in chase walls, Contractor may submit for approval for use of remote regulators.)

C. Construction:

1. Frames:

   a. 16 gage steel with 1 inch wide, exposed, perimeter flange and adjustable masonry anchors for units installed in masonry, pre-cast, cast-in-place concrete, or ceramic tile.
   b. 16 gage steel, perforated flanges with bead for gypsum or plaster wall board.
   c. 16 gage steel with galvanized, expanded metal lath and exposed casing bead, welded to perimeter of frame for full bed plaster applications.

2. Access Doors:

   a. Provide 14 gage sheet steel, flush panel doors with concealed, continuous, factory-installed piano hinge, primed and painted, set to open 175 degrees in unrated partitions.
   b. Provide fire-rated, insulated, flush panel doors, with continuous piano hinge and self-closing mechanism rated for 1-½ hour “B” labeled, in fire-rated partitions.

3. Provide flush, screwdriver operated cam locks on all access doors.
4. Access doors shall be gasketed type where installed in rooms or spaces required to maintain a positive or negative pressure requirement to adjacent rooms or spaces.

2.10 CONCRETE BASES

A. Provide concrete bases for all floor mounted equipment. Provide 4000# concrete, camfer edges, trowel finish and securely bond to floor by roughing slab and coating with cement grout. Provide a minimum of one ½" rebar dowel for every 2 sq. ft. base area, anchored 2" into floor and base to eliminate movement, minimum of 4 dowels per base. Bases shall be nominal 4" high unless otherwise indicated, shaped and size to accommodate equipment, and extend 4" beyond equipment footprint in all directions. Set equipment anchor bolts in sleeves before pouring.

2.11 FIRE STOPPING

A. Fire-stopping for openings through fire and / or smoke rated walls and floor assemblies shall be listed or classified by an approved independent testing laboratory for "Through-Penetration Fire-Stop Systems." The system shall meet the requirements of "Fire Tests of Through-Penetration Fire-Stops" designated by ASTM E814.

B. Submit for approval all fire stop systems and materials for approval by the Engineer

C. Acceptable Manufacturers:

1. Hilti Firestop Systems
2. Dow Corning Fire-Stop System Foams and Sealants.
3. Nelson Electric Fire-Stop System Putty, CLK and WRP.
4. Thomas & Betts - S-100 FS500/600,
5. Carborundum Fyre Putty.

PART 3 - EXECUTION

3.1 SUBMITTALS: SHOP DRAWINGS/PRODUCT DATA/SAMPLES

A. Submit Shop Drawings on all items of equipment and materials to be furnished and installed. Submission of Shop Drawings and samples shall be accompanied by a transmittal letter, stating name of project and contractor, number of drawings, titles, and other pertinent data called for in individual sections. Shop Drawings shall be dated and contain: name of project; name of prime professional; name of prime contractor; description or names of equipment, materials and items; and complete identification of locations at which materials or equipment are to be installed. Incomplete submittals will not be accepted. All products specified in an individual Division 23 Section shall be submitted at the same time. Number each submittal. Indicate deviations from contract requirements on Letter of Transmittal. Corrections or comments made on the Shop Drawings during the review do not relieve the Contractor from compliance with requirements of the drawings and specifications. The Contractor is responsible for confirming and correcting all quantities; checking electrical characteristics and dimensions; selecting fabrication processes and techniques of construction; coordinating his work with that of all other trades; and performing his work in a safe and satisfactory manner.

B. Approval of shop drawings will not relieve this contractor from responsibility for deviations from the contract documents. It is the responsibility of the Contractor to meet the requirements of these documents. All errors or omissions in the product data are to be corrected by this contractor irrespective of any approvals by the Architect or Engineer.

C. Pre-test submittals must be written in report format, submitted and signed off on by the Owner and Engineer prior to the start of any construction work, including demolition.

D. Shop drawings include, but are not limited to, the submissions listed below. Refer to individual specification sections for specific requirements and additional submission requirements.

SECTION	DESCRIPTION	REQUIRED SUBMISSIONS
019113	Commissioning Requirements	Preliminary Commissioning Report Final Commissioning Report
230010	Basic Mechanical Requirements	Access doors Fire Stopping Special requirements related to substitutions Sheet metal shop / coordination drawings Operation and Maintenance Manuals Record Documents / Drawings
230506	Painting of Mechanical Work	Product data for vehicles, primers and paints. (name, title, manufacturer, mfr's stock number, color name & number, & application instructions). Submit a schedule of surfaces/systems to be painted along with paint products and colors that shall be applied.
230509	Roof Curbs and Equipment Supports	Typical detail and schedule for equipment. Details shall include cross-sectional view illustrating clearly the type of curb being submitted, i.e. double wall insulated, with or without cant.
230513	Motors	Generally None Required **OR** Motor info with equipment submittal for equipment served.
230514	Electric Wiring	Complete wiring diagram for equipment and systems.
230519	Gauges and Thermometers	Manufacturer's data for each gauge and thermometer type. Submittal shall clearly designate where each device shall be utilized, including the scale range.
230523	Valves	Valves and accessories
230550	Wind Restraints for HVAC Systems.	Manufactures technical product data for wind restraint systems. Provide professional engineer stamped and signed calculations, and details of wind restraint systems to meet total design lateral force requirements for support and restraint of mechanical and electrical systems.

230553	Mechanical Identification	Manufactures technical product data and installation instructions for each identification material and device. Valve schedule for each piping system typewritten on an 8-1/2. X 11 in. (minimum) indicating code number, location and valve function. Schedule of pipe, equipment and name identification for review before stenciling or labeling. Confirm naming/numbering is consistent with Owner's convention.
230593	Testing, Adjusting and Balancing	Quality-Assurance Submittals Sample Report Forms Report of plan review for balancing devices necessary to achieve proper system balance but not specified Certified Testing, Adjusting, and Balancing Reports (including any specified pre-testing of systems) Warranty Documentation
230700	Insulation	Manufacturer data. Schedule of insulation applications. Certifications to demonstrate compliance specifications and governing regulations, including proof of compliance for test of products for fire rating, corrosiveness, and compressive strength.
230923	Temperature Controls	Control System Submittal Pre-Commissioning Report As-Built documentation and drawings Operations and Maintenance Manuals / Closeout Documentation Training Agenda and Documentation Warranty
232000	Piping Systems and Accessories	Schedule of pipe materials, fittings, connections and accessories by piping system.
232133	Water Systems Specialties	Shop drawings on water system specialties
233000	Sheet Metal and Ductwork Accessories	Shop drawings of all sheet metal equipment being provided. Submit a complete shop standard manual including construction details for all shop fabricated materials. Ductwork Detail Drawings. Exhaust and kitchen hood details.
233726	Louvers	Louvers including all blade types, finishes and arrangements. Provide original color charts for selection of finish
235100	Prefabricated Chimney	A complete material and construction details for chimney and accessories including guy wire layout. Drawings showing floor and roof openings, which shall indicate exact sizes and locations.

235223	Boiler	Performance data and operating characteristics, Boiler-burners and accessories. All other auxiliaries. Boiler room showing boilers, auxiliaries, piping, breeching, etc. Include plans, elevations, sections, details and attachments to other work. Wiring diagrams: detail power, signal and control wiring. Source quality-control test reports. Startup service reports Operation and maintenance data, include emergency, operation and maintenance manuals. Warranties

3.2 COORDINATION DRAWINGS

A. Before construction work commences, Contractors for all trades shall submit Coordination Drawings in the form of color coded paper drawings or electronic files (dwg or rvt) not less than 3/8" = 1'-0" scale. Coordination Drawings are required throughout all areas for all trades. These drawings shall identify and show resolutions of trade conflicts. Mechanical Equipment Rooms shall be drawn early in the Coordination Drawing process, simultaneous with all other congested areas. Prepare Coordination Drawings as follows:

1. Division 23 shall prepare the base plan Coordination Drawings showing all ductwork and all pertinent piping and equipment. These drawings may be AutoCAD format of the required ductwork Shop Drawings. The drawings shall be coordinated with cable tray, light fixtures, sprinklers, air diffusers, other ceiling mounted items, ceiling heights, structural work, maintenance clearances, electric code clearance, reflected ceiling plans, and other contract requirements. Re-position proposed locations of work after coordination drawing review by the Construction Manager and the Architect. Provide adjustments to exact size, location and offsets of ducts, pipes, conduit, etc. Provide these adjustments as part of Base Bid Contracts.
2. Division 23 will provide AutoCAD files and prints and submit the base plan to all major trades' Contractors.
3. Division 26 (Electrical), Division 22 (Plumbing) and Division 21 (Fire Protection) will each draft location of piping, conduits, equipment, etc. on the base plan as provided by Division 23 such that a complete coordination of all trades is represented and areas of conflict and recommended resolutions are noted.
4. Do not install any equipment, equipment foundations, ductwork, or piping until Coordination Drawings have been approved. Failure to receive approval prior to installation of the aforementioned items, will put the risk on the contractor to remove and reinstall at the engineer’s discretion. Additional time spent by the engineer in the field reviewing construction progress due to not receiving ductwork shop drawings and coordination drawings prior, will be considered an additional service by the consultant, which shall be paid by the contractor and deducted from any moneys owed to the contractor. The consultant’s hourly rate will apply.

3.3 PROTECTION OF PERSONS AND PROPERTY

A. Contractor shall assume responsibility for Construction Safety at all times and provide, as part of contract, all trench or building shoring, scaffolding, shielding, dust/fume protection, mechanical/electrical protection, special grounding, safety railings, barriers, and other safety feature(s) required to provide safe conditions for all workmen and site visitors.

3.4 EXISTING SYSTEMS AND CONDITIONS

A. Existing conditions are taken from field observations and prior construction documents and are not guaranteed. The contractor shall field verify all existing conditions. No allowance will be made for additional costs due to Contractors failure to verify existing conditions.

B. Prior to beginning work, inspect the entire work area for defects in the existing construction such as scratches, holes etc. Submit a complete list and photographs of existing damage, to the Owner prior to beginning work. If existing damage is not documented and submitted, the Contractor shall repair all damage found at the completion of the project that is determined to have been caused by the work of this contract. Repairs shall restore the area to like new condition.

C. The Owner's Representative shall determine if the Contractor has damaged existing systems or construction and shall approve the repairs.

3.5 ASBESTOS RECOGNITION AND PRECAUTIONS

A. The Contractor shall be responsible for coordination of all required removal work, coring, cutting and patching with the Owner's asbestos management plan. Prior to performing such work, identify areas containing asbestos. Notify the Owner so that arrangements may be made for abatement and/or containment prior to work proceeding. The Contractor shall be responsible for cleaning all areas where asbestos is released due to the failure to coordinate with the asbestos management plan. Refer to Division 1 Sections for further requirements.

B. The disturbance or dislocation of asbestos-containing materials causes asbestos fibers to be released into the building's atmosphere, thereby creating a health hazard to workmen and building occupants. Consistent with Industrial Code Rule 56 and the content of recognized asbestos-control work, the Contractor shall apprise all of his workers, supervisory personnel, subcontractors, Owner and Consultants who will be at the job site of the seriousness of the hazard and of proper safeguards and work procedures which must be followed, as described in New York State Department of Labor Industrial Code Rule 56.

C. Refer to Division 2 sections for further requirements.

3.6 REMOVALS

A. Demolition of mechanical systems will include removal and deprogramming of multiple control system devices and sensors. Coordinate with Owner for quantity and type of devices which they desire to retain. Remove all components in good condition and turn over to the Owner's representative.

B. Where existing equipment removals are called for, submit complete list to Owner's Representative. All items that the Owner wishes to retain that do not contain asbestos or PCB Material shall be delivered to location directed by the Owner. Items that the Owner does not wish to retain shall be removed from site and legally disposed of. Removal and disposal of material containing asbestos and/or PCB's shall be in accordance with Federal, State and Local law requirements. Where equipment is called for to be relocated. Contractor shall carefully remove, clean and recondition, then reinstall. Remove all abandoned piping, wiring, equipment, lighting, ductwork, tubing, supports, fixtures, etc. Visit each room, each crawl space and each roof to determine total Scope of Work. Consistent with Industrial Code Rule 56 and the content of recognized asbestos-control work, the Contractor shall apprise all of his workers, supervisory personnel, subcontractors, Owner and Consultants who will be at the job site of proper safeguards and work procedures which must be followed, as described in New York State Department of Labor Industrial Code Rule 56.

C. Completely remove all piping, conduit, controls, and other devices associated with the equipment not to be reused in the new work. This includes all pipe, valves, fittings, insulation, conduit, panels, and all hangers, including the top connection and any fastenings to building structural systems. Where pipe and ductwork is removed and no new connections are planned or shown, cap, seal and insulate the pipe and ductwork which remains. Seal all openings, after removal of equipment, pipes, ducts, conduits and other penetrations in roof, walls, floors, in an approved manner and in accordance with plans and specifications where specifically covered. Structural integrity of the building system shall be maintained. Reference shall also be made to the architectural, structural, mechanical, site, and electrical drawings and specifications for additional facilities to be demolished or handled.

D. The shutting down of the existing HVAC systems shall be properly coordinated with the Owner. Provide the necessary personnel in shutting down the systems as necessary to facilitate the intended work. Water and glycol systems shall be fully drained prior to any removals. The Contractor shall propose to the Owner the points of isolation of the system to minimize the duration of the shutdown for draining, performing the necessary work and refilling of the system. Systems containing a glycol solution shall be drained in a manner to collect the solution in containers for storage or disposal. Glycol solution not utilized for refilling the systems upon completion of work shall be removed from the site and properly disposed of in a legal manner by the Contractor. Upon completion of removals and new work, the Contractor shall refill and vent the systems to return the systems back to their original operation condition.

3.7 STORAGE AND PROTECTION OF MATERIALS

A. Store Materials on dry base, at least 6" above-ground or floor. Store so as not to interfere with other work or obstruct access to buildings or facilities. Provide waterproof/windproof covering. Remove and provide special storage for items subject to moisture damage. Protect against theft or damage from any cause. Replace items stolen or damaged, at no cost to Owner.

3.8 FREEZING AND WATER DAMAGE

A. Take all necessary precautions with equipment, systems and building to prevent damage due to freezing and/or water damage. Repair or replace, at no change in contract, any such damage to equipment, systems and building. Perform first seasons winterizing in presence of Owner's operating staff.

3.9 ROUGH-IN

A. Due to small scale of Drawings, it is not possible to indicate all offsets, fittings, changes in elevation, etc. Verify final locations for rough-ins with field measurements and with the equipment being connected. Verify exact location and elevations at work site prior to any rough in work. **DO NOT SCALE PLANS**. If field conditions, details, changes in equipment or shop drawing information require a significant change to the original documents, contact the Owner's Representative for approval before proceeding.

B. All equipment locations shall be coordinated with other trades to eliminate interference with required clearances for equipment maintenance and inspections.

1. Coordinate work with other trades and determine exact routing of all duct, pipe, conduit, etc., before fabrication and installation. Coordinate with Architectural Drawings. Verify with Owner's Representative exact location and mounting height of all equipment in finished areas, such as thermostats, fixtures, communication and electrical devices, including panels. Coordinate all work with the architectural reflected ceiling plans and/or existing Architecture. Mechanical and electrical drawings show design arrangement only for Diffusers, grilles, registers, air terminals, lighting fixtures, sprinklers, speakers and other items. Do not rough-in contract work without reflected ceiling location plans.
2. Before roughing for equipment furnished by Owner or in other contracts, obtain from Architect and other contractors, approved roughing drawings giving exact location for each piece of equipment. Do not "rough in" services without final layout drawings approved for construction. Cooperate with other trades to insure proper location and size of connections to insure proper functioning of all systems and equipment. Obtain written authorization from the Owner's Representative or other contractor for any "rough ins" that, due to project schedule, are required before approved coordination drawings are available. Any work installed without written authorization or approved coordination drawings, causing a conflict will be relocated by the Contractor at no expense to the Owner.
3. For equipment and connections provided in this contract, prepare roughing drawings as follows:

    a. Existing equipment being relocated: Measure the existing equipment and prepare drawings for installation in new location.
    b. New equipment: Obtain equipment roughing drawings and dimensions, then prepare rough-in drawings.

4. Where more than one trade is involved in an area, space or chase, all shall cooperate and install their own work to utilize the space equally between them in proportion to their individual requirements. In general, ductwork shall be given preference except where grading of piping becomes a problem, followed by piping then electrical wiring. If, after installation of any equipment, piping, ducts, conduit, and boxes, it is determined that ample maintenance and passage space has not been provided, rearrange work and/or furnish other equipment as required for ample maintenance space. Any changes in the size or location of the material or equipment supplied, which may be necessary in order to meet field conditions or in order to avoid conflicts between trades, shall be brought to the immediate attention of the Owner's Representative and approval received before such alterations are made.

C. Provide easy, safe, and code mandated clearances at controllers, motor starters, valve access, and manufacturer's recommended service clearances to allow for required maintenance and operation. Contractor shall relocate existing work in the way of new construction. VISIT SITE BEFORE BIDDING TO DETERMINE SCOPE OF WORK. Provide new materials, including new piping and insulation for relocated work.

D. All equipment requiring service and / or access shall be provided adequate clearances for this purpose. Any clearances described in manufacturer's information, code requirements, etc., shall be taken into account in determining final rough-in positions. Reasonable access for maintenance and service shall be maintained. The most stringent standard, as determined by the Engineer, shall apply.

3.10 CUTTING AND PATCHING

A. Each trade shall include their required cutting and patching work unless shown as part of the General Construction work on the architectural drawings. Refer to "General Conditions of the Contract for Construction," for additional requirements. Cut and drill from both sides of walls and/or floors to eliminate splaying. Patch, cut or abandoned holes left by removals of equipment or fixtures. Patch adjacent existing work disturbed by installation of new work including insulation, walls and wall covering, ceiling and floor covering, other finished surfaces. Patch openings and damaged areas equal to existing surface finish. Cut openings in prefabricated construction units in accordance with manufacturer's instructions.

3.11 CONCEALMENT

A. **Conceal all contract work** above ceilings and in walls, below slabs, and elsewhere throughout building. If concealment is impossible or impractical, notify Owner's Representative before starting that part of the work and install only after his review. In areas with no ceilings, install only after Owner's Representative reviews and comments on arrangement and appearance.

3.12 CHASES

A. In Existing Buildings:

1. Drill holes for floor and/or roof slab openings.
2. Multiple pipes smaller than 1" properly spaced and supported may pass through one 6" or smaller diameter opening.
3. Seal voids in fire rated assemblies with a fire-stopping seal system to maintain the fire resistance of the assembly. Provide 18 gauge galvanized sleeves at fire rated assemblies. Extend sleeves 2" above floors.
4. In wall openings, drill or cut holes to suit. Provide 18 gauge galvanized sleeves at shafts and fire rated assemblies. Provide fire-stopping seal between sleeves and wall in drywall construction. Provide fire-stopping similar to that for floor openings

3.13 ACCESS DOORS AND PANELS

A. Provide access doors, sized to permit complete access for any concealed and/or inaccessible junction boxes, control and monitoring devices, duct mounted fire alarm detectors and other electrical equipment requiring access for maintenance or operation.

B. Provide access doors, sized to permit compete access for all items requiring adjustment, such as balance dampers above solid ceilings.

C. Set frames accurately in position and securely attach to supports with face panels plumb and level in relation to adjacent finish surfaces.

D. Adjust hardware and panels after installation for proper operation.

E. Access doors and panels shall operate freely and be fully usable for their intended function.

3.14 FIRE-STOPPING

A. Fire-stopping for openings through fire and smoke rated wall and floor assemblies:

1. Provide materials and products listed or classified by an approved independent testing laboratory for "Through-Penetration Fire-Stop Systems." The system shall meet the requirements of "Fire Tests of Through-Penetration Fire-Stops" designated ASTM E814.
2. Provide fire-stop system seals at all locations where piping, tubing, conduit, electrical busways/cables/wires, ductwork and similar utilities pass through or penetrate fire-rated wall or floor assembly. Provide fire-stop seal between sleeve and wall for drywall construction.
3. The minimum required fire resistance ratings of the wall or floor assembly shall be maintained by the fire-stop system. The installation shall provide an air and watertight seal.
4. The methods used shall incorporate qualities, which permit the easy removal or addition of electrical conduits or cables without drilling or use of special tools. The product shall adhere to itself to allow repairs to be made with the same material and permit the vibration, expansion and/or contraction of any items passing through the penetration without cracking, crumbling and resulting reduction in fire rating.
5. Apply fire stopping within the temperature and humidity limits permitted by the manufacturer.
6. Provide rigid steel sleeves where non-armored cables pass through fire rated walls and barriers.

3.15 FLASHING AND SEALING

A. Openings through roofs shall be flashed in a manner to not affect roof guarantee or bond. Engage qualified Roofing Contractor licensed by the Roofing Manufacturer, as part of the contract. Provide non-ferrous flashing pieces, skirts, hoods and collars as required to make ducts, pipes, conduits, and other penetrations watertight. Where curbs are called for with respect to rectangular openings in new roofs, flashing will be done by others unless specifically indicated otherwise. Caulk and waterproof with additional material so as to seal airtight and watertight.

B. Where openings for pipe/duct penetrate through roofs into equipment pipe chases, mechanical spaces or penthouses, the penetration of the roof deck/slab shall be sleeved, sealed and firestopped as required. Insulate at base of pipe chase, mechanical space or penthouse to match insulation value of the roofing system.

C. Apply all flashing and sealers within the temperature and humidity limits permitted by the manufacturer.

3.16 SUPPORTS

A. Provide required supports, beams, angles, hangers, rods, bases, braces, and other items to properly support contract work. Supports shall meet the approval of the Owner's Representative. Modify studs, add studs, add framing, or otherwise reinforce studs in metal stud walls and partitions as required to suit contract work. If necessary, in stud walls, provide special supports from floor to structure above. For Precast Panels/Planks and Metal Decks, support mechanical/electrical work as determined by manufacturer and Owner's Representative. Provide heavy gauge steel mounting plates for mounting contract work. Mounting plates shall span two or more studs. Size, gauge, and strength of mounting plates shall be sufficient for equipment size, weight, and desired rigidity.

3.17 GENERAL INSTALLATIONS REQUIREMENTS

A. Coordinate the installation of required supporting devices and sleeves to be set in poured-in-place concrete and other structural components, as they are constructed

B. Coordinate ordering and installation of all equipment with long lead times or having a major impact on work by other trades so as not to delay the job or impact the construction schedule. Pay close attention to equipment that must be installed prior to building enclosure.

C. Where mounting heights are not detailed or dimensioned, install systems, materials and equipment to provide the maximum headroom possible.

D. Set all equipment to accurate line and grade, level all equipment and align all equipment components.

E. Provide all scaffolding, rigging, hoisting and services necessary for erection and delivery of equipment and apparatus furnished into the premises. These items shall be removed from premises when no longer required.

F. No equipment shall be hidden or covered up prior to inspection by the Owner’s Representative. All work requiring inspection which is concealed prior to approval shall be re-opened for inspection at the Contractor’s expense. All work that is determined to be unsatisfactory shall be corrected immediately.

G. All work shall be installed level and plumb, parallel and perpendicular to other building systems and components.

H. Install access panels or doors where units are concealed behind finished surfaces.

3.18 PAINTING

A. This Contract Includes the following:

1. Painting for all cut and patch work performed as part of Division 23 contract.

2. Painting required for touch-up of surfaces damaged due to the installation of Division 23 work.
3. Painting as required to repair finish of equipment furnished.
4. Painting as called for on Division 23 Drawings and/or Specifications.

3.19 ADDITIONAL ENGINEERING SERVICES

A. In the event the Consultant is required to provide additional engineering services as a result of substitution of equivalent materials or equipment by the Contractor, or changes by the Contractor in dimension, weight, power requirements, etc., of the equipment and accessories furnished, or if the Consultant is required to examine and evaluate any changes proposed by the Contractor for the convenience of the Contractor, then the Consultant's hourly rate and expenses in connection with such additional services shall be paid by the Contractor and shall be deducted from any moneys owed to the Contractor.

B. In the event the Consultant is required to provide additional engineering services as a result of Contractor's errors, omissions or failure to conform to the requirements of the Contract Documents, or if the Consultant is required to examine and evaluate any changes proposed by the Contractor solely for the convenience of the Contractor, then the Consultant's hourly rate and expenses in connection with such additional services shall be paid by the Contractor and shall be deducted from any moneys owed to the Contractor.

C. In the event the Consultant is required to initiate design changes due to failure of the contractor to properly coordinate with the construction schedule, and / or other trades, then the Consultant’s hourly rate and expenses in connection with such additional services shall be paid by the Contractor and shall be deducted from any moneys owned to the Contractor.

3.20 ALL TRADES TEMPORARY HEAT

A. Refer to the Standard General Conditions of the Contract for Construction and Supplemental General Conditions.

3.21 HVAC MAINTENANCE OF SYSTEMS DURING TEMPORARY USE PERIODS

A. Provide each air handling system with a set of pre-filters in addition to the permanent filters. Furnish four sets of pre-filters for each system for use when system is operated for temporary heating or cooling. During such use, change pre-filters as often as directed by Owner's Representative. Provide necessary temporary throwaway filters in all return openings to keep dust out of ductwork. Change as often as necessary. Remove all such temporary filters upon completion. Use supply units only. Do not operate return fans.

B. Blank-off outside air intake opening during construction. Install first set of permanent filters and pre-filters. Install filters over all return air openings with adequate efficiency and capacity to keep construction dust and debris out of the duct systems. Contamination of the duct systems shall necessitate cleaning to dust free condition.

C. Adjust dampers on supply system.

D. Set all heating coil control valves for manual operation.

E. Do not install any grilles or diffusers at room terminal ends of ducts until permission is given.

F. Assume responsibility for systems and equipment at all times, even though used for temporary heat or ventilation.

G. Repair or replace all dented, scratched or damaged parts of systems.

H. Remove concrete, rust, paint spots, other blemishes, then clean.

I. Just prior to final acceptance, remove used final filter. Deliver all unused sets of pre-filters to the Owner and obtain written receipt. Properly lubricate system bearings before and during temporary use. Maintain thermostats, freeze stats, fire stats, overload devices, and all other safety controls in operating condition

3.22 CLEANING

A. It is the Contractor's responsibility to keep clean all equipment and fixtures provided under this contract for the duration of the project. Each trade shall keep the premises free from an accumulation of waste material or rubbish caused by his operations. The facilities require an environment of extreme cleanliness, and it is the Contractor's responsibility to adhere to the strict regulations regarding procedures on the existing premises. After all tests are made and installations completed satisfactorily:

1. Thoroughly clean entire installation, both exposed surfaces and interiors.
2. Remove all debris caused by work.
3. Remove tools, surplus, materials, when work is finally accepted.

B. Cleanliness of construction shall extend to include the interior and exterior surfaces of all equipment and systems provided under this contract. This includes, but is not limited to:

1. Unitary equipment exposed to occupant use (cabinet heaters, baseboard systems, etc.) Shall be thoroughly cleaned for final use both inside and out prior to project completion.
2. Equipment located in mechanical spaces shall be cleaned on the exterior such that no significant accumulation of debris or dirt is evident.
3. Interiors of all air handling equipment (rooftop systems, air handlers, etc.) shall be thoroughly cleaned on the interior such that no evidence of dust, dirt or debris remains prior to project turnover.
4. Ductwork systems – Ductwork shall be delivered to the job site with ends capped or covered to eliminate contamination during transportation and site storage. All open ends shall remain covered during the entire course of the construction process. Ductwork with evidence of dust, dirt or debris shall be thoroughly cleaned by an approved method prior project turnover.

3.23 HVAC EQUIPMENT CONNECTIONS

A. Provide final steam, condensate, hot water, glycol, chilled and condenser water, drain, vent, oil line and gas connections to all equipment as required by the equipment. Provide final connections, including domestic water piping, wiring, controls, and devices from equipment to outlets left by other trades. Provide equipment waste, drip, overflow and rail connections extended to floor drains.

B. Provide for Owner furnished and Contractor furnished equipment all valves, piping, piping accessories, traps, pressure reducing valves, gauges, relief valves, vents, drains, insulation, sheet metal work, controls, dampers, as required.

C. Refer to manufacturer's drawings and specifications for requirements of medical equipment, laboratory equipment and special equipment. Verify connection requirements before bidding and confirm prior to roughing.

3.24 CONTINUITY OF SERVICES

A. The building will be in use during construction operations. Maintain existing systems in operation within all rooms of building at all times. Refer to "General Conditions of the Contract for Construction" for temporary facilities for additional contract requirements. Schedules for various phases of contract work shall be coordinated with all other trades and with Owner's Representative. Provide, as part of contract, temporary mechanical connections and relocation as required to accomplish the above. Obtain approval in writing as to date, time, and location for shut-down of existing mechanical facilities or services.

3.25 START UP AND OWNER INSTRUCTIONS

A. Before acceptance of the work, furnish necessary skilled labor to operate all systems by seasons. Instruct the Owner's designated personnel on the proper operation and maintenance of systems and equipment. Obtain written acknowledgment from person instructed. Prior to acceptance repeat the instructions. If asked to do so. Contractor is fully responsible for systems until acceptance, even though operated by Owner's personnel, unless otherwise agreed in writing. Provide operating, maintenance and starting precautions and procedures to be followed by the Owner for operating systems and equipment. Mount the instruction in clear plastic holder on or adjacent to the equipment.

B. Where supervision by a manufacturer is called for, provide manufacturer's certified technician or engineer to supervise the startup, testing and adjustment of the equipment or system. Where two or more manufacturers are involved (i.e. adjustable speed drive and air handling unit) both manufacturers shall be present at start up. The manufacturer shall provide a written report detailing the testing and start-up, including problems that occurred and their method of resolution.

3.26 OPERATION AND MAINTENANCE MANUALS

A. In addition to requirements stated elsewhere in these specifications, provide Operating and Maintenance manual(s) which include the following:

1. Approved Submittal documentation for all equipment stating size and selected options for each piece of equipment requiring maintenance.
2. Manufacturer's operation manuals and maintenance manuals for each piece of equipment requiring maintenance (excepting equipment not furnished as part of this project). Routine maintenance actions shall be clearly identified. The data shall include internal wiring diagrams and spare parts lists.
3. Name and address of each equipment supplier and at least one service agency for each piece of equipment.

4. HVAC and service water controls system maintenance and calibration information, including wiring diagrams, schematics, and control sequence descriptions. Desired or field-determined setpoints shall be permanently recorded on control drawings and at control devices or, for digital control systems, in programming instructions.
5. A narrative of how each system is intended to operate, including recommended setpoints. Include emergency operating instructions, seasonal changeover, freeze protection and precautions necessary for Owner operations of systems.
6. As-built drawings for the project (see Record Documents) and piping diagrams.

B. Bind above items in a three ring binder with name of project on the cover. Deliver to Owner's Representative before request for acceptance. Provide copy of O&M Manual in electronic format on CD or other media format acceptable to the Owner. All documents shall be in PDF format, with the exception of record drawings which shall be provided in AutoCAD compatible drawing format.

3.27 RECORD DOCUMENTS

A. In addition to all requirements elsewhere in the Contract Documents, prepare and provide record documents of the as-constructed work which meets the following minimum standards:

1. Utilities below floors, slabs and grade: During construction, maintain accurate records of all final locations and inverts for all services inside and outside of the buildings, beneath grade and below floors.
2. Ductwork and Piping:

    a. All ductwork and piping shall be clearly dimensioned with its outside dimensions (diameter or length X width) at each unique section/piece.
    b. Elevations of all ductwork and piping shall be clearly identified. Elevation should be taken in respect to the finish floor and bottom of ductwork or pipe.
    c. X/Y dimensions should be included for all ductwork and piping to provide precise location from a fixed bench-mark such as the corner of a building, column, etc., and neatly and clearly indicate same on reproducible prints.

3. Provide Record Drawings for all Contract Work. Document the location of control devices isolation valves, safety devices and equipment.
4. Incorporate all field changes, change orders and other modifications into the final Record Drawings.
5. Record drawings shall contain all corrections from construction documents to as-built conditions and shall be submitted for review and approval.
6. Drawing format:

    a. Documents shall be provided in PDF formant or, where fully developed in CAD, in AutoCAD compatible file format. Submittal media shall be as acceptable to the Owner and Engineer
    b. Drawings scale shall not be less than 3/8" = 1'-0".
    c. Marked up PDFs of the contract documents will not be acceptable

3.28 SALVAGEABLE MATERIALS

A. Salvageable materials will be reviewed and identified by the Owner. Instruction shall be given to the Contractor whether the Owner will remove salvageable materials, or whether contractor is to remove and deliver salvageable materials to a pre-designated site.

B. HVAC items normally accepted as salvage by the Owner:

1. Temperature control and automation hardware.

END OF SECTION

SECTION 230506 - PAINTING OF MECHANICAL WORK

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. Painting of mechanical related work specified in the Contract Documents including, but not limited to, the following:

1. Exposed natural gas piping - yellow

1.2 RELATED DOCUMENTS

A. All work under this section is subject to the Contract Documents. This Contractor shall be responsible for and governed by all requirements therein.

1.3 SUBMITTALS

A. Submit product data for vehicles, primers and paints including name, title, manufacturer, manufacturer's stock number, color name and number, and application instructions. Submit a schedule of surfaces/systems to be painted along with paint products and colors that shall be applied.

1.4 DELIVERY, STORAGE AND HANDLING

A. Deliver painting materials to job site in original, new and unopened packages and containers bearing manufacturer's name and label showing the following information:

1. Name and title of material
2. Manufacturer's stock number and date of manufacture
3. Contents by volume, for major pigments and vehicles
4. Thinning instructions
5. Application instructions
6. Color name and number

B. Store materials in approved fire-safe location with adequate ventilation. Area must be kept clean.

PART 2 - PRODUCTS

2.1 GENERAL PAINTING PRODUCT REQUIREMENTS

A. Painting products based on a system by Rust-Oleum. Other equivalent systems may be approved.

B. Steel surfaces – normal temperatures:

1. First Coat – Rust-Oleum #769 Red Primer.
2. Second Coat – Rust-Oleum #7400 Zinc Chromate Primer.

3. Third Coat – Rust-Oleum finish, colors as directed.

C. Steel surfaces – elevated temperatures above 150 degrees F.

1. First Coat – Rust-Oleum #819 heat resistant primer.
2. Second Coat – Rust-Oleum #55 heat resistant aluminum finish paint, color to match existing or as directed by Engineer.
3. Machinery, equipment and apparatus having factory applied prime coat shall be painted as specified above except omit first coat.

D. Vehicles and thinners: Comply with governing regulations and recognized safe practices in handling, use and drying of paint vehicles and thinners. Compatibility of paint products is the Contactor's exclusive responsibility. Select paint products to ensure freedom from problems relating to vehicles and thinners of type and within limits recommended by paint manufacturer.

PART 3 - EXECUTION

3.1 GENERAL

A. Clean surfaces before applying paint products. Remove oil and grease prior to mechanical cleaning. Comply with paint products manufacturer's instructions for surface cleaning and preparation. Remove surface applied accessories which are not to be painted, and reinstall after completion of painting. Protect non-removable items not to be painted, by covering with paper or plastic film.

B. Ferrous metal surfaces: Remove mill scale and loose rust on surfaces which are not zinc coated or shop/factory prime coated.

1. Clean shop applied prime coats on metal surfaces, and repair (touch-up) prime coats wherever abraded or otherwise damaged, prior to application of paint system.
2. Zinc coated surfaces: Clean with non-petroleum based solvent. Wash with copper sulfate solution and flush with water, unless surface has been pre-treated, or unless treatment is not recommended by manufacturer of prime coat.

3.2 PAINT SYSTEM APPLICATION

A. Comply with manufacturer's recommendations for mixing or stirring paint products immediately before application.

B. Application limitations: Paint every accessible surface of each unit of work indicated to be painted, regardless of whether in location recognized as "concealed" or "exposed" except as otherwise indicated.

1. Omit painting on required name plates, labels, identification tags, signs, markers, printed instructions, performance ratings, flow diagrams and similar test and graphics, located within the scope of work indicated to receive paint application.

2. Omit specified prime coat of paint system for metal surfaces where surface has shop applied prime coat of equivalent quality. Apply prime coat on other surfaces to be painted, comply with paint manufacturer's instructions for prime coating where not otherwise indicated. Apply additional prime coats where suction spots or unsealed areas appear.

C. Apply paint in accordance with manufacturer's directions. Apply additional coats when undercoats, stains or other conditions show through final coat of paint, until paint film is of uniform finish, color and appearance. Apply paint at edges, corners, joints, welds and exposed fasteners in manner which will ensure dry-film thickness equal to that of flat surfaces. Allow sufficient time between successive coats for proper drying (comply with manufacturer's drying instructions).

1. Number of coats: Number indicated is minimum number, apply as many coats as are necessary to cover.
2. Coating thickness: Apply paint in uniform coats without thinning and in application thickness recommended by manufacturer for each coat.
3. Apply paint in smooth finish without noticeable texture, cloudiness, spotting, holidays, laps, brush marks, runs, sags, ripples, ropiness and other surface imperfections.

3.3 CLEAN UP AND PROTECTION, PAINTING

A. During progress of work, remove from site discarded paint materials, rubbish, cans and rags at end of each work day. Do not leave in paint storage area.

B. Spattered surfaces: Upon completion of painting work, clean paint spattered surfaces. Remove spattered paint by proper methods of washing and scraping, using care not to scratch or otherwise damage finished surfaces.

C. Protection: Protect work of other trades, whether to be painted or not, against damage by painting work. Correct damage by cleaning, repairing or replacing and repainting as directed. Provide "Wet Paint" signs as required to protect newly painted finishes. Remove temporary protective wrappings installed for protection of work not to be painted, after completion of painting operations. At completion of work by other trades, touch up and restore damaged or defaced painted surfaces.

END OF SECTION

SECTION 230509 - ROOF CURBS AND EQUIPMENT SUPPORTS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Provide labor, materials, equipment and services as required for the complete installation of roof curbs, rails and support systems as shown or called for in the Contract Documents. This section applies to all HVAC support system components inclusive of curbs, equipment support rails and stands and penetration housings.

1.2 RELATED DOCUMENTS

A. All work under this section is subject to the Contract Documents. This Contractor shall be responsible for and governed by all requirements therein.

B. This contractor shall coordinate all selections of materials and equipment specified under this section, including anchoring details to both equipment and building roof deck, with the requirements of specification Section 230550 (Wind Restraint for HVAC Systems). Final determinations as provided by the Engineer of Record for the seismic and/or wind restraint calculations shall override any similar information provided within these specifications and the project drawings.

1.3 SUBMITTALS

A. Typical detail and schedule for equipment used to support mechanical system components shall include cross-sectional view clearly illustrating key component details, i.e. the type of curb, rail or support being submitted, double wall insulated, with or without cant, etc.

PART 2 – PRODUCTS

2.1 ROOF CURBS

A. Curb constructed of galvanized steel, with continuous welded corner seams and painted at all welds. 20 gauge up to 36”., 18 gauge 38 to 72”., 16 gauge over 72” in any dimension. Minimum 22ga interior liner liner and 1-1/2” minimum thickness 3# density fiberglass insulation. All equipment to have minimum 18" high curbs. Curb heights to be adjusted based on field verification of roofing system such that exhaust / relief outlets are no less than 18” above the membrane surface. Provide curb with gasket on top to make airtight seal between curb and ventilator, fan, or air handling unit. Curb provided with raised cant, flanged or recessed to coordinate with roofing type. Curb flange shall suit roof construction, wind restraint requirements and type of insulation being applied.

B. Design Equipment: RPS Model RC Series.

C. Acceptable Make: Pate, Shipman & Son, RPS.

2.2 PIPE SUPPORTS ASSEMBLY

A. Same construction as "Equipment Supports." Provide with full length steel bracket, U-bolts and accessories as required to secure piping to the pipe support as detailed on Contract Drawings.

B. Design Equipment: RPS Model ER-2A.

C. Acceptable Makes: Pate, Shipman & Son, RPS.

2.3 PIPE CURB ASSEMBLY

A. 2” x 2” continuous cap blocking, fully insulated with rigid 1-1/2" 3# density insulation. Minimum 18” high. Constructed of 18 gauge galvanized steel with welded at all contact points. Painted at all welds. Acrylic coated, ABS rib reinforced curb cover and integral counter flashing, size and number of pipe and conduit openings as required to suit job conditions. EPDM protective rubber pipe boots and stainless steel clamps secured around each pipe individually. Curb provided with raised cant, flanged or recessed. Curb flange shall suit roof construction and type of insulation being applied.

B. Design Equipment: RPS N Series with RC Series curb system.

C. Acceptable Makes: Pate, Shipman & Son, RPS.

PART 3 - EXECUTION

3.1 GENERAL

A. Height as recommended by equipment manufacturer, not less than described in Part 2.0. This Contractor shall be responsible for exact size, length, and location and shall set and secure each curb to roof. Shim and level curb as required. Provide curb and supports for all roof-mounted equipment. All roof penetrations shall be made through an appropriate curb. All roof-mounted equipment including fans, air handling units, etc., shall be set on an equipment support unless otherwise noted. Refer to Contract Drawings for details on plenums extending from curbs.

3.2 EQUIPMENT AND PIPE SUPPORTS

A. Insulate the entire rail cavity with minimum R-6.3 thermal and acoustic insulation.

END OF SECTION

SECTION 230513 – MOTORS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Provide labor, materials, equipment and services as required for the complete installation designed in Contract Documents.

1.2 SUBMITTALS

A. Submit motor information with submittal for equipment served, when applicable. Motor submittal shall include manufacturer's name and model number, motor type, motor characteristics including voltage, phase, horsepower, and speed.

B. Contractor shall provide to the Owner a completed application form as prescribed by the NYSERDA "Existing Facilities Pre-Qualified Motors Incentives" program including application, required documentation, and post-installation inspection, if required.

PART 2 – PRODUCTS

2.1 MOTORS

A. General Requirements:

1. Motors built for 60 Hz operation, three phase for 1/2 hp and larger; single phase for 1/3 hp and smaller. In compliance with NEMA Standards, wound specifically for nameplate voltage, and selected for appropriate duty and environment. Minimum service factor of 1.15 at rated voltage and frequency. Bearings ABMA L10 rated for 5 years continuous, non-severe duty. V-belt connected motors with adjustable slide rail bases and pulleys. Motors shall have Class F insulation system, with Class B temperature rise. Maximum allowable motor temperature rise for open drip-proof or totally enclosed fan cooled (TEFC) type at 1.15 service factor shall be 80°C above 40°C ambient up to 300 hp. NEMA locked rotor KVA code as required to match unit equipment torque characteristics. Single-phase motors shall be capacitor start, induction run, or split phase type. Polyphase motors shall be constant speed, squirrel cage, unless otherwise called for.
2. Motors for solid state driven, variable speed fans or AHU units shall be designed for definite purpose energy efficient drive control.
3. Fractional HP Fan Motors between 1/12 and 1 hp shall be electronically commutated motors or have a minimum motor efficiency of 70%, rated in accordance with DOE 10 CFR 431. Motors shall be provided with local motor speed adjustment for balancing and / or remote control capability as required by the sequences of operation. The use of belt driven fans to sheave adjustments for air flow balancing in lieu of varying motor speed is permitted only where direct drive equipment is not specifically called out as design basis.

    a. Exceptions:

        1) Motors in the air stream of fan coils and terminal units that only provide heating to the space served.

2) Motors in systems which meet the efficiency ratings in part 403 of the IECC while accounting for motor power in the efficiency calculations.

4. Three Phase Motors rated 1 hp and greater shall meet the following nominal efficiency ratings:

a. Minimum Nominal Full-Load Efficiency for 60 Hz NEMA General Purpose Electric Motors (Subtype I) rated 600 Volts or less (Random Wound)

Motor Horsepower	Number of Poles	Open Drip Proof Motors			Totally Enclosed Fan Cooled Motors		
		2	4	6	2	4	6
	Synchronous Speed (RPM)	3600	1800	1200	3600	1800	1200
1		77.0	85.5	82.5	77.0	85.5	82.5
1.5		84.0	86.5	86.5	84.0	86.5	87.5
2		85.5	86.5	87.5	85.5	86.5	88.5
3		85.5	89.5	88.5	86.5	89.5	89.5
5		86.5	89.5	89.5	88.5	89.5	89.5
7.5		88.5	91.0	90.2	89.5	91.7	91.0
10		89.5	91.7	91.7	90.2	91.7	91.0
15		90.2	93.0	91.7	91.0	92.4	91.7
20		91.0	93.0	92.4	91.0	93.0	91.7
25		91.7	93.6	93.0	91.7	93.6	93.0
30		91.7	94.1	93.6	91.7	93.6	93.0
40		92.4	94.1	94.1	92.4	94.1	94.1
50		93.0	94.5	94.1	93.0	94.5	94.1
60		93.6	95.0	94.5	93.6	95.0	94.5
75		93.6	95.0	94.5	93.6	95.4	94.5
100		93.6	95.4	95.0	94.1	95.4	95.0
125		94.1	95.4	95.0	95.0	95.4	95.0
150		94.1	95.8	95.4	95.0	95.8	95.8
200		95.0	95.8	95.4	95.4	96.2	95.8
250		95.0	95.8	95.4	95.8	96.2	95.8
300		95.4	95.8	95.4	95.8	96.2	95.8
350		95.4	95.8	95.4	95.8	96.2	95.8
400		95.8	95.8	95.8	95.8	96.2	95.8
450		95.8	96.2	96.2	95.8	96.2	95.8
500		95.8	96.2	96.2	95.8	96.2	95.8

Note: Nominal efficiencies shall be established in accordance with DOE 10 CFR 431.

b. Minimum Average Full Load Efficiency Polyphase Small Electric Motors:

Motor Horsepower	Open Motors			
	Number of Poles	2	4	6
	Synchronous Speed (RPM)	3600	1800	1200
0.25		65.6	69.5	67.5
0.33		69.5	73.4	71.4
0.50		73.4	78.2	75.3
0.75		76.8	81.1	81.7
1		77.0	83.5	83.8
1.5		84.0	86.5	83.8
2		85.5	86.5	N/A
3		85.5	86.9	N/A

c. Minimum Average Full Load Efficiency for Capacitor-Start Capacitor-Run and Capacitor-Start Induction-run Small Electrical Motors

Motor Horsepower	Open Motors			
	Number of Poles	2	4	6
	Synchronous Speed (RPM)	3600	1800	1200
0.25		66.6	68.5	62.2
0.33		70.5	72.4	66.6
0.50		72.4	76.2	76.2
0.75		76.2	81.8	80.2
1		80.4	82.6	81.1
1.5		81.5	83.8	N/A
2		82.9	84.5	N/A
3		84.1	N/A	N/A

d. Minimum Nominal Full-Load Efficiency of General Purpose Electric Motors (Subtype II) and all Design B Motors Greater than 200 Horsepower

Motor Horsepower	Number of Poles	Open Drip Proof Motors				Totally Enclosed Fan Cooled Motors			
		2	4	6	8	2	4	6	8
	Synchronous Speed (RPM)	3600	1800	1200	900	3600	1800	1200	900
1		NR	82.5	80.0	74.0	75.5	82.5	80.0	74.0
1.5		82.5	84.0	84.0	75.5	82.5	84.0	85.5	77.0
2		84.0	94.0	85.5	85.5	84.0	84.0	86.5	82.5
3		84.0	86.5	86.5	86.5	85.5	87.5	87.5	84.0
5		85.5	87.5	87.5	87.5	87.5	87.5	87.5	84.0
7.5		87.5	88.5	88.5	88.5	88.5	89.5	89.5	85.5
10		88.5	89.5	90.2	89.5	89.5	89.5	89.5	88.5
15		89.5	91.0	90.2	89.5	90.2	91.0	90.2	88.5
20		90.2	91.0	91.0	90.2	90.2	91.0	90.2	89.5

25		91.0	91.7	91.7	90.2	91.0	92.4	91.7	89.5
30		91.0	92.4	9.4	91.0	91.0	92.4	91.7	91.0
40		91.7	93.0	93.0	91.0	91.7	93.0	93.0	91.0
50		92.4	93.0	93.0	91.7	92.4	93.0	93.0	91.7
60		93.0	93.6	93.6	92.4	93.0	93.6	93.6	91.7
75		93.0	94.1	93.6	93.6	93.0	94.1	93.6	93.0
100		93.0	94.1	94.1	93.6	93.6	94.5	94.1	93.0
125		93.6	94.5	94.1	93.6	94.5	94.5	94.1	93.6
150		93.6	95.0	94.5	93.6	94.5	95.0	95.0	93.6
200		94.5	95.0	94.5	93.6	95.0	95.0	95.0	94.1
250		94.5	95.4	95.4	94.5	95.4	95.0	95.0	94.5
300		95.0	95.4	95.4	NR	95.4	95.4	95.0	NR
350		95.0	95.4	95.4	NR	95.4	95.4	95.0	NR
400		95.4	95.4	NR	NR	95.4	95.4	NR	NR
450		95.8	95.8	NR	NR	95.4	95.4	NR	NR
500		95.8	95.8	NR	NR	95.4	95.8	NR	NR

Note: Nominal efficiencies shall be established in accordance with DOE 10 CFR 431.

5. Nominal Motor Voltage Table:

Nominal System Voltage	Motor Nameplate
480V - 3 phase	460 volt
240V - 1 phase and 3 phase	230 volt
208V - 1 phase and 3 phase	200 volt
120V - 1 phase	115 volt

6. Motor Application:

Environment/Location	Motor Enclosure Type
General Purpose	Open drip-proof, TEFC, or encapsulated
Outdoors, below grade or high humidity	TEFC
Hazardous	Explosion-proof
Packaged Refrigeration Compressors	Hermetic or semi-hermetic

7. Make: Need not be all of same make, but one of the following: General Electric, Gould, Reliance, Westinghouse, Marathon, Baldor or equal.

2.2 ELECTRICALLY COMMUTATED MOTORS (ECM):

A. Electronically Commutated Motors (ECMs) shall be UL listed and provided with integral electronic overload protection, including thermal protection, current limiting, and locked-rotor protection, suitable for the motor application and operating conditions. External motor overload devices shall not be required unless specifically indicated by the manufacturer.

PART 3 – EXECUTION

3.1 MOTORS

A. Furnished by equipment manufacturer and especially manufactured and/or selected, mounted, and installed for intended use. Install motors accessible for maintenance and belt adjustment.

3.2 REPLACEMENT OF EXISTING MOTORS

A. Field verify existing motor characteristics and provide motors as called for. Modify or replace existing motor mounts and bases to accommodate the replacement motors. Replace drive and driven sheaves and provide a heavy duty belt set.

3.3 ELECTRICALLY COMMUTATED MOTORS (ECM):

A. Submittals shall clearly indicate the presence of integral electronic overload and thermal protection. Motors lacking integral protection shall be clearly identified, and required external overload devices shall be provided.

END OF SECTION

SECTION 230514 - ELECTRIC WIRING

PART 1 – GENERAL

1.1 WORK INCLUDED

A. Provide labor, materials, equipment and services for the complete installation of motor control, equipment manufacturer remote device and temperature control wiring as required for a fully functional system. Provide interlock wiring from safety devices (freezestats, flow switches, etc.) to control panels. Provide wiring and conduit required to connect devices furnished as part of or adjunctive to the automatic temperature control system and for motor control regardless of the source of supply. Control wiring includes 120 volt and lower voltage wiring for control signals directing equipment operation. Control circuits shall be 120 volt maximum. Provide devices required for proper system operation, including special electrical switches, transformers, disconnect switches, relays, and circuit breaker protection.

B. Coordinate all work with Division 26, "Electrical".

1.2 RELATED SECTIONS

A. All work under this section is subject to the Contract Documents. This Contractor shall be responsible for and governed by all requirements therein.

B. This Section applies to all work provided under division 23.

1.3 WORK NOT INCLUDED

A. Power wiring for motors, motor starters and associated starting and control equipment, as well as the motor starters (except in the case of equipment specified to have packaged controls/starters), are included in Division 26, "Electrical," unless otherwise called for.

1.4 QUALIFICATIONS

A. Wiring installed in compliance with all requirements of Division 26, "Electrical" and the National Electric Code.

1.5 SUBMITTALS

A. Provide submittals including complete wiring diagrams for equipment and systems. Deliver wiring diagrams to proper trades in time for roughing of conduit, equipment connections, and to avoid delay in construction schedule. Wiring diagrams and roughing information shall clearly indicate scope of work that is part of the Work of Division 26, "Electrical".

PART 2 – PRODUCTS

2.1 PRODUCTS

A. Refer to Division 26 specifications for required wiring materials.

B. All wiring system materials within plenums shall be non-combustible or shall be listed and labeled as having a flame spread index not more than 25 and a smoke developed index of not more than 50 when tested in accordance with ASTM E84 or UL 723. These requirements include control system components and all associated components. All electrical and control components not conforming to these requirements must be fully contained in a non-combustible enclosure or raceway unless listed and labeled for such use under UL 2043.

C. Combustible electrical wires and cables and fiber-optic cables exposed within a plenum shall be listed as having a peak maximum optical density of 0.50 or less and an average optical density of 0.15 or less, and a maximum flame spread distance of 5 ft. or less when tested in accordance with NFPA 262 or shall be installed in metal raceways or sheathed cable. Combustible optical fiber and communication raceways exposed within a plenum shall be listed to the same maximum and average optical densities and flame spread distance under ANSI/UL 2024. Only plenum rated wires and cables shall be installed in plenum rated raceways.

PART 3 – EXECUTION

3.1 GENERAL

A. Check electrical wiring pertaining to equipment for completeness and correctness of connections. Correct any misapplied motor and/or motor starter, improper thermal overload device, or device which fails to function and resultant damage, whether due to incorrect connections or improper information on wiring diagrams.

B. All wiring which passes through an enclosure, wall stud, framing, or other material where abrasion to the wiring system is a long term risk shall be protected using bushing inserts. Electrical tape or other removal media is not considered proper protection against abrasion.

C. Final connections to equipment shall be provided with using flexible whips no longer than 18 inches in length terminated using appropriate connectors.

D. Conduits mounted directly to the outside of insulated plenums, equipment or ductwork shall be installed using appropriate standoff's to avoid compressing the insulation and reducing the value. Repair all insulation damaged during conduit and wiring system installation.

E. Wiring shall be appropriately trimmed and terminated at all equipment. Bundled excess wiring "loops" will not be permitted.

3.2 WIRING FOR CONTROL SYSTEMS

A. Provide motor control, temperature control, interlock, safety device and instrumentation wiring for equipment.

B. Provide pushbutton stations, pilot lights, selector switches, auxiliary starter contacts, and other devices required to provide specified functions.

C. All wiring shall be in conduit, unless otherwise noted. Refer to Division 26 for type of conduit to be used in specific applications. Provide 18 in. long flexible conduit at motors and devices subject to vibration. Conduit shall be supported on 5 ft. centers. Do not attach directly to hot surfaces, piping, or ductwork. Control wiring shall be in separate conduit from all other wiring. Provide green grounding wire circuited from starter, and run ground wire through conduit to each remote auxiliary relay, pushbutton station, remote panel heating device, thermostat, or device with potentials in excess of 50 volts. Size ground wire as required by NEC.

3.3 EQUIPMENT WIRING

A. Provide power and control wiring between sections of electric radiation units, between shipping splits, and between remote panels, thermostats, disconnect switches, and their respective units. Provide control wiring from the package control system, to each respective electric heat coil, reheat coil or motor. Properly mount control package. Power wiring to and including disconnect switch shall be by Division 26 "Electrical".

3.4 FIELD WIRING IN STARTERS, CONTROLLERS, AND PANELS

A. Wiring within starters, controllers, and temperature control panels, shall be routed neatly in gutter space, away from moving and/or heat producing parts. Provide 30 ampere, 600 volt rated terminal blocks. Do not place more than two wire connections on pilot device or relay terminal. Where more than two circuit connections are required, use terminal blocks. Provide nylon self-insulated, locking type spade lugs for all control wires. Cables and wires shall be neatly bundled and lashed with nylon cable straps. All wiring installed in a single enclosure shall be rated for the maximum voltage in said enclosure or physical separation provided in compliance with the NEC.

END OF SECTION

SECTION 230519 - GAUGES AND THERMOMETERS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide labor, materials, equipment and services to perform operations required for the complete installation and related Work as required in Contract Documents.

1.2 RELATED DOCUMENTS

A. All work under this section is subject to the Contract Documents. This Contractor shall be responsible for and governed by all the requirements therein.

1.3 SUBMITTALS

A. Submit manufacturer's data for each gauge and thermometer type. Submittal shall clearly designate where each device shall be utilized, including the scale range.

PART 2 - PRODUCTS

2.1 WATER PRESSURE GAUGES

A. Construction shall be Bourdon tube type; 4-1/2 in. diameter minimum dial face, in stainless steel case and plastic lens. Phosphor bronze tube, phosphor bronze bushed rotary movement, silver brazed or soldered to brass socket and brass tip, 1/4 in. bottom connection. Accuracy, one (1.0) percent of included scale range. White dial face with black numerals, graduated in pounds per square inch (psi); equipped with bronze adjustable pressure snubber and ball valve. Ball valve shall meet the requirements of Specification Section 230523 for the system it is serving.

B. Make: American, Ashcroft, Crosby, Duro, Marsh, Moeller, Trerice, Weiss, Weksler.

2.2 PIPING SYSTEM THERMOMETERS

A. Vertical liquid filled type - Industrial type, black molded aluminum case with plastic front, mercury free blue reading column, V-shaped aluminum scale, black numerals. Union flange mounted, separable socket, extension necks where required; range as called for based on service. Universal adjustable type, 9 in. scale size. For installation in water systems where the maximum temperature is less than 120°F: graduations of 1°F, accurate to within 1°F. For installation in hot water systems: graduations of 2°F, accurate to within 2°F.

1. Make: American, Moeller, Trerice, Weiss, Weksler.

PART 3 - EXECUTION

3.1 WATER PRESSURE GAUGES

A. Provide ball valve on each gauge line meet the requirements of Specification Section 230523.

B. Provide water pressure gauge in piping systems where called for and where scheduled below:

1. Provide ball valve in each pump inlet and outlet tapping, or in piping adjacent to same. Range: 30 in. vacuum to 100 psi.
2. Compression tanks: 0 to 100 psi range.
3. Each water make-up valve assembly: 0 to 60 psi range.

C. Select gauges from manufacturer's standard equipment such that anticipated measurements will reside generally in the middle third of the instrument's range.

3.2 PIPING THERMOMETERS

A. Mounted in oversize tee or elbow if necessary, to provide as little restriction as possible to fluid flow and maintain sensing bulb fully in measured media, with stems of proper length to allow accurate reading. Locate adjacent to control sensing equipment. Arrange so as to be easily read from floor.

B. Provide in piping systems where called for.

C. Select thermometers from manufacturer's standard equipment such that anticipated measurements will reside generally in the middle third of the instrument's range.

END OF SECTION

SECTION 230523 – VALVES

PART 1 – GENERAL

1.1 WORK INCLUDED

A. Provide labor, materials, equipment, and services as required for the complete installation and related work designated in contract documents.

1.2 RELATED DOCUMENTS

A. All work under this section is subject to the Contract Documents and this Contractor shall be responsible for and governed by all the requirements therein.

1.3 SUBMITTALS

A. Valves and accessories.

PART 2 – PRODUCTS

2.1 VALVES:

A. General: Valves shall meet the following requirements:

1. Working pressure shall be stamped or cast on bodies.
2. Stem packing shall be serviceable without removing valve from line.
3. To establish a standard of quality and identify features, certain manufacturer's numbers are given in the following paragraphs.

B. Swing Check Valves – HVAC Systems (Non-Potable Water Systems):

1. **CV-01 -** Bronze 2" and Under (Threaded and Soldered End Connections):

    a. Valves shall be suitable for 125 SWP/200WOG, renewable disc, T-Pattern or Y-Pattern.
    b. Body and Cap: Bronze ASTM B62.
    c. Lever: Stainless steel or brass.
    d. Disc: Bronze ASTM B16, ASTM B453, or ASTM B61.
    e. Acceptable Makes: Milwaukee 509/1509 (Class 125), 515/1515 (Class 150) or 507 (Class 300); Hammond IB904//IB912 (Class 125), IB515Y (Class 150) or IB949 (Class 300); Crane 37/ (Class 125), 137 (Class 150) or 36E (Class 300); Nibco T-413/S-413 (Class 125), T-433/S-433 (Class 150) or T-473 (Class 300); Apollo 161T (Class 125), 164T (Class 150).

2. **CV-02 –** NOT USED

3. **CV-03 -** Cast Iron 2 ½" and Larger (Flanged End Connection):

    a. Valves shall be Class 125 or Class 250, bolted cap.

b. Body and Bonnet: Cast iron ASTM A126, Class B.
c. Seat Ring: Bronze ASTM B62
d. Disc: Cast iron ASTM A126, Class B or cast bronze ASTM B62
e. Hinge: Ductile iron ASTM A536 or cast bronze ASTM B62.
f. Acceptable Makes: Milwaukee F-2974A (Class 125) or F-2970-M (Class 250); Crane 373 (Class 125) or 39E (Class 250); Powell Figure 559 (Class 125); Lunkenheimer Figure 1790 IBBM (Class 125); Nibco F-918-B (Class 125) or F-968-B (Class 250).

4. **CV-04 –** NOT USED

5. **CV-05 –** NOT USED

6. **CV-06 -** Grooved Type 2 ½" and Larger:

a. Valves shall be rated for 300 psi CWP (2½" to 12") and 230 psi CWP (14" to 24")
b. Body: Ductile iron conforming to ASTM A536, Grade 65-45-12.
c. Seat: EPDM (rated for minimum of 230°).
d. Disc: Stainless steel with elastomer seal or ductile iron conforming to ASTMA536, Grade 65-45-12.
e. Shaft Packing: EPDM.
f. Spring and Shaft: Series 300 stainless steel.
g. Acceptable Makes: Victaulic Series 716 (2½" to 12") and Series W715 (14" to 24"); Gruvlok Series7800 (2½" to 12") and Figure CV890 (14" to 24").

C. Silent Check Valves – HVAC Systems (Non-Potable Water Systems):

1. **SCV-01** - Bronze 1½" and Under (Threaded End Connection):

a. Valves shall be suitable for 400 psi at 150°F, globe style, two piece design, center guided disc.
b. Body and Cap: Bronze ASTM B62 or ASTM B585.
c. Guide Pin: Stainless steel
d. Seat of Seal: EPDM A240 Type 304/ASTM A276 Type 410 (Class 300).
e. Spring: Stainless steel.
f. Acceptable Makes: Mueller 303; Apollo 61-500.

2. **SCV-02** - Cast Steel 2" and Larger (Flanged End Connection):

a. Valves shall be Class 150 (285 psi at 100°F) or Class 300 (740 psi at 100°F), globe body design, guided disc.
b. Body and Bonnet: Cast steel ASTM A216 WCB.
c. Spring: Stainless steel ASTM 182, Grade F-316.
d. Seat: Stainless steel ASTM 351, Grade CF8M.
e. Disc: Stainless steel ASTM 351, Grade CF8M.
f. Acceptable Makes: Mueller 105MDT (Class 150) or 109MDT (Class 300); Keckley Style CG (Class 150 and Class 300); Dezurik CSC 600A (Class 150 and Class 300).

D. Ball Valves: Domestic - Potable Water:

1. **BV-01 -** Bronze 2" and Under (Threaded and Soldered End Connections):

   a. Valve shall be suitable for 600 psi WOG non-shock, 150 psi WSP full port with blowout proof stem.
   b. Lead Free.
   c. Body: Bronze.
   d. Stem: Type 316 Stainless Steel ASTM A276.
   e. Ball: Type 316 Stainless Steel ASTM A276.
   f. Seats and Seals Stem Packing and Thrust Washer: PTFE.
   g. Handle: Zinc-plated carbon steel with vinyl insulator. Provide handle with extended stem on insulated piping. Provide locking lever.
   h. Adjustable stem packing.
   i. Acceptable Makes: Watts LFB6080-G2-SS (threaded) and LFB6081-G2-SS (solder); Apollo 77CLF-140-C (threaded) and 77CLF-240-C (solder); Milwaukee UPBA400S (threaded) and UPBA450S (solder); Nibco T-585-66-LF (threaded) and S-585-66-LF (solder); Hammond UP8303A (threaded) and UP8313A (solder).

2. **BV-02 –** NOT USED

E. Ball Valves – HVAC Systems (Non-Potable Water Systems):

1. **BV-03 -** Bronze 2" and under (Threaded and Soldered End Connections)

   a. Valve shall be suitable for 600 psi WOG non-shock, 150 psi WSP full port with blowout proof stem.
   b. Body: Bronze.
   c. Stem: 316 Stainless Steel.
   d. Ball: 316 Stainless Steel.
   e. Seats and Seals Stem Packing and Thrust Washer: PTFE.
   f. Handle: Zinc-plated carbon steel with vinyl insulator. Provide handle with extended stem on insulated piping. Provide locking lever.
   g. Adjustable stem packing.
   h. Acceptable Makes: Watts LFB6080-G2-SS (threaded) and LFB6081-G2-SS (solder); Apollo 77C-140 (threaded) and 77C-240 (solder); Milwaukee BA400S (threaded) and BA450S (solder); Nibco T-585-66 (threaded) and S-585-66 (solder); Hammond 8303A (threaded) and 8313A (solder).

2. **BV-04 –** NOT USED

3. **BV-05 –** NOT USED

4. **BV-06 –** NOT USED

5. **BV-07 –** NOT USED

6. **BV-08 –** NOT USED

7. **BV-09 –** NOT USED

8. **BV-10 –** NOT USED

9. **BV-11 –** Polyvinyl Chloride (PVC Sch. 40) or Chlorinated Polyvinyl Chloride (CPVC Sch. 80) 2" and Under (Threaded, Sock Welded or Flanged End Connections):

    a. Valve shall be suitable for 250 psi WOG non-shock water service at 70°F, full port, true union, Flanged shall be pressure rated for 150 psi at 70°F.
    b. Body: Polyvinyl Chloride (PVC Type 1, Grade 1 ASTM D1784, Cell Classification 12454) or Chlorinated Polyvinyl Chloride (CPVC ASTM D1784, Cell Classification 23447).
    c. Stem: Polyvinyl Chloride (PVC) or Chlorinated Polyvinyl Chloride (CPVC).
    d. Ball: Polyvinyl Chloride (PVC) or Chlorinated Polyvinyl Chloride (CPVC).
    e. Seats Polyvinyl Chloride (PVC), Chlorinated Polyvinyl Chloride (CPVC), Teflon or PTFE.
    f. Seal: EPDM
    g. Handle: Orange PVC or ABS
    h. Acceptable Makes: Nibco Chemtrol Style U45TB-E (PVC socket weld or threaded), F45TB-E (PVC flanged), U51TB-E (CPVC socket weld or threaded) or F51TB-E (CPVC flanged); Hayward Series TBH.

F. Valves for Gauges and Instruments – HVAC Systems (Non-Potable Water Systems):

1. Ball valve ½" in size meeting the requirements above for the services specified.

G. Butterfly Valves – HVAC Systems (Non-Potable Water Systems):

1. **BFV-01 -** Standard Performance 2 ½" and Larger (Lugged Type Connection):

    a. Valves shall be rated at 200 psi CWP (2 ½" to 12") and 150 psi CWP (14" to 24"), ASNI 125/200 flange pattern, extended neck, integral mounting pad for actuator, fully rated for dead end bidirectional service.
    b. Body: Ductile Iron ASTM A536.
    c. Seat: EPDM ASTM D20000
    d. Shaft: Type 316 stainless steel or Type 416 stainless steel.
    e. Disc: Type 316 stainless steel ASTM A351.
    f. Bushing: Duralon or bronze
    g. Handle: Lever for valves below 6" and gear operators for 6" and larger.
    h. Acceptable Makes: Watts DBF; Crane 44; Milwaukee Series ML; Nibco LD 2022; Jenkins Series 225; Keystone Figure 322.

2. **BFV-02 –** NOT USED

3. **BFV-03 -** Grooved Type 2 ½" and Larger:

    a. Valves shall be rated for 300 psi, bi-directional bubble tight shutoff against working pressure, extended neck, integral mounting pad for actuator,
    b. Body: Ductile iron conforming to ASTM A536, Grade 65-45-12.
    c. Seat: EPDM (rated for minimum of 230°).
    d. Shaft: Type 416 stainless steel ASTM A582.
    e. Disc: Ductile iron conforming to ASTM A536, Grade 65-45-12.

f. Shaft Packing: EPDM.
g. Shaft Bearing: Brass or bronze
h. Handle: Lever for valves below 6" and gear operators for 6" and larger.
i. Acceptable Makes: Victaulic VIC-300 MasterSeal and AGS-VIC-300; Gruvlok Series7700.

H. Hose Threaded Drain and Manual Vent Valve (Non-Potable Heating Hot Water, Chilled Water, Heating Glycol and Cooling Glycol Systems Operating at a maximum pressure of 125 psi and temperature of 200°F or Below):

1. **DBV-01** - Bronze ½" and ¾" (Threaded and Soldered End Connections)

a. Valve shall be suitable for 400 psi CWP, 2-piece, full port ball valve with blowout proof stem, ¾" hose connection.
b. Body: Bronze ASTM B584 or Brass ASTM B283.
c. Stem: Brass ASTM B16, silicon bronze ASTM B371 alloy C69430 or ASTM B99 alloy C65100.
d. Ball: Chrome plated brass ASTM B16 alloy C36000, ASTM B125 alloy C37700 or ASTMB282 alloy C37700.
e. Seats and Seals Stem Packing and Thrust Washer: PTFE and RPTFE.
f. Handle: Zinc-plated carbon steel with vinyl insulator. Provide handle with extended stem on insulated piping. Provide locking lever.
g. Adjustable stem packing.
h. Acceptable Makes: Watts LFFBV-3C-CC (threaded) and LFFBVS-3C-CC (solder); Apollo 70-100-HC (threaded) and 70-200-HC (solder); Milwaukee BA100H (threaded) and BA150H (solder); Nibco T-585-70-HC (threaded) and S-585-70-HC (solder); Hammond 8501H (threaded) and 8511H (solder).

I. Self-Regulated Flow Control Valves:

1. Miniature threaded iron valves shall consist of ductile iron (A445-70, Class 60-40-18) body and stainless steel flow control cartridge assembly; shall be rated at 450 PSI/250°F; shall have female NPT end connections; shall be supplied with dual pressure or pressure/temperature test valves for verifying accuracy of flow performance for all sizes; shall be permanently marked to show direction of flow; shall have body tag to indicate flow rate, model number and PSIG control range; shall be available in ½", ¾", 1", 1-1/4" and 1-1/2" sizes, with flow rates from 0.33 GPM to 34.0 GPM.
2. Threaded flange valves shall consist of grey iron (ASTM A126-61T, Class 30) body and stainless steel flow control cartridge assembly; shall be rated at 300 PSI/275°F; shall have female NPT threaded flange end connections; shall be supplied with plated steel studs and nuts; shall be supplied with dual pressure or pressure/temperature test valves for verifying accuracy of flow performance for all sizes; shall be permanently marked to show direction of flow; shall have body tag to indicate model number, flow rate and PSID control range; shall be available in 1-1/2", 2" and 2-1/2" sizes, with flow rates from 14.0 GPM to 150.0 GPM. Valves shall be based on pressure rating of 2-32 psig at 20 GPM.

3. Upstream of each flow control valve, provide a Y-type strainer. Unit shall have threaded configuration shall be made of bronze (ASTM B584) with a brass cap; shall be rated at 300 PSI; shall be available in sizes ranging from ½" through 2". Strainer screen shall be stainless steel, ported with 0.055" diameter, 1400 micron holes and easily accessible for cleaning; shall be provided with blowdown option.
4. Acceptable Make: Griswold.

J. Balance Valve:

1. **General:**

a. Where contractor submits "termination kits" with integral balance valve for approval, use does not preclude the need to provide separate equipment isolation valve. Balance valves are not to be used for isolation duty. Provide separate isolation valve in compliance with Exhibit A of this section.

2. **GBV-01** - Globe Type Balancing Valve:

a. Balancing valve and flow meter stations suitable for use on heating and cooling systems.
b. Maximum Pressure Drop 5.0 Ft. or less.
c. Calibrated balance valve with provisions for connecting a portable differential pressure meter. Meter connections to have built-in check valves.
d. Multi-turn handle for precision adjustment.
e. Balance valve size shall be based upon gpm range rather than pipe size. Select flow balancers such that the range of pipe flow resides in the middle 50% of the manufacturer's recommended operating range for the device.
f. Operating temperature range -4 – 248°F. Suitable for 300psi at 150°F.
g. Brass: Solder or threaded body to match piping system up to 2".
h. Cast Iron: Grooved or flanged bodies to match piping system 2 ½ - 12".
i. Acceptable Makes: Armstrong CBV; Tour & Anderson 780 Series; Griswold "Speedset"; Macon STV

PART 3 – EXECUTION

3.1 INSTALLATION

A. General:

1. Provide valves of type called for and where required to service equipment.
2. Provide at major building and system sections.
3. Provide chain wheels, guides, and chain loops for valves, where called for or in Mechanical Rooms where valves are mounted higher than 8'-0" AFF.
4. Isolating valves for individual fan convectors, room units, terminal units, or other similar apparatus may be inside cabinet or at connection to branch main where accessible.
5. Locate valves with stems at or above horizontal positions and swing check valves in horizontal position only.

6. Provide hose threaded drain valves at all piping system low points, strainers, equipment, and as called for heating hot water systems, chilled water systems, glycol heating systems and glycol cooling systems operating at or below 125 psi and 200°F. Drain or blowdown valves for water and glycol systems operating above 125 psi and 200°F, and steam systems shall be provided with valves specified in Exhibit 'A'. Provide Cap or plug at valve discharge.

B. Install self-regulating flow control valves as recommended by manufacturer. All flow control valves shall have strainer upstream of valve. Strainer shall be as specified in part 2 – Self Regulating Flow Control Valves.

C. Balance Valves:

1. Provide on zone or riser returns, on each hydronic unit and where called for. Meter connection points shall not point downward.
2. Install device in pipe line per manufacturer's instructions for upstream and downstream distances.

3.2 VALVE SELECTION

A. Provide valve types for the specific services as specified in Exhibit 'A'. Valve changes shall be made only as reviewed by Owner's Representative.

EXHIBIT - 'A' - VALVE TYPE (HVAC)
Notes are at the end of Exhibit 'A'

Service	**Gate**	**Globe**	**Check**	**Ball**	**Butterfly**	**Plug**	**Balancing**	**Special Purpose, Drains and Manual Air Vents**	**Notes**
Hot water heating, glycol heating operating at 125 psi or below			CV-01 Class 125 and CV-03 Class 125	BV-03	BFV-01		GBV-01	DBV-01	Note 1,2 and 3
Hot water heating, glycol heating operating at 125 psi or below (Optional)			CV-01 Class 125 and CV-06	BV-03	BFV-03		GBV-01	DBV-01	Note 1, 2 and 3
Domestic water				BV-01					

Water treatment (max. 100 psi wp)				BV-11					Note 4

NOTES FOR EXHIBIT "A":

NOTE 1: Hose threaded drain and vent valves DBV-01 shall only be used on heating hot water, chilled water, glycol heating and glycol cooling systems operating pressure at or below 125 psi and temperature at or below 200°F. Systems operating pressure above 125 psi and operating temperature above 200°F, or sizes above ¾" shall be provided with the listed service valve with the open end of the valve provided with a threaded plug or cap.

NOTE 2: Where options are indicated for the valve connection types (threaded, soldered or welded) in this specification section, refer to Specification Section 232000 for the specific requirement for the connection type for the intended service.

NOTE 3: Silent check valves SCV-01 or SCV-02 shall be used at pump discharges.

NOTE 4: Provide valve of the same material as adjoining piping. Refer to Specification Section 232000. PVC and CPVC valves must have flame spread rating of 25 or less and a smoke developed rating of 50 or less.

END OF SECTION

SECTION 230550 – WIND RESTRAINT FOR 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 SECTION INCLUDES

A. Review for adequacy all curbs, rails and support systems proposed by Division 23 to withstand calculated wind loads.

B. Support and brace mechanical (Div 23) and related electrical (Div 26) and plumbing (Div 22) systems to resist directional wind forces (lateral, longitudinal and vertical)

C. Provide restraint / attachment requirements for mechanical, electrical and plumbing systems to curbs, rails and support systems , and restraint / attachment of curbs, rails and support systems to the structure.

1.3 APPLICABLE CODES AND STANDARDS

A. Provide work in compliance with the following codes and standards.

B. Building Code of New York State, Section 1603.

C. Mechanical Code of New York, Section 301.

D. American Society of Civil Engineers (ASCE) Minimum Design Loads for Buildings and Other Structures – Standard ASCE/SEI 7-16.

1.4 QUALITY ASSURANCE

A. General:

1. The contractor shall provide calculations and details of wind restraint systems to meet total design lateral force requirements for support and restraint of mechanical and related electrical and plumbing systems, sealed and signed sealed by a New York registered Professional Engineer.
2. Systems requiring wind restraint:

    a. Boiler flue ductwork

1.5 SUBMITTTALS

A. Submit wind force level (Fp) calculations for applicable building code. Submit pre-approved restraint selections, installation details, and plans indicating locations of restraints.

B. Calculations, plans, restraint selection, and installation details shall be signed and sealed by a professional engineer licensed in the State of New York and experienced in wind restraint design.

C. Submit manufacturer's product data.

D. For each piece of equipment that requires wind restraint as outlined in this section, include the following:

1. Dimensioned Outline Drawings of Equipment Unit: Identify the center of gravity and locate and describe mounting and anchoring provisions.
2. Anchorage: Provide detailed description of equipment anchorage devices on which the calculations are based and their installation requirements. Identify anchor bolts, studs and other mounting devices. Provide information on the size, type and spacing of mounting brackets, holes and other provisions.

PART 2 – PRODUCTS

2.1 CODE INFORMATION

A. This project is subject to the wind bracing requirements of the Building Code of New York State, International Building Code and American Society of Civil Engineers ASCE 7.

1. Basic Wind Speed (V) (Per ASCE 7-16).
2. Importance Factor (I) (Per ASCE 7-16).
3. Exposure Category (Per ASCE 7-16).
4. Height and Exposure Adjustment Coefficient (Per ASCE 7-05).
5. The mean height of the structure (h_{mean}) shall be determined thru coordination with Architectural plans and the General Contractor.

2.2 WIND BRACING AND SUPPORT OF SYSTEMS AND COMPONENTS

A. General:

1. Design analysis shall include calculated dead loads, wind loads, and capacity of materials utilized for the connection of the equipment or system to the structure.
2. Analysis shall detail anchoring methods, bolt diameter, and embedment depth.
3. All wind restraint devices shall be designed to accept without failure the forces calculated per the applicable building code and as summarized in Section 2.1.

B. Friction from gravity loads shall not be considered resistance to wind forces.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Wind Restraint of Ductwork and Equipment:

1. All restraint systems shall be installed in strict accordance with the manufacturer's restraint guidelines and all certified submittal data.

2. The interaction between mechanical and electrical equipment and the supporting structures shall be designed into the restraint systems.
3. Friction clips shall not be used for anchorage attachments.
4. Expansion anchors shall not be used for non-vibration isolated equipment rated over 10HP.
5. Components mounted on vibration isolation systems shall have a bumper restraint or snubber in each horizontal direction and vertical restraints shall be provided to resist overturning.
6. Installation of restraints shall not cause any change in position of equipment or ductwork, resulting in stresses or misalignment.
7. No ridged connections between equipment and the building structure shall be made that degrade the noise and vibration-isolation system specified.
8. Do not install any equipment or duct that makes rigid connections with the building unless isolation is not specified.
9. Prior to installation, bring to the Architect's/Engineer's attention any discrepancies between the specifications and the field conditions, or changes required due to specific equipment selection.
10. Bracing may occur from flanges of structural means, upper truss cords of bar joists, cast in place inserts, or wedge-type concrete anchors. Consult Structural Engineer of record.
11. Overstressing, of the building structure shall not occur from overhead support of equipment. Bracing attached to structural members may present additional stresses. The Contractor shall submit loads to the Structural Engineer of record for approval in this event.
12. Brace support roads when necessary to accept compressive loads. Welding of compressive braces to the vertical support rods is not acceptable.
13. Provide reinforced clevis bolts where required.
14. Do not brace a system to two independent structures such as a roof and wall.

END OF SECTION

SECTION 230553 - MECHANICAL IDENTIFICATION

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide labor, materials, equipment and services as required for the complete installation designed in Contract Documents.

1.2 QUALIFICATIONS

A. All identification devices shall comply with ANSI A13.1 for lettering size, length of color field, colors, and viewing angles.

1.3 SUBMITTALS

A. Prior to Ordering Products: Submit manufacturer's technical product data and installation instructions for each identification material and device. For valve tags include proposed tag methodology, including code number, location and valve function. For piping systems and equipment submit proposed schedule of pipe, equipment and name identification for review and approval. Confirm naming / numbering is consistent with any Owner’s naming / numbering convention.

B. As-built submission – Provide final valve schedule for each piping system in both 8-1/2 in. X 11 in. (minimum) and WORD format, indicating code number, location and valve function.

1.4 MAKES

A. Allen Systems, Inc., Brady (W.H.) Co.; Signmark Div., Industrial Safety Supply Co., Inc., Seton Name Plate Corp., Marking Services Incorporated, or approved equal.

PART 2 - PRODUCTS

2.1 GENERAL

A. Provide manufacturer's standard products of categories and types required for each application. In cases where there is more than one type specified for an application, selection is installer's option, but provide single selection for each product category.

2.2 PIPING IDENTIFICATION

A. Identification Types:

1. Pressure sensitive type: Provide manufacturer's standard pre-printed, permanent adhesive, color coded, pressure sensitive, vinyl pipe markers complying with ANSI A13.1.

B. Pipe Identification:

1. Piping labeling shall conform to the following list:

Pipe Function	Identification
Heating Water Supply	HWS
Heating Water Return	HWR
Vent	V
Overflow	OF
Drain	D
Natural Gas	NG

2.3 VALVE IDENTIFICATION

A. Valve Tags:

1. Standard brass valve tags, 2" diameter with 1/2" high numerals. Identify between heating and plumbing services with 1/4" letters above the valve number.
2. Equal to Seton Style 300 Cat.

B. Valve Chart:

1. Provide valve chart for all valves provided as a part of this project. Frame and place under clear glass. Hang in Mechanical Room.

2.4 EQUIPMENT IDENTIFICATION

A. General:

1. Provide custom engraved acrylic or vinyl plates for each major piece of mechanical equipment provided.
2. Nameplates: 3/4" x 2-1/2" equal to Seton Setonflex.
3. Provide for the following equipment:

    a. Pumps
    b. Boilers
    c. Expansion Tank
    d. Air Separator

PART 3 - EXECUTION

3.1 GENERAL

A. Provide valve tags for all valves provided on project.

B. Provide equipment tags for all equipment listed in Equipment Identification Section above.

C. Provide piping identification with directional flow arrows for all piping on project. Maximum every 15'-0". Provide tags on piping at all coil terminations. For piping installed through rooms, provide at least one pipe label in each room, for each pipe function.

END OF SECTION

SECTION 230593 - TESTING, ADJUSTING AND BALANCING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. All work under this section is subject to the Contract Documents and this Contractor shall be responsible for and governed by all the requirements therein.

B. This Contractor shall reference the entirety of Divisions 22 and 23 as they apply to this work.

C. Refer to specification Section 019113 for commissioning requirements related to this project.

D. Refer to temperature control drawings for additional balancing requirements associated with calibration and setup of temperature control sequences of operation. In addition to any additional requirements, all air flow measuring stations shall be field calibrated by traverse or other means that does not introduce duck leakage error into the final setting.

1.2 SUMMARY

A. Provide labor, materials, equipment and services to perform operations required for testing, adjusting, and balancing HVAC systems to produce design objectives, including, but not limited to the following:

1. Balancing airflow and water flow within distribution systems, including submains, branches, and terminals, to indicated quantities according to specified tolerances.
2. Adjusting total HVAC systems to provide indicated quantities.
3. Measuring electrical performance of HVAC equipment.
4. Setting quantitative performance of HVAC equipment.
5. Verifying that automatic control devices are functioning properly.
6. Calibration of flow (air and water) sensors provided by the 230923 contractor
7. Additional balancing procedures described within the 230993 sequences of operation.
8. Reporting results of the activities and procedures specified in this Section.

1.3 SUBMITTALS

A. Quality-Assurance Submittals: Submit copies of evidence that the Testing, Adjusting, and Balancing contractor and this Project's testing, adjusting, and balancing team members meet the qualifications specified in the "Quality Assurance" article below.

B. Sample Report Forms: Submit required number of sets of sample testing, adjusting, and balancing report forms.

C. Certified Testing, Adjusting, and Balancing Reports: Submit required number of copies of reports prepared, as specified in the Submission of Certified Balance Reports Section, on approved forms certified by the registered contractor; include registration number.

D. Warranty: Submit required number of copies of the warranty specified in the "Warranty" Article below.

1.4 QUALITY ASSURANCE

A. Agent Qualifications: Engage a testing, adjusting, and balancing contractor certified/registered by the Associated Air Balance Council (AABC) or National Environmental Balancing Bureau (NEBB). Contractor shall have performed as a member in good standing with recognized procedures for no less than five (5) years including projects of the magnitude and design of this project. Balancing Contractor must be approved by the Engineer. See Section 1.3.

B. Certification of Testing, Adjusting, and Balancing Reports: Certify the testing, adjusting, and balancing field data reports. This certification includes the following:

1. Review field data reports to validate accuracy of data and to prepare certified testing, adjusting, and balancing reports.
2. Certify that the testing, adjusting, and balancing team complied with the approved testing, adjusting, and balancing plan and the procedures specified and referenced in this Specification.

C. Testing, Adjusting, and Balancing Reports: Use standard forms from AABC or NEBB's Standards for Testing, Adjusting, and Balancing, or approved equal.

D. Instrumentation Type, Quantity, and Accuracy: As described in AABC or NEBB national standards.

E. Instrumentation Calibration: Calibrate instruments at least every 6 months or more frequently if required by the instrument manufacturer.

1.5 PROJECT CONDITIONS

A. The Owner may occupy all or part of the site and existing building during the entire testing, adjusting, and balancing period as required. Cooperate with the Owner during testing, adjusting, and balancing operations to minimize conflicts with the Owner's operations. It is the intent to have all possible balancing procedures complete prior to any Owner occupancy. Contractor shall perform the necessary work in an expedient and accurate manner which best serves the need of verifying proper installation and operation of the installed systems and allowing prompt Owner occupancy.

1.6 COORDINATION

A. Coordinate the efforts of factory-authorized service representatives for systems and equipment, HVAC controls contractor, and other mechanics to operate HVAC systems and equipment to support and assist testing, adjusting, and balancing activities.

B. Coordinate TAB activities with temperature control system setup and calibration

1.7 WARRANTY

A. General Warranty: The national project performance guarantee specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by this Contractor under requirements of the Contract Documents.

B. NEBB will assist in completing the requirements of the Contract Documents if the testing, adjusting, and balancing contractor fails to comply with the Contract Documents. Guarantee shall include the following provisions:

1. The certified contractor has tested and balanced systems according to the Contract Documents.
2. Systems are balanced to optimum performance capabilities within design and installation limits.
3. Copy of the performance guarantee shall be included in each final certified air balance report.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Provide all required instrumentation and tools, including, but not limited to ladders, recording meters, gauges, thermometers, voltmeters, anemometers, Pitot tubes, inclined gauge manometers, magnehelic gauges, amprobes, voltmeters, psychrometers and tachometers. Instruments used shall be accurately calibrated as per AABC or NEBB requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers, are located as required in the Contract Documents and installed per manufacturer’s requirements. Verify that quantities and locations of these balancing devices are accessible and appropriate for effective balancing and for efficient system and equipment operations. All deficiencies shall be reported to the Engineer in writing within 60 days from award of contract. Failure to provide notice within this time period may require that any devices required for proper balance of these systems be installed at the cost of this contractor.

B. Examine approved submittal data of all HVAC systems and equipment.

C. Examine equipment performance data, including fan and pump curves. Relate performance data to project conditions and requirements, including system effects that can create undesired or unpredicted conditions and/or cause reduced capacities in all or part of a system. Calculate system effect factors to reduce the performance ratings of HVAC equipment when installed under conditions different from those presented when the equipment was performance tested at the factory. 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 this data with the design data and installed conditions.

D. Examine system and equipment installations to verify that they are complete and ready for testing.

E. Examine HVAC system and equipment installations to verify that indicated balancing devices, such as balancing valves and fittings, and manual volume dampers, are properly installed, and their locations are accessible and appropriate for effective balancing and for efficient system and equipment operation.

F. Examine systems for functional deficiencies that cannot be corrected by adjusting and balancing. Any noted deficiencies should be reported immediately to the Engineer for further action.

G. Examine terminal units, such as variable-air-volume boxes, to verify that they are accessible and their controls are connected and functioning.

H. Examine strainers for clean screens, removal of startup screens and proper perforations.

I. Examine 3-way valves for proper installation for their intended function of diverting or mixing fluid flows.

J. Examine heat-transfer coils for correct piping connections and for clean and straight fins.

K. Examine equipment for installation and for properly operating safety interlocks and controls.

L. Examine automatic temperature control system components to verify the following:

1. Dampers, valves, and other controlled devices operate by the intended controller.
2. Dampers and valves are in the position indicated by the controller.
3. Integrity of valves and dampers for free and full operation and for tightness of fully closed and fully open positions. This includes dampers in multi-zone units, mixing boxes, and variable-air-volume terminals.
4. Automatic modulating and shutoff valves are properly connected.
5. Temperature sensors are located to avoid adverse effects of sunlight, drafts, and cold walls. Sensors are located to sense only the intended conditions.
6. Sequence of operation for control modes is according to the Contract Documents.
7. Controller set points are set at design values. Observe and record system reactions to changes in conditions. Record default set points if different from design values.
8. Interlocked systems are operating.
9. Changeover from heating to cooling mode occurs according to design values.

M. Report deficiencies discovered before and during performance of testing, adjusting, and balancing procedures immediately to the Engineer for further action.

3.2 PREPARATION

A. Complete system readiness checks and prepare system readiness reports. Verify the following:

1. Permanent electrical power wiring is complete. Equipment rotation has been checked.
2. Hydronic systems are filled, clean, strainers cleaned, startup screens removed and system free of air.
3. Automatic temperature control systems are operational.
4. Equipment and duct access doors are securely closed.
5. Balance, smoke, and fire dampers are open.
6. Isolating and balancing valves are open and control valves are operational.
7. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices has been provided.
8. Filters are clean and in place, including pre-filters and final filters where applicable.

3.3 GENERAL TESTING AND BALANCING PROCEDURES

A. All systems shall be tested and verified to be in compliance with the performance characteristics contained in the contract documents. All testing shall be performed in compliance with the requirements of NEBB or AABC Standards for Testing and Balancing, or within the standards described in this section. The more stringent standard shall apply.

B. Adjusting and balancing shall be accomplished as soon as the systems are completed to the extent required to allow the work to proceed, and before the Owner takes possession. Verify that the system is properly vented, cleaned, and strainers are cleared with startup mesh removed prior to balance.

C. Cut insulation, ducts, and pipes for installation of test probes to the minimum extent necessary to allow adequate performance of procedures. After testing and balancing, close probe holes and patch insulation with new materials identical to those removed. Restore vapor barrier and finish according to the Insulation Specifications for this Project.

D. Mark equipment settings with paint or other suitable, permanent identification material, including damper-control positions, valve indicators, fan speed control levers, and similar controls and devices, indicating final settings.

E. Adjusting and balancing shall be accomplished under appropriate outdoor temperature conditions. All outdoor conditions (Db, Wb, and a description of the weather conditions) at the time of testing shall be documented in the report.

F. Identify flow balancers and dampers in systems which cannot be manipulated to satisfy balancing requirements. Return to site after remedial actions are performed to adjust corrected systems.

G. Traverse duct mains to determine total air system delivery quantities after all outlets have been set and, if necessary prior to final adjustment if the system does not meet design requirements. A sum of room CFM’s is not acceptable.

3.4 FUNDAMENTAL AIR SYSTEM BALANCING PROCEDURES

A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Cross check the summation of required outlet volumes with required fan total volume.

1. Determine system diversity factors. Prepare plan to simulate system diversity
2. Determine the best locations in main and branch ducts for accurate duct airflow measurements.
3. Check the airflow patterns from the outside air louvers and dampers and the return and exhaust air dampers, through the supply fan discharge and mixing dampers.
4. Locate start-stop and disconnect switches, electric interlocks, and motor starters.
5. Verify that motor starters are equipped with properly sized thermal protection.
6. Check dampers for proper position to achieve desired airflow path.
7. Check for airflow blockages.
8. Check condensate drains for proper connections and function.
9. Check for proper sealing of air-handling unit components

B. Air System Balancing Procedures:

1. The procedures in this article apply to all supply, return, and exhaust air systems. Additional procedures are required for variable air volume systems; these additional procedures are specified in the following articles in this specification.
2. Adjust fans to deliver total design air flows within the maximum allowable speed (rpm) listed by the fan manufacturer.
3. Measure fan static pressures to determine actual static pressure as follows:

    a. Measure outlet static pressure as far downstream from the fan as practicable and upstream from restrictions in ducts such as elbows and transitions.
    b. Measure static pressure directly at the fan outlet or through the flexible connection.
    c. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible, upstream from flexible connection and downstream from duct restrictions.
    d. Measure inlet static pressure of double-inlet fans through the wall of the plenum that houses the fan.

4. Measure static pressure across each air-handling unit component to provide full static pressure profile of air handling unit.
5. Compare design data with installed conditions to determine variations in design static pressures versus actual static pressures. Compare actual system effect factors with calculated system effect factors to identify where variations occur. Recommend corrective action to align design and actual conditions in the event that adverse resulting conditions occur which make the system unable to achieve design performance levels.
6. Adjust fan speed higher or lower as required to meet as installed conditions. Provide new sheaves as required. Make required adjustments to pulley sizes, motor sizes, and electrical connections to accommodate fan speed changes.
7. 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 no overload will occur. Measure amperage in full cooling, full heating, and economizer modes to determine the maximum required brake horsepower.

8. Adjust volume dampers for main duct, submain ducts, and major branch ducts to design air flows within specified tolerances.

    a. Measure static pressure at a point downstream from the balancing damper and adjust volume dampers until the proper static pressure is achieved. Where sufficient space in submains and branch ducts is unavailable for pitot tube traverse measurements, measure air flow at terminal outlets and inlets and calculate the total air flow for that zone.
    b. Re-measure each submain and branch duct after all have been adjusted. Continue to adjust submains and branch ducts to design air flows within specified tolerances.

9. Measure terminal outlets and inlets without making adjustments. Measure terminal outlets using a direct reading hood or the outlet manufacturer's written instructions and calculating factors.
10. Adjust terminal outlets and inlets for each space to within +/- 10% of design airflow. Make adjustments using volume dampers rather than the dampers at the air terminals, where available.

    a. Adjust each outlet in the same room or space to within specified tolerances of design quantities without generating noise levels above the limitations prescribed by the Contract Documents.
    b. Adjust patterns of adjustable outlets for proper distribution without drafts.
    c. Where pressure gradients are required between spaces, provide adjustment of supply and return / exhaust air such that the supply vs return / exhaust rate shown on the plan is maintained.
    d. Record final air volume and air flow pattern for each inlet and outlet.

C. Variable Air Volume System Additional Procedures

1. Compensating for Diversity: When the total airflow of all terminal units is more than the fan design airflow volume, place a selected number of terminal units at a maximum set-point airflow condition until the total airflow of the terminal units equals the design airflow of the fan. Select the reduced airflow terminal units so they are distributed evenly among the branch ducts.
2. Direct drive fans – Adjust the maximum HZ on fans to provide for operation at the specified fan speed (for example, 2120rpm with a 1760 rpm motor would be 72 Hz.) plus an allowance for filter loading.

    a. Maintain maximum setting to avoid overload conditions. Consult with Engineer as required to determine maximum setting to be programmed.
    b. Verify that minimum permissible speed (RPM/HZ) limit parameters are within limits permitted by the equipment manufacturer and include this value on the TAB report.
    c. Coordinate with the temperature controls and Div 26 contractors for adjustment of drive parameters.

3. Pressure-Independent, Variable Air Volume Systems – Supply Air: After the fan systems have been adjusted, adjust the variable air volume systems as follows:

    a. Set outside air dampers at minimum; return and relief air dampers at a position that simulates full cooling load.
    b. Perform air terminal TAB per NEBB / AABC procedures. Lock final terminal controller "K factor" into the operating programs for all air terminals.
    c. Select the terminal unit that is most critical to the supply fan airflow and static pressure. Adjust the total system air flow compensating for diversity and determine the necessary duct pressure and enter to the control system. This will be the design or peak static pressure requirement.
    d. For variable volume systems specified to operate with variable pressure control (VVP) – set all air terminals to control to minimum air delivery. Reduce the duct pressure setpoint until at least one terminal damper position is in excess of 80% open. Record and enter this value to the building management system as the minimum reset level for the VVP control strategy.
    e. Using diversity compensation, measure total system airflow by traverse for both supply and return air streams. Adjust to within 5% of design airflow. Compare to the sum of the diffusers / registers and report apparent duct leakage in percentage. Record supply fan apparatus data under peak performance conditions.
    f. Re-measure the return airflow to the fan while operating at maximum return airflow and minimum outside airflow. Adjust the fan and balance the return air ducts and inlets as described for Air Systems.
    g. Measure static pressure at the most critical terminal unit and adjust the static-pressure controller at the main supply air sensing station to ensure adequate static pressure is maintained at the most critical unit.

3.5 FUNDAMENTAL PROCEDURES FOR HYDRONIC SYSTEMS

A. Prepare test reports with pertinent design data and number in sequence starting at pump to end of system. Check the sum of branch-circuit flows against approved pump flow rate. Correct variations that exceed plus or minus 5%.

B. Verify that systems are prepared for hydronic systems testing and balancing according to the following, in addition to the general preparation procedures specified above:

1. Open all manual valves for maximum flow.
2. Check flow control valves for specified sequence of operation and set at design flow.

C. Hydronic System Balancing Procedures:

1. Set calibrated balancing valves, if installed, at calculated pre-settings.
2. Measure flow at all stations and adjust, where necessary, to obtain first balance.

    a. System components that have C_V rating or an accurately cataloged flow pressure drop relationship may be used as a flow indicating device.

3. Measure flow at main balancing station and set main balancing device to achieve flow that is 5% greater than design flow. Where pump selection provides a firm operating point, pump flow may be derived from the pump curve in lieu of the balancing device.

4. Adjust balancing stations to within specified tolerances of design flow rate as follows:

    a. Determine the balancing station with the highest percentage over design flow.
    b. Adjust each station in turn, beginning with the station with the highest percentage over design flow and proceeding to the station with the lowest percentage over design flow.
    c. Record settings and mark balancing devices.

5. Pumps equipped with Adjustable Speed Drives:

    a. Where required to achieve specified TAB results, coordinate with the temperature controls and Div 26 contractors for adjustment of drive parameters.
    b. Adjust high speed (RPM/HZ) limit parameters to avoid overamp conditions.
    c. Adjust high speed (RPM/HZ) limit parameters as necessary to achieve design requirements within the limitations of motor capacity.
    d. Verify that minimum permissible speed (RPM/HZ) limit parameters are within limits permitted by the pump manufacturer and include this value on the TAB report.

3.6 MOTORS

A. Motors, 1/2 HP and Larger: Test at final balanced conditions and record the following data as it applies.

1. Manufacturer, model, frame and serial numbers.
2. Complete nameplate data.
3. Efficiency rating if high efficiency motor.
4. Measured voltage and amperage, each phase
5. Starter thermal protection element rating.

3.7 HEAT TRANSFER COILS

A. Hydronic: Measure the following data for each coil.

1. System identification.
2. Location.
3. Coil Type and nameplate data
4. Dry-bulb temperatures of entering and leaving air.
5. For cooling coils – record entering %RH or wet bulb data.
6. For primary coils (Air Handlers, etc.) – Record face velocity and air pressure drop.
7. Record airflow rate
8. Adjust water flow rate as scheduled
9. Adjust bypass water flow on three-way circuits for 50% of total coil water flow scheduled.

3.8 TEMPERATURE CONTROL VERIFICATION

A. Verify that all control devices are calibrated and fully operational.

B. Check transmitter and controller locations and note conditions that would adversely affect control functions.

C. Record controller settings and note variances between set points and actual measurements.

D. Verify free travel and proper operation of control devices such as damper and valve operators.

3.9 TOLERANCES

A. Unless noted to the contrary in other portions of the contract documents, set HVAC system airflow and waterflow rates within the following tolerances.

1. Supply, Return, and Exhaust, Air Inlets and Outlets: +/- 10%, maintaining required pressure balance between adjacent spaces / zones.
2. Water-Flow Rates: +/- 5%.

3.10 FINAL REPORT

A. General: Computer printout in letter quality font, on standard bond paper. Provide 1 hard copy in 3-ring binder, tabulated and divided into sections by tested and balanced systems. Provide PDF copy for project record.

B. A certification sheet in front of binder signed and sealed by the certified testing and balancing agent. All reports shall bear the seal of the certifying agent for the balancing contractor. Include a list of the instruments used for procedures, along with proof of calibration.

C. Final Report Contents: Final report shall consolidate data from all segments of phased project. In addition to the certified field report data, include the following:

1. Manufacturers' test data.
2. Field test reports prepared by system and equipment installers.
3. Other information relative to equipment performance; do not include approved Shop Drawings and Product Data.

D. General Report Data: In addition to the form titles and entries, include the following data in the final report, as applicable:

1. Title page including:

a. Name and address of testing, adjusting, and balancing contractor.
b. Project name.
c. Project location.
d. Architect's name and address.
e. Engineer's name and address.
f. Contractor's name and address.
g. Report date

2. Signature of testing, adjusting, and balancing agent who certifies the report.
3. Summary of contents, including the following:

    a. Design versus final performance.
    b. Notable characteristics of systems.
    c. Description of system operation sequence if it varies from the Contract Documents.

4. Nomenclature sheets for each item of equipment.
5. Data for terminal units, including manufacturer, type, size, and fittings.
6. Report shall document all information items requested within this specification section.

E. System Diagrams: On complete set of reproducible contract drawings provide single line sketch of system (designer – one or the other) marked up with terminal unit numbers, room numbers, test locations, register, grill, and diffuser numbers to correlate with test sheet. Include the following:

1. Quantities of outside, supply, return, and relief/exhaust airflow.
2. Water flow rates.
3. Pipe and valve sizes and locations.
4. Balancing stations.

F. Fan Test Reports: In addition to other requirements for supply, return, and exhaust fans, include the following:

1. Fan Data: Include the following:

    a. System identification.
    b. Location.
    c. Make and type.
    d. Model number and size.
    e. Manufacturer's serial number.
    f. Arrangements and class.
    g. Number of belts, manufacturer, and size

2. Test Data: Include design and actual values for the following:

    a. Total airflow rate in cfm.
    b. Total system static pressure in inches wg.
    c. Fan rpm.
    d. Discharge static pressure in inches wg.
    e. Suction static pressure in inches wg.
    f. Motor data.

G. Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record and report the following data as a minimum:

1. System and air handling unit number.
2. Location and zone.
3. Traverse air temperature in °F.

4. Duct static pressure in inches wg.
5. Duct size in inches.
6. Duct area in sq. ft.
7. Design airflow rate in cfm.
8. Design velocity in fpm.
9. Actual airflow rate in cfm.
10. Actual average velocity in fpm.

H. Instrument Calibration Reports: For instrument calibration, include the following data in report, as a minimum:

1. Instrument type and make.
2. Serial number.
3. Application.
4. Dates of use.
5. Date of calibration.

3.11 ADDITIONAL TESTS

A. Balance Contractor shall be prepared to verify the balance of select devices in the presence of the Engineer and / or Commissioning Authority at their discretion. This typically will require only a few hours to a day of labor, depending on the project scope. If, in the opinion of the Engineer or Commissioning Authority these verifications contain adequate discrepancies to provide doubt to the accuracy of the balance procedures performed, the Engineer or Commissioning Authority may order additional re-balancing or re-verification until such time as these discrepancies are eliminated throughout the systems; this verification shall be at the Contractor's expense.

B. Seasonal Periods: Initial testing, adjusting, and balancing procedures at start-up will not provide a good representative sample of system performance due to seasonal conditions. Therefore the Contractor shall return at a later time to perform the required balancing work, up to 8 hours of balancing work, to address seasonal conditions. This shall not delay the submittal of the certified balance reports for all work otherwise performed.

3.12 SUBMISSION OF CERTIFIED BALANCE REPORTS

A. Time is of the essence in the completion of this portion of the contract. It is expected that the certified balance reports will be submitted in a timely manner, within thirty (30) days of the work performed. At the completion of the project, it shall be the responsibility of this Contractor to assemble a single certified report and submit electronic (PDF) to the Engineer as closeout documentation, along with electronic copy in PDF format.

END OF SECTION

SECTION 230700 - INSULATION

PART 1 – GENERAL

1.1 WORK INCLUDED

A. All work shall comply with the requirements of the 2020 Energy Construction Conservation Code of New York State, manufacturer's requirements for installation and these specifications. In the event of conflicts between these documents, the more stringent requirements shall govern.

B. Provide labor, materials, equipment and services to perform operations required for the complete installation and related work as required in the Contract Documents. The extent of insulation work is indicated on the drawings and by the requirements of this section.

C. Repair all insulation at points of piping and ductwork system tie in to existing and at locations where existing systems are cut, patched or capped.

D. Insulate all existing piping systems, ductwork systems and equipment after removal of existing insulation whether by this contractor or another, including but not limited to removal of asbestos products.

E. Remove existing insulation where indicated on the drawings or specified here-in.

1.2 SUBMITTALS

A. Manufacturers' Data. Submit manufacturer's data and installation instructions.

B. Schedule of insulation applications.

C. Certification: Provide certifications as necessary to show compliance with these specifications and governing regulations. Include proof of compliance for test of products for fire rating, corrosiveness, and compressive strength.

1.3 RELATED WORK SPECIFIED ELSEWHERE

A. Section 232000 – Piping Systems and Accessories.

B. Section 232133 – Water Systems Specialties.

C. Section 233000 – Sheet Metal and Ductwork Accessories.

PART 2 – PRODUCTS

2.1 GENERAL

A. Insulation, Jackets, Adhesives, and Coatings, shall comply with the following:

1. Treatment of jackets or facings for flame and smoke safety must be permanent. Water soluble treatments are not permitted.

2. Insulation, including finishes and adhesives on the exterior surfaces of ducts, pipes, and equipment, shall have a flame spread rating of 25 or less and a smoke developed rating of 50 or less, as tested by ASTM E84 (NFPA 255) and UL 723 methods, using the specimen preparation and mounting procedures of ASTM E2231.
3. Insulation within plenums, duct coverings and duct linings shall not flame, glow, smolder or smoke when tested in accordance with ASTM C411 at the temperature to which they are exposed in service. The test temperature shall not fall below 250°F. Pipe and duct insulation shall be listed and labeled.
4. All adhesives, coatings and sealants used for the insulation shall comply with the maximum Volatile Organic Compound (VOM) limits as called for in the current version of U.S. Green Building Council LEED Credits.
5. Provide materials which are standard insulation products of manufacturers for piping, ductwork and equipment systems.
6. Provide insulation in accordance of MICA and NAIMA standards.
7. Asbestos or asbestos bearing materials are prohibited.
8. Ducts operating at temperatures above 120 degrees shall have sufficient thermal insulation to limit the exposed surface temperature to 75 degrees.
9. The insulation shall be clearly labelled by the manufacturer with the installed thermal "R" values in accordance to the Energy Conservation Code.
10. UL GREENGUARD Gold Certification – all insulation materials shall be GREENGUARD certified, documentation for which shall be contained in the paragraph 1.2.c submittal information.

2.2 ACCEPTABLE MANUFACTURERS

A. Fiberglass and Mineral Wool: Knauf, Manville, Owen-Corning, Certainteed.

B. Polyisocyanurate: Dow Trymer 2000XP, HyTherm.

C. Flexible Elastomeric: Armstrong, Rubatex International, Armacell

D. Calcium Silicate: Industrial Insulation Group (IIG), Johns Manville, Owens-Corning.

E. Removable Thermal Blanket: Insultech, Shannon, Irwin.

F. Adhesives, Coatings, Mastics, Sealants: Childers, Foster, Armacell.

G. Aluminum and Stainless Steel Jacket Material: GIC, GLT, RPR.

H. Laminated Rubberized Bitumen Jacket: Alumaguard, VentureClad, Flex Clad.

I. Pre-Molded PVC Fitting Covers: Zeston, Proto System

2.3 PIPE INSULATION (RIGID FIBERGLASS TYPE)

A. Glass Fiber insulation meeting ASTM C 547, Type II, Class 2, ASTM C 585, ASTM C 795 and ASTM C 1136; rigid, molded, noncombustible.

B. Maximum 'K' Value: ASTM C 335, 0.23 at 75°F mean temperature installed value. Maximum Service Temperature: 1000°F.

C. Vapor Retarder Jacket: ASJ/SSL conforming to ASTM C 1136 Type I, secured with self-sealing longitudinal laps and butt strips.

D. Field-Applied PVC 30 mil Fitting Covers with Flexible Fiberglass Insulation complying with ASTM C 450 and ASTM C 585: Proto Corporation LoSmoke, UV-resistant fittings and accessories, white or colored. Fitting cover system consists of pre-molded, high-impact PVC materials with blanket type fiberglass wrap inserts. Blanket fiberglass wrap inserts shall have a thermal conductivity ('K') of 0.26 at 75°F mean temperature. Closures to be stainless steel tacks, matching PVC tape, or PVC adhesive per manufacturer's recommendations.

2.4 PIPE INSULATION (RIGID POLYISOCYANURATE TYPE)

A. Preformed Rigid Polyisocyanurate Insulation: Cellular foam complying with ASTM C591or C1289, Type I and Type IV, rigid molded, non-combustible. 2 lb./ft^3 nominal density. Maximum thermal conductivity (k) shall be 0.19 BTU-in/ft^2 hr. °F at 75°F mean temperature. Maximum Service Temperature; 300°F.

B. Vapor Retarder Jacket; Dow Saran Vapor Retarder Film and Tape

C. Covering Jacket; White Kraft outer surface bonded to aluminum foil and reinforced with fiberglass yarn.

2.5 PIPE INSULATION (RIGID MINERAL WOOL TYPE)

A. Mineral wool 1200°F Degree Pipe Insulation. Inorganic fibers bonded with a thermosetting resin, complying to ASTM C547, Type II, Grade A, ASTM C585, ASTM C 795 and ASTM C 1138.

B. Vapor Retarder Jacket: ASJ/SSL conforming to ASTM C 1136 Type I, secured with self-sealing longitudinal laps and butt strips.

C. Maximum ‘K’ Value: ASTM C 335, 0.24 at 75°F mean temperature installed value.

D. Field-Applied PVC Fitting Covers 30 mil with Flexible Fiberglass Insulation complying with ASTM C 450 and ASTM C 585: Proto Corporation LoSmoke, UV-resistant fittings, jacketing and accessories, white or colored. Fitting cover system consists of pre-molded, high-impact PVC materials with blanket type fiberglass wrap inserts. Mineral wool wrap inserts shall have a thermal conductivity ('K') of 0.29 at 100°F mean temperature. Closures to be stainless steel tacks, matching PVC tape, or PVC adhesive per manufacturer's recommendations.

2.6 PIPE INSULATION (FLEXIBLE ELASTOMERIC FOAM)

A. Flexible, elastomeric thermal insulation, with expanded closed-cell foam structure, antimicrobial protection and free of CFC’s, HFC’s, HCFC’s, formaldehyde, fibers and dust, with low VOC’s. Maximum water vapor transmission of 0.10 perm-inch based on ASTM E96, Procedure A. Maximum thermal conductivity (k) shall be 0.27 Btu/ft^2•hr.• F/in. at 75°F mean temperature. Fire spread/smoke developed rating of 25/50 or less based on ASTM E84 for up to 2” material thickness. Furnish with self-sealing reinforced lap seal.

B. Pipe Insulation: ASTM C534, Type I.

C. Sheet Insulation for Ductwork and Equipment: ASTM C534, Type II, smooth skin one side.

2.7 PIPE INSULATION (CALCIUM SILICATE TYPE)

A. Asbestos free, hydrous calcium silicate, 12 lbs/cu. ft. density minimum complying with ASTM C 533, Type I. Maximum thermal conductivity (k) shall be 0.39 Btu/sq. ft. hr.^{o}F/in. at 200°F.

B. Field-Applied PVC 30 mil Fitting Covers and Jacket with Molded Calcium Silicate Fitting Insert: Proto LoSmoke, UV-resistant fitting covers and accessories, white or colored, complying with ASTM C 450 and ASTM C 585. Fasteners for the PVS fitting covers shall be stainless steel tacks, matching PVC tape, or PVC adhesive per manufacturer's recommendations. Prefabricated calcium silicate insulation inserts and fitting covers shall be dimensioned properly to cover valves, elbows, tees, and flanges.

2.8 PIPE INSULATION TAPES

A. ASJ (All Service Jacket) Tape: White vapor retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.

1. Width: 4 inches.
2. Thickness Total: 0.19mm
3. Adhesion: Exceeds strength of tape back.
4. Elongation: 2 percent.
5. Tensile Strength: 40 lbf/inch in width.
6. Make: 3M Venture Tape 1540CW, Owens Corning ASJ Max or approved equal

B. FSK (Foil. Scrim and Kraft Laminate) Tape: Foil face, vapor retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.

1. Width: 4 inches.
2. Thickness Total: 5.5 mil.
3. Adhesion: 66 ounces force/inch in width.
4. Elongation: 2 percent.
5. Ambient Limits: -40 to 240 deg F
6. Tensile Strength: 39 lbf/inch in width.
7. Make: Owens Corning Thermafiber. 3M Venture Tape 1525CW, or approved equal.

2.9 DUCT INSULATION

A. Duct Liner – Refer to Specification Section 233000.

B. Flexible Fiber Glass Blanket:

1. Insulation Blanket meeting ASTM C 553, Type II, ASTM C 1290, Type III, and ASTM C 1138.
2. Maximum 'K' Value of 0.27 at 75°F mean temperature. Maximum Service Temperature (Faced): 250°F.
3. Vapor Retarder Jacket: ASJ conforming to ASTM C 1136 Type I, II, III, IV, VIII or FSK conforming to ASTM C 1136 Type II, IV. Provide ASJ jacket for ductwork to be painted.

4. Installation: Maximum allowable compression is 25%.
5. Density: Minimum 1.0 PCF.
6. For duct wrap, the installed thickness shall be assumed to be 75 percent (25% compression) of nominal thickness.

C. Rigid Fiber Glass Board

1. Insulation Board meeting ASTM C 612 Type IA, IB and II, ASTM C 795 and ASTM C 1138.
2. Maximum 'K' Value of 0.23 at 75°F mean temperature. Maximum Service Temperature: 450º F.
3. Vapor Retarder Jacket: ASJ conforming to ASTM C 1136 Type I, or FSK or conforming to ASTM C 1136 Type II, IV. Provide ASJ jacket for ductwork to be painted.
4. Concealed Areas: Minimum 3 lb./ft.^{3}.
5. Exposed Areas: 6 lb./ft.^{3} minimum density for duct less than 8 ft. - 0 in. above finished floor or where indicated in these specifications or on the drawings.

D. Rigid Polyisocyanurate Insulation:

1. Cellular foam complying with ASTM C591, rigid molded, non-combustible. 2 lb./ft^3 nominal density. Maximum thermal conductivity (k) shall be 0.19 BTU-in/ft^2 hr. °F at 75°F mean temperature. Maximum Service Temperature; 300°F.

E. Flexible Elastomeric Foam:

1. Flexible, elastomeric thermal insulation, with expanded closed-cell foam structure, antimicrobial protection and free of CFC's, HFC's, HCFC's, formaldehyde, fibers and dust, with low VOC's. Maximum water vapor transmission of 0.10 perm-inch based on ASTM E96, Procedure A. Maximum thermal conductivity (k) shall be 0.27 Btu/ft²•hr.• F/in. at 75ºF mean temperature. Fire spread/smoke developed rating of 25/50 or less based on ASTM E84 for up to 2" material thickness.
2. Sheet Insulation for ductwork: ASTM C534, Type II, smooth skin one side.

F. Duct Insulation Tapes:

1. ASJ (All Service Jacket) Tape: White vapor retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.

    a. Width: 4 inches.
    b. Thickness Total: 0.19mm
    c. Adhesion: Exceeds strength of tape back.
    d. Elongation: 2 percent.
    e. Tensile Strength: 40 lbf/inch in width.
    f. Make: 3M Venture Tape 1540CW, Owens Corning ASJ Max or approved equal

2. FSK (Foil. Scrim and Kraft Laminate) Tape: Foil face, vapor retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.

    a. Width: 4 inches.
    b. Thickness Total: 5.5 mil.

c. Adhesion: 66 ounces force/inch in width.
d. Elongation: 2 percent.
e. Ambient Limits: -40 to 240 deg F
f. Tensile Strength: 39 lbf/inch in width.
g. Make: Owens Corning Thermafiber. 3M Venture Tape 1525CW, or approved equal.

2.10 EQUIPMENT INSULATION

A. Segmented board, sheets, blocks, size, shape, and material as called for.

B. Rigid Fiber Glass Board

1. Insulation Board meeting ASTM C 1393, Type I, II, IIIA, III B and Category 2, ASTM C 795 ASTM and C 1138.
2. Maximum 'K' Value of 0.27 at 75°F mean temperature. Maximum Service Temperature: 650º F.
3. Vapor Retarder Jacket: ASJ conforming to ASTM C 1136 Type I, II, III, IV or FSK conforming to ASTM C 1136 Type II. Provide ASJ jacket for ductwork to be painted.
4. Concealed Areas: Minimum 3 lb./ft.^{3}.
5. Exposed Areas: 6 lb./ft.^{3} minimum density for equipment less than 8 ft. - 0 in. above finished floor or where indicated in these specifications or on the drawings.

2.11 PIPE, DUCT AND EQUIPMENT JACKETING

A. Metal Jacketing Material:

1. Aluminum Jacket: Comply with ASTM B 209 (ASTM B 209M), Alloy 3003Temper H-14. Sheet and roll stock ready for shop or field sizing. Stucco Embossed: 0.020 inch.

   a. Moisture Barrier for Indoor Applications: Minimum 1mil thick, heat bonded polyethylene and kraft paper.
   b. Moisture Barrier for Outdoor Applications: Minimum 2.5 mil thick polysurlyn.

2. Factory-Fabricated Fitting Covers:

   a. Same material, finish, and thickness as jacket.
   b. Preformed 2 piece or gore, 45 and 90 degree, short and long radius elbows covers.
   c. Flange and union covers.
   d. Tee end caps.
   e. Beveled collars.
   f. Valve covers.
   g. Field-fabricate fitting covers only if factory-fabricated fitting covers are not available. Valve covers.

3. Banding: Stainless Steel: ASTM A 167 or ASTM A 240/A 240M, Type 304 or Type 316 equal to the jacketing material, ½ and ¾ inch wide with wing seal. Banding. Aluminum: ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105, or 5005, Temper H-14, 0.020 inch thick, ½ and ¾ inch wide with wing seal.

B. PVC 30 mil Jacket: High impact resistant, UV resistant PVC complying with ASTM D 1784, Class 16354-C. Roll stock ready for shop or field cutting and forming.

1. Color: White

C. Self-Adhesive, Laminated Rubberized Jacket:

1. Multi-ply laminated rubberized bitumen compound system. UV-resistant aluminum foil/polymer or polyester/foil system with acrylic adhesive.
2. 55-60 mil thickness with a low-pressure sensitive adhering system.
3. Stucco-embossed aluminum finish.

2.12 FIELD-APPLIED FABRIC-REINFORCING MESH

A. Woven Glass Fiber Fabric: Approximately 6 oz. /sq. yd. with a thread count of 5 strands by 5 strands/sq. in. for covering ducts and equipment. Childers CHIL-GLAS #5 or equal.

2.13 COATINGS, MASTICS, ADHESIVES AND SEALANTS

A. Vapor Barrier Coatings: Used in conjunction with reinforcing mesh to coat insulation on below ambient services temperatures. Permeance shall be no greater than 0.08 perms at 37 mils dry as tested by ASTM D5590 meeting zero growth rate for mold. Foster 30-80 or approved equal, or approved equal.

B. Lagging Adhesives: Used in conjunction with canvas or glass lagging cloth to protect equipment/piping indoors. Foster 30-36 AF meeting ASTM D 5590 with zero mold growth rating, or approved equal.

C. Weather Barrier Mastic: Used outdoors to protect above ambient insulation from weather. Foster 46-50 Weatherite; Childers CP-10 Vi Cryl, or approved equal.

D. Fiberglass Adhesive: Used bond low density fibrous insulation to metal surfaces. Shall meet ASTM C916 Type II. Foster 85-60; Childers CP-127, or approved equal.

E. Elastomeric Insulation Adhesive: Used to bond elastomeric insulation. Foster 85-75; Childers CP-82, or approved equal.

F. Elastomeric Insulation Coating: Water based coating used to protect outside of elastomeric insulation. Foster 30-65, Armacell WB Coating or approved equal.

G. Insulation Joint Sealant: Vapor sealant for below ambient piping with polyisocyanurate and cellular glass insulation. Foster 95-50; Childers CP-76, or approved equal.

H. Metal Jacketing Sealant: Used as a sealant on metal jacketing seams to prevent water entry. Foster 95-44; Childers CP-76, or approved equal.

PART 3 – EXECUTION

3.1 GENERAL REQUIREMENTS

A. Provide Thermal Insulation:

1. Insulation is required on ductwork, piping and equipment in compliance with these specifications and referenced codes and standards.
2. Continuous through openings, sleeves and hangers.
3. Install only on clean, dry surfaces and after ductwork has been tested.
4. On cold surfaces provide continuous unbroken vapor seal. Exceptions - Do not cover inspection stampings, nameplate data, openings, petcocks, hand-holes, manholes, access doors, plugged outlets, air vents, plugged openings or petcocks. Provide continuity of insulation system and vapor barrier though partitions, floors, casings, plenums, etc.
5. Ductwork and Piping insulation exposed to the weather shall be protected from damage, including that due to sunlight, moister, equipment maintenance and wind, and shall be provided with a jacketing material as specified in these specifications.

3.2 PIPE INSULATION

A. Insulate piping systems including fittings, valves, flanges, unions, strainers, and other attachments installed in piping system, whether exposed or concealed, with the following exceptions:

1. Factory-installed piping within the HVAC equipment tested and rated in accordance with the 2020 ECCCNYS
2. Factory installed piping within room fan coil Units and unit ventilators tested and rated according to AHRI 440 and AHRI 840, respectively.
3. Piping that conveys fluids that have a design operating temperature range between 60 and 105 degrees.
4. Piping that conveys fluids that have not been heated or cooled through use of fossil fuels or electric power, the surface temperature of which does not risk condensation or occupant / service hazard (between 60°F and 105°F).
5. Strainers, control valves and balance valves associated with piping 1 inch or less in diameter and conveying fluids over 60 degrees.

B. Piping in exterior walls, spaces, overhangs, attics, or where subject to freezing, double the thickness of the insulation. Piping in wall chases adjacent to an exterior wall shall be packed with type glass fiber batting type insulation.

C. Hanger Shields: Refer to Section "Piping Systems and Accessories."

1. Pre-insulated type: Butt insulation to hanger shields and apply a wet coat of vapor barrier cement to the joints and seal with 3 in. wide vapor barrier tape.

D. Clamp Hanger insulation: "Piping Systems and Accessories."

1. Pre-insulated clamp hangers shall be utilized to provide continuous insulation through hangers. Provide tape at joint from pre-insulated clamp to piping insulation.

E. Joints in sections of pipe insulation shall be made as follows:

1. Standard: Longitudinal laps and butt joint shall be fully sealed. Factory applied pressure sensitive adhesive lap seal is acceptable.
2. Vapor barrier: For cold services, all service jacket (ASJ) longitudinal laps and 4 in. vapor barrier strip at butt joints shall be sealed with vapor barrier coating. Seal ends of pipe insulation at valves, flanges, and fittings with vapor barrier coating and reinforcing mesh.

F. Fittings, Valves and Flanges:

1. Hot services: Pre-molded fitting insulation of the same material and insulation value as the adjacent pipe insulation.
2. Hot water shall be coated with weather barrier mastic and reinforcing mesh.
3. Provide PVC fitting covers on all fittings.

G. Flexible Elastomeric Foam Pipe Insulation:

1. Split longitudinal joint and seal with contact adhesive. Carefully mate and seal with adhesive all contact surfaces to maintain the integrity of the vapor barrier of the system.
2. Fittings made from miter-cut pieces properly sealed with adhesive, or ells may be continuous. Use templates provided by the manufacturer and assemble the cut section in accordance with the manufacturer's printed instructions.
3. Where exposed outdoors, apply water-based UV resistant coating and/or reinforcing membrane as recommended by manufacturer. Follow manufacturer's installation instructions.

3.3 JACKETING ON PIPING

A. Secure jacketing to insulated piping with preformed aluminum band straps or stainless-steel band straps.

B. Jacket exposed insulated fittings, valves and flanges with mitered sections of aluminum or stainless-steel jacketing or factory fabricated, preformed, sectional aluminum or stainless-steel fitting covers shall be fully sealed water tight

C. Provide PVC, aluminum or stainless-steel jacket and fitting covers on exposed insulated piping installed in finished rooms including Mechanical Equipment Rooms, Penthouses, and Machine Rooms within 8 feet of the finished floor.

D. Lap all joints a minimum of 2 inches.

E. Secure jacketing in place with a continuous longitudinal friction type joint to provide a positive weatherproof seal. Circumferential joints shall be weatherproof sealed with 2 inch x 0.016 inch thick aluminum straps lined with metal jacketing sealant.

F. Install jacketing to avoid trapping condensation and precipitation.

3.4 DUCTWORK INSULATION

A. External thermal insulation for duct. Not required where ducts have internal acoustical insulation, are located inside the conditioned space and lining meets the insulation value of these specifications and the 2020 ECCCNYS. Make special provisions at dampers, damper motors, thermometers, instruments, and access doors. Apply as Follows:

1. Rigid board type: Impale board over mechanical fasteners, welded pins or adhered clips, 12 in. to 18 in. centers; minimum of two rows per side. Secure insulation with washers on clips. Seal breaks and joints in vapor barrier with 4 in. wide matching tape or 4 in. reinforcing mesh applied with Foster 30-65 vapor barrier coating. Apply tape over corner beading where exposed. Flexible blanket type: Joints and seams made with 2 in. lap of vapor barrier. Round ducts: Apply Foster 85-20 adhesive to ducts in 6 in. brush widths at 1 ft. intervals and at each facing edge. Square ducts: Over 18" duct face width, fasten by impaling insulation on adhered or welded clips. Secure insulation with washers on clips. Seal joints and breaks with 4 in. wide matching tape or 4 in. reinforcing mesh applied with Foster 30-65 vapor barrier coating. Cooling ducts shall be covered with a vapor retarder having a maximum permeance of 0.05perm or an aluminum foil jacket with a minimum thickness of 2 mils. All joints and seams shall be sealed to maintain the continuity of the vapor retarder.
2. Flexible blanket type: Joints and seams made with 2 in. lap of vapor barrier. Round ducts: Apply Foster 85-20 adhesive to ducts in 6 in. brush widths at 1 ft. intervals and at each facing edge. Square ducts: Over 18" duct face width, fasten by impaling insulation on adhered or welded clips. Secure insulation with washers on clips. Seal joints and breaks with 4 in. wide matching tape or 4 in. reinforcing mesh applied with Foster 30-65 vapor barrier coating.
3. Expanded polystyrene: Impale over glued pins, 12 in. to 18 in. centers, minimum of 2 rows per side. Secure insulation with washers on clips. All insulation shall be covered with 0.016" embossed aluminum jacket. Corners shall be protected with aluminum corner bead, screwed to jacketing. All seams and breaks to be weatherproofed and caulked. All joints to be cleanly finished.
4. Flexible Elastomeric Foam Insulation: Apply foam sheet insulation to ductwork with adhesive. Insulate duct seams, angle bracing and reinforcing with same thickness as ductwork. Where exposed outdoors, apply UV resistant coating as recommended by manufacturer. Follow manufacturer's installation instructions.
5. Insulate the tube bends and all exposed surfaces of duct coils operating in excess of 10 degrees differential from ambient conditions.
6. Ductwork installed outdoors, exposed to weather.

    a. All duct insulation on ductwork installed outdoors shall be adhered 100 percent using Approved Contact Adhesive.
    b. Apply self-adhesive, laminated rubberized jacket per manufacturer's requirements. Apply to each side, starting with the bottom surface, then the sides, and finally the top. Provide minimum 3" overlap of material at each joint.

c. Application:

1) Flat ducts in a horizontal plane must be sloped to shed water. There must be no areas of ponding water.
2) Install system over only clean, dry insulation base. Any insulation which becomes damp or damaged shall be removed and replaced prior to installation.

B. Service and access openings shall not be concealed by duct coverings unless the exact location of the opening is properly identified.

C. Continuous vapor barriers shall be provided on all ductwork subject to condensation. No gaps or methods for air to permeate the insulation materials below the vapor barrier shall be permitted.

3.5 EQUIPMENT INSULATION

A. Equipment insulation surfaces shall be a hard, smooth, uniform finish. Install Work ready for painting.

3.6 RECOVERING

A. Field apply glass cloth and applied over standard insulation jacket with lagging adhesive. Properly cut at fittings to avoid wrinkles and coat with lagging adhesive. Leave ready for painting.

3.7 EXISTING INSULATION

A. Patch existing insulation damaged during the course of the work.

B. Report any deficiencies in existing insulation systems to the Owner's Representative for further action.

3.8 EXISTING WORK

A. Insulate existing piping, ductwork and equipment where called for.

EXHIBIT "I" - PIPE INSULATION MATERIALS

SERVICE	INSULATION MATERIAL	THICKNESS	REMARKS
Hot water and glycol/hot water (200°F and lower)	Glass fiber, **(k=.25-.29)**	1-1/2 in. and Larger: 2 in. 1-1/4 in. and Smaller: 1-1/2 in.	
Domestic cold water	Glass fiber,	4 in. and Larger: 1 in. 3 in. and Smaller: 1/2 in.	

EXHIBIT "II" - DUCT INSULATION MATERIALS

SERVICE	INSULATION MATERIAL	THICKNESS	REMARKS
Outside air ducts and plenums, connections and mixing boxes, Combustion air ductwork	Rigid fiberglass	2 in.	Min. installed R value of 8 Provide neat fit at intake plenum

General Note – use duct liner only where specified or called for on drawings. Where duct liner is called for provide external insulation to balance of specified R value.

EXHIBIT "III" - EQUIPMENT INSULATION MATERIALS

SERVICE	INSULATION MATERIAL	THICKNESS	REMARKS
Air removal assemblies, air and dirt removal assemblies, side stream filter system and filter assemblies		SAME AS WATER PIPING	
Heating system expansion tanks and chemical feed tanks		NOT INSULATED	

END OF SECTION

SECTION 230923 – TEMPERATURE CONTROL SYSTEMS

PART 1 – GENERAL

1.1 FUNCTIONAL INTENT

A. Accessibility: As much as practical, design the system to keep the BACS equipment out of, and above user areas. The maintenance staff must have quick and ready access with sufficient room for operation and maintenance.

B. Reliability: Controls are integral to maintaining reliable conditions throughout the building and as such need to be designed and installed with an appropriate degree of robustness and reliability.

C. Digital Terminal Unit Control - This intent of this standard is to require digital electronic control down to the terminal level. Terminal level controls will typically be cost-effective controllers designed for the specific application. Stand-alone local controls may only be used when specifically approved by the Engineer.

D. Expandability - When configuring the BACS equipment, provision must be made for expansion that may be required in the future. Hardware and software required to implement expansion must be provided via system sizing, configuration, and appropriate license agreements

E. When a portion of an existing building is to be renovated, the new control system shall match or integrate seamlessly with the existing control system.

F. Unless stated to the contrary, all hardware points (AI, AO, BI and BO) shall be hardwired to controllers. Data points / BACnet Objects are to be accessed through equipment integration where called for.

1.2 RELATED SECTIONS

A. This Contractor shall reference the entirety of Divisions 22, 23 and 26 as they apply to this work, with specific attention to the following sections:

1. Section 019113 – Commissioning Requirements
2. Section 230514 – Electric Wiring
3. Section 230593 – Testing, Adjusting and Balancing

1.3 DEFINITIONS

Binary Input (BI)	An on/off indication that has a maximum cycle rate of 1 Hz. This is typically sensing a contact closure
Binary Output (BO)	A contact closure on the controller that will cause inaction in the system
Binary Value (BV)	A network-visible binary point whose value is determined by a controller computation

Analog Input (AI)	A continuously varying voltage or amperage signal that is varied by a sensor in relation to a sensed variable. This signal is processed in the controller after an analog-to-digital converter on the controller that converts the analog signal to a digital value
Analog Output (AO)	A continuously varying voltage or amperage signal that is generated from the controller after digital-to-analog conversion. The voltage or amperage signal will be used, for instance, to drive a modulating actuator or reset a hardwired set point on a packaged device. 6. Analog Value (AV): A network-visible analog point whose value is determined by a controller computation
Analog Variable / Value (AV)	A network-visible analog point such as a setpoint or calculation result whose value is determined by a controller computation or user input
Building Management System (BMS)	Integrated DDC Temperature control system used both for system operation and troubleshooting meeting the requirements of this specification.

1.4 WORK INCLUDED

A. Provide labor, materials, equipment, services and warranty for a complete installation, startup and commissioning of motor control wiring and temperature control wiring as required in Contract Documents.

B. Provide wiring and conduit required to connect devices furnished as a part of, or integral to the automatic temperature control system, and for motor control and interlocks regardless of the source of supply.

1. Control wiring includes, as required, 120 volt and lower voltage wiring for control signals directing equipment operation. Control circuits shall be 24VAC in general, and no more than120 VAC where required.
2. Provide wiring in accordance with the requirements specified in Division 26, "Electrical", Section 230514 and the National Electrical Code.
3. Provide all devices required for proper system operation including electrical switches, transformers, disconnect switches, relays, device controllers and control modules, hubs, routers, temporary servers, actuators, transducers, sensors, safety devices, power supplies, mode selecting switches, enclosures, and circuit breakers.
4. Provide complete wiring and terminations. Provide all assembly, programming and test of all items as necessary to create a coherent system, encompassing all combined intents of design, drawings, specifications, addenda, and professional quality of work.
5. Assembly of all damper linkages and shafts, including extension through duct walls where applicable and mounting of actuators shall be by the Temperature Controls Contractor.
6. Mounting of all actuators and sensing devices shall be by the Temperature Controls Contractor.

C. The temperature controls contractor shall be responsible for extending 120vac power from power panels / circuit breakers to all temperature control panels.

D. Provide support requirements for Commissioning as described in Section 019113. The DDC temperature control system is a primary tool for HVAC Commissioning.

E. Coordinate all work with factory provided equipment controllers.

F. Coordination: Work with the Engineer, Commissioning Agent, air-balancing contractor, ventilation contractor, piping contractor and electrical contractor to provide proper and obstruction free component location, and system commissioning.

1.5 WORK NOT INCLUDED

A. Power wiring for motors, motor starters, adjustable speed drives, as well as the motors, motor starters, and adjustable speed drives (except in the case of equipment specified to have packaged controls/starters) are included in Division 26, "Electrical," unless otherwise called for.

B. Electrical wiring, interlocks or components specifically called out in the electrical specifications or drawings shall be included in the Division 26 scope of work.

1.6 ACCEPTABLE MANUFACTURERS

A. Erie County Community College has an existing Building Management System manufactured by Schneider Electric Direct Digital Controls system, provided by U&S Services (a division of Starktech) This project is designed around an extension of this system.

B. All control systems provided shall seamlessly integrate with the existing system without the use of integrator panels, routers, or any other hardware or software. The control system manufacturer shall guarantee that all new controls operate with the existing controls system.

C. Basis of Design: Schneider Electric

D. Acceptable Manufacturers: Subject to engineer approval, must be compatible with existing BMS system.

1.7 WORK INCIDENTAL TO TEMPERATURE CONTROL CONTRACTOR

A. The temperature control contractor shall furnish the following materials, for installation by the contractor responsible for HVAC piping and sheet metal (Sections 232000 and 233000) scope of work.

B. For piping work - Section 232000 Contractor shall install:

1. Control valves in piping.
2. Immersion sensing wells in piping systems.
3. Valved pressure taps (typically for pressure switches or sensors)

C. For sheet metal work - Section 233000 Contractor shall install:

1. Automatic Control Dampers:

    a. Control dampers, at the direction of the Temperature Controls Contractor.

2. The Mechanical Contractor shall provide access doors or other means of access through ducts or ceilings and walls for service and adjustment of controllers, valves, and dampers.

D. Control system manufacturer or their authorized representative shall furnish written details, instructions and supervision for the above trades to ensure proper installation, size, and location of any equipment furnished for installation by others.

1.8 QUALITY ASSURANCE

A. Acceptable Products: All products shall be proven to be functional and suitable in accordance with this specification for a period of warranty commencing on the day of transfer of completed project to the Owner. Demonstration of such warranty may be required prior to the submittal approval.

B. Contractor Qualifications: The Temperature Controls Contractor shall be factory-authorized by the respective manufacturer to provide pertinent installation and service.

C. Any subcontractors in employ of the Temperature Controls Contractor on this project must receive prior approval to be permitted work on this project.

D. Field Representation: The Temperature Controls Contractor shall staff the project with a field representative that has been factory-trained in the installation, programming and commissioning of the equipment specified. This representative must be in the direct employ of the Temperature Controls Contractor.

E. Coordination of Work During Construction – this contractor shall:

1. Protect work installed by other trades
2. Coordinate its work with other trades
3. Repair any damage caused by his work
4. Promptly correct all work that Engineer finds as defective or failing to conform to Contract Documents
5. Bear all cost of correcting of work found defective as described above.

1.9 SHOP DRAWINGS AND SUBMITTALS

A. Product Data: Submit for approval the manufacturer's technical product data for each component furnished as part of the control system. Data shall include dimensions, capacities, performance characteristics, electrical requirements, and material finishes. Data shall also include installation and start-up requirements.

B. Shop Drawings: Submit for approval control drawings detailing the following:

1. Network Block Diagrams and System Riser Diagrams: These diagrams shall depict all DDC components that make up the network. They shall provide specific detail on network terminations, and panel power requirements, including breaker allocation. Each DDC panel within the diagram shall list the equipment that it is controlling.

2. Point-to-point Termination Detail: These drawings shall be created for each unique control application type. Drawings that are typical for similar application shall state the application and quantity of that they represent, and the specifics for each. All wiring and piping required to install and operate the system shall be represented in these details. For terminations that are unknown at the time of submittal, or introduced over the course of project, properly designate these as "Field determined terminations," and include in the As-built Drawings after completion. All wiring and piping shall be number coded on the drawings. These tag numbers shall be used during the installation, and shall appear at both ends of all conductors, including within any junction boxes.
3. Provide individual details for each control type, as described in the Sequence of Operation.
4. Provide spreadsheets of schedules for dampers, valves, wiring, fans and other miscellaneous components if they are part of this control contract showing sizes, characteristics, model numbers and specific locations.
5. For prefabricated control panels, provide panel's interior and exterior layout details. These details shall depict the equipment layout and shall detail the panel wiring and piping.

C. Product Data: The BACS vendor shall submit manufacturer's technical product data for each control device, panel, controller, and accessory furnished indicating dimensions, capacities, performance and electrical characteristics, and material finishes. Also, include installation, start-up, calibration, and maintenance instructions as well as all cable and tubing requirements.

D. Database Information: The submittal package shall contain detailed information on the point naming convention that is to be used.

E. Provide documentation for all sequences of operation that cannot be performed by stand-alone controllers and require non-controller-resident programs, or programs requiring retransmission to be effective on the controller's output. Wherever possible, sequences of operation and associated inputs and outputs shall be contained on a single controller.

F. BACnet Protocol Implementation Conformance Statement (PICS) for each submitted type of controller and operator interface. All controllers and operator interface shall fully conform to ANSI/ASHRAE 135: Data Communication Protocol for Building Automation and Control Systems (BACNET).

1.10 OPERATION AND MAINTENANCE MANUALS FOR COMPLETE PROJECT

A. Upon completion of installation and prior to the training, provide manuals containing the following information:

1. Installation and Service Manuals for all products and components
2. Calibration and Troubleshooting Procedures for all installed equipment and components.
3. List of location of all enclosures, controllers, sensors, transformers and other components as specified above
4. As-built Control Drawings with all modifications, changes and wiring details that depict actual installation. These shall include all final controller and device names, locations for concealed components (pressure sensors, etc.),wire tags, etc.

5. Sequence of operation – Describing in detail the operation of every piece of equipment subject to control by the DDC system. Each section of the sequence should contain the following:

    a. Overview – describes what the intent is, what components are involved and provides a concise description of the piece of equipment to be described.
    b. Occupied Mode – Describes the operation of this system during occupied periods.
    c. Unoccupied Mode – Describes the operation of this system during unoccupied periods.
    d. Alarm Mode - Describes operation of the system in the event of alarm condition and steps to restore system to normal operation. List all anticipated alarm conditions.
    e. Each Component's individual Sequence - Describes the detailed operation of each component and how it interacts with the entire system.

6. Listing of the entire DDC controllers with database, software and programs and program locations.
7. Provide spreadsheets of schedules for enclosures, control modules, dampers, valves, wiring, fans, well, tap and other miscellaneous components if they are part of this control contract showing sizes, characteristics, model numbers and specific locations.

B. Provide laminated control diagrams in each control panel for each piece of major controlled equipment or system.

C. Backup database information in electronic format (other than resident on computer hard drive) to be left on-site that will allow the Owner to fully download the entire DDC System software, including programming point database, configuration, graphic screens and all library of typically composed objects, and details supporting navigation, screens and graphics.

D. Within five working days from the time of the final system commissioning, one (1) hard copy and one (1) electronic copy in PDF format of Operation and Maintenance Manuals shall be turned directly to the Engineer.

E. A Programmers Manual shall be provided with graphic and text descriptions of all functions required for software modifications and developments. The use and installation of high-level programming language shall be included in this manual. The manual shall include ASCII text (or block diagram printouts for graphical programming language based systems) of all DDC programs with the spreadsheet inventorying the name and location of each program. Each file shall be accompanied by a "plain English" description of the program operation by subroutine to assure that future programmers can easily modify the existing database. The manual shall contain computerized printouts of all data file construction including all point information, physical terminal relationships, scales and offsets, alarm limits, messages, schedules, etc. The manual should also contain:

1. System overview
2. Networking concepts
3. Launching browsers from log in
4. Schedule manipulation
5. Software upload and download instruction, including field devices
6. Trend and alarm creation and maintenance

7. Report generation
8. Backup procedure for entire system and modular controllers
9. Sequence of Operation

F. Section for each Major Piece of equipment – Contains the cutsheets for the controllers, custom programs, and relevant information pertaining to that piece of equipment. (IE: schedules for AHUs showing Equipment Tag, Controller address, serial #, airflow, and pertinent engineering units like MBH, GPM, etc…).

G. Wiring Details – Contains 8-1/2" x 11" drawings of all the wiring details shown throughout the set of drawings.

H. Instrumentation Cut sheets – Contains the Manufacturer's original cut sheets for all the instrumentation used on the job. (IE: Well sensor, transformers, enclosures, pressure sensors, etc.).

I. AutoCAD Drawings – All drawings shall be provided in Auto CAD format (i.e. each file format should have the ".dwg" extension), made as set of both, a set 11"x17" black and white and a set of 24"x36" (1 color set and 3 black and white sets). Drawing Sets consists of the following:

1. System Description Drawing – Shows the overview of the job and what is being controlled.
2. Network Riser Drawings – Shows how the network is connected between all the devices on the job
3. Detail drawing(s) – Shows all the wiring and piping details for the entire job – all other drawings refer to these drawings.
4. Individual Control panel drawings & Schematics (1 or 2 drawings per piece of equipment) Shows the EXACT wiring and layout of each control panel. Also shows the schematic representation of the system that is being controlled. (IE: AHU, HW Plant, Fan Coil, Etc.)
5. Controls Floor plans (at least 1 for each floor) – Shows the approximate location of the control panels, thermostats, equipment, network wiring, thermostat wiring and any specific controls required for the job. All this information is overlaid on top of the mechanical floor plan showing the architectural layout (Wall and room #'s).

J. All above shall be copied to a CD (or another approved electronic format) and released to the Owner.

1.11 SYSTEM PRE-COMMISSIONING

A. In addition to responsibilities described within section 019113, and prior to formal project commissioning contractor shall complete the following Pre-Commissioning requirements to assure operational readiness of equipment prior to conducting commissioning.

B. Equipment Start-up: Upon completion of installation, all equipment being controlled shall be initially started and tested on site using a workstation configured identically to that to be presented for permanent use by the Owner, including graphical user interface. Upon completion of all system pre-commissioning (and 019113 commissioning) the entire contents of the workstation, including all changes and corrections performed during these phases, shall be re-loaded to the permanent operator workstation.

C. System Pre-Commissioning shall document the following:

1. Measure, calibrate and adjust all analog inputs. This is to be performed in a manner that verifies that sensors meet the accuracy requirements as specified for the device. All measurements shall be taken using an instrument certified for accuracy within a 12 month period.

    a. Where multiple sensors are "in line" within an air handling system – such as VAV leaving air temperature sensors vs an AHU leaving air temperature, or return / mixed / coil discharge sensors (with economizer correctly positioned) within an air handler, only one of the sensors need be directly measured, and the balance may be validated against the reference sensor.
    b. Where multiple sensors are "in line" within a piping system, the system may be manipulated such that only one sensor need be directly measured, and the balance may be validated against the reference sensor.

2. Stroke all analog outputs from 0% to 100%

    a. Visually verify that all linkage adjustments are set properly.
    b. Verify and record range of operation for ASD commands
    c. Verify and calibrate ASD feedback signals to correspond with command signal and actual operating speed in either RPM or HZ.

3. Valves and Dampers shall fully close and provide tight shut-off.

    a. Hydronic coils – verify that no temperature rise / drop occurs with the valve commanded fully closed
    b. Economizers – Verify return air temperature =mixed air temperature at 100% return air position, mixed air temperature = outdoor air temperature at 100% outdoor air position

4. Verify that all binary outputs are properly energizing the controlled device.
5. Verify that all binary inputs are properly calibrated to accurately reflect status of monitored equipment
6. Adjust setpoints so that equipment operates properly. Tune all PID control loops to avoid unnecessary cycling of control equipment, overheating, sub-cooling, tripping of freezestats or other limit switches and safeties. Create trends for review by the Engineer and Commissioning Agent.
7. Provide control and operational assistance to the balancing personnel during testing and balancing procedures.

D. Communication Network Start-up: Verify from a host computer that all configured controllers are engaged in proper communication passing all configured points to viewing stations. Verify communication speed and level of transactions until it is acceptable and meets the requirements of this specification.

E. Software Verification: All programs and software functions shall be verified to be in compliance with the contract documents for proper sequence of operation.

F. Pre-Commissioning Report: A report shall be provided to the Engineer detailing the dates, times and person(s) performing each phase of the specified system pre-commissioning. This report shall detail when and who performed the individual processes described in this section, and documents the results of all testing procedures. Coordinate phasing of work such that this can be completed PRIOR to formal system commissioning.

G. Project commissioning is considered complete only once the following are completed:

1. Pre-commissioning as described under this paragraph 1.11 is performed, the associated report submitted and approved. All points connected to the BMS shall operate in full compliance with this specification before project substantial completion is acknowledged.
2. The project formal commissioning as outlined under section 019113 is performed, including completion of all remedial work to correct Issues log items,
3. A physical walk-though of the project, conducted by the Engineer or Commissioning Agent and attended by the Temperature Controls Contractor and Owner or their authorized representative is concluded
4. The complete set of required closeout documentation is provided by the contractors. The Owner has no right to refuse or delay a reasonably scheduled walk through. The Owner and Engineer shall determine the level of detail required for the walk-through, and may take this to a component level inspection, at their discretion.

1.12 TRAINING

A. Provide BMS training for up to four (4) Owner selected personnel.

B. After Section 019113 Commissioning is complete as specified, the Temperature Controls Contractor shall provide an on-site session detailing the layout of the BMS. This shall include network wiring routes, control panel locations, transformer locations, etc.

C. The Temperature Controls Contractor shall then provide an on-site session to review the entire Operations and Maintenance manual(s) with the Owner. This session shall also include but not be limited to:

1. Fundamental operation of the system
2. Training on setpoint adjustment and scheduling modifications
3. Operation and sequencing of control loops for all mechanical equipment being controlled

D. Provide telephone support and answer system relevant questions throughout the warranty period.

1.13 WARRANTY

A. Warranty for the entire control system shall commence upon completion and acceptance by the Engineer of the system commissioning as specified. The warranty includes fine-tuning of all dynamic elements of control system to achieve reasonable, efficient end equipment protective mode of operation.

B. Provide a one-year warranty on all DDC controllers.

C. Provide a one-year warranty on all other components.

D. Disclose to Owner and accommodate longer warranty periods if provided by components manufactured at the time of purchasing.

E. The Contractor shall provide all OEM recommended preventative maintenance of the installed work as described in the operating and maintenance manuals during the warranty period. In addition, the Contractor shall provide two (2) semi-annual service visits (i.e., one visit during the peak cooling season and one visit during the peak heating season) to test and evaluate the performance of the installed work. The Contractor shall provide a written report of the test and evaluation results. The service visits shall include, but not be limited to:

1. Checking and, if necessary, correcting the calibration of the sensors, transducers, and transmitters for airflow, liquid flow, pressure, and temperature.
2. Checking and, if necessary, correcting the operation of the dampers and damper actuators.
3. Checking and, if necessary, correcting the operation (i.e., monitoring and command) of the system points, graphics, and display functions.

F. Software and Hardware Updates: At the end of the first six months after acceptance, and during the subsequent six-month period, the BACS contractor shall update the equipment and any controllers, servers, workstations and HMI web servers with the latest modification and improvements in software, firmware, and hardware that the manufacturer may have incorporated in the furnished equipment.

G. Contractor shall, during the ensuing four seasons (one year), conduct periodic inspections and fine-tune all dynamic elements of the system with all costs of testing to be included in this scope of work.

PART 2 – PRODUCTS

2.1 SYSTEM DESCRIPTION

A. General Requirements

1. A distributed logic control system, complete with Direct Digital Control (DDC) software shall be provided. This system is to control all mechanical equipment, as described on the project drawings and these specifications.
2. All BMS controllers, including (but not limited to) those for terminal units, air handlers, central mechanical equipment and systems shall be as manufactured by a single manufacturer, the hardware from which has been represented by this contractor for no less than a 10 year period.
3. All controllers for terminal units, air handlers, central mechanical equipment and the Microsoft Windows-based operator's terminal(s) shall communicate and share data.
4. All controllers shall be fully programmable.
5. System architectural design shall eliminate dependence upon any single device for alarm reporting and control execution. Each DDC Controller shall operate independently by performing its own specified control, alarm management, operator I/O, and data collection. The failure of any single component or network connection shall not interrupt the execution of any control strategy, reporting, alarming and trending function, or any function at any operator interface device.

6. DDC Controllers shall be able to access any data from, or send control commands and alarm reports directly to, any other DDC Controller or combination of controllers on the network without dependence upon a central or intermediate processing device. DDC Controllers shall also be able to send alarm reports to multiple operator workstations without dependence upon a central or intermediate processing device.
7. All control points associated with a single piece of equipment (air handler, VAV air terminal, heat exchanger, pump control, etc.,) shall be wired to the local controller. Network sharing of data via the network, for example, remote monitoring of a temperature sensor to control a valve or other devices, shall not be permitted without advance permission from the Engineer.
8. The Temperature Controls Contractor shall assume complete responsibility for the entire controls system as a single source, providing installation, program debugging and service of all portions of logic control system. This shall include designated server, operator's terminal, global controllers, routers, terminal unit controllers, sensors and all other sections of the system.
9. During construction, at least one operator's terminal shall be equipped to act as a system server / operator interface. This system server shall store copies of all installed software for all field components and shall be capable of automatic or manual reloading of such software into the field components as required. The system server shall also gather and archive system-operating data, such as trends, energy logs, and other historical operating data. Complete energy management firmware, including self-adjusting optimum start, demand limiting, global control strategies and logging routines for use with total control systems shall be supplied. All energy management firmware shall be resident in field hardware and shall not be dependent on the operator's terminal for operation. Operator's terminal software is to be used for access to field-based energy management control firmware only. All schedules shall be module resident and shall not be affected in case of interruption network transport between the module and the host station.
10. Upon completion of the project, the Contractor shall transfer and install to all software, graphics, etc., associated with the scope of this project to the existing operator workstations.

B. Basic System Features

1. Direct digital logic control of temperature, scheduling, optimum start, equipment alarm reporting and override devices for unoccupied mode of operation.
2. Operator's terminal software (Graphical User Interface or GUI) shall run under Microsoft Windows operating system. Software shall be multi-tasking, capable of executing and displaying multiple instances in individual windows while running concurrently with other Windows programs such as word processors or database programs. Operation of the terminal software shall be simple and intuitive.
3. Operator's terminal software shall contain graphical user interface software, allowing configuration of system-wide controllers.
4. Provide all communication media, connectors, repeaters, bridges, switches, and routers necessary for network communications and interface to the internet as required to allow for remote access to system operations.
5. The system shall meet peer-to-peer communication services such that the connection of any operator interface to any one controller shall allow the operator to interface with all other controllers. The software shall provide transparent viewing and editing of all data, control programs, schedules, trends, alarms from any one controller through connection to any other controller on the internet work, regardless of subnetwork routers.

6. Priority password security systems shall prevent unauthorized use. Each user shall have an individual password. The user shall only be given access to the system functions required for individual job performance.
7. Equipment monitoring and alarm functions, including information for diagnosing equipment problems shall be included with the system.
8. The complete system, including, but not limited to terminal unit controllers, higher level controllers and operator's terminals shall auto-restart, without operator intervention, on resumption of power after a power failure. Database stored in any controller's memory shall reside error free for a minimum of 30 days. Logic controllers for all air handlers and all unitary equipment shall utilize EEPROM or battery backup for all variable data storage.
9. System design shall be modular.
10. All software and/or firmware interface equipment for connection to remote monitoring station from field hardware or the operator's terminal shall be provided.
11. System shall be capable of equipment runtime totalization of fans, heaters, boilers, etc. And capable of alarm generation and alarm dial out.
12. All hardware shall be listed Underwriters Laboratory for Open Energy Management Equipment (PAZX) under the UL Standard for Safety 916 in both the US and Canada, with integral labels showing rating.
13. All hardware shall be in compliance with FCC Part 15, Subpart J, Class A.

2.2 SYSTEM PERFORMANCE

A. Performance Standards. System shall conform to the following minimum standards over network connections. Systems shall be tested using manufacturer's recommended hardware and software for operator workstation.

1. Graphic Display. A graphic with a minimum of 20 dynamic points shall display with current data within 10 sec.
2. Graphic Refresh. A graphic with 20 dynamic points shall update with current data within 8 sec.
3. Configuration and Tuning Screens. Screens used for configuring, calibrating, or tuning points, PID loops, and similar control logic shall automatically refresh within 6 sec.
4. Object Command. Devices shall react to command of a binary object within 2 sec. Devices shall begin reacting to command of an analog object within 2 sec.
5. Alarm Response Time. An object that goes into alarm shall be annunciated at the workstation within 15 sec.
6. Program Execution Frequency. Custom and standard applications shall be capable of running as often as once every 1 sec. Select execution times consistent with the mechanical process under control.
7. Performance. Programmable controllers shall be able to completely execute DDC PID control loops at a frequency adjustable down to once per sec. Select execution times consistent with the mechanical process under control.
8. Multiple Alarm Annunciation. Each workstation on the network shall receive alarms within 5 sec of other workstations.
9. Control Stability and Accuracy. Control loops shall maintain measured variable at setpoint within tolerances listed in Table 1.

Table 1 - Control Stability and Accuracy

Controlled Variable	Control Accuracy	Range of Medium
Water Flow	±2% of full scale	
Water Temperature	±1.2 ºF	
Airflow	±5% of full scale	
Space Temperature	±1.0ºF	
Duct Temperature	±1.2ºF	
Fluid Pressure (note 2)	±0.5 psi	
CO2 Sensors	50ppm	400-2000ppm

NOTE 1: Accuracy applies to 10% - 90% of scale
NOTE 2: For both absolute and differential pressure
GENERAL NOTE - Sensors to be selected such that measured media is near middle third of sensor range

2.3 TEMPERATURE SENSORS

A. General

1. Sensors shall have a limited lifetime warranty.
2. All devices shall use precision thermistors unless stated to the contrary in this section.
3. Provide NEMA 1 termination box unless otherwise specified

B. Sensor Specifications

1. Space Sensors:

a. Standard Space sensor shall be available in an off-white enclosure for mounting in a standard electrical box. Mount at 48” height.
b. Sensors in public areas shall be provided without local temperature indication, setpoint adjustment or setback override.
c. Sensors in private / staff only areas shall be provided with local temperature indication, setpoint adjustment and setback override functions.
d. Where potentially subject to damage (stairwells, gyms, corridors) or as directed by the Owner or Engineer, provide bushed stainless steel blank wall plate type sensors.
e. Where space sensors are connected to dedicated terminal unit controllers, they shall be equipped with local communication interface for troubleshooting and balancing purposes. Provide all required wiring from the terminal controller to the space sensor to allow for interface to a local laptop interface device.
f. Wall Plate Sensors - Blank wall plate style sensors, Kele KTP3 Stainless Steel Flush Mounted Thermistor and RTD Sensors or approved equal. Provide only where specified or called out on project drawings

2. Duct Sensors:

    a. Single point duct mounted sensors shall have a minimum 8" rigid probe and be used when the duct size is less than 24"or where duct stratification is not present, such as downstream of fans. Shorter probes may be acceptable for ducts only less than 12". Probes less than 4" in length are unacceptable.
    b. Averaging duct-mounted sensors shall have a minimum 8' long averaging element and be used when the duct size is greater than 24". Where multi-point thermistor averaging sensors are to be used, sensing element spacing not to exceed 16". Provide averaging sensors in all locations where specified or where temperature stratification can occur. Minimum element to be provided, 1 ft. per 2. sq ft of area. Securely support all elements to avoid movement in air stream or long term damage at stress / mounting locations. Supports shall provide radius bend support and insulation to avoid thermal bridging.

3. Well Sensors:

    a. Liquid immersion sensors shall have a stainless-steel probe and a stainless steel or brass well. Length of the sensor well shall be selected based on the diameter of the pipe to provide accurate, reliable sensing of the liquid temperature.

4. Outside Sensors:

    a. The sensing element shall mounted inside a ventilated, treated, sun shield to minimize the radiant energy and wind effects. Sensor location shall be selected to minimize effects from sunlight, building heat, exhaust systems, etc. Temperature Controls Contractor shall be responsible for selection of an appropriate location. Where sensor location is determined to be adversely affected by outdoor conditions, this contractor shall relocate the sensing devices to a more reliable position.

2.4 THERMOSTATS

A. Low-Voltage Space Thermostats. Low-voltage space thermostats shall be 24 V, bimetal-operated, mercury-switch type, with adjustable or fixed anticipation heater, concealed setpoint adjustment, 13°C-30°C (55°F-85°F) setpoint range, 1°C (2°F) maximum differential, and vented ABS plastic cover.

B. Line-Voltage Space Thermostats. Line-voltage space thermostats shall be bimetal-actuated, open-contact type or bellows-actuated, enclosed, snap-switch type or equivalent solid-state type, with heat anticipator, UL listing for electrical rating, concealed setpoint adjustment, 13°C-30°C (55°F-85°F) setpoint range, 1°C (2°F) maximum differential, and vented ABS plastic cover.

2.5 FLOW SWITCHES. Flow-proving switches shall be paddle (water service only) or differential pressure type (air or water service). Switches shall be UL listed, SPDT snap-acting, and pilot duty rated (125 VA minimum).

A. Paddle switches shall have adjustable sensitivity and NEMA 1 enclosure unless otherwise specified.

B. Differential pressure switches shall have scale range and differential suitable for intended application and NEMA 1 enclosure unless otherwise specified.

2.6 RELAYS

A. Control Relays. Control relays shall be UL listed, and shall have dust cover and LED "energized" indicator. Contact rating, configuration, and coil voltage shall be suitable for application.

B. Time Delay Relays. Time delay relays shall be solid-state, UL listed, and shall have adjustable time delay. Delay shall be adjustable ±100% from setpoint shown. Contact rating, configuration, and coil voltage shall be suitable for application. Provide NEMA 1 enclosure for relays not installed in local control panel.

2.7 OVERRIDE TIMERS

A. Unless implemented in control software, override timers shall be spring-wound line voltage, UL Listed, with contact rating and configuration required by application. Provide 0-6 hour calibrated dial unless otherwise specified. Flush mount timer on local control panel face or where shown.

2.8 CURRENT TRANSMITTERS

A. AC current transmitters shall be self-powered, combination split-core current transformer type with built-in rectifier and 4-20 mA two-wire output. Full-scale unit ranges shall be 10 A, 20 A, 50 A, 100 A, 150 A, and 200 A, with internal zero and span adjustment. Unit accuracy shall be ±1% full-scale at 500-ohm maximum burden.

B. Transmitter shall meet or exceed ANSI/ISA S50.1 requirements and shall be UL/CSA recognized.

C. Unit shall be split-core type for clamp-on installation on existing wiring.

2.9 CURRENT TRANSFORMERS

A. AC current transformers shall be UL/CSA recognized and shall be completely encased (except for terminals) in approved plastic material.

B. Transformers shall be available in various current ratios and shall be selected for ±1% accuracy at 5 A full-scale output.

C. Use fixed-core transformers for new wiring installation and split-core transformers for existing wiring installation.

2.10 VOLTAGE TRANSMITTERS

A. AC voltage transmitters shall be self-powered single-loop (two-wire) type, 4-20 mA output with zero and span adjustment.

B. Adjustable full-scale unit ranges shall be 100-130 Vac, 200-250 Vac, 250-330 Vac, and 400-600 Vac. Unit accuracy shall be ±1% full-scale at 500-ohm maximum burden.

C. Transmitters shall meet or exceed ANSI/ISA S50.1 requirements and shall be UL/CSA recognized at 600 Vac rating.

2.11 VOLTAGE TRANSFORMERS

A. AC voltage transformers shall be UL/CSA recognized, 600 Vac rated, and shall have built-in fuse protection.

B. Transformers shall be suitable for ambient temperatures of 4°C-55°C (40°F-130°F) and shall provide ±0.5% accuracy at 24 Vac and 5 VA load.

C. Windings (except for terminals) shall be completely enclosed with metal or plastic.

2.12 POWER MONITORS

A. Power monitors shall be three-phase type and shall have three-phase disconnect and shorting switch assembly, UL listed voltage transformers, and UL listed split-core current transformers.

B. Power monitors shall provide selectable output: rate pulse for kWh reading or 4-20 mA for kW reading. Power monitors shall operate with 5 A current inputs and maximum error of ±2% at 1.0 power factor or ±2.5% at 0.5 power factor.

2.13 CURRENT TRANSDUCER / EQUIPMENT INTERFACE RELAY

A. Low voltage, single phase:

1. Combined status sensor, command relay, and hand-off-auto switch.
2. Sized for monitor and control of small motors.
3. Field selectable relay output.
4. High and low voltage isolation.
5. Industrial grade load switching relay.
6. Mountable on single or double gang boxes, flush on starter enclosures, or stand-alone.
7. Approved for installation in the following environmental conditions:

    a. 0-95% RELATIVE HUMIDITY, NON-CONDENSING.
    b. –15° TO 60° C

8. Design equipment: Veris Hawkeye H500 Series or approved equal.
9. Alternative components combining the total functionality of the specified device may be submitted for approval.

2.14 PRESSURE TRANSMITTERS

A. Pressure transmitters shall be of 2-wire, 4-20 mA / 0-10vdc output type with a capacitance element having an accuracy of +/- 1% over the entire range. Transmitter shall include protection against reverse polarity and supply voltage transients. Accuracy and zero span adjustment shall be provided with each transmitter to allow for recalibration as necessary.

1. LIQUID PRESSURE

   a. The operating range shall be -40.0 to 176.0 F.
   b. Safe overpressure shall be a minimum of 150% of the rated pressure.
   c. Sensor range to be selected so anticipated control setpoint resides in the middle third of the sensor span.
   d. Use of two discrete pressure sensors and mathematical determination of system differential pressure is acceptable.
   e. Differential pressure sensor shall use a five-valve manifold to allow proper service and removal of air from the sensing lines without damage. Locate such that the lines from the primary piping can be properly drained and vented. Provide isolation at the mains to allow service to the assembly.
   f. Shall be contained in an aluminum NEMA-1 enclosure.

2. Air Pressure (option 1)

   a. The operating range shall be 0 to 150.0 F.
   b. Safe overpressure of 10psi.
   c. Sensor shall be equipped with reverse polarity protection.
   d. Accurate to within 1% over full scale
   e. Sensor shall have ability for field zero of reading and output.
   f. Bi-directional ranges available by application
   g. Shall be contained in a NEMA-1 enclosure.
   h. Not to be provided when Space Pressure Monitor (SPM) / Room Pressure Monitor (RPM) is specified or called out on the drawings.
   i. Sensor warranty shall be 3 years.
   j. Design Make – Setra 264 or approved equal

2.15 DIFFERENTIAL PRESSURE SWITCHES

A. Differential pressure switches (air or water service) shall be UL listed, SPDT snap-acting, pilot duty rated (125 VA minimum) and shall have scale range and differential suitable for intended application and NEMA 1 enclosure unless otherwise specified.

2.16 PRESSURE-ELECTRIC (PE) SWITCHES. PE switches shall be UL listed, pilot duty rated (125 VA minimum) or motor control rated, metal or neoprene diaphragm actuated, operating pressure rated for 0-175 kPa (0-25 psig), with calibrated scale minimum setpoint range of 14-125 kPa (2-18 psig).

A. Provide one- or two-stage switch action (SPDT, DPST, or DPDT) as required by application.

B. Switches shall be open type (panel-mounted). Exception: switches shall be enclosed type for remote installation. Enclosed type shall be NEMA 1 unless otherwise specified.

C. Each pneumatic signal line to PE switches shall have permanent indicating gauge.

2.17 FLOW TRANSMITTERS

A. Airflow – Acceptable for all applications

1. Duct mounted airflow measuring station shall consist of one or more airflow/temperature measuring devices based on size of duct and all required electronics. The complete system shall be factory tested prior to shipment. The airflow measuring station shall not require calibration over the life of the equipment.
2. Fan inlet measurement devices shall not be substituted for duct or plenum measurement devices indicated on the plans without prior approval by the Engineer.
3. Each sensing point shall measure both airflow and temperature using a pair of instrument grade, hermitically sealed, glass encapsulated thermistors, one self-heated and one ambient temperature. Airflow rate sensing device shall utilize thermal dispersion technology. Individual sensor notes shall be individually calibrated at 16 points to NIST calibration standards. Sensors will read and system will compensate for air temperature and impact on velocity or CFM. Provide copy of NIST calibration report for the reference standard to calibration the production tunnels used to calibrate individual sensor nodes. Devices claiming AMCA certification are not acceptable.
4. Provide air flow measuring station transmitter including any 24 VAC transformer to interface with the BAS. Each measurement location shall produce a single, separate linear analog output signal for airflow and temperature where indicated, both of which can be directly interfaced to the BMS.
5. The system shall have the ability to perform self-diagnostics and produce an alarm, which can identify the source of malfunction. In the event of a sensor failure, the system shall ignore failed sensor(s), average remaining sensors and shall continue to operate.
6. Sensor range shall be minimum and maximum system airflow rates with an accuracy of ±2%. Sensors and electronics shall operate over a temperature range of -20° F to 120° F, acceptable for use over a range of 5-95% RH, non-condensing. Size for 125% of anticipated range of air flow. The number of independent sensing points shall be per manufacturer's recommendations for the specified application as shown on drawings.
7. Remote transmitters to be mounted in a location protected from moisture. Provide weatherproof enclosure and mount away from direct sunlight when outdoor mounting is required.
8. The probe body shall be constructed of extruded anodized aluminum alloy.
9. Provide a Bluetooth and Android/IOS software that allows real time airflow and temperature monitoring.
10. Provide required length of cable to location of adjacent transmitter station to be mounted in an accessible, convenient location for operator use. Prior to start-up, a factory trained representative shall visit the site to inspect installation of air flow measuring devices and wiring. A written report shall be submitted to the engineer for the start-up services.
11. Acceptable Make: Ebtron, Air Monitor

B. Liquid Flow

1. Insertion Type - Onicon F3500 or approved equivalent only
2. Install in compliance with all manufacturers requirements.
3. Provide type as specified on the contract drawings.

C. Remote Readout Unit:

1. Provide only where specified or shown on the drawings.
2. Able to accept signals from meter, temperature transmitter and pressure transducer.
3. Shall provide local display of actual flow rate, totalized flow (counter), and percent of full flow.
4. Shall provide a 4-20 mA DC analog signal to read actual flow and totalized flow at DDC controller.
5. 115V or 230V AC operation (+ 15%).
6. Provide in NEMA 4 enclosure. Mount on adjacent wall.

2.18 VOC SENSORS

A. Provide where specified or shown on the drawings

B. Contains calibration algorithm for correlation to CO2 concentration levels

C. Available as combination VOC / Temperature / Humidity sensor – coordinate with zone requirements.

D. Provide digital reading of VOC level and optional temperature and humidity.

E. Eighteen-month warranty from installation date

2.19 CO2 SENSORS

A. Space

1. Provide only where specified or shown on the drawings.
2. Dual Channel optical system for reference calibration
3. Optional temperature sensing – coordinate with zone requirements
4. 90% response time inside of 45 seconds at 25°C.
5. Local LCD display of CO2 concentration
6. Temperature and altitude compensation
7. 0-10v or 4-20 ma output
8. Accurate to within 50ppm between 400 and 2000ppm
9. Drift not to exceed 20ppm / year.
10. Eighteen-month warranty from installation date

B. CO2 Sensors – Duct

1. Provide only where specified or shown on the drawings.
2. Dual Channel optical system for reference calibration
3. 90% response time inside of 45 seconds at 25°C.
4. Temperature and altitude compensation
5. 0-10v or 4-20 ma output
6. Accurate to within 50ppm between 400 and 2000ppm
7. Drift not to exceed 20ppm / year.
8. Eighteen-month warranty from installation date

2.20 NATURAL GAS (METHANE) SENSORS

A. Catalytic or NDIR sensing element

B. LCD display with backlight

C. Minimum two SPDT output relays

D. Alarm buzzer, minimum 80db

E. RS485 Modbus communication protocol

F. 5-20mA, 1-5vdc, 2-10vdc custom span analog outputs proportional to sensor reading.

G. Make: ACI Q5-CH4-100L-0-X or approved equal

2.21 ENCLOSURES

A. Enclosures shall be NEMA-1 rated steel, finished to control oxidation in a highly humid atmosphere.

B. Each enclosure shall have a hinged door with handle and keyed lock

C. Shall provide 40% of free space for future expansion of the system.

2.22 DAMPER MOTORS

A. Electronic:

1. Electronic actuators shall be driven directly by 0-10 VDC, supply power: 24 VAC or 30VDC, as acceptable to its controller, and provide adequate torque to meet the application.
2. Where actuators over 30vdc requirement are supplied, coordinate with furnishing contractor for all wiring requirements in compliance with NEC and these specifications.
3. Electronic actuators shall be direct-coupled type.
4. For all actuators, assure execution of the fail-safe position in case of the Freezestat trip or power loss.
5. Actuators to be sized for smooth operation over entire range and a minimum of 150% of required torque for connected components.
6. Design Make: Belimo, Neptronic.

2.23 CONTROL DAMPERS

A. Rectangular;

1. Blades are extruded aluminum profiles. Aluminum end caps are press fitted to blade ends in order to seal hollow interior and reduce air leakage rates.
2. Blade and frame seals are extruded silicone and are secured in an integral slot within the aluminum extrusions.

3. Bearings are composed of a Celcon inner bearing fixed to a 7/16" (11.11mm) aluminum hexagon blade pin, rotating within a polycarbonate outer bearing inserted in the frame, resulting in no metal-to-metal or metal-to-plastic contact.
4. Linkage hardware is installed in the frame side and constructed of aluminum and corrosion-resistant, zinc-plated steel, complete with cup-point trunnion screws for a slip-proof grip.
5. Dampers are designed for operation in temperatures ranging between -40°F (-40°C) and 212°F (100°C).
6. Dampers are available with either opposed blade action or parallel blade action.
7. Leakage class 1A at 1" w.g. Static pressure differential. Standard air leakage data is certified under the AMCA Certified Ratings Program.
8. Two position dampers - Pressure drop not to exceed 0.2"wc as installed. If frame is fully within the duct, the pressure drop calculations shall account for this installation method.
9. Modulating Control Dampers shall be sized by the temperature control manufacturer. Maximum velocity shall be 1500 fpm and maximum pressure drop shall be 0.15 in w.g, not to exceed 0.2"wc. Dampers shall be of adequate authority and sized and positioned to allow for smooth modulation of controlled air streams.
10. Damper pressure drops shall take into account the as-installed position and be certified for pressure drop per AMCA standard 500-d.
11. Dampers are available in two mounting types: i.e., "Installed in Duct" or "Flanged to Duct".
12. Provide thermally broken frame design where use of standard frame could cause condensation or operational issues.
13. Installation of dampers shall be in accordance with current manufacturer's installation instructions.
14. Dampers over 48 in. In length and height shall be made into multiple sections.
15. Automatic dampers are required at all exterior walls and roof openings. Dampers to open when respective fan starts. Dampers at exterior walls and roof openings shall be insulated blade, thermal break design.
16. Dampers located outdoors or exposed to ambient temperatures, shall be provided with the following:

    a. Extruded silicone blade seals
    b. Extruded aluminum damper frame shall not be less than 0.080" (2.03 mm) in thickness. Frame shall be assembled using stainless steel screws. Welded frames shall not be acceptable.
    c. Hexagonal control shaft shall be 7/16" (11.11 mm). It shall have an adjustable length and shall be an integral part of the blade axle. A field-applied control shaft shall not be acceptable. All parts shall be stainless steel.
    d. Linkage hardware shall be aluminum and stainless steel, installed in the frame side, out of the airstream, and accessible after installation. Linkage hardware shall be complete with stainless steel cup-point trunnion screws to prevent linkage slippage and a Celcon bearing between moving parts to reduce wear and increase longevity. Linkage that consists of metal rubbing metal will not be approved.

17. Design make: Tamco 1500 series (standard), Tamco 9000 series (outdoor air intake and exhaust / relief locations)

B. Round

1. Temperature Rating: Withstand maximum of 250 degrees F.
2. Minimum diameter 4 inches. Maximum 48 inch.
3. Capacity: Damper shall withstand HVAC system operating conditions:
4. Closed Position: Maximum pressure of 10 inches w.g @ a 6 inch diameter.
5. Open Position: Maximum air velocity of 4,000 feet per minute.
6. Leakage: Provide with damper blade seals. Maximum 10 cfm at 4 inches w.g. for 48 inch diameter damper.
7. Pressure Drop: Maximum 0.1 inch w.g at 1,000 feet per minute
8. Frame: Under 6 inch diameter; 2 inch x 12 gauge steel tube. 6 thru 12 inch, 2 inch x 0.5 inch x 14 gauge steel channel. Above 12 inch thru 24 inch, 2 x 0.5 x 1/8 inch steel channel. Above 24 inch; 2 x 1 x 3/16 inch steel channel.
9. Blade Style: Single skin round blade.
10. Material: Diameter 18 inch or under; 12 gauge steel. Diameter over 18 inch; 10 gauge steel (3.5 mm). Stiffeners as required.
11. Bearings: Stainless steel pressed into frame.
12. Seals: Neoprene ring.
13. Axles: Diameter 24 inch or under; 0.5 inch diameter plated steel. Diameter over 24 inch); 0.75 inch plated steel.
14. Actuation: Refer to Damper Actuators paragraph. Provide actuator mounting plate and extended shaft where required to allow proper insulation of duct insulation and damper actuator. Direct mount of actuator anti-rotation pin to the ductwork is not permitted.
15. Design Make: Ruskin CDR25

2.24 CONTROL VALVES

A. General:

1. Valves shall be applicable for the rated pressure and temperature service. Close off pressures must be determined in concert with the actuators and valves shall be provided to close off against extreme anticipated conditions. Valves shall be selected such that they are not, as a practice, “oversized.”
2. Modulating valves shall be carefully selected to control in a smooth and stable fashion across the range of anticipated conditions. “Split ranging” of heating and cooling valves controlled by the BMS is not acceptable. A separate output from the BMS shall be provided for all control valves. When the selection criteria indicated below are not met, flow characteristic analyses shall be submitted to demonstrate reasonable correlation between stroke and flow.
3. Modulating actuators for Primary Equipment (air handlers, etc.) shall be selected for smooth actuation over the entire operating range, use a 24vac power supply, and respond to an electronic input of: 4-20 mA or 0-10 VDC.
4. Pulse Width Modulation (PWM) actuators will be permitted on small unitary equipment, such as fan coils or other systems less than 1200cfm in size, but under no circumstances for use in control of outdoor air economizers or control valves greater than 1” in size. Additional applications may be permitted with advance permission by the Engineer.

B. Provide factory fabricated control valves with operators as required by this specification. Provide selection as determined by manufacturer for installation requirements and pressure class, based on maximum pressure and temperature in piping system. Provide valve size in accordance with specified maximum pressure drop across control valve. Equipment control valves with heavy duty actuators, with proper shut off rating for each individual application.

C. Valves shall be selected to perform as specified taking into account inlet and outlet piping geometry correction factors. Temperature control contractor shall instruct mechanical contractor on correct installation technique and verify that installation matches manufacturer's requirements for proper performance.

D. Design Pressure Drop –

1. Water Service Valves - Unless specified to the contrary, valves shall be selected for a pressure drop approximately equal to that of the connected equipment, but **no greater than 3 psi** at the design water flow rate.

E. Ball Valves:

1. Modulating water valves shall be ball valves with an equal percentage characteristic.
2. Type: Two or three-way as called for, V-port ball valve with characterizing disk, 1/4 turn.
3. Packing: EPDM O-rings, lubricated.
4. Ball & Stem: Stainless steel.
5. Seat: Fiberglass reinforced Teflon.
6. Actuator: Electric, one motor only; valves 4 inches and larger shall have single operator.
7. Flow Characteristic: Equal percentage.

F. Actuator: Electric, one motor only

1. Failure positions shall generally be as follows, contact owner for special circumstances requiring deviation from these requirements:

   a. Terminal hot water radiation: fail last
   b. Fan Coil Unit cooling coils: normally closed spring return
   c. Pre-Heat coils in air handling units: normally open spring return

2. Input signal: 0-10 VDC, equipped with spring failure position return all heating applications. "Floating point" actuation allowed only where specifically noted elsewhere in the contract documents.
3. The Back-to-back electronic actuations, i.e., where two identical actuators are engaged in operating the rising or rotation of valve stem are not permitted.
4. Valve Closeoff:

   a. Water – 120% of total system (pump) head.
   b. Steam – 200% of system operating (inlet) pressure.
   c. Valves to be used on this project shall be suitable for complete closeoff to the levels stated under modulating duty. In the event that manufacturer's data provides a separate maximum differential pressure under modulating duty, both criteria shall exceed the above requirements.

2.25 SAFTEY/STATUS DEVICES

A. Low Limit Detector ("freezestat"): Electric type, with manual reset and auxiliary contacts to the DDC, set for 37°F for "freeze" protection and 55°F for fan discharge application. Provide a 20' long element for every 25 sq. Ft. Of coil face area or fraction thereof. Low-Limit Thermostats. Low-limit airstream thermostats shall be UL listed, vapor pressure type. Element shall sense temperature in each 30 cm (1 ft) section and shall respond to lowest sensed temperature. Low-limit thermostat shall be manual reset only.

B. High Limit Detector ("firestat"): Electric type, with manual reset and auxiliary contacts to the DDC, UL Listed for fire, set for 180°F.

C. Pump status through adjustable range current sensing element on pump motor. Calibrate to actual conditions.

D. Fan status through adjustable range current sensing element on the fan motor. Calibrate to actual conditions.

2.26 COMMUNICATIONS

A. Control products, communication media, connectors, repeaters, hubs, and routers shall comprise a BACnet internetwork. Controller and operator interface communication shall conform to ANSI/ASHRAE Standard 135, BACnet.

B. Install new wiring and network devices as required to provide a complete and workable control network.

C. Each controller shall have a communication port for temporary connection to a laptop computer or other operator interface. Connection shall support memory downloads and other commissioning and troubleshooting operations.

D. Internet operator interface and value passing shall be transparent to network architecture.

1. An operator interface connected to a controller shall allow the operator to interface with each internetwork controller as if directly connected. Controller information such as data, status, and control algorithms shall be viewable and editable from each internetwork controller.
2. Inputs, outputs, and control variables used to integrate control strategies across multiple controllers shall be readable by each controller on the internetwork. Program and test all cross-controller links required to execute control strategies specified. An authorized operator shall be able to edit cross-controller links by typing a standard object address or by using a point-and-click interface.

E. System shall automatically synchronize system clocks daily from an operator-designated controller via the network. If applicable, system shall automatically adjust for daylight saving and standard time.

F. System shall be expandable to at least twice the required input and output objects with additional controllers, associated devices, and wiring.

2.27 OPERATOR INTERFACE

A. All operator workstation functions shall be updated on the existing operator workstation(s) to reflect the new equipment and systems installed under this project.

B. Communication. Web server or workstation and controllers shall communicate using BACnet protocol. Web server or workstation and control network backbone shall communicate using ISO 8802-3 (Ethernet) Data Link/Physical layer protocol and BACnet/IP addressing as specified in ANSI/ASHRAE 135, BACnet.

C. Operator Functions. Operator interface shall allow each authorized operator to execute the following functions as a minimum:

1. Log In and Log Out. System shall require user name and password to log in to operator interface.
2. Point-and-click Navigation. Operator interface shall be graphically based and shall allow operators to access graphics for equipment and geographic areas using point-and-click navigation.
3. View and Adjust Equipment Properties. Operators shall be able to view controlled equipment status and to adjust operating parameters such as setpoints, PID gains, on and off controls, and sensor calibration.
4. View and Adjust Operating Schedules. Operators shall be able to view scheduled operating hours of each schedulable piece of equipment on a weekly or monthly calendar-based graphical schedule display, to select and adjust each schedule and time period, and to simultaneously schedule related equipment. System shall clearly show exception schedules and holidays on the schedule display.
5. View and Respond to Alarms. Operators shall be able to view a list of currently active system alarms, to acknowledge each alarm, and to clear (delete) unneeded alarms.
6. View and Configure Trends. Operators shall be able to view a trend graph of each trended point and to edit graph configuration to display a specific time period or data range. Operator shall be able to create custom trend graphs to display on the same page data from multiple trended points.
7. View and Configure Reports. Operators shall be able to run preconfigured reports, to view report results, and to customize report configuration to show data of interest.
8. Manage Control System Hardware. Operators shall be able to view controller status, to restart (reboot) each controller, and to download new control software to each controller.
9. Manage Operator Access. Typically, only a few operators are authorized to manage operator access. Authorized operators shall be able to view a list of operators with system access and of functions they can perform while logged in. Operators shall be able to add operators, to delete operators, and to edit operator function authorization. Operator shall be able to authorize each operator function separately.

D. System Software

1. Operating System. Workstation server shall operate on Microsoft Windows 10.

2. System Graphics. Operator interface shall be graphically based and shall include at least one graphic per piece of equipment or occupied zone, graphics for each chilled water and hot water system, and graphics that summarize conditions on each floor of each building included in this contract. Indicate thermal comfort on floor plan summary graphics using dynamic colors to represent zone temperature relative to zone setpoint.

    a. Functionality. Graphics shall allow operator to monitor system status, to view a summary of the most important data for each controlled zone or piece of equipment, to use point-and-click navigation between zones or equipment, and to edit setpoints and other specified parameters.
    b. Animation. Graphics shall be able to animate by displaying different image files for changed object status.
    c. Alarm indication. Indicate areas or equipment in an alarm condition using color or other visual indicator.
    d. Format. Graphics shall be saved in an industry-standard format such as BMP, JPEG, PNG, or GIF. Web-based system graphics shall be viewable on browsers compatible with World Wide Web Consortium browser standards. Web graphic format shall require no plug-in (such as HTML and JavaScript) or shall only require widely available no-cost plug-ins (such as Active-X and Macromedia Flash).
    e. Provide a link from each piece of graphically represented equipment to the associated wiring diagram and sequence of operation.

E. System tools. System shall provide the following functionality to authorized operators as an integral part of the operator interface or as stand-alone software programs. If furnished as part of the interface, the tool shall be available from each workstation or web browser interface. If furnished as a stand-alone program, software shall be installable on standard IBM-compatible PCs with no limit on the number of copies that can be installed under the system license.

1. Automatic System Database Configuration. Each workstation or web server shall store on its hard disk a copy of the current system database, including controller firmware and software. Stored database shall be automatically updated with each system configuration or controller firmware or software change.
2. Controller Memory Download. Operators shall be able to download memory from the system database to each controller.
3. System Configuration. Operators shall be able to configure the system.
4. Online Help. Context-sensitive online help for each tool shall assist operators in operating and editing the system.
5. Security. System shall require a user name and password to view, edit, add, or delete data.

    a. Operator Access. Each user name and password combination shall define accessible viewing, editing, adding, and deleting functions in each system application, editor, and object.
    b. Automatic Log Out. Automatically log out each operator if no keyboard or mouse activity is detected. Operators shall be able to adjust automatic log out delay.
    c. Encrypted Security Data. Store system security data including operator passwords in an encrypted format. System shall not display operator passwords.

6. System Diagnostics. System shall automatically monitor controller and I/O point operation. System shall annunciate controller failure and I/O point locking (manual overriding to a fixed value).
7. Alarm Processing. System input and status objects shall be configurable to alarm on departing from and on returning to normal state. Operator shall be able to enable or disable each alarm and to configure alarm limits, alarm limit differentials, alarm states, and alarm reactions for each system object.
8. Alarm Messages. Alarm messages shall use an English language descriptor without acronyms or mnemonics to describe alarm source, location, and nature.
9. Alarm Reactions. Operator shall be able to configure (by object) actions workstation or web server shall initiate on receipt of each alarm. As a minimum, workstation or web server shall be able to log, print, start programs, display messages, send e-mail, send page, and audibly annunciate.
10. Alarm Maintenance. Operators shall be able to view system alarms and changes of state chronologically, to acknowledge and delete alarms, and to archive closed alarms to the workstation or web server hard disk from each workstation or web browser interface.
11. Trend Configuration. Operator shall be able to configure trend sample or change of value interval, start time, and stop time for each system data object and shall be able to retrieve data for use in spreadsheets and standard database programs. Controller shall sample and store trend data and shall be able to archive data to the hard disk.
12. Object and Property Status and Control. Operator shall be able to view, and to edit if applicable, the status of each system object and property by menu, on graphics, or through custom programs.
13. Reports and Logs. Operator shall be able to select, to modify, to create, and to print reports and logs. Operator shall be able to store report data in a format accessible by standard spreadsheet and word processing programs.
14. Standard Reports. Furnish the following standard system reports:

    a. Objects. System objects and current values filtered by object type, by status (in alarm, locked, normal), by equipment, by geographic location, or by combination of filter criteria.
    b. Alarm Summary. Current alarms and closed alarms. System shall retain closed alarms for an adjustable period.
    c. Logs. System shall log the following to a database or text file and shall retain data for an adjustable period:

        1) Alarm History.
        2) Trend Data. Operator shall be able to select trends to be logged.
        3) Operator Activity. At a minimum, system shall log operator log in and log out, control parameter changes, schedule changes, and alarm acknowledgment and deletion. System shall date and time stamp logged activity.

15. Graphics Generation. Graphically based tools and documentation shall allow Operator to edit system graphics, to create graphics, and to integrate graphics into the system. Operator shall be able to add analog and binary values, dynamic text, static text, and animation files to a background graphic using a mouse.

16. Graphics Library. Complete library of standard HVAC equipment graphics shall include equipment such as chillers, boilers, air handlers, terminals, fan coils, and unit ventilators. Library shall include standard symbols for other equipment including fans, pumps, coils, valves, piping, dampers, and ductwork. Library graphic file format shall be compatible with graphics generation tools.
17. Custom Application Programming. Operator shall be able to create, edit, debug, and download custom programs. System shall be fully operable while custom programs are edited, compiled, and downloaded. Programming language (or block language equivalent) shall have the following features:

    a. Language. Language shall be graphically based and shall use function blocks arranged in a logic diagram that clearly shows control logic flow. Function blocks shall directly provide functions listed below, and operators shall be able to create custom or compound function blocks.
    b. Debugging and Simulation. Operator shall be able to step through the program observing intermediate values and results. Operator shall be able to adjust input variables to simulate actual operating conditions. Operator shall be able to adjust each step's time increment to observe operation of delays, integrators, and other time-sensitive control logic. Debugger shall provide error messages for syntax and for execution errors.
    c. Conditional Statements. Operator shall be able to program conditional logic using compound Boolean (AND, OR, and NOT) and relational (EQUAL, LESS THAN, GREATER THAN, NOT EQUAL) comparisons.
    d. Mathematical Functions. Language shall support floating-point addition, subtraction, multiplication, division, and square root operations, as well as absolute value calculation and programmatic selection of minimum and maximum values from a list of values.
    e. Variables: Operator shall be able to use variable values in program conditional statements and mathematical functions.

        1) Time Variables. Operator shall be able to use predefined variables to represent time of day, day of the week, month of the year, and date. Other predefined variables or simple control logic shall provide elapsed time in seconds, minutes, hours, and days. Operator shall be able to start, stop, and reset elapsed time variables using the program language.
        2) System Variables. Operator shall be able to use predefined variables to represent status and results of controller software and shall be able to enable, disable, and change setpoints of Controller Software as described in Controller Software section.

2.28 CONTROLLER SOFTWARE

A. Building and energy management application software shall reside and operate in system controllers. Applications shall be editable through operator workstation, web browser interface, or engineering workstation.

B. Scheduling. System shall provide the following schedule options as a minimum:

1. Weekly. Provide separate schedules for each day of the week. Each schedule shall be able to include up to 5 occupied periods (5 start-stop pairs or 10 events).

2. Exception. Operator shall be able to designate an exception schedule for each of the next 365 days. After an exception schedule, has executed, system shall discard and replace exception schedule with standard schedule for that day of the week.
3. Holiday. Operator shall be able to define 24 special or holiday schedules of varying length on a scheduling calendar that repeats each year.

C. System Coordination. Operator shall be able to group related equipment based on function and location and to use these groups for scheduling and other applications.

D. Alarm Reporting.

E. Remote Communication. System shall automatically contact operator workstation or server on receipt of critical alarms.

F. Maintenance Management. System shall generate maintenance alarms when equipment exceeds adjustable runtime, equipment starts, or performance limits.

G. PID Control. System shall provide direct- and reverse-acting PID (proportional-integral-derivative) algorithms. Each algorithm shall have anti-windup and selectable controlled variable, setpoint, and PID gains. Each algorithm shall calculate a time-varying analog value that can be used to position an output or to stage a series of outputs.

H. Staggered Start. System shall stagger controlled equipment restart after power outage. Operator shall be able to adjust equipment restart order and time delay between equipment restarts.

I. Startup Optimization – All equipment noted in the sequences of operation to have scheduled operation shall be started on an optimized basis which attempts to reach occupied conditions just prior to the scheduled occupancy time.

J. Pressure control optimization – All equipment noted in the sequences of operation (fans and pumps) shall have reset of pressure control setpoint initiated in the sequence. Typically, for pumps this would cause the software to examine all connected control valves for position, determine the critical valve (defined as the valve at the highest demand position), and reset the pressure setpoint up or down to maintain the critical valve between 80 and 90% open. For fans serving zone air valves / VAV boxes, this would similarly reset the duct pressure setpoint to maintain the critical zone damper between 80 and 90% open.

K. Heating Water Pump Control – Whenever heating demand reaches a minimum controllable threshold; the heating pumps shall be disabled and the heating water system shut down until demand for heating / reheat reaches a controllable level. This shall apply only in non-critical environment, exclusions apply to medical and laboratory application.

L. Energy Calculations.

1. System shall accumulate and convert instantaneous power (kW) or flow rates (L/s [gpm]) to energy usage data.
2. System shall calculate a sliding-window average (rolling average). Operator shall be able to adjust window interval to 15 minutes, 30 minutes, or 60 minutes.

M. Anti-Short Cycling. Binary output objects shall be protected from short cycling by means of adjustable minimum on-time and off-time settings.

N. On and Off Control with Differential. System shall provide direct- and reverse-acting on and off algorithms with adjustable differential to cycle a binary output based on a controlled variable and setpoint.

O. Runtime Totalization. System shall provide an algorithm that can totalize runtime for each binary input and output. Operator shall be able to enable runtime alarm based on exceeded adjustable runtime limit. Configure and enable runtime totalization and alarms as specified.

2.29 CONTROLLERS

A. General. Provide controllers and accessory devices as required to achieve performance specified.

B. BACnet.

1. Building Controllers (BCs). Each BC shall conform to BACnet Building Controller (B-BC) device profile as specified in ANSI/ASHRAE 135, and shall be listed as a certified B-BC in the BACnet Testing Laboratories (BTL) Product Listing.
2. Advanced Application Controllers (AACs). Each AAC shall conform to BACnet Advanced Application Controller (B-AAC) device profile as specified in ANSI/ASHRAE 135, and shall be listed as a certified B-AAC in the BACnet Testing Laboratories (BTL) Product Listing.
3. Application Specific Controllers (ASCs). Each ASC shall conform to BACnet Application Specific Controller (B-ASC) device profile as specified in ANSI/ASHRAE 135, and shall be listed as a certified B-ASC in the BACnet Testing Laboratories (BTL) Product Listing.
4. Smart Actuators (SAs). Each SA shall conform to BACnet Smart Actuator (B-SA) device profile as specified in ANSI/ASHRAE 135, and shall be listed as a certified B-SA in the BACnet Testing Laboratories (BTL) Product Listing.
5. Smart Sensors (SSs). Each SS shall conform to BACnet Smart Sensor (B-SS) device profile as specified in ANSI/ASHRAE 135, and shall be listed as a certified B-SS in the BACnet Testing Laboratories (BTL) Product Listing.
6. BACnet Communication.

    a. Each BC shall reside on or be connected to a BACnet network using ISO 8802-3 (Ethernet) Data Link/Physical layer protocol and BACnet/IP addressing.
    b. BACnet routing shall be performed by BCs or other BACnet device routers as necessary to connect BCs to networks of AACs and ASCs.
    c. Each AAC shall reside on a BACnet network using ISO 8802-3 (Ethernet) Data Link/Physical layer protocol with BACnet/IP addressing, or it shall reside on a BACnet network using the ARCNET or MS/TP Data Link/Physical layer protocol.
    d. Each ASC shall reside on a BACnet network using the ARCNET or MS/TP Data Link/Physical layer protocol.
    e. Each SA shall reside on a BACnet network using the ARCNET or MS/TP Data Link/Physical layer protocol.

f. Each SS shall reside on a BACnet network using ISO 8802-3 (Ethernet) Data Link/Physical layer protocol with BACnet/IP addressing, or it shall reside on a BACnet network using ARCNET or MS/TP Data Link/Physical layer protocol.

C. Communication

1. Service Port. Each controller shall provide a service communication port for connection to a Portable Operator's Terminal. Connection shall be extended to space temperature sensor ports where shown on drawings.
2. Signal Management – Master or Global Controller operating systems shall manage input and output communication signals to allow distributed controllers (lower level networks) to share real and virtual object information and to allow for central monitoring and alarms.
3. Data Sharing. Each Master or Global Controller shall share data as required to allow the specified performance and sequence of operation.
4. Stand-Alone Operation. Each piece of equipment specified shall be controlled by a single controller to provide stand-alone control in the event of communication failure. All I/O points specified for a piece of equipment shall be integral to its controller. Provide stable and reliable stand-alone control using default values or other method for values normally read over the network.

D. Environment. Controller hardware shall be suitable for anticipated ambient conditions.

1. Controllers used outdoors or in wet ambient conditions shall be mounted in waterproof enclosures and shall be rated for operation at -29°C to 60°C (-20°F to 140°F).
2. Controllers used in conditioned space shall be mounted in dust-protective enclosures and shall be rated for operation at 0°C to 50°C (32°F to 120°F).

E. Real-Time Clock. Controllers that perform scheduling shall have a real-time clock.

F. Serviceability

1. Controllers shall have diagnostic LEDs for power, communication, and processor.
2. Wires shall be connected to a field-removable modular terminal strip or to a termination card to allow service without rewiring the controller.
3. Each controller shall continually check its processor and memory circuit status and shall generate an alarm on abnormal operation. System shall continuously check controller network and generate alarm for each controller that fails to respond.

G. Immunity to Power and Noise. Controllers shall be able to operate at 90% to 110% of nominal voltage rating and shall perform an orderly shutdown below 80% nominal voltage. Operation shall be protected against electrical noise of 5 to 120 hz and from keyed radios up to 5 W at 1 m (3 ft).

H. Transformer. ASC power supply shall be fused or current limiting and shall be rated at a minimum of 125% of ASC power consumption.

2.30 INPUT AND OUTPUT INTERFACE

A. General. Hard-wire input and output points to all controller hardware.

B. Protection. Shorting an input or output point to itself, to another point, or to ground shall cause no controller damage. Input or output point contact with up to 24 V for any duration shall cause no controller damage.

C. Binary Inputs. Binary inputs shall monitor the on and off signal from a remote device. Binary inputs shall provide a wetting current of at least 12 mA and shall be protected against contact bounce and noise. Binary inputs shall sense dry contact closure without application of power external to the controller.

D. Pulse Accumulation Inputs. Pulse accumulation inputs shall conform to binary input requirements and shall accumulate up to 10 pulses per second.

E. Analog Inputs. Analog inputs shall monitor low-voltage (0-10 Vdc), current (4-20 mA), or resistance (thermistor or RTD) signals. Analog inputs shall be compatible with and field configurable to commonly available sensing devices.

F. Binary Outputs. Binary outputs shall send an on-or-off signal for on and off control. Building Controller binary outputs shall have three-position (on-off-auto) override switches and status lights. Outputs shall be selectable for normally open or normally closed operation.

G. Analog Outputs. Analog outputs shall send a modulating 0-10 Vdc or 4-20 mA signal as required to properly control output devices. Each Building Controller analog output shall have a two-position (auto-manual) switch, a manually adjustable potentiometer, and status lights. Analog outputs shall not drift more than 0.4% of range annually.

H. Tri-State Outputs. Control three-point floating electronic actuators without feedback with tri-state outputs (two coordinated binary outputs). Tri-State outputs may be used to provide analog output control in zone control and terminal unit control applications such as VAV terminal units, duct-mounted heating coils, and zone dampers.

I. Universal Inputs and Outputs. Inputs and outputs that can be designated as either binary or analog in software shall conform to the provisions of this section that are appropriate for their designated use.

2.31 POWER SUPPLIES AND LINE FILTERING

A. Power Supplies. Control transformers shall be UL listed. Furnish Class 2 current-limiting type or furnish over-current protection in primary and secondary circuits for Class 2 service in accordance with NEC requirements. Limit connected loads to 80% of rated capacity.

1. DC power supply output shall match output current and voltage requirements. Unit shall be full-wave rectifier type with output ripple of 5.0 mV maximum peak-to-peak. Regulation shall be 1.0% line and load combined, with 100-microsecond response time for 50% load changes. Unit shall have built-in over-voltage and over-current protection and shall be able to withstand 150% current overload for at least three seconds without trip-out or failure.

    a. Unit shall operate between 0°C and 50°C (32°F and 120°F). EM/RF shall meet FCC Class B and VDE 0871 for Class B and MILSTD 810C for shock and vibration.
    b. Line voltage units shall be UL recognized and CSA listed.

B. Power Line Filtering

1. Provide internal or external transient voltage and surge suppression for workstations and controllers. Surge protection shall have:

    a. Dielectric strength of 1000 V minimum
    b. Response time of 10 nanoseconds or less
    c. Transverse mode noise attenuation of 65 dB or greater
    d. Common mode noise attenuation of 150 dB or greater at 40-100 Hz

PART 3 - EXECUTION

3.1 WIRING

A. All wiring shall comply with these specifications, Specification Section 230514, and the NEC. Deviations are only permitted where manufacturer's requirements specifically conflict with gauge and wiring type specified within this section.

B. Communication wiring shall be installed using the particular system recommended, plenum rated, jacket shielded cable. The communication network wiring shall be clearly marked with a specific color code. Communication wiring shall not be installed near noise producing equipment, such as ballasts, magnetic starters, etc. Communication wiring shall comply with the optimum requirements necessary to assure communication integrity and speed.

C. All analog inputs and analog outputs shall be wired using 18 gauge stranded shielded cable. All Analog inputs and analog outputs wiring shall not be installed near noise producing equipment, such as ballasts, magnetic starters, etc.

D. All digital outputs shall be wired using 18 gauge stranded wire.

E. All wiring in mechanical rooms, walls shall be installed in EMT conduit. Concealed conduit and wiring is required in all finished spaces.

F. Power Supplies

1. Transformers – Each w/ low voltage fuse holder/disconnect
2. Actuators and relays shall use separate transformers from those powering microprocessor control panels.
3. Transformers shall be sized for a minimum of 150% of the connected load.
4. Convenience Outlet –

    a. 110vac combination outlet w/ switch to kill 110vac to panel

5. Switched 110vac to panel is fused before transformers (after outlet).
6. Provide at all control panels excepting those for terminal equipment (exclude reheats, cabinet heaters, fan coils, etc.)
7. Wiring Panduit

    a. Wire ducts around exterior of panel for cables entering panel
    b. Wire ducts as necessary to route hookup wires from terminals to controllers and other devices

8. Panel Construction (sized to provide 25% future expansion w/ removable back panel)

    a. Indoors – Johnson M8100 series
    b. Outdoors – Hoffman fiberglass Nema 4x

9. Wire Labeling

    a. All DDC system wiring shall be individually labeled and permanently tagged at both ends of the conductors, including within all junction boxes between panels.
    b. All submittal and as-built drawings shall reflect the field installed wire tag numbers.
    c. All wire numbers shall be unique throughout the system installation.

3.2 DDC EQUIPMENT

A. All components and controllers shall be installed in protective enclosures. All wiring within the DDC enclosure shall be number coded. Both the enclosure and the controller shall be properly grounded in accordance with manufacturer's recommendation. Documentation shall be firmly attached to the enclosure within a plastic envelope. Documentation shall state point-to-point termination detail, description of each individual point, location of power source for the controller and ID number or address within the network.

B. All DDC Controllers shall be mounted on walls within equipment rooms, custodial closets or electrical rooms. Only application-specific controllers for rooftop units or package units may be mounted on the equipment.

3.3 EXAMINATION

A. Thoroughly examine project plans for control device and equipment locations. Report discrepancies, conflicts, or omissions to Architect or Engineer for resolution before starting rough-in work.

B. Inspect site to verify that equipment can be installed as shown. Report discrepancies, conflicts, or omissions to Engineer for resolution before starting rough-in work.

C. Examine drawings and specifications for work of others. Report inadequate headroom or space conditions or other discrepancies to Engineer and obtain written instructions for changes necessary to accommodate work of others. Temperature Controls Contractor shall perform at his expense necessary changes in specified work caused by failure or neglect to report discrepancies.

3.4 PROTECTION

A. Temperature Controls Contractor shall protect against and be liable for damage to work and to material caused by Contractor's work or employees.

B. Temperature Controls Contractor shall be responsible for work and equipment until inspected, tested, and accepted. Protect material not immediately installed. Close open ends of work with temporary covers or plugs during storage and construction to prevent entry of foreign objects.

3.5 COORDINATION

A. Site.

1. Assist in coordinating space conditions to accommodate the work of each trade where work will be installed near or will interfere with work of other trades. If installation without coordination causes interference with work of other trades, Contractor shall correct conditions without extra charge.
2. Coordinate and schedule work with other work in the same area and with work dependent upon other work to facilitate mutual progress.

B. Test and Balance.

1. Furnish Test and Balance Contractor a single set of necessary tools to interface to control system for testing and balancing for the duration of TAB activity
2. Train Test and Balance Contractor to use control system interface tools.
3. Provide a qualified technician to assist with testing and balancing of all air handling equipment and terminal units.
4. Test and Balance Contractor shall return tools undamaged and in working condition at completion of testing and balancing.

C. Life Safety.

1. Duct smoke detectors required for air handler shutdown are furnished and installed by others. Interlock smoke detectors to air handlers for shutdown as specified Sequence of Operations for HVAC Controls.
2. Smoke dampers and actuators required for duct smoke isolation are furnished and installed by others. Interlock smoke dampers to air handlers as specified in Sequence of Operations for HVAC Controls.

D. Coordination with Other Controls. Integrate with and coordinate controls and control devices furnished or installed by others as follows.

1. Each supplier of a controls product shall configure, program, start up, and test that product to meet the required sequences of operation regardless of where within the contract documents those products are described.
2. Coordinate and resolve incompatibility issues that arise between control products provided under this section and those provided under other sections or divisions of this specification.
3. Temperature Controls Contractor shall be responsible for integration of control products provided by multiple suppliers regardless of where integration is described within the contract documents.

3.6 GENERAL WORKMANSHIP

A. Install equipment, piping, and wiring or raceway horizontally, vertically, and parallel to walls wherever possible.

B. Independently support all temperature control wiring from other systems. Do NOT support from conduits, piping or hangers for equipment.

C. Provide sufficient slack and flexible connections to allow for piping and equipment vibration isolation.

D. Install equipment in readily accessible locations as defined by National Electrical Code (NEC) Chapter 1 Article 100 Part A.

E. Verify wiring integrity to ensure continuity and freedom from shorts and ground faults.

F. Equipment, installation, and wiring shall comply with industry specifications and standards and local codes for performance, reliability, and compatibility.

3.7 FIELD QUALITY CONTROL

A. Work, materials, and equipment shall comply with rules and regulations of applicable local, state, and federal codes and ordinances.

B. Continually monitor field installation for code compliance and workmanship quality.

C. Contractor shall arrange for work inspection by local or state authorities having jurisdiction over the work.

3.8 COMMUNICATION WIRING

A. Install communication wiring in separate raceways and enclosures from other Class 2 wiring.

B. During installation do not exceed maximum cable pulling, tension, or bend radius specified by the cable manufacturer.

C. Verify entire network's integrity following cable installation using appropriate tests for each cable.

D. Install lightning arrestor according to manufacturer's recommendations between cable and ground where a cable enters or exits a building.

E. Each run of communication wiring shall be a continuous length without splices when that length is commercially available. Runs longer than commercially available lengths shall have as few splices as possible using commercially available lengths.

F. Label communication wiring to indicate origination and destination.

3.9 INSTALLATION OF SENSORS

A. Install sensors according to manufacturer's recommendations.

B. Mount sensors rigidly and adequately for operating environment.

C. Install room temperature sensors on concealed junction boxes properly supported by wall framing. Where sensor locations can be effected by wall surface temperature, pack junction box with insulation and provide insulated back plate for sensor. Install all space sensors so they are not affected by direct sunlight, appliances / equipment, or air currents. Consult with the Engineer prior to installing device if the location shown on the project drawings does not meet these criteria.

D. Air seal wires attached to sensors in their raceways or in the wall to prevent sensor readings from being affected by air transmitted from other areas. Use of Silicon or similar sealant is prohibited. Use Fiberglass or poly fill in the junction boxes.

E. Use averaging sensors in mixing plenums and hot and cold decks, and all duct locations which may be subject to stratification. Install averaging sensors in a serpentine manner vertically across duct. Support each bend with a mechanically fastened capillary clip. “Stick on” type fasteners are specifically prohibited.

F. Install mixing plenum low-limit sensors in a serpentine manner horizontally across duct. Support each bend with a mechanically fastened capillary clip. “Stick on” type fasteners are specifically prohibited.

G. Install pipe-mounted temperature sensors in wells. Install liquid temperature sensors with heat-conducting fluid in thermal wells. Sensors and wells shall be installed to assure that the entire sensing element is completely immersed in the measured media with minimal pressure drop. Provide oversized pipe section, oversized elbow, or other recognized method to achieve this result in compliance with this specification and manufacturer’s recommendations.

H. Install outdoor air temperature sensors on north wall with sun shield. Sensor to be located where thermal characteristics of the building and solar load do not effect readings.

I. All sensors to be mounted on externally insulated ductwork or plenums shall be provided with standoff brackets. Insulation and vapor barriers shall be carried continuously beneath the sensor enclosure. Coordinate installation with mechanical and insulation contractors.

J. Differential Air Static Pressure.

1. Piping to pressure transducer pressure ports shall contain a capped test port adjacent to transducer.
2. Air pressure transducers: Mount transducers in a vibration-free location accessible for service without use of ladders or special equipment.
3. Mount gauge tees adjacent to air and water differential pressure taps. Install shut-off valves before tee for water gauges.

K. Smoke detectors, freezestats, high-pressure cut-offs, and other safety switches shall be hard-wired to de-energize equipment as described in the sequence of operation. Switches shall require manual reset. Provide contacts that allow DDC software to monitor safety switch status. Interlock shall be provided such that the unit cannot be restarted in either hand or auto modes without manual reset of the safety device.

3.10 FLOW SWITCH INSTALLATION

A. Use correct paddle for pipe diameter.

B. Adjust flow switch according to manufacturer's instructions.

3.11 FLOW TRANSMITTER INSTALLATION

A. Airflow and Liquid Flow

1. Provide meter probe size, type and arrangement per manufacturers recommendations to obtain accuracy and performance specified.
2. Verify calibration of Remote Readout Unit (where specified to be provided) over operating range in conjunction with TAB contractor. Perform all necessary field calibration to obtain readout accuracy within specified limits.
3. Provide specified interface to DDC system.
4. Verify accuracy of DDC system reading against Remote Readout Unit (where specified) and balancer readings over operating range of device.
5. Provide installation in strict compliance with manufacturer’s requirements.

3.12 ACTUATORS

A. General. Mount actuators and adapters according to manufacturer's recommendations.

B. Electric and Electronic Damper Actuators. Mount actuators directly on damper shaft or jackshaft unless shown as a linkage installation. Link actuators according to manufacturer's recommendations.

1. For low-leakage dampers with seals, mount actuator with a minimum 5° travel available for damper seal tightening.
2. To compress seals when spring-return actuators are used on normally closed dampers, power actuator to approximately 5° open position, manually close the damper, then tighten linkage.
3. Check operation of damper-actuator combination to confirm that actuator modulates damper smoothly throughout stroke to both open and closed positions.

4. Provide necessary mounting hardware and linkages for actuator installation.

C. Valve Actuators. Connect actuators to valves with adapters approved by actuator manufacturer.

D. Where actuators are mounted to the side of insulated ductwork or equipment, provide insulation standoffs and repair insulation and vapor barrier.

3.13 CONTROL VALVE INSTALLATION

A. Control valves to be installed in strict compliance with manufacturer's requirements.

B. A minimum of 3 straight pipe diameters shall be provided at the inlet, and 2 at the outlet of all control valves. Pipe to be of the identical size as valve body inlet and outlet. Where reducers are provided to adapt pipe size to valve body size these shall be located approximately 3 pipe diameters upstream of pipe inlet (s) and 2 diameters downstream of the outlet. These values may be reduced or adjusted so long as final installation complies with manufacturer's requirements.

C. The contractor is responsible for verifying valve porting to conform to system requirements. If direction is required to assure correct operation, it is the responsibility of this contractor to contact the Engineer clarify design intent.

D. For heating water and steam systems – where conditions permit, the actuator shall be canted 45 degrees from vertical such that the actuator is not directly above the pipe.

3.14 WARNING LABELS

A. Affix permanent warning labels to equipment that can be automatically started by the control system.

1. Labels shall use white lettering (12-point type or larger) on a red background.
2. Warning labels shall read as follows.

C A U T I O N
This equipment is operating under automatic control and may start or stop at any time without warning. Switch disconnect to "Off" position before servicing.

B. Affix permanent warning labels to motor starters and control panels that are connected to multiple power sources utilizing separate disconnects.

1. Labels shall use white lettering (12-point type or larger) on a red background.
2. Warning labels shall read as follows.

C A U T I O N
This equipment is fed from more than one power source with separate disconnects. Disconnect all power sources before servicing.

3.15 IDENTIFICATION OF HARDWARE AND WIRING

A. Label wiring and cabling, including that within factory-fabricated panels, with control system address or termination number at each end within 2 in. of termination.

B. Permanently label or code each point of field terminal strips to show instrument or item served.

C. Label control panels with minimum ½ in. letters on laminated plastic nameplates.

D. Label each control component with a permanent label. Label plug-in components such that label remains stationary during component replacement.

E. Label room sensors related to terminal boxes or valves with nameplates.

F. Manufacturers' nameplates and UL or CSA labels shall be visible and legible after equipment is installed.

G. Label identifiers shall match record documents.

H. Provide laminated control diagrams in each control panel for each piece of major controlled equipment or system.

3.16 OPERATOR INTERFACE

A. Standard Graphics. Provide graphics as specified. Show on each equipment graphic input and output points and relevant calculated points such as indicated on the applicable Points List / diagram. Point information on graphics shall dynamically update.

B. Install, initialize, start up, and troubleshoot operator interface software and functions (including operating system software, operator interface database, and third-party software installation and integration required for successful operator interface operation).

C. Provide logical descriptions and engineering units on all data displays. Example: percentage position shall be easily discernable as percent open or closed.

D. Provide logical linking between graphics. For example, direct penetration from building to floor to air handler to air terminal and back is to be provided without need to resort to a menu tree to navigate the building.

E. Graphical user interface shall be reviewed by the Owner and / or Engineer. If in their sole opinion the graphics are inaccurate, incomplete, or improperly represent the systems, the graphics shall be updated as no additional cost to the project.

3.17 CONTROL SYSTEM DEMONSTRATION AND ACCEPTANCE

A. Prior to demonstration and acceptance, the contractor shall:

1. Complete all Pre-Commissioning requirements as described in paragraph 1.11 of this section.
2. Complete system commissioning requirements per section 019113.
3. Correct all deficiencies in control system hardware and software noted in engineer's punchlists, field observations, and commissioning issues logs / reports.

B. Demonstration. Prior to acceptance, perform the following to demonstrate system operation and compliance.

1. Engineer and / or Owner's representative will be present to observe and review system demonstration. Notify Engineer at least 10 days before system demonstration begins.
2. Demonstrate actual field operation of sequence of operation. Provide at least two persons equipped with two-way communication (if required). Demonstrate calibration and response of any input and output points requested by Engineer. Provide and operate test equipment required to prove proper system operation. Engineer may, at their discretion, perform these tests on a "spot check" basis.
3. Demonstrate complete operation of operator interface.
4. Demonstrate each of the following.

    a. DDC loop response. Supply graphical trend data output showing each DDC loop's response to a setpoint change representing an actuator position change of at least 25% of full range. Trend sampling rate shall be from 10 seconds to 3 minutes, depending on loop speed. Each sample's trend data shall show setpoint, actuator position, and controlled variable values. Engineer will require further tuning of each loop that displays unreasonably under- or over-damped control.
    b. Demand limiting (where applicable). Supply trend data output showing demand-limiting algorithm action. Trend data shall document action sampled each minute over at least a 30-minute period and shall show building kW, demand-limiting setpoint, and status of setpoints and other affected equipment parameters.
    c. Building fire alarm system interface.
    d. Trend logs for each system. Trend data shall indicate setpoints, operating points, valve positions, and other data as specified in the points list provided with each sequence of operation.. Each log shall cover three 48-hour periods and shall have a sample frequency not less than 10 minutes or as specified on its points list. Logs shall be accessible through system's operator interface and shall be retrievable for use in other software programs.

5. Tests that fail to demonstrate proper system operation shall be repeated after Contractor makes necessary repairs or revisions to hardware or software to successfully complete each test.

C. Acceptance.

1. After tests described in these specifications are performed to the satisfaction of both Engineer and Owner, Engineer will accept control system as meeting completion requirements. Engineer may exempt tests from completion requirements that cannot be performed due to circumstances beyond Contractor's control, such as seasonal requirements or construction progress issues. Engineer will provide written statement of each exempted test. Exempted tests shall be performed as part of warranty.

3.18 CLEANING

A. Each day clean up debris resulting from work. Remove packaging material as soon as its contents have been removed. Collect waste and place in designated location.

B. On completion of work in each area, clean work debris and equipment. Keep areas free from dust, dirt, and debris.

C. On completion of work, check equipment furnished under this section for paint damage. Repair damaged factory-finished paint to match adjacent areas. Replace deformed cabinets and enclosures with new material and repaint to match adjacent areas.

END OF SECTION

SECTION 232000 - PIPING SYSTEMS AND ACCESSORIES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide labor, materials, equipment and services as required for the complete installation designed in Contract Documents.

B. Provide all chemical treatment required for piping systems each time an individual system is drained and then refilled as a result of work performed under this contract.

1.2 RELATED DOCUMENTS

A. All work under this section is subject to the Contract Documents and this Contractor shall be responsible for and governed by all the requirements therein.

1.3 SUBMITTALS

A. Provide submittal documentation for the following:

1. Schedule of pipe materials, fittings and connections by piping system.
2. Piping materials, fittings and appurtenances to demonstrate compliance with the requirements of this section.
3. Piping accessories
4. Grooved mechanical connection system.
5. Anchors, sleeves, hanger shields, and guides.

1.4 QUALITY ASSURANCE

A. Manufacturer: Provide domestically manufactured pipe, fittings and accessories.

B. All pipe, tubing and fittings shall be either tested by an approved third party testing agency or certified by an approved third party certification agency.

C. All grooved couplings and fittings shall be the products of a single manufacturer. Grooving tools shall be of the same manufacturer as the grooved components. All casting used for the couplings and fittings shall be date stamped quality assurance and traceability.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver products in factory-fabricated containers. Deliver pipe and tube with factory-applied plastic end-caps on each length.

B. Store products in original wrapping and protect from dirt and damage. Store piping and tube inside. Where necessary to store outside, evaluate well above grade and enclose with waterproof wrapping.

C. Handle products carefully to avoid damage. Do not install damaged products.

PART 2 - PRODUCTS

2.1 GENERAL

A. Each length of pipe and each pipe fitting shall be new and marked with manufacturer's name; complying with the following Standards where applicable:

1. American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)
2. American Society of Mechanical Engineers (ASME)
3. American Society of Testing and Materials (ASTM)
4. American National Standards Institute (ANSI)
5. American Water Works Association (AWWA)
6. American Petroleum Institute (API)
7. American Standards Association (ASA)

B. Refer to the MCNYS section 1202 for additional compliance standards for piping and fittings.

C. Refer to the MCNYS section 1210 for piping requirements specific to ground source Heat Pump Loops.

2.2 STEEL PIPING AND FITTINGS

A. Pipe: ASTM A53, ASTM A106, Schedule 40 or Schedule 80 weight as specified as Exhibit "A"; black or galvanized finish as specified in Exhibit 'A' or as noted on drawings; ends chamfered for welding or roll grooved for grooved mechanical connections. Galvanizing on piping shall be in compliance with ASTM A123.

B. Fittings: Same material and pressure class as adjoining pipe.

1. Welded fittings: Same weight as adjoining piping, factory forged, seamless construction, butt weld type, chamfered ends, in compliance with ASTM A105, ANSI/ASME B16.9 and MSS SP-43. Socket weld, Class 3000, forged in compliance with ASTM A105 and ASME B16.11. Where branch connections are two or more sizes smaller than main size, "Weldolets", Class 3000, forged, in compliance with ASTM A105, ANSI/ASME B16.9 and MSS SP-97, "Threadolets", Class 3000, forged, in compliance with ASTM A105, ASME B16.11, ANSI/ASME B1.20.1 and MSS SP-97. Sockolet weld type, Class 3000, forged in compliance with ASTM A105, ASME B16.11 and MSS SP-97 where specified in Exhibit 'A'.
2. Screwed fittings: Malleable iron, black or galvanized, as called for in Exhibit 'A' or as noted on the Drawings. Fittings shall be in compliance with ASTM A197, ANSI/ASME B1.20.1 and ASME B16.3. Galvanizing of fittings sha1l be in compliance with ASME A153.
3. Malleable iron fitting shall be Standard Class 150 unless otherwise specified in Exhibit 'A' to be Extra Heavy Class 300.
4. Mitered elbows, "shaped" nipples, and job fabricated reductions are not acceptable unless specifically called for.

C. Flanges, Unions and Couplings:

1. Unions: For sizes 2 in. and smaller - Malleable iron, bronze to iron seat, Class 300 in compliance with ASTM A197, ANSI/ASME B1.20.1 and ASME B16.39, or Class 3000 forged steel, steel to steel ground joint to ASTM A181, ANSI/ASME and B1.20.1. MSS SP-83 as called for in Exhibit 'A'. Galvanizing on the unions sha1l be in compliance with ASME A153.
2. Flanges: For sizes 2-1/2 in. and larger pipe sizes - Welding neck type, forged, in compliance with ASTM A105 and ASME B16.5. Class 150 or Class 300 as called for in Exhibit 'A'.
3. Flange Gaskets: All flange gaskets shall be Flexitallic Thermculite Type 835 Spiral Wound.

D. Grooved Mechanical Connections:

1. Couplings of two ductile iron housings with painted coating designed for rolled or grooved piping in compliance with ASTM A536. Housing castings shall be provided with offsetting angle-pattern, bolt pads to provide system rigidity support and hanging in accordance with ASME B31.1 and 31.9. Installation ready design for complete installation without field disassembly based on the sizes available by the manufacturer.
2. Gaskets suitable for water service: Center-leg gasket with pipe with pipe stop to ensure proper groove engagement, alignment, and pipe insertion depth: -30°F to 230°F of EPDM, Grade E or -30°F to 250°F of EPDM, Grade EHP.
3. Bolts and nuts: Heat treated, hex head carbon steel with zinc electroplated coating in compliance with ASTM A449 and ASTM A183.
4. Fittings: Elbows, tees, laterals, reducers, adapters as required. Same construction as couplings. The use of mechanical tees is permitted only when a branch size is two or more sizes smaller than the main size. Reducing couplings and segment-welded elbows are not acceptable.
5. Makes: Victaulic Rigid System, Style 107N (Sizes 2" to 12"), Victaulic AGS Rigid System Style W07 (Sizes 14" to 24"), Gruvlok 74 SlideLok coupling (sizes 2" to 8") or Gruvlok Style 7401 (Sizes 10" to 14"), Gruvlok Style 7401-2 (Sizes 16" to 24").

E. Cleanouts, gauge and instrument connections, nipples and plugs, for adapting gauges and instruments to piping system shall be IPS brass.

F. Base Elbows:

1. Cast iron or steel type, flange connections; Crane 500 or equivalent. Made from welding elbows, with welded pipe support and steel base. Reducing elbows where necessary.

Elbow Size	Support Size	Base Plate
To 3 in.	1-1/4 in.	6 in. x 6 in. x 1/4 in.
4 in. to 6 in.	2-1/2 in.	8 in. x 8 in. x 1/4 in.
6 in. and larger	6 in.	14 in. x 14 in. x 5/16 in.

2. Anchor bolt holes in each corner of base for securely bolting to floor or concrete base; minimum 3/4 in. bolts.

2.3 COPPER PIPE, SOLDER FITTINGS

A. Tubing (Type K, L or M "pipe"): Hard temper meeting in compliance with ASTM B75 and ASTM B88; Type K, L, M. as called for in Exhibit 'A' or as noted on the Drawings. Soft temper only as called for in Exhibit 'A' or as noted on the Drawings. Plans show copper tube sizes.

B. Tubing (DWV): Hard tempered, seamless copper, in compliance with ASTM B306.

C. Fittings (Tees, Elbows, Reducers, etc.): Wrought copper or cast bronze as called for in Exhibit 'A' or as noted on the Drawings; solder end connections; shall meet applicable and applicable ASME B16.22 or ASME B16.18.

D. Fittings (Tees, Elbows, Reducers, etc.): Cast bronze, threaded end connections, in compliance with ASME B16.15 and ANSI/ASME B1.20.1.

E. Fittings (Tees, Elbows, Reducers, etc.): Wrought copper or cast copper alloy drainage fitting (DWV), solder end connections, in compliance with ASME B16.29 or ASTM B23.

F. Unions and Flanges: 2 in. and smaller use unions, solder type, cast copper alloy or wrought copper alloy, metal to metal meeting surface, 150 lb. swp, in compliance with ASME B16.18 or ASME B16.22, ANSI/ASME B1.20.1. For piping 2-1/2 in. and over use flanges, cast copper alloy, companion type, Class 150, in compliance with ASME B16.24.

G. Solder Materials: No-lead solder, using alloys made from tin, copper, silver and nickel.

1. Make: Harris "Stay-Safe 50" and "Bright", Englehart "Silverbright 100", Willard Industries "Solder Safe (silver bearing), Canfield "Watersafe".

2.4 DRAINAGE PIPE AND FITTINGS

A. Tubing (DWV): Hard tempered, seamless copper, in compliance with ASTM B306.

B. Fittings (Tees, Elbows, Reducers, etc.): Wrought copper drainage fitting (DWV), solder end connections, in compliance with ASME B16.29.

C. Unions: Solder type, cast copper alloy or wrought copper alloy, metal to metal meeting surface, in compliance with ASME B16.18 or ASME B16.22, ANSI/ASME B1.20.1.

D. Solder Materials: No-lead solder, using alloys made from tin, copper, silver and nickel.

1. Make: Harris "Stay-Safe 50" and "Bright", Englehart "Silverbright 100", Willard Industries "Solder Safe (silver bearing), Canfield "Watersafe".

2.5 COPPER PIPE AND BRAZED FITTINGS

A. Tubing (Type K, L): Hard temper in compliance with ASTM B75 and ASTM B88. As called for in Exhibit 'A' or as noted on the Drawings.

B. Fittings (Tees, Elbows, Reducers, etc.): Wrought copper or cast bronze as called for in Exhibit 'A' or as noted on the Drawings; solder end connections; shall meet applicable and applicable ASME B16.22 or ASME B16.18.

C. Unions and Flanges: 2 in. and smaller use unions, solder type, cast copper alloy or wrought copper alloy, metal to metal meeting surface, 150 lb. swp, in compliance with ASME B16.18 or ASME B16.22, ANSI/ASME B1.20.1. For piping 2-1/2 in. and over use flanges, cast copper alloy, companion type, Class 150, in compliance with ASME B16.24.

D. Brazing Materials: Silver Alloy, Airco Sil-4S or Sil-Fos as called for in Exhibit 'A' or as noted on the Drawings.

2.6 POLYVINYL CHLORIDE (PVC) PIPE AND FITTINGS

A. Pipe: Schedule 40 in compliance with ASTM D1785, ASTM D1786. Schedule 80 in compliance with ASTM D1785, ASTM D1789. Commercial Classification of Ridged Compound: Type 1, Grade 1, PVC 1120. Class Designation: 12454-B.

B. Fittings: Schedule 40 in compliance with ASTM D2466. Schedule 80 incompliance with ASTM D2467.

C. Solvent welded, Primer in compliance with ASTM F656. Solvent Cement ASTM D2564. Back weld 3 in. and larger and where called for.

D. All tubing, piping fittings and components shall certified as conforming to NSF 14

2.7 DIELECTRIC PIPE FITTINGS

A. Tensile strength, ASME B16.8 union 250 psi, or flange design, 175 psi, pressure rating, threaded or solder joint, constructed to prevent gasket from squeezing into internal opening.

B. Make: Capitol Manufacturing, Epco, Watts, Victaulic.

2.8 HANGERS, INSERTS AND SUPPORTS

A. Hangers, Inserts, Clamps: Carpenter and Patterson, Central Iron, Fee and Mason, ITT Gruvlok.

B. Hangers:

1. Adjustable, wrought malleable iron or steel. Copper plated or PVC coated where in contact with copper piping. Cadmium plated or galvanized for exterior.
2. Adjustable ring type where piping is installed directly on hanger for piping 3 in. and smaller.
3. Adjustable steel clevis type for piping 4 in. and larger, and where insulation passes through hanger.
4. Steam (over 50 psi) piping, adjustable yoke pipe roller equivalent Gruvlok.
5. Hangers sized to permit passage of continuous insulation through the hanger.
6. Nuts and rods with electroplated zinc or cadmium (0.005 in. minimum) finish.

C. Hanger Shields:

1. Pre-insulated type:

   a. To be used where direct firm support and / or load restraint of piping system required while insulation system maintained. Includes, but not limited to riser clamps, pipe guides and seismic restraint points. May be used for general support at hanger or trapeze locations at contractor option.
   b. To be used where anticipated pipe surface temperatures may exceed 800 degrees on a consistent basis.
   c. Insulated pipes shall be protected at point of support by a 360º insert of high density, 100 psi waterproofed calcium silicate, encased in a 360º sheet metal shield. Insulation insert to be same thickness as adjoining pipe insulation and extend 1 in. beyond sheet metal shield.

2. Field-insulated type:

   a. #18 USSG, galvanized steel shields, minimum 120º arc. Provide temporary blocking between pipe and hanger to maintain proper spacing for insulation. Provide at all support points.

3. Shield Sizing:

Pipe Size	Shield ID (1 ½" insulation)	Shield Length	Minimum Gauge
Up to 3-1/2"	Up to 6.5"	12 in.	18
4"	7"	12 in.	16
5" and 6"	8" and 9"	12 in.	14
8" to 14"	11" to 17"	24 in.	12
16" to 24"	19" to 27"	24 in.	10

   a. Hanger shield gauges listed are for use with band type hangers only. For point loading (roller support), increase shield thickness by one gauge, and length by 50%.

D. Spacing Schedule: Hanger spacing shall be per the following tables. For alternate materials and sizes not listed herein, refer to the MCNYS, Section 305

Pipe Size	Steel	Copper	PVC Plastic	Rod Size
½ to 1 in.	8 ft.	6 ft.	3 ft.	3/8 in.
1 ¼ to 2 in.	10 ft.	6 ft.	3 ft.	3/8 in.
2 ½ to 4 in.	12 ft.	10 ft.	4 ft.	1/2 in.
5 and 6 in.	12 ft.	10 ft.	4 ft.	5/8 in.
8 in.	12 ft.	10 ft.	4 ft.	3/4 in.
Over 8 in.	To suit loading conditions			

E. Inserts: Provide high density fiberglass or calcium silicate piping inserts to eliminate compression of pipe insulation system, full length of specified piping shield, by pipe size.

1. Make: "H-Block" by ICA, Inc., TPS / TPSX by SPI, or approved equal.

F. Supports:

1. For weights under 1000 lbs.: "Drill-In" inserts equivalent to Phillips "Red Head," "U-Channel," "Unistrut," beam clamps or other structurally reviewed support. The factor of safety shall be at least four. Follow manufacturer's recommendations.
2. For weights above 1000 lbs.: Drill through floor slabs and provide flat flush plate welded to top of rod or provide additional "Drill-In" inserts and hangers to reduce load per hanger below 1000 lbs. The factor of safety shall be at least four.
3. For metal decks: Drill hole through for hanger rods and imbed a welded plate in concrete or use Phillips "Red Head" devices designed for this application, with a safety factor of four.

2.9 PIPING ACCESSORIES

A. Escutcheon Plates: Steel or cast iron polished chrome, split hinge type with setscrew, high plates where required for extended sleeves.

B. Pipe Guides: Cylindrical steel guide sleeve, proper length for travel, integral bottom base anchor; top half removable. Split steel spider to bolt to pipe, copper plated spider for copper pipe. Space between sleeve and spider to allow for insulation where required. Make: Anaconda, Flexonics, Pipe Shields, Keflex, or equal.

C. Anchors: Same material as pipe. Make: Keflex, Flexonics, Pipe Shields, or field constructed.

D. Pipe Roll Stand: Cast iron roll stand. Make: Advanced Thermal Systems, Carpenter and Patterson, ITT Gruvlok, Pipe Shields.

2.10 SLEEVES

A. Standard Type:

1. Schedule 40 black steel pipe sleeves, two pipe sizes larger than the pipe, for structural surfaces (bearing walls, structural slabs, beams and other structural surfaces) and where called for.
2. Schedule 40, PVC sleeves or sheet metal sleeves for nonstructural surfaces and existing construction. Sheet metal sleeves shall be 18 gauge minimum and braced to prevent collapsing.

B. Pre-Insulated Type:

1. Adjustable or fixed length metal cans, 24 gauge minimum, sized for 1 in. spacing between insulation and can. Insulation shall consist of a 360º waterproofed calcium silicate insert sized to extend 1 in. beyond wall or floor penetration. Calcium silicate insert shall be same thickness as adjoining pipe insulation. Spacing between shield and can packed at each end with double neoprene coated rope positively fastened. To be used where specified and at all locations where pipe surface temperature may exceed 500 degrees.

2.11 SEALING ELEMENTS

A. Waterproof Type:

1. Exterior walls, below grade, above floor: Synthetic rubber material with zinc plated bolts.
2. Acceptable Make: "Link-Seal" Series 200, 300 or 400, Pyropac, Calipco.

2.12 FIRESTOP SYSTEM FOR OPENINGS THROUGH FIRE RATED WALL FLOOR ASSEMBLIES

A. Materials for firestopping seals shall be listed by an approved independent testing laboratory for "Through-Penetration Firestop Systems". The system shall meet the standard fire test for Through-Penetration Firestop Systems designated ASTM E814. Firestop system seals shall be provided at locations where piping passes through fire rated wall, floor/ceiling, or ceiling/roof assembly. Minimum required fire resistant ratings of the assembly shall be maintained by the Firestop System. Installation shall conform to the manufacturer's recommendations and other requirements necessary to meet the testing laboratory's listing for the specific installation.

2.13 PIPING MATERIALS AND SCHEDULE

A. See Exhibit "A," "Schedule of Piping Materials" at end of this Section for (HVAC) piping.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install pipe, tube and fittings in accordance with recognized industry practices which will achieve permanently leak proof piping systems, capable of performing each indicated service without piping failure. Install each run with a minimum of joints and couplings, but with adequate accessible unions and flanges for disassembly and maintenance/replacement of valves and equipment. Reduce sizes (where indicated) by use of reducing fittings. Align piping accurately at connections, with 1/16" misalignment tolerance.

B. Locate piping runs, except as otherwise indicated, vertically and horizontally (pitched to drain) and avoid diagonal runs wherever possible. Orient horizontal runs parallel with walls and column lines. Locate runs as indicated or described by diagrams, details and notations or, if not otherwise indicated, run piping in the shortest route which does not obstruct usable space or block access for servicing the building and equipment. Hold piping close to walls, overhead construction, columns and other structural and permanent enclosure elements of the building. Limit clearance to 1.0" where furring is shown for enclosure or concealment of piping, but allow for insulation thickness, if any. Wherever possible, in finished and occupied spaces, conceal piping from view, by locating in column enclosures, in hollow wall construction or above suspended ceilings. Do not encase horizontal runs in solid partitions, except as indicated.

C. Space pipe supports, arrange reducers, and pitch piping to allow air to be vented to system high points and to allow the system to be drained at the low points, and wherever required to permit complete draining of all lines.

D. Make all changes in size and direction of piping with fittings, except for soft copper tubing, use tubing bender.

E. Install piping to valves, strainers, pumps and other equipment at full line size. Where reduction or increase in size is required, make it with a fitting at the equipment connection.

F. Air Vents: Provide manual air vents at high points in piping system and where indicated on the drawings.

G. Drain Valves: Provide manual drain valves at low points in piping system and where indicated on the drawings.

H. All piping located in chases, soffits or other elements of construction which is not accessible by access doors or ceiling tile removal shall be welded, brazed or soldered. Mechanical coupling fittings are not permitted.

I. Grooved joints shall be installed in accordance with the manufacturer's latest published instructions. The gasket style and elastomeric material (grade) shall be verified as suitable for the intended service. Gaskets shall be molded and produced by the grooved coupling manufacturer. Grooved ends shall be clean and free from indentations, projections, and roll marks in the area from pipe end to groove. Grooved coupling manufacturer's factory trained field representative shall provide on-site training for contractor's field personnel in the proper use of grooving tools, application of groove, and installation of grooved piping products. Factory trained representative shall periodically visit the jobsite to ensure best practices in grooved product installation are being followed. Contractor shall remove and replace any improperly installed products.

3.2 EQUIPMENT AND SYSTEMS

A. Equipment and systems in accordance with laws, codes, and provisions of each applicable section of these specifications. Accurately establish grade and elevation of piping before setting sleeves. Install piping without springing or forcing (except where specifically called for), making proper allowance for expansion and anchoring. Arrange piping at equipment with necessary offsets, unions, flanges, valves, to allow for easy part removal and maintenance. Offset piping and change elevation as required for coordination with other work. Avoid contact with other mechanical or electrical systems. Provide adequate means of draining and venting units, risers, circuits and systems. Conceal piping unless otherwise called for. Ream pipes after cutting and clean before installing. Cap or plug equipment and pipe openings during construction. Install piping parallel with lines of building, properly spaced to provide clearance for insulation. Make changes in direction and branch connections with fittings. Do not install valves, unions and flanges in inaccessible locations. Provide trap seal of adequate depth on drain pans.

3.3 WATER AND GLYCOL SYSTEMS

A. Top connection for upfeed, bottom or side connection for downfeed. Grade off-level; up in direction of flow and down toward drain.

3.4 HANGERS, INSERTS AND SUPPORTS

A. Piping shall not be supported by wires, band iron, chains, vertical expansion bolts or from other piping. Support each pipe with individual hangers from concrete inserts, welded supports, or beam clamps of proper configuration and loading design requirements for each location. Trapeze hangers are acceptable for racking of multiple pipes of 1-1/2" or less in size. Follow manufacturer's safe loading recommendations. Suspend with rods of sufficient length for swing and of size as called for, using four nuts per rod. Provide additional rust proofed structural steel members, where required for proper support. Provide oversized hangers where insulation/supports must pass between pipe and hanger. Hangers, when attached to joists, shall only be placed at the top or bottom chord panel point. Only concentric type hangers are permissible on joists; "C" type not permitted on joists. Provide riser clamps for each riser at each floor.

3.5 PIPE CONNECTIONS

A. Solder Connections: Utilize non-acid flux and clean off excess flux and solder. Flux conforming to ASTM B813 shall be used in conjunction with solder conforming to ASTM B32.

B. Brazed Connections: Make joints with silver brazing alloy in accordance with manufacturer's instructions. Remove working parts of valves before applying heat. "Walseal" fittings may be used; if insufficient alloy is showing, face braze such joints. Filler material shall conform to AWS A5.8

C. Threaded Connections: Clean out tapering threads, made up with pipe dope; screwed until tight connection. Pipe dope must be specific for each application. Threads shall conform to ASTM B.1.20.1.

D. Dielectric Pipe Fittings: Provide dielectric unions at all equipment connections where dissimilar metals meet. In addition, provide dielectric unions in all open type piping systems (condensing water, domestic water, etc.) where dissimilar metals are to be joined.

E. Grooved Mechanical Joints: Pipe shall be prepared in accordance with the latest Victaulic Grooving Specifications (ref. Victaulic PB137), using Victaulic Vic-Easy Grooving tools. Pipe shall be checked to be sure it is free of indentations, projections, weld seams or roll marks on the exterior of the pipe over the entire gasket seating area. Pipe ends are to be square cut. Victaulic lubricant shall be applied to gasket and/or pipe ends and housing interiors to eliminate pinching the gasket. Grooved Joints shall conform to the requirements of ASTM F 1476.

3.6 WELDING

A. Welding shall be performed in compliance with the welding procedure specifications prepared by the National Certified Pipe Welding Bureau. Welded piping shall be fabricated by certified welder. Contractor shall submit proof of current certification of each welder, if requested by Owner. Use full length pipe where possible; minimum distance between welds shall be 18 in. on straight runs. Welds must be at least full thickness of pipe with inside smooth and remove cutting beads, slag and excess material at joints; chamfer ends. Minimum gap 1/8 in., maximum 1/4 in., for butt welds. Overlaps on position and bench welds to be not less than 3/4 in. One internal pass and one external pass minimum required on slip-on flanges. Do not apply heat to rectify distorted pipe due to concentrated welding; replace distorted pipe. Welding is prohibited in existing building, except in the following areas: boiler rooms, mechanical rooms, crawl spaces and roof decks**.** When welding galvanized pipe, apply cold galvanizing on joint after welding.

3.7 HANGER SHIELDS

A. Pre-insulated type or field-insulated type at Contractor's option.

B. Provide for all chilled water and all "non-direct" connection supports.

3.8 SLEEVES

A. Provide for pipes passing through floors, roofs/decks, walls or ceilings. Not required for floors which are core-drilled, except where floor is waterproofed.

B. Standard type: Provide for piping as noted above. Extend 1/8 in. above finished floor in finished areas. In above grade mechanical rooms and other areas with floor drains; use steel pipe sleeves projecting 2 in. above floor. Sleeves shall be as small as practical, consistent with insulation, to preserve fire rating. Fill abandoned sleeves with concrete. Where necessary for pipes to pass through ducts, air chambers or built-up housings and approved by Engineer, provide rubber grommet seals.

C. Roof/deck penetrations: Provide sleeve and deck sealing for watertight installation per detail on Contract Documents.

D. Provide a 0.16 inch thick smooth aluminum jacket over insulated pipes where they pass through sleeves.

3.9 ANCHORS AND GUIDES

A. Provide piping system anchors and guides as shown on the plans, and as recommended by the expansion joint/loop manufacturer. Where an anchor is shown at a change in piping direction, it shall fully control movement in all three axes. In lieu of a single anchor fabricated for two directional pipes, two (2) individual anchors may be provided.

3.10 SLEEVE PACKING

A. Seal void space at sleeves as follows:

B. Interior locations: Firmly pack with fiberglass and caulk.

C. Exterior walls and below grade cored holes: Use sealing element.

D. Fire rated, partitions and floor slabs: Use fire rated sealing elements, materials and methods. Provide per manufacturer's instructions to maintain firestop.

E. Vapor Barriers – provide continuity of vapor barriers through sleeves.

F. Waterproofed floors: Use waterproof sealing element, device, or compound.

3.11 ESCUTCHEON PLATES

A. Provide polished chrome escutcheon plates for exposed piping passing through floors, walls or ceilings, except in Boiler, Fan and Mechanical Rooms.

3.12 TESTS

A. Test piping and accessories before insulation, connecting to existing piping, and concealment. Repeat as many times as necessary to prove tight system. Notify Owner's Representative at least seven days in advance of each test. Isolate valves and equipment not capable of withstanding test pressures. Make leaks tight; no caulking permitted. Remove and replace defective fittings, pipe or connections. Furnish necessary pumps, gauges, equipment, piping, valving, power and labor for testing. Certify that test have been successfully completed.

B. Schedule of Test Requirements:

1. Hot and domestic water: Hydrostatic, 100 psig at high point of system; two hours duration.
2. Vent, drain, overflow and condensate drain: Hydrostatic, maintain 10 feet head of water above highest point of section being tested for six hours.
3. Tests: No change in pressure under stable temperature conditions.
4. Equipment: Test at working pressures.

3.13 PIPE LINE SIZING

A. Pipe sizes called for shall be maintained. Pipe size changes shall be made only as reviewed by Owner's Representative. Where discrepancy in size occurs, the larger size shall be provided.

EXHIBIT 'A' – PIPING MATERIALS (HVAC)

Notes are at the end of Exhibit 'A'

SERVICE	PIPE MATERIALS	FITTINGS	CONNECTIONS
Hot water heating	Schedule 40, black steel	Malleable iron and butt weld	2 in. and smaller screwed 2-1/2 in. and larger welded SEE NOTE 1
Hot water heating (Optional)	Schedule 40, black steel	Grooved, rigid couplings	2-1/2 in. and larger: Mechanical with gasket
Hot water heating (Optional)	Type L copper	Wrought copper or cast bronze, solder end	2 in. and smaller: No-lead solder
Vent, Drain, Overflow, Coil Condensate	Schedule 40, galvanized steel or Type M copper	Malleable iron drainage type or wrought copper	Threaded or solder
Domestic water	Type L copper	Solder end	2 in. and smaller: No-lead solder
Water treatment (max. 100 psi wp)	Schedule 80, PVC	Socket type PVC	Solvent welding

NOTES FOR EXHIBIT "A":

NOTE 1: Screwed piping permitted in Crawl Spaces, Mechanical Rooms and Boiler Rooms.

END OF SECTION

SECTION 232023 - PUMPS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Provide labor, materials, equipment and services as required, for the complete installation designed in Contract Documents.

1.2 SUBMITTALS

A. Shop drawings and performance curves, on pumps and pump accessories. Clearly indicate which equipment is being submitted.

PART 2 – PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Pumps shall be non-overloading over their entire performance range with motors capable of running continuously without undue noise, heating, or sparking. Impellers statically and dynamically balanced. Mechanical seals for closed systems, shall be constructed of carbon rings with ceramic mating seat up to 220ºF. Packing type seals for open systems only. Materials suitable for water pressures, temperature and conditions for each application. Tapped discharges and suction connections for gauges, vent and drain. With trimmed impeller if required to meet initial delivery requirements. Factory service engineer or machinist must check each pump alignment before pump is started. Include the cost of checking and start-up in pump quotation.

B. Motors shall be furnished with each pump of sizes scheduled. Refer to specification Section 230513 for acceptable motor manufacturers.

1. Pump motors specified with Adjustable Speed Drives (ASD) either by Div 23, Div 22, or packaged, shall be provided with shaft grounding rings per 230513.
2. Pumps specified either through model number or motor type to contain Electrically commutated motors (ECM) shall be:

    a. Provided with either local speed adjustment modules or controllers allowing interface to the BMS as required for specified sequences of operation.
    b. UL listed and provided with integral electronic overload protection, including thermal protection, current limiting, and locked-rotor protection, suitable for the motor application and operating conditions. External motor overload devices shall not be required unless specifically indicated by the manufacturer.

2.2 IN-LINE CENTRIFUGAL PUMPS

A. Designed for continuous operation between 40º and 250ºF.

B. In-line, close-coupled, single stage, bronze fitted construction.

C. All pump internals shall be capable of being serviced without disturbing piping connections.

D. Replaceable shaft sleeves at the seal.

E. Enclosed type impeller, keyed to the shaft and secured by a locking cap screw.

F. Factory guaranteed operating performance.

G. Design equipment: Bell & Gossett, Series 80 & 90

H. Make: Armstrong, Bell & Gossett, Taco, Grundfos.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Adjust flow rate (gpm) of each pump to capacity called for on schedule, re-adjust during balancing. Install in-line pumps in locations shown, supported independently of piping, using hangers on both pump flanges.

END OF SECTION

SECTION 232133 - WATER SYSTEMS SPECIALTIES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide labor, materials, equipment, and services as required for the complete installation designed in Contract Documents.

1.2 RELATED DOCUMENTS

A. All work under this section is subject to the Contract Documents and this Contractor shall be responsible for and governed by all the requirements therein.

1.3 SUBMITTALS

A. Submit shop drawings on all water system specialties.

1.4 GENERAL REQUIREMENTS

A. Equipment and accessories shall be rated for a minimum of 125 psi wwp, and 250°F temperatures. Manufacturer's written installation procedures shall become a part of these specifications.

B. Provide equipment, piping, valves, fittings, switches, and miscellaneous equipment necessary and required for the complete installation.

PART 2 – PRODUCTS

2.1 EXPANSION TANK AND ACCESSORIES

A. Shell and Head: Carbon Steel, welded construction.

B. Design Pressure and Temperature: 125 psi at 240°F.

C. Bladder: Replaceable heavy-duty butyl rubber.

D. ASME Section VIII, Div. 1 with U Stamp.

E. Finish: Red oxide prime coat; factory applied.

F. The tank shall be capable of full acceptance of the tank volume when tank is void of air.

G. Provide lifting rings and supports for floor mounting.

H. Design Equipment: Bell & Gossett Series B.

I. Acceptable Make: Armstrong, Bell & Gossett, Wessels Company, John Wood Company.

2.2 AIR REMOVAL ASSEMBLY

A. Centrifugal type air separator.

B. Shell and Head: Carbon Steel, welded construction (flanged or threaded connections). Grooved if allowed in Specification Section 232000.

C. Design Pressure and Temperature: 125 psi at 350°F.

D. Stainer: Removable Type 304 stainless steel with maximum 3/16" perforations and 51% free open area.

E. Designed to collect air to an air removal fitting at the top of the separator.

F. Provide bottom blowdown connection to facilitate routine cleaning.

G. ASME Section VIII, Div. 1 with U stamp.

H. Size: Minimum full size of system piping but shall be oversized for a maximum pressure drop 3.0 ft.

I. Design Equipment: Bell & Gossett Rolairtrol.

J. Acceptable Make: Armstrong, Bell & Gossett, Wessels Company, John Wood Company.

2.3 STRAINERS – HVAC WATER AND GLYCOL SYSTEMS (NON-POTABLE WATER SYSTEMS):

A. Wye Type Strainer:

1. Bronze 2" and Under (Threaded End or Soldered Connections):

   a. Strainer shall be suitable for 150 psi @ 350°F WOG (threaded ASTM B16.15) and 150 psi @ 350 °F WOG (soldered ASTM B16.18).
   b. Body: Lead free bronze (NSF/ANSI 372, ASTM B584, C87800, C89833).
   c. Cap and Plug: Lead free bronze (NSF/ANSI 372, ASTM B584, C87800, C89833).
   d. Screen: Type 304 or 316 stainless steel, 20 mesh.
   e. Gasket: Metal filled graphite, PTFE, or copper.
   f. Threaded blowdown connection.
   g. Magnetic Screen Assembly: Plug with magnetic rod or rod with horseshoe magnets and spacers. Magnet material shall be Alnico N0. 5. Provide a quantity of horseshoe magnets as recommended by strainer manufacturer. To be used where called for and at all locations directly upstream of pumps with EC motors
   h. Makes: Mueller Model LF351 (threaded) or Model LF358 (soldered); Keckley Style F7 (threaded) or Style E7 (soldered); Apollo 59LF-000 series (threaded) or 59LF-300 series (soldered).

2. Cast Iron 2 ½" and Larger (Flanged End Connection):

a. Strainer shall be suitable for Class 125, 200 psi @ 150°F WOG (2½" to 12") and 150 psi @ 150 °F WOG (14" and larger) or Class 250, 500 psi @ 150°F WOG (2½" to 12") and 300 psi @ 150 °F WOG (14" and larger).
b. Body and Cover: Lead free cast iron (NSF/ANSI 372, ASTM A126, Class B).
c. Screen: Type 304 stainless steel, 0.062 perforation (2½" to 4") and 0.125 perforations (5" and larger").
d. Gasket: composition.
e. Threaded blowdown connection.
f. Magnetic Screen Inserts: Magnet material cast Alnico No. 5. Magnets shall be attached to screen with corrosion resistant fasteners. Provide quantity of magnets as recommended by strainer manufacturer To be used where called for and at all locations directly upstream of pumps with EC motors.
g. Acceptable Makes: Mueller Model 758 (Class 125) or Model 752 (Class 250); Keckley Style A-7 (Class 125 and 250).

3. Cast Steel 2 ½" and Larger (Flanged End Connection):

a. Strainer shall be suitable for Class 150, 285 psi @ 100°F WOG (2½" to 12") and 150 psi @ 150 °F WOG (14" and larger) or Class 300, 500 psi @ 150°F WOG (2½" to 12") and 300 psi @ 150 °F WOG (14" and larger).
b. Body and Cover: Lead free cast steel (NSF/ANSI 372, ASTM A216, Grade WCB).
c. Screen: Type 304 stainless steel, 0.062 perforation (2½" to 4") and 0.125 perforations (5" and larger").
d. Gasket: Spiral wound Type 304 stainless steel with graphite filler.
e. Threaded blowdown connection.
f. Magnetic Screen Inserts: Magnet material cast Alnico No. 5. Magnets shall be attached to the screen with corrosion resistant fasteners. Provide quantity of magnets as recommended by strainer manufacturer To be used where called for and at all locations directly upstream of pumps with EC motors.
g. Acceptable Makes: Mueller Model 781 (Class 150) or Model 782 (Class 300); Keckley Style SA-7 (Class 150 and Class 300).

2.4 MULTI-PURPOSE VALVE

A. To serve as system balancing device, shutoff valve and soft seat non-slam check valve constructed with linear contoured disc and calibrated adjustment feature. Designed for installation in vertical position.

B. Body: Angle or straight pattern type, cast iron ASTM A126, Class B with bronze seat.

C. Connection Type: Flanged. Grooved if allowed in Specification Section 232000.

D. Disc: Brass with EPDM seat insert (2" – 8" in size) and stainless steel with brass bushing and EPDM insert (10" and 12" in size).

E. Stem and Spring: Stainless steel.

F. Packing: Teflon-Graphite.

G. Readout Valve: Brass with EPT insert, check valve and gasket.

H. Design Pressure and Temperature: 175 psi at 250°F.

I. Maximum pressure drop of 5.0 ft. or less.

J. Design Equipment: Bell & Gossett Model 3DS (straight pattern) or 3D (angle pattern).

K. Acceptable Make: Armstrong, Bell & Gossett.

2.5 AUTOMATIC AIR VENTS

A. High Capacity Automatic Air Vent:

1. Float type design to remove contained air or non-condensable gases from liquid piping systems with ¾" threaded connections.
2. Body: Cast iron ASTM A126, Class B.
3. Trim: Stainless steel.
4. Valve and valve Seat: Stainless steel and EPDM.
5. Design Pressure and Temperature: 150 psi at 250°F.
6. Acceptable Make: Sarco Model 13WS, Bell & Gossett Model 107A, Armstrong Model 1-AV.

B. General Purpose Automatic Air Vent:

1. Float type design to remove contained air or non-condensable gases from liquid piping systems with ¾" threaded connections.
2. Body: Brass.
3. Trim: Stainless steel.
4. Valve and Valve Seat: Stainless steel and EPDM.
5. Design Pressure and Temperature: 150 psi at 240°F.
6. Acceptable Make: Bell & Gossett Model 87, Taco Model 409 or approved equal.

2.6 BYPASS CHEMICAL FEEDER

A. Cast iron quarter turn closure with Buna-N O-ring. The body shall be carbon steel. Designed for temperatures up to 200°F and pressures up to 200 PSI. The fill capacity shall be greater than 5 gallons.

B. Design Equipment: Calgon #20 Micromet

C. Acceptable Makes: Calgon, JL Wingert Co. or approved equal.

2.7 PUMP AND COIL FLEXIBLE CONNECTORS

A. Bronze Braid and Hose 2" and Under (Soldered End Connection):

1. Hose and Braid Bands: Bronze.
2. End Connections: Copper female soldered ends.
3. Minimum operating pressure of 150 psi at operating temperature of 200°F.
4. Design Equipment: Metraflex Model BBSC.
5. Acceptable Makes: Metraflex, Mason Industries, Inc., Flex-Hose Co. Inc.

B. Stainless Steel Braid and Hose 2" and Under (Threaded) and 2½ and Larger (Flanged and Grooved Connections):

1. Hose and Braid Bands: Series 300 stainless-steel.
2. End Connections: Carbon steel Class 150 flanged, Sch. 40 carbon steel male threaded, or Sch. 40 carbon steel grooved.
3. Minimum operating pressure of 125 psi at operating temperature of 200°F.
4. Design Equipment: Metraflex Model MLPC and RMF (flange to flange), Model GFC (flange to groove), Model GGC (groove to groove), Model SSTC (male thread to male thread).
5. Acceptable Makes: Metraflex, Mason Industries, Inc., Flex-Hose Co. Inc.

2.8 PRESSURE RELIEF VALVE

A. Bronze ¾" to 2" (Threaded End Connection) for Heating Hot Water, Chilled Water and Heating Glycol or Cooling Glycol Systems:

1. ASME Section IV capacity certified for protection of heating hot water systems, pre-set minimum pressure range from 30 psi to 125 psi at 250°F.
2. Body and Cap: Bronze ASTM B584, or cast-iron ASTM A126, Class A/B.
3. Spring: Stainless Steel ASTM A313-631.
4. Seat: Bronze ASTM B584 alloy 84400.
5. Corrosion resistant construction.
6. High Capacity. Sized to relieve full heating capacity of system protecting. Provide multiple valves as required to meet capacity requirements.
7. Acceptable Makes: Kunkle Model 537, McDonnel Miller Series 250, Watts Series 174A, Apollo Model RVW60.

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

A. Obtain detailed instructions from each manufacturer for proper method of installation.

B. Equipment and systems shall be installed in accordance with the manufacturer's installation requirements.

3.2 EXPANSION TANKS

A. For compression tanks pitch connection to heating system 1" in 5 ft. minimum up toward tank. Provide shutoff valve in piping connection to system and 3/4" hose end drain valve on tank. Provide supporting steelwork, hangers, and suspension racks. Provide water make-up connection, site glass, petcocks, and tank fitting.

B. For expansion tanks, provide housekeeping pad with length and width greater than 1.2 times the maximum diameter of the tank for floor mounted tanks. Provide supporting steelwork, hangers, and suspension racks for wall or ceiling hung expansion tanks. Provide pitch connection to heating system 1" in 5 ft. minimum up toward system. Provide automatic air vent at high point. Provide shutoff valve in piping connection to system and 3/4" hose end drain valve on tank. Provide water make-up connection to air separator or system piping before pump suction. Air separator or air/dirt separator shall have automatic high capacity air vent.

3.3 SYSTEM FILLING

A. After cleaning, fill each system from low point:

1. With pumps off, vent mains, risers, runouts, and units, working consecutively from low to high point in building. Obtain approximately 2 psi at highest point. Obtain proper air cushion in compression tanks.

3.4 AIR VENTING

A. Provide one of the following vents at points in piping system where air may collect.

1. Manual vent assembly consisting of 1-1/4" x 6" air collection chamber, 1/2" ball valve in accessible location, install hose connection on valve outlet.
2. Automatic vent with air chamber. Automatic air vents are only allowed in mechanical spaces.

B. Equipment Vents:

1. When equipment is above mains: Connect runouts or risers to upper quadrant or top of mains. Install vent assembly concealed within enclosure, consisting of 1" diameter by 4" to 6" long air collection chamber with 1/4" soft copper tube to manual valve. Mount securely near bottom of enclosure, but not fastened to enclosure. For individual units such as radiators, fan convectors and units with return grilles, provide screwdriver operated manual valve, operated from discharge grille or access door. Drill enclosure and position valve for operating without removing enclosure.

2. When equipment is below mains: Connect piping runouts or risers to bottom or lower quadrant of mains. Provide means of purging and draining each unit downstream of the isolation valves. Use tees instead of ells at low point of runouts.

3.5 AIR AND DIRT REMOVAL ASSEMBLY

A. Provide supports and provide blowdown with hose end drain valve full size of opening.

B. Provide automatic high capacity air vent valve. Air vents shall be piped, full size, 12" above finish floor. For glycol systems, the vent shall be piped, full size of equipment connection, to the glycol make-up unit.

3.6 MAKE-UP WATER VALVES

A. Provide for each system, with 3/4 in. ball valve, bypass connection and isolation ball valve at inlet and outlet of make-up valve and check valve downstream of bypass valve. Set valves to provide 2 psi at high point of system. Provide pressure gauge assembly.

3.7 STRAINERS

A. Provide where called for. Provide blowdown connection for strainers with valves. Provide valve type as specified in Specification Section 230523. All blowdown valves shall be provided with a cap or plug. Open ended valves are not allowed.

3.8 PUMP AND COIL FLEXIBLE CONNECTORS

A. Flexible connectors shall be installed in accordance with the manufacturer's installation requirements.

B. Where pump discharge or suction size is smaller than system pipe size, provide concentric type reducing flexible connector.

C. Install flexible connectors within manufacturer's parallel offset tolerances. Flexible connectors shall not be subjected to the weight of equipment or piping causing deformation of connector.

3.9 PRESSURE RELIEF VALVES

A. Heating Hot Water: Pipe discharge, full size of valve outlet connection, to floor drain and place hanger at elbow. Install piping so as not to introduce stress on pressure relief valve body.

END OF SECTION

SECTION 233000 - SHEETMETAL AND DUCTWORK ACCESSORIES

PART 1 – GENERAL

1.1 WORK INCLUDED

A. Provide labor, materials, equipment and services required for the complete installation designed in Contract Documents.

1.2 QUALITY ASSURANCE

A. Ductwork shall be fabricated and installed in compliance with latest edition of the following standards:

1. SMACNA Duct Construction Standards - Metal and Flexible Ductwork.
2. SMACNA Duct Liner Application Standard.
3. NFPA Standards, Bulletin 90A, 96, 101.
4. 2020 New York State Mechanical Code
5. Plans and Specifications which exceed the requirements in any of the referenced standards.

B. All sheet metal shall be fabricated and installed by an experienced Contractor specializing in this type of Work.

C. All ductwork shall be maintained to the following cleanliness standards throughout the project:

1. All ductwork is to be shipped to the job site with ends covered in plastic or capped, and fully shrink or poly sheet plastic wrapped. On arrival to the project site, all ductwork shall be manually inspected and anywhere protective plastic or caps that have been damaged shall be cleaned inside and out and re-wrapped prior to storage.
2. Ductwork protective coverings shall be removed only immediately prior to installation.
3. All adhesive labels or part identification markings shall be on the exterior of the ductwork only.
4. All open ends are to be maintained covered through the progress of construction with self-adhesive poly sheeting.
5. Duct contaminated due to failure to maintain these standards shall be cleaned to the satisfaction of the Owner and Engineer at the cost of this contractor.

1.3 SUBMITTALS

A. Provide a complete shop standard construction manual including construction details for all shop fabricated materials, fittings, and accessories.

B. Provide coordinated sheetmetal shop drawings. Refer to DUCTWORK SHOP DRAWINGS in this specification section for further requirements.

C. Ductwork detail drawings.

1.4 DUCTWORK CLASSIFICATION

A. Duct systems are classified and constructed per the SMACNA pressure classification as follows:

1. All ductwork shall be constructed for a minimum pressure class of 2 in. w.g. unless stated otherwise.

1.5 DUCTWORK SHOP DRAWINGS

A. Prepare minimum 1/4 in. scale drawings:

1. Constructed from actual field inspections and measurements so as to assure a complete job.
2. Incorporating dimensions of actual equipment proposed for use on the project.
3. Showing adequate sections, elevations, and plan views and indicating the bottom of ductwork elevations from the finished floor.
4. Indicating all volume dampers, damper access doors, air balance test plugs, and other accessories required for a complete project.

B. Immediately call to the attention of the Engineers any major deviations from the Contract Drawings which must be made. All deviations shall be documented in writing.

C. Submit roof, wall and floor opening dimensions and locations shown on shop drawings.

D. Submit prints to each Contractor of other trades for review for interferences and coordination with their work.

E. Refer to 230010.3.2 for further information related to Sheet Metal Shop and Coordination Drawings

PART 2 – PRODUCTS

2.1 DUCTWORK MATERIALS

A. Unless otherwise called for, provide materials in accordance with these specifications and Exhibit I.

B. Where ductwork is called out to be painted, sheet metal shall be of “Galvanneal” construction complying with ASTM A653.

2.2 SQUARE AND RECTANGULAR DUCTWORK

A. Transverse and longitudinal duct seams reinforcement shall conform to appropriate tables and figures per SMACNA Pressure Classification for duct construction.

1. “Ductmate" or "Nexus" 4-bolt corner connection systems may be used in lieu of standard construction. Provide all corner brackets, corner bolts, transverse clips, and seals between flange to flange connections

B. Corner closures shall be required as described and illustrated by SMACNA Duct Construction Standards.

C. Throat radius on all elbows shall not be less than dimension of duct in plane of radius. Where this cannot be maintained, use shorter radius with internal guide / splitter vanes per SMACNA guidelines, or square elbow with turning vanes.

D. Bracing and hanging of ductwork shall be per SMACNA Standards for size and pressure class of ductwork being used.

E. Any transformations shall not reduce the ductwork cross-sectional area. Maximum angle in straight duct, 20° for diverging flow and 30° for contraction flow. Transformation from square to round or flat oval seams welded or brazed.

F. Provide 45 degree shoe-taps or 45 degree laterals for square and rectangular branch ductwork. Unless noted otherwise or shown on the contract drawings, 90 degree straight taps or "A" collars are prohibited.

2.3 DUCTWORK SEALING

A. Ductwork sealing shall comply with paragraphs 403.13 of the ECCCNYS.

B. SMACNA duct sealing classification shall be used for duct systems using the following criteria:

1. Seal Class A, shall include transverse and longitudinal joints and duct wall penetrations, grommets at damper shafts for all ductwork to be provided.

C. Approved ductwork sealing materials shall include the following Hardcast products or approved equivalents when and where applied per manufacturer's recommendations and requirements:

1. Water Based Sealants - Versa-grip 181

D. Mastics used to seal metallic and flexible air connectors shall comply with UL 181B and be marked 181 B-FX for pressure sensitive tape or 181-B-M for mastic.

2.4 TURNING VANES

A. Standard Type:

1. Provided in square elbows as shown on contract drawings. Vanes for ducts with areas greater than 100 sq. in. shall be "double" type having dimensions and spacing as detailed.
2. Make: Elgen, or contractor fabricated.

2.5 DAMPERS IN DUCTWORK

A. Volume Dampers:

1. Provide single blade type volume dampers where duct sizes in both dimensions are under 12". Constructed per SMACNA standards, one gauge heavier than duct material. For round ducts, Rossi RD series blades securely fastened to 3/8 in. sq., cold rolled steel operator rod and B300/B330 end bushings. For rectangular ducts use Greenheck MBD-10M with 3/8 in. sq., cold rolled steel operator rod. Provide quadrant locking handle on standoff for ductwork to be externally insulated. Wing nut friction screw type are specifically prohibited. Shop fabricated or alternate damper manufacturers meeting these specifications are to be submitted for approval.
2. Provide volume dampers at all air outlets, diffusers, grilles. Dampers to be located at branch takeoff collar or as close as practical. Use of register dampers in return or exhaust inlets shall be strictly limited and approved by the Engineer in advance.
3. Provide multi-blade dampers above 12 in. duct dimension in width or depth. Where multi-blade dampers are required, they shall be equal to Ruskin Model CD35. Provide quadrant locking handle on air volume dampers, wing nut friction screw type are specifically prohibited. Provide quadrant locking handle on standoff for ductwork to be externally insulated.

B. Automatic Air Dampers:

1. Furnished as part of "Control Systems" Section 230923 installed by this Contractor.

2.6 FLEXIBLE CONNECTIONS TO FANS AND EQUIPMENT

A. Materials for flexible connections shall be fire retardant, water and mildew resistant, and comply with NFPA Standard 701:

1. Systems up to 2" w.g. s.p.: approximately 20 oz. of fabric per sq. yd. Ventfabrics, Inc., "Ventfab".
2. Systems greater than 2" w.g. s.p., and watertight systems: Of heavy glass fabric, double neoprene coated, approximately 30 oz. per sq. yd. Ventfabrics Inc., "Ventglas".
3. Flexible connections for grease duct system fans shall be listed and labeled for the application per NYSMC 506.3.2.4

2.7 ACCESS DOORS

A. In Ductwork: Shall be double panel construction, 1" rigid insulation when in insulated ducts; SMACNA construction, hinged type. Double cam type only acceptable where hinged type will not fit and if approved by engineer. Same metal as duct, or factory fabricated. Doors airtight to fit system static pressure, minimum size 16" x 12" or as practical based on the specified location. Refer to section 233316, "Fire and Smoke Dampers", for additional requirements.

B. When installed in intake or exhaust plenums, access doors will be sized to allow for full access to plenum.

C. Where plenums are greater than 4 feet wide or deep, the access door is to be at least 2 ft. wide by 4 ft. tall to allow for personnel entry.

D. Door Hardware:

1. Hinges: Minimum of two per door, at least 1-1/2" long by 1/8" thick, spaced no more than 2 ft. apart and no more than 1/4 of the door size from top to bottom of door. Maximum 4" length, 6 ft. door, for larger doors, length equal to 1/12 door height.
2. Latches: As manufactured by Ventfabrics, Inc. or equivalent. Metal window sash latch not acceptable.

    a. Access doors up to 2" w.g.: Ventlok #100/#102.
    b. Walk-in doors up to 2" w.g.: Ventlok #260.
    c. Access or walk-in above 2" w.g.: Ventlok #310.

E. Make: Air Balance, Ruskin, Ventlok, Elgen.

2.8 INSTRUMENT TEST HOLES

A. Suitable for insertion pitot tubes and other test instruments:

B. Fabricated with heavy screw cap and gasket.

C. With sufficient extension to accommodate exterior insulation where required.

D. Make: Ventlok #699.

PART 3 – EXECUTION

3.1 REQUIREMENTS

A. Equipment and systems shall be installed in accordance with local and state codes and regulations having jurisdiction.

B. Install all ductwork concealed and tight to the structure above unless noted otherwise on shop drawings. Fabricate only after the approval of shop drawings, and in locations to avoid interference. Ductwork installed without approved shop drawings, which requires removal/modification and/or reinstallation due to conflicts or improper installation shall be corrected at no cost to the Owner.

C. Sizes given on contract drawings are inside dimensions. Keep openings closed with protective caps or blanks during construction to prevent entrance of dirt and debris.

D. Extend access openings, damper rods and levers, to outside of external insulation make systems airtight.

E. No piping, conduit or other obstruction to airflow is permitted in ductwork.

F. Provide necessary openings, sleeves, hanger inserts, framing, chases, and recesses, not provided by other trades.

G. Exposed exhaust or return registers and grilles shall be flush with face of duct; exposed supply registers and grilles shall be mounted outside airstream with 45° shoe-tap extension collars.

3.2 FLEXIBLE CONNECTIONS

A. Provide flexible connections for the intake and discharge connections of duct connected to fans and air handling equipment:

1. Round connections made with adhesive and metal drawbands with ends tightly bolted.
2. Rectangular connections made with material securely held in grooved seam between flanges, tightly clipped or riveted on 6” centers.

B. Connections made with a minimum of 2” space between duct and equipment collars, installed in line, and with 1” excess material folded so as not to interfere with airflow through connection.

3.3 TURNING VANES

A. Install fixed turning vanes in square elbows of equal dimensions only.

1. Provide turning vanes in compliance with SMACNA duct construction standards figures 2.3 and 2.4
2. Use large size vanes, 2-1/4” spacing when ducts are 20” or wider.
3. Secure vane runners to duct with spot welding, riveting or sheet metal screws.
4. Seal all penetrations for attachment of vane runners.

B. For unequal dimension elbows:

1. Provide Aero Dyne HEP turning vanes and rail assembly or approved equal
2. Turning valves to be installed in compliance with all manufacturer requirements to obtain intended performance.
3. Adjust vanes for angle of attack per manufacturer instructions
4. Seal all penetrations for attachment of vane runners.

C. When installing in ductwork with internal insulation:

1. Install runners in ductwork inside insulation and bolt through insulation and duct sides, welding bolts to insure rigid installation. Provide build-outs for duct Velocity-Pressure classes above 2” w.g.

3.4 INSTRUMENT TEST HOLES

A. Locate in the following locations:

1. Downstream of fan discharge

3.5 CLEANING DUCTWORK AFTER INSTALLATION

A. Clean rubbish and dirt from system before fans are turned on.

B. Keep openings closed during this construction period.

C. Pay damages resulting from dirt blown on painted or other finished surfaces.

D. Repair or replace damaged fan wheels, dampers, or other system parts damaged as a result of dirt.

E. Clean system as many times as required until the entire system is dirt-free.

3.6 LEAKAGE TEST OF DUCTWORK

A. Ductwork designated to operate below 3" wc shall be checked and guaranteed to meet standards of SMACNA Seal and Leakage Classifications, seal Class A. Air balancing and testing shall be used to determine satisfactory operation of duct systems.

3.7 DAMPERS AND AIR CONTROL DEVICES

A. Provide dampers necessary to permit proper balancing of air quantities. Comply with code requirements for smoke and fire control. Prevent introduction of uncontrolled outside air into building through roof and wall openings.

B. When dampers are installed in acoustically lined ductwork, install with insulated "build-outs" per SMACNA.

C. Install all dampers furnished as part of "Control Systems" Section.

3.8 ACCESS DOORS

A. Provide as required for maintenance and service access at:

1. Control dampers
2. Damper motors
3. Smoke, fire and combination smoke / fire dampers for inspection and services as required under NFPA 80 and NFPA 105.
4. Smoke detectors
5. Control instruments
6. Fan bearings
7. Both inlet and outlet of terminal heating and/or cooling coils
8. Intake or exhaust plenums
9. Any other equipment requiring periodic inspection or service, complete with angle iron frame.

3.9 DUCT SUPPORTS

A. Provide per SMACNA, same material as duct. Hanger bands to extend down sides and turn under bottom 2". Minimum two metal screws per hanger. Steel angle or "unistrut" on larger duct. Spaced per building structural system but not greater than 8 ft or the maximum allowable by SMACNA guidelines. Provide extra support angles as required.

B. Provide supports per manufacturers requirements for factory fabricated duct systems

EXHIBIT I - DUCTWORK MATERIALS

(Notes are at the end of Exhibit "I")

SERVICE	MATERIAL	SPECIAL REQUIREMENTS
Supply, return, vent, relief, and exhaust	Lock forming quality, galvanized steel ASTM A525	Joints and features as called for SEE NOTE 1
Accessories, dampers and air turns	Same or better as parent duct	------

NOTES FOR EXHIBIT I:

NOTE 1: Wall plenums that are likely to see moisture collection due to rain or snow are to be provided with a sloped floor and trapped drain to indirect waste connection.

END OF SECTION

SECTION 233726 - LOUVERS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Provide labor, materials, equipment and services as required for the complete installation designed in Contract Documents.

1.2 RELATED DOCUMENTS

A. All work under this section is subject to the Contract Documents. This Contractor shall be responsible for and governed by all the requirements therein.

1.3 SUBMITTALS TO THE ARCHITECT/ENGINEER

A. Louvers including all blade types, finishes and arrangements.

B. Provide original color charts for selection of finish.

PART 2 - PRODUCTS

2.1 LOUVERS

A. Factory constructed aluminum louvers.

B. Provide mullions where blade lengths exceed 60 in.

C. With 1/2 " x 1/2" mesh, 14 gauge wire, aluminum birdscreen secured in removable frame, secured to back of louver.

D. Extruded sections 6063-T5 alloy, 0.125” minimum thickness, 5” deep, Double Drainable unless otherwise called for.

E. Sill extension and sill style as required by job conditions.

F. Standard anodized (Clear), 500 70% finish color as selected at review of submittal.

G. Size, type and free areas indicated in location as called for on the Contract Documents.

H. "Stormproof" design with special curb to trap rain.

I. One-piece structural head, sill, and jambs to eliminate requirement for on-site assembly.

J. All stainless steel fasteners.

K. Design Equipment: Greenheck EHH-501 Double Drainable Blade.

L. Acceptable Make: Construction Specialties, Inc., Greenheck, Ruskin, Pottorff.

PART 3 - EXECUTION

3.1 GENERAL

A. Install louvers and penthouses as per manufacturer's recommendations.

3.2 LOUVERS

A. Size called for is approximate wall/or masonry opening size. Adjust slightly to suit construction or coursing (review architectural drawings or field conditions for rough opening sizes). Slope ductwork and plenum to louver weephole or provide drain.

END OF SECTION

SECTION 235100 - PREFABRICATED CHIMNEY

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide labor, materials, equipment and services as required for the complete installation designed in Contract Documents.

1.2 QUALIFICATIONS

A. All chimney sections, lining, fittings, supports, etc., shall be manufactured from U.L. tested and listed components.

B. Chimney and venting systems shall be designed for the type of appliance being vented.

C. Venting systems for appliances shall comply with these specifications, the International Mechanical Code and the International Fuel Gas Code.

D. UL 1738/ ULC S636-95 – Standard for Venting Systems for Gas-Burning Appliances Categories II, III, and IV

E. All oil fired appliances shall be vented in accordance with NFPA 31.

1.3 SUBMITTALS

A. Submit complete material and construction details for chimney and accessories including guy wire layout. Submit Drawings showing floor and roof openings, which shall indicate exact sizes and locations.

PART 2 - PRODUCTS

2.1 POSITIVE PRESSURE FLUE PIPE

A. General:

1. Suitable to serve hot water boilers and hot water heaters utilizing natural gas.
2. Factory built all metal chimney with modular components. Suitable for outdoor installation and up to 1000ºF constant (1400ºF intermittent) flue temperature.
3. Designed to handle positive internal pressures.
4. Double wall chimney with minimum 1 inch air space between the walls.
5. Adjustable lengths with closely fitting sliding internal section with graphited mineral fiber packing gland and a sliding outer section to absorb thermal expansion.
6. Meets requirements of UL standards 1978, 103, 641 and 441, and NFPA 31, 37, 54, 96, and 211.

B. Outer Jacket:

1. Type 316 stainless steel 0.025" thick in 6"-24" sizes

C. Inner Gas Pipe:

1. Type 316 stainless steel 0.035" thick in 6"-36" sizes. 0.048" thick in 42"-48" sizes.

D. Accessories:

1. Double walled stainless steel top section exit cone. Rain cap.
2. Wall support assembly, wall guide assembly and plate support assembly.
3. Fittings to suit job conditions.
4. Drained tee cap, tee connection, inside V bands, ventilated roof thimble, external channel bands, and other necessary hardware as required for complete installation.

E. Design Equipment: Selkirk Model "PS".

F. Acceptable Make: Hart and Cooley, Metal-Fab, Schebler and Van-Packer

2.2 Condensing and/or Negative Pressure Flue (Category II, III, and IV)

A. Provide double wall metal vents, tested to UL 1738 and UL listed for use with category II, III, and IV gas fired appliances.

B. Vent shall be rated for up to 550° F continuous fire and 40” water column positive pressure.

C. Fabricate with 1-inch minimum air space between walls.

D. Construct inner liner of 24 gauge minimum corrosion resistant VP1738 stainless steel or AL29-4C stainless steel in accordance with UL listing.

1. 24 gauge for liners from 4” to 24” ID.

2. 20 gauge for liners from 26” to 36” ID.

3. 18 gauge for liners from 38” to 48” ID.

E. Construct outer shell of 24 gauge minimum type 430 stainless steel.

1. 24 gauge for shells from 6” to 26” OD.

2. 20 gauge for shells from 28” to 50” OD.

F. Vent shall be listed for 2” clearance to combustibles and 0” clearance to non-combustibles.

G. Provide all required accessories for a complete system each bearing factory applied UL Label, including but not limited to supports, appliance connectors, drain fittings, and terminations.

H. Design Equipment: Van-Packer CM.

Acceptable Make: Metal-Fab, Schebler and Van-Packer

PART 3 - EXECUTION

3.1 CHIMNEY

A. Provide chimney of sizes as shown on Drawings. Sizes are clear inside dimensions. Maintain minimum clearances between chimney and existing construction.

B. Install in strict accordance with manufacturer's recommendations and NFPA 211. Complete assembly shall be gas and airtight.

C. Provide adjustable lengths between two fixed points to permit thermal expansion.

D. Seal joints with sealant suitable for temperature in excess of specified intermittent flue temperature rating.

E. Support and chimney as recommended by the manufacturer and as shown on the Drawings. Provide all necessary braces, guides, guy wires, tensioners and supports. Fasteners shall penetrate wall and terminate on inside of wall with steel bearing plates.

END OF SECTION

SECTION 235223 - HOT WATER CONDENSING BOILERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. The boilers are considered long lead items and the contractor is to reference the specific instructions in Section 013300 – SUBMITTALS for treatment of these long lead items.

1.2 SUMMARY OF WORK INCLUDED, BUT NOT LIMITED TO

A. Controls and Boiler Trim.

B. Fuel Connections.

C. Burners, natural gas.

D. Chimney/flue Connections.

E. Boiler

F. GE GAP Gas Train.

1.3 QUALITY ASSURANCE

A. Comply with applicable regulations and have authorized boiler inspection prior to shipment.

B. Constructed in accordance with ASME Boiler Code, Section IV.

C. Provide a copy of the inspection report to the Architect/Engineer.

D. Units shall be AGA certified.

E. Comply with New York State Code Rule 4 and NFPA 85.

F. Provide factory tests to check construction, controls and operation of unit.

G. Boilers to be guaranteed to operate at minimum thermal efficiency as scheduled.

H. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

I. ASME Compliance: Boilers shall bear ASME “H” stamp and be National-Board listedASHRAE/IESNA 90.1 Compliance: Boilers shall have minimum efficiency according to "Gas and Oil Fired Boilers - Minimum Efficiency Requirements”.

J. DOE Compliance: Minimum efficiency shall comply with 10 CFR 430, Subpart B, Appendix N, "Uniform Test Method for Measuring the Energy Consumption of Furnaces and Boilers".

K. UL Compliance: Test boilers for compliance with UL 795, "Commercial-Industrial Gas Heating Equipment." Boilers shall be listed and labeled by a testing agency acceptable to authorities having jurisdiction.

1.4 REGULATORY REQUIREMENTS

A. Install water heaters in accordance with the most current revision of following, standards, codes and recommendations.

1. New York State Industrial Code Rule #4.
2. National Electric Code (NFPA 70).
3. Gas train shall conform to General Electric Global Asset Protection requirements.
4. ASME Compliance: Construct water heaters in accordance with American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, Section IV.
5. UL Labels: Provide water heater ancillary electrical components which have been listed and labeled by Underwriter's Laboratories (UL).
6. ASHRAE 90.1.
7. N.Y. State Energy Conservation Construction Code.
8. Regulations of the New York State Education Department, Manual of Planning Standards Part S602-3 - Fuel Burning Equipment.

1.5 SUBMITTALS

A. Supply manufacturer's descriptive literature, operating instructions, maintenance and repair data, and dimensions including tube removal in accordance with Section 013300.

B. Supply manufacturer's installation instructions.

C. Submit shop drawings in accordance with Section 013300.

D. Submit complete wiring diagrams for all boiler operating and temperature control systems.

E. Submit complete piping diagrams for field installation of all boiler components.

F. Provide copy of warranties.

G. Provide a blank copy of start-up certification.

H. All warranties shall be delivered as part of the close-out submission.

I. A receipt shall be delivered as part of the close-out submission that states all required spare parts have been delivered to the owner. This receipt must be signed and dated by the owner.

PART 2 - PRODUCT

2.1 ACCEPTABLE MANUFACTURERS

A. Manufacturer's catalog numbers are used as illustrations. Similar products of the following manufacturers are acceptable equals. All similar items shall be by one manufacturer.

1. Design Equipment: ATH KN Series
2. Acceptable Make: ATH KN series, Fulton Vantage, Cleaver Brooks Switchfire

B. Design Approval for models illustrated above represent equipment that is substantially repairable. Down fired stainless steel heat exchanger boilers will not be accepted.

2.2 BOILER

A. Furnish and install in accordance with all applicable codes and authorities having local, state and federal jurisdiction.

B. The boiler plant shall consist of 2 hydronic boiler(s). Each Boiler shall be UL Listed, CSD-1 approved, ASME coded and stamped, and incorporate a gas train designed in accordance with GE GAP.

C. Each Boiler shall have an input as scheduled on contract drawings and be rated to fire with natural gas.

D. The Boiler manufacturer must publish known part load value efficiencies; the thermal efficiency must increase as the firing rate decreases.

E. Electrical service to each unit shall be 208V/1/60Hz 25 amp service.

F. Each boiler shall include a diagnostic control panel with a full text display indicating the condition of all interlocks and the BTUH input percentage. Access to the controls shall be through a completely removable cover leaving diagnostic panel intact and not disrupted.

A. Construction: The combustion chamber shall be constructed of cast iron. It shall be a down-fired design utilizing lightweight refractory around the burner housing.

G.

H. Modulating Air/Fuel Valve and Burner: Design: Boilers shall be CSA design certified as a condensing boiler. Boilers shall be designed for a minimum of 5:1 continuous turn down with constant CO2 over the turndown range. The boiler shall operate with natural gas or propane and have a CSA International certified input rating as noted on the drawings, and a thermal efficiency rating up to 99% at minimum input. The boiler shall be symmetrically air-fuel coupled such that changes in combustion air flow or flue flows affect the BTUH input without affecting combustion quality. The boiler will automatically adjust input for altitude and temperature induced changes in air density. The boiler will use a proven pilot interrupted spark ignition system. The boiler shall use a UL approved flame safeguard ignition control system using UV detection flame sensing. The UV detector shall be air cooled to prevent condensate formation and so designed as to prevent misalignment. The design shall provide for silent burner ignition and operation. The boiler shall be down fired counter flow such that formed

condensate always moves toward a cooler zone to prevent re-evaporation. A stainless-steel corrosion resistant condensate drain designed to prevent pooling and accessible condensate trap shall be provided. A means of neutralizing the condensate Ph levels is required. Boiler shall be able to vent a horizontal distance of 120 equivalent feet, 36.5m with a vent diameter equivalent to the combustion chamber outlet diameter

I. Single Fuel Capability: Natural Gas shall be the fuel.

J. Pressure Vessel/Heat Exchanger: Boilers shall be a cast iron sectional unit designed for pressure firing and shall be constructed and tested for 100 P.S.I water working pressure, in accordance with the A.S.M.E. Section IV Rules for the Construction of Heating Boilers. Individual sections will have been subjected to a hydrostatic pressure test of 250 PSIG at the factory before shipment and they shall be marked, stamped or cast with the A.S.M.E. Code symbol. Boilers with less than 250-psi pressure test will not be acceptable for this project. The sections shall be of a down fired counter flow single-pass design. Water ports will be sealed with steel push nipple connectors. The sections will be fully machined for metal to metal sealing of the gas side surfaces. The design will provide for equal temperature rise through all sections. The iron shall have a minimum thickness of ¼". The heat exchanger design should have no limitations on temperature rise or restrictions to inlet water temperature and a Cv of 246..

B. The boiler shall be capable of operating at a PH Level of 6.5 to 11 PPM @ <500 PPM Dissolved Solids and 300 PPM Hardness water chemistry in the boiler water side of the heat exchanger as part of the warranty requirements. Cast Aluminum heat exchanger will NOT be acceptable **(No Exceptions)** The boiler water shall be tested and with yearly sample reports as part of the warranty.

C. Gas Burner: The burner shall be metal fiber mesh construction, allowing high turndown of the fuel-air mixture. The burner flame shall burn horizontally and be of the pre-mix type with a forced draft fan. Burner shall fire to provide equal distribution of heat throughout the entire heat exchanger. The burner shall be easily removed for maintenance without the disruption of any other major component of the boiler. A window view port shall be provided for visual inspection of the boiler during firing. The gas distribution components and burner shall be enclosed with a cast- aluminum housing.

D. Ignition components: The ignition hardware shall consist of Alumina ceramic insulated ignition electrodes aligned with a pilot burner which shall be integrated into the burner and a UV sensing tube permanently arranged to ensure proper ignition electrode and UV alignment.

E. Rated Capacity: The boiler shall be capable of operating at rated capacity with pressures as low as 3" W.C. at the inlet to the burner gas valve.

F. The burner shall be capable of 99% efficiency without exceeding a NOx reading above 11ppm.

G. The burner and gas train shall be provided with the following trim and features:
   a. The burner shall be capable of and provide variable modulating firing

rates.

b. The burner shall be capable of operating with repeatable CO2 at both low fire and high fire modulating firing rates. The O2 level shall be a maximum of 3% at high fire and 4.5% at low fire. CO shall not exceed 20 ppm for gas firing at all firing rates to minimize excess air required to maintain combustion and pressure drop through the heat exchanger. The burner shall be capable of operating without exceeding 20ppm of NOx.

c. The boiler shall be supplied with a zero-governor gas valve coupled with a variable speed blower system, to precisely control the fuel/air mixture for maximum combustion efficiency.

d. Burner Ignition: pilot with intermittent spark

e. Safety Controls: Energize ignition, limit time for establishing flame, prevent opening of gas valve until pilot flame is proven, stop gas flow on ignition failure, and allow gas valve to open.

f. Flue Gas Collector: Enclosed combustion chamber with integral combustion air blower and single venting connection.

g. Gas Train: Manual ball type gas valves (2), main gas valve, manual leak test valve, pilot gas pressure regulator, and automatic pilot gas valve. All components to be factory mounted and CSD- 1 compliant.

h. Safety Devices: Low gas pressure switch, air flow switch, and blocked flue detection switch, low water cutoff (manual reset), high temperature manual reset. All safeties to be factory mounted.

K. Boiler Controls:

Controls: The boiler control package shall be a MTI HeatNet or equivalent, integrated boiler management system. The control system must be integral to each boiler, creating a control network that eliminates the need for a “wall mount” stand-alone boiler system control. Additional stand-alone control panels, independent of a Building Management System (BMS), shall not be allowed to operate the boiler network.

1. The Heat-Net control shall be capable of operating in the following ways:
   a. As a stand-alone boiler control system using the HeatNet protocol, with one “Master” and multiple “Member” units.
   b. Adaptive Modulation – Lowers the modulation rate of all currently operating boilers before a newly added boiler enters operation.
   c. Available priority start/stop qualifiers shall be done using any combination of: A) Modulation Percentage B) Outdoor Air Temperature or C) Return Water Temperature.
   d. Base Loading – Provides the ability to control (1) base load boiler with enable/disable and 4-20mA modulating signal (if required).

2. MASTER CONTROLLER:
   A boiler becomes a Master when a resistance type 10K sensor is connected to the J10 “SYS/ DHW HEADER” terminals. **The sensor shall be auto detected**. The

Master senses and controls the header/loop temperature utilizing a system setpoint. It uses any boilers it finds "HeatNet Members" or those defined in the control setup menus to accomplish this. The "Master" shall also have the option of monitoring Outside Air Temperature "OA" to provide full outdoor air reset functionality. **Only one master shall be allowed in the boiler network.**

a. When operating as a "Master", the HeatNet control provides a stand-alone method using a PID algorithm to regulate water temperature. The algorithm allows a single boiler "Master" or multiple "Master + Member" boilers in a network of up to 16 total boilers.
b. The control algorithm is based upon a control band, at the center of which is the setpoint. While below the control band, boilers are staged on and modulated up until the control band is entered. Once in the control band, modulation is used to maintain setpoint. Optimized system efficiency is always accomplished by setting the Modulation Maximum "Mod-Max" setting to exploit each boiler in the network's inverse efficiency curve. The control shall operate so that the maximum number of boilers required, operate at their lowest inputs until all boilers are firing. Once all boilers are firing, the modulation clamp is removed, and all boilers are allowed to fire above this clamped percentage up to 100%. This "boiler efficiency" clamp is defaulted to 80% and thus limits all the boilers individual outputs to 80% until the last boiler fires. **The 80% default must be field adjustable for varying operating conditions.** All boilers modulate up and down together always at the same modulation rate. Boilers are shut down only when the top of the band is breached, or before the top of the band, if the control anticipates that there is a light load. Timers shall also be included in each control in the network to prevent any boiler from short cycling.

3. MEMBER BOILER CONTROLLER:

Additional boilers in the network always default to the role of member. The lack of sensors connected to the J10 terminals "SYS/DHW Header" on each additional boiler shall ensure this.

a. Each "Member" shall sense its supply outlet water temperature and modulate based on signals from a "Master" boiler. When operating as a member, starting, stopping, and firing rate shall also be controlled by the "Master" boiler.
b. When using the HeatNet protocol, the system setpoint shall be sent from the "Master", along with the modulation value to control firing rate. It also receives its command to start or stop over the HeatNet cable. Each "Member" will continuously monitor its supply outlet temperature against its operating limit. If the supply temperature approaches the operating limit temperature (adjustable), the boilers input control rate is limited and its modulation value decreases to minimize short cycling. If the operating limit is exceeded, the boiler shall shut off.
c. Each HeatNet control in the boiler network shall have the following standard features and operating capabilities:
    1) Digital Communications Control, Boiler to Boiler: Heat-Net Building Management System (BMS): MODBUS standard or BACnet protocol
    2) Analog 4:20 and 0-10vdc also supported, BACnet interface, USB/RS485 network plug-in to allow firmware updates or custom configurations
    3) Distributed control using HeatNet protocol for up to 16 total boilers.
    4) System/Boiler operating status in English text display.

5) Interlock, Event, and System logging with a time stamp.
6) Advanced PID algorithm optimized for specific boilers.
7) Four dedicated temperature sensor inputs for: Outside Air Temperature, Supply (Outlet Temperature, Return Temperature (Inlet), and Header Temperature. The controller utilizes the data from sensors to calculate the required firing rate of all boilers to reach system setpoint with maximum efficiency being a priority in staging.
8) Automatically detects the optional temperature sensors on start up.
9) Menu driven calibration and setup menus with a bright 4-line Vacuum Fluorescent Display.
10) Eight (8) Dedicated 24vac interlock monitors and Eight (8) dedicated 120vac system monitors used for diagnostics and providing feedback of faults and system status, Alarm contacts and Runtime hours.
11) Each boiler shall include (as a standard) a Sika Vortex Flow Meter across the inlet and outlet to calculate the total BTU's/Hr. of boiler output based on flow and Delta T. This will maximize the overall efficiency and provide the proper boiler output to match building setpoint and load profile. (No Exceptions)
12) Combustion Air Damper control with "proof of open" end switch with timing sequence for added freeze protection.
13) Outdoor Air Reset with programmable ratio.
14) Time of Day clock to provide up to four (4) night setback temperatures.
15) Failsafe mode when a Building Management System (BMS) is controlling setpoint. If communications is lost, the boiler/system shall run off the Local Setpoint.
16) Continuous Daily Runtime Restart feature that monitors the runtime of each boiler and if any in the network have exceeded 24 hours of continuous runtime, the boiler is restarted to protect the UV flame scanner.
17) Allows for selection of any boiler in the network to act as Lead Boiler.
18) Adaptive Modulation feature in which the Master boiler adjusts the system modulation rate to a lower value when a new boiler in the network is started to compensate for the added BTU's to the system. Once the newly added boiler fires and the adjustable timer expire, the Master resumes control of the system modulation to maintain setpoint temperature.
19) Priority firing – Allows mixing of condensing and non-condensing, base load and/or other combination of (2) functional boiler types utilizing (2) priority levels.
20) Available priority start/stop qualifiers shall be done using any combination of: A) modulation percentage B) outdoor air temperature (or) C) return water temperature.
21) Base Loading – Provides the ability to control (1) base load boiler with enable/disable and 4-20mA modulating signal (if required).
22) Flow Sensing – Uses Sika vortex flow sensor to gather flow data. The HeatNet control will modulate boilers and building pumps to reach flow rate and delta T required to meet building load profile.
23) Boilers will be placed in a primary-only piping configuration. Each boiler shall have a 4" Belimo automatic isolation valve with end switch, provided and wired by the boiler manufacture for individual isolation. The HeatNet Control will always operate the valve to guarantee at least one boiler control valve to be open to the system. The boiler firing rate and Delta will

determine the next boiler in sequence to open the return line valve and firing rate required. The HeatNet control will provide an 80 sec (adj) delay to dissipate any residual heat after the boiler is turned off.

24) Boiler(s) shall be equipped with an integrated web-based monitoring system.
   a) Monitoring system shall provide an email or SMS text message notification upon detecting an out of tolerance condition.
   b) The integrated monitoring system shall provide a web portal with performance dashboard displaying key data points for the system and each boiler in the system.
   c) The web portal shall provide the following capabilities;
   d) Detailed status of data points and system set points
   e) Boiler and System runtime and cycle count
   f) Intelligent diagnostics and troubleshooting guide
   g) Provide original factory test data including as built bill of materials
   h) The ability to enter field service records with file upload capabilities
   i) The ability to view time stamped history of data points and settings
   j) The ability to view detailed event log entries
   k) The ability to provide visual trending of the boiler system and operating parameters
   l) Video tutorials explaining each section of the web portal

d. The monitoring system shall have the capability of connecting directly to a 10/100mbps TCP/IP network. Optionally when a facility network connection is not available the system shall be capable of utilizing wireless cellular network

e. The monitoring system shall utilize a non-public proprietary data encryption algorithm

f. Secure data transmission shall be directly to the cloud from HeatNet enabled system(s) without third party integration

L. Warranty**:** General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents. Installing contractor shall provide one year of warranty parts and labor.

M. Special Warranty: Submit a written warranty, executed by the contractor for the heat exchanger.

N. Warranty Period: The heat exchanger assembly shall carry a twenty-five (25) year warranty (non-prorated) and will cover damage due to thermal shock, such as leaks to the cast iron sections, when installed as a closed loop hot water boiler. The manufacturer shall guarantee any part of the boilers and all other equipment supplied against defective material or workmanship for a period of not less than 12 months. However, guarantee must be extended to include one (1) full and continuous heating season. Boiler manufacturer shall furnish electrical drawings and shall install the control and power wiring for the boiler system, including responsibility for polarity.

O. Unless otherwise stated above, provide a written warranty (Manufacturer's standard form) in which the Manufacturer agrees to repair or replace components that fail in material and workmanship within one year from date of Substantial Completion / Start-Up.

2.3 BOILER TRIM

2.4 PROVIDE THE FOLLOWING STANDARD TRIM:

A. Stainless Steel Condensate Receiver Pan
B. Low Air Pressure Switch
C. Blocked Flue Detection Switch
D. Modulation Control
E. Temperature/Pressure Gauge
F. Manual Reset High Limit (CSD-1 Factory Mounted and Wired)
G. Low Gas Pressure Safety Switch
H. Low Water Cutoff with Manual Reset (CSD-1 Factory mounted and wired)
I. Supply Outlet Temperature Display
J. Full Digital Text Display for all Boiler Series of Operation and Failures
K. Air Inlet Filter
L. Combustion Air Fan with Safety Interlock
M. Condensate Trap
N. High Gas Pressure Switch
O. Flow Sensor Mounted
P. Relief Valve (Loose) Set to 60 PSI Relief Pressure

2.5 OPERATING CONTROL AND SAFEGUARDS

A. The control system shall be supplied for 120 volts, single phase, 60 hertz.

B. Operating controls shall include an adjustable immersion type temperature controller and an immersion safety high limit to regulate boiler water temperatures. Multiple air pressure switches shall be provided to prove operation of the combustion air fan, monitor combustion chamber pressures and monitor operation of the flue. Manually operated gas plug cock, multiple main gas valves and built-in low gas pressure regulator shall be supplied as standard. A low gas pressure switch shall monitor gas supply. Additional standard controls shall include a low voltage transformer for the control circuit, a flow switch to provide water flow, inlet and outlet temperature gauges, and a factory installed ASME pressure relief valve.

C. The units control panel shall contain a lighted on/off main power switch, pilot lights to indicate sequential operation and diagnostic pilot lights to indicate control sensed malfunctions. A 120VAC control circuit and components shall be used. All components shall be easily accessed and serviceable from the front and top of the unit. All wiring harness connections shall have multi-pin plug in type connectors to ease service, troubleshooting and reduce removal and replacement cost.

D. Provide in each boiler control panel, relay with contacts to cycle and prove combustion air damper, and contacts for remote emergency shutdown switch.

E. Boiler supplier shall provide center control panel to schedule boilers, hot water pumps and combustion air.

2.6 GAS TRAIN

A. The boiler shall be capable of operating at rated capacity with pressures as low as 3" W.C. at the inlet to the burner pressure regulator.

B. Main gas manifold shall consist of AGA approved, lubricated manual plug cock, pressure regulator, low gas pressure switch with manual reset and two separate, solenoid operated, diaphragm valves. Pilot gas manifold shall consist of AGA-approved pilot cock, pressure regulator, gas filter and solenoid valve. Both manifolds shall be totally accessible for adjustment and servicing without the necessity to remove any sections of the jacket or cabinet assembly. Provide all gas train controls as required by General Electric Global Asset Protection; GE GAP.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Startup shall be performed by factory-authorized personnel, and start up performance data verifying the 95% efficiency shall be provided to the Owner. Installation of boiler shall be in strict accordance with the manufacturer's express written instructions and recommendations and as shown on the drawings. The manufacturer shall furnish a Field Engineer for supervision of installation; for the starting up of the units, and for instructing the local personnel in the operating of the units.

B. The entire boiler shall be factory assembled, requiring only connection to the water circulating system, fuel, electric utilities, the flue gas vent, and combustion air ductwork. Complete operating and start-up instructions are to be furnished in booklet form.

C. Provide a continuous housekeeping pad for all boilers, extended a minimum of 6 inches beyond unit and provide a 45° chamfer at edges.

D. Provide all control and instrumentation wiring in accordance with the boiler manufacturers ladder-type wiring diagrams. All wiring shall be in accordance with N.E.C. and requirements of Division 26 - Electrical.

E. Provide all necessary relays and contactors for combustion air damper operation and proof, as well as remote shutdown from emergency shut down switch.

3.2 SERVICES OF FACTORY MECHANIC

A. Arrange to have services of a trained field mechanic from the factory of the manufacturer of the boiler and burner at the time of erection and startup of the installation.

B. Mechanic shall checkout entire installation, including all pumps and feed apparatus and controls, shall start the units into operation and shall make all necessary tests and adjustments to have said equipment operate to his and to the Engineer's satisfaction.

C. Manufacturer shall issue a letter stating that the installation has been checked and adjusted and is ready to turn over to the Owner following the completion of this work.

D. Manufacturer is to forward three (3) copies of the starting reports to Engineer for distribution to Owner.

E. Factory mechanic shall be at the job for the initial startup for not less than two (2) consecutive calendar days.

F. Factory mechanic shall conduct demonstration and combustion tests in the presence of the Site Representative for each boiler for oil and gas firing and shall submit written report to the Engineer.

G. The same factory mechanic shall make two more trips to the job within the succeeding eight (8) months from the date of the above-mentioned letter for the purpose of further adjusting and checking, and shall be immediately available in the event of operating failure of the units within a period of one year from the date of the letter.

END OF SECTION

SUNY ERIE COMMUNITY COLLEGE NORTH CAMPUS
KITTINGER HALL BOILER ROOM UPGRADES
DIVISION 26
ELECTRICAL SPECIFICATIONS
PAGE 1

SECTION	DESCRIPTION
260010	BASIC ELECTRICAL REQUIREMENTS
260100	BASIC MATERIALS AND METHODS
260513	MEDIUM-VOLTAGE CABLES
260519	LOW-VOLTAGE CABLES
260526	GROUNDING
260533	RACEWAYS
260620	WIRING DEVICES
260923	WIRED LIGHTING CONTROLS
262213	MEDIUM-VOLTAGE DISTRIBUTION TRANSFORMERS
262400	SWITCHBOARDS AND PANELBOARDS
262913	SWITCHES, CONTACTORS AND MOTOR CONTROLLERS
262923	ADJUSTABLE SPEED DRIVES
263200	PACKAGED GENERATOR ASSEMBLIES
265100	LIGHTING

SECTION 260010 - BASIC ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. All drawings and general provisions of Contract, including all General and Supplementary Conditions, Division 1 Specification Sections, and Instructions to Bidders apply to this section and all other sections of Division 26, 27, & 28.

B. Section 019113 – Commissioning Requirements

1.2 REGULATIONS AND CODE COMPLIANCE

A. All work and materials shall conform to and be installed, inspected and tested in accordance with the governing rules and regulations of federal, state and local governmental agencies having jurisdiction. In the event of conflict between these contract documents and the governing rules, regulation, and codes.

B. The following is a list of codes and standards that will apply to this project:

1. 2025 Building Code of New York State (BCNYS)
2. 2025 Existing Building Code of New York State (EBCNYS)
3. 2025 Residential Code of New York State
4. 2025 Fire Code of New York State (FCNYS)
5. 2025 Energy Conservation Construction Code of New York State (ECCCNYS)
6. New York State Department of Labor Rules and Regulations
7. 2023 National Electrical Code, NFPA 70
8. Electrical Safety Requirements, NFPA 70E
9. 2022 National Fire Alarm Code, NFPA 72
10. New York State Department of Health Regulations
11. Local Codes and Ordinances for Erie County.
12. Federal Occupational Safety and Health Act - OSHA.
13. Factory Mutual or other Insurance Carrier.

1.3 LICENSING & PERMITSa

A. The Contractor shall hold all necessary licenses to perform the scope of work at the project location.

B. Provide certificate of inspection from a licensed electrical inspection agency for all electrical work prior to acceptance of each phase.

C. Apply for and obtain all required permits and inspections, include costs for all fees and charges within bid. Provide third party inspection of all electrical work by a certified inspection agency or approved professional.

D. Refer to General Conditions of the Contract for additional requirements.

1.4 GLOSSARY

ACI	American Concrete Institute
ADA	American Disabilities Act
AGCA	Associated General Contractors of America, Inc.
AIA	American Institute of Architects
AISC	American Institute of Steel Construction
ANSI	American National Standards Institute
ASTM	American Society for Testing Materials
AWSC	American Welding Society Code
FM	Factory Mutual Insurance Company
IEEE	Institute of Electrical and Electronics Engineers
ISO	International Standards Organization
NEC	National Electrical Code
NEMA	National Electrical Manufacturers' Association
NESC	National Electrical Safety Code
NFPA	National Fire Protection Association
NYS/DEC	New York State Department of Environmental Conservation
NYS/UFBC	New York State Uniform Fire Prevention and Building Code
OSHA	Occupational Safety and Health Administration
UFPO	Underground Facilities Protective Organization
UL	Underwriter's Laboratories, Inc.

1.5 DEFINITIONS

Approved / Approval	Written permission to use a material or system.
As Called For	Materials, equipment including the execution specified/shown in the contract documents.
Code Requirements	Minimum requirements.
Concealed	Work installed in pipe and duct shafts, chases or recesses, inside walls, above ceilings, in slabs or below grade.
Design Equipment	Refer to the article, BASIS OF DESIGN.
Design Make	Refer to the article, BASIS OF DESIGN.
Equal or Equivalent	Equally acceptable as determined by Owner’s Representative
Exposed	Work not identified as concealed.
Final Acceptance	Owner acceptance of the project from Contractor upon certification by Owner's Representative.
Furnish	Supply and deliver to installation location.
Furnished by Others	Receive delivery at job site or where called for and install.
Inspection	Visual observations by Owner's site Representative.
Install	Mount and connect equipment and associated materials ready for use.
Labeled	Refers to classification by a standards agency.
Make	Refer to the article, BASIS OF DESIGN.
Or Approved Equal	Approved equal or equivalent as determined by Owner’s Representative.
Owner’s Representative	The Prime Professional
Prime Professional	Architect or Engineer having a contract directly with the Owner for professional services.

Provide	Furnish, install and connect ready for use.
Relocate	Disassemble, disconnect, and transport equipment to new locations, then clean, test, and install ready for use.
Replace	Remove and provide new item.
Review	A general contractual conformance check of specified products.
Rough-in	Pipe, duct, conduit, equipment layout and installation.
Satisfactory	As specified in contract documents.
Site Representative	Construction Manager or Owner's Inspector at the work site.

Refer to General Conditions of the Contract for additional definitions.

1.6 BASIS OF DESIGN

A. The contract documents are prepared on basis of one manufacturer as "design equipment," even though other manufacturers' names are listed as acceptable makes. If Contractor elects to use one of the listed makes other than "design equipment," submit detailed drawings, indicating proposed installation of equipment. Show maintenance clearances, service removal space required, and other pertinent revisions to the design arrangement. Contractor shall provide changes in the work of other trades, at no increase in any contract. Provide larger electrical feeders, circuit breakers, equipment, additional control devices and other miscellaneous equipment required for proper operation, and assume responsibility for proper location of rough-in and connections by other trades. Remove and replace door frames, access doors, walls ceilings or floors required to install other than design make equipment. If revised arrangement submittal is rejected, revise and resubmit specified "design equipment" item which conforms to contract documents.

1.7 INTENT OF DRAWINGS

A. The drawings are diagrammatic, unless detailed dimensioned drawings are included. Drawings show approximate locations of equipment, fixtures, panelboards, conduits, and wiring devices. Exact locations are subject to the approval of the Owner's Representative.

B. The general run of electrical feeders, branch circuits, and conduits, indicated on the drawings, is not intended to be the exact routing. Circuit designations, in the form of "Home Runs" on branches, indicate the designation of the branch circuit, the size and the quantity of branch circuit conductors, and the panelboard or interconnection box from which the branch circuit is served.

C. In the event of conflict between the drawings and specifications, or discrepancies within either, this shall be brought to the attention of the Engineer for resolution prior to the submission of bids. In the event that the contractor fails to note these discrepancies prior to submission of bids or in writing with the bid submission, the Engineer shall resolve the discrepancy such that the design intent is provided. The contractor shall provide all labor, materials, and equipment to correct the installation deficiencies as defined by the Engineer.

1.8 QUALITY ASSURANCE

A. Manufactures of equipment shall be firms regularly engaged in the production of factory fabricated systems and equipment whose products have been in satisfactory use in similar service for not less than three (3) years.

B. Suppliers of equipment must have factory trained and authorized personnel for the service of all equipment provided.

PART 2 - PRODUCTS

2.1 SUBSTITUTIONS

A. The Materials, products and equipment described in the Bidding Documents establish a standard of required quality, functions, dimensions and appearance that must be met by any proposed substitution.

B. Proposed substitutions must be submitted to the Architect/Engineer a minimum of ten (10) days prior to the date for receipt of Bids. Each request shall include the name of the proposed material equipment being substituted, cut sheets, installation drawings, performance and test data and warranties. At that time the equipment or will be evaluated and if determined to be acceptable an Addendum will be issued to all bidders.

C. Requests for substitution shall be made only by a Bidder. Requests for substitution from sales representatives, vendors or suppliers are not acceptable and will not be considered.

2.2 MATERIALS

A. All materials, unless otherwise specified, shall be new and be the standard products of the manufacturer. Used equipment or damaged material will be rejected.

B. The listing of a manufacturer as “acceptable” does not indicate acceptance of a standard or catalogued item of equipment. All equipment and systems must conform to the Specifications.

2.3 U.L. LISTING

A. Equipment shall bear the Underwriter’s Laboratories (UL), or other approved agency listing label. This listing requirement applies to the entire assembly. Any modifications to equipment to suit the intent of the specifications shall be performed in accordance with the National Electric Code and listed by U.L.

2.4 SHOP DRAWINGS/PRODUCT DATA/SAMPLES

A. Submit Shop Drawings on all items of equipment and materials to be furnished and installed.

B. Submission of Shop Drawings and samples shall be accompanied by a transmittal letter, stating name of project and contractor, number of drawings, titles, and other pertinent data called for in individual sections. Refer to applicable Division 01 Section(s) for additional information and requirements.

C. All products specified in an individual Division 26, 27, and 28 specification sections shall be submitted at the same time and each Division Specification section shall have its own submittal. Number each submittal and do not combine multiple specification sections into a single submittal.

D. Shop Drawings Shall Be Dated and Contain:

1. Name of project
2. Name of prime professional;
3. Name of prime contractor;
4. Associated Specification Section, description or names of equipment, materials and items; and complete identification of locations at which materials or equipment are to be installed.
5. Incomplete submittals will not be accepted.
6. Indicate deviations from contract requirements on Letter of Transmittal.

E. Corrections or comments made on the Shop Drawings during the review do not relieve Contractor from compliance with requirements of the drawings and specifications.

F. The Contractor is responsible for confirming and correcting all quantities; checking electrical characteristics and dimensions; selecting fabrication processes and techniques of construction; coordinating his work with that of all other trades; and performing his work in a safe and satisfactory manner.

PART 3 - EXECUTION

3.1 COORDINATION DRAWINGS

A. Before construction work commences, Contractors for all trades shall submit Coordination Drawings in the form of color-coded paper drawings or electronic files (.dwg or .rvt) not less than 3/8" = 1'-0" scale. Coordination Drawings are required throughout all areas for all trades. These drawings shall identify and show resolutions of trade conflicts. Mechanical Equipment Rooms shall be drawn early in the Coordination Drawing process, simultaneous with all other congested areas. Prepare Coordination Drawings As Follows:

1. HVAC Contract will prepare the base plan Coordination Drawings showing all ductwork and all pertinent piping and equipment. These drawings may be AutoCAD or Revit format of the required ductwork Shop Drawings. The drawings shall be coordinated with cable tray, lighting fixtures, sprinklers, air diffusers, other ceiling mounted items, ceiling heights, structural work, maintenance clearances, electric code clearance, reflected ceiling plans, and other contract requirements. Re-position proposed locations of work after coordination drawing review by the Construction Manager and the Architect. Provide adjustments to exact size, location and offsets of ducts, pipes, conduit, etc., to achieve reasonable appearance objectives. Provide these adjustments as part of Base Bid Contracts. Minor revisions need not be redrawn.
2. HVAC Contract will provide AutoCAD or Revit files and prints and submit the base plan to all major trades' Contractors.
3. Electrical, Plumbing and Fire Protection Contracts will draft location of piping, raceways, cable trays, light fixtures and equipment on the base plan, such that a complete coordination of all trades is represented and areas of conflict and recommended resolutions are noted.
4. Do not install any equipment, equipment foundations, raceways, cable tray, lighting or cabling until Coordination Drawings have been approved. Failure to receive approval prior to installation of the aforementioned items, will put the risk on the contractor to remove and reinstall at the engineer’s discretion. Additional time spent by the engineer in the field reviewing construction progress due to not receiving coordination drawings prior, will be considered an additional service by the consultant, which shall be paid by the contractor and deducted from any moneys owed to the contractor. The consultant’s hourly rate will apply.

3.2 ELECTRONIC CAD DRAWING FILES

A. The Engineer may provide the Contractor with AutoCAD (.dwg) or Revit (.rvt) format files for this project with the understanding that these CAD files shall be used for reference purposes only, and not as shop drawings or as-built documents. It is the Contractors’ responsibility to provide detailed, coordinated shop drawings and documentation prior to installation. The purpose of the Contractors’ coordination shop drawings is to account for all trades and field conditions and identify any conflicts that shall be resolved prior to installation.

B. Any additional cost for changes due to conflicts as a result of the Contractors' failure to provide properly coordinated documents will be the responsibility of the Contractors and not of the Engineer.

C. A request must be made in writing to the Engineer with the requested individual files. The contractor will then be sent a CAD Release Form and must sign the form to obtain electronic drawings.

3.3 ROUGH-IN

A. Due to small scale of Drawings, it is not possible to indicate all offsets, fittings, changes in elevation, etc. Verify final locations for rough-ins with field measurements and with the equipment being connected. Verify exact location and elevations at work site prior to any rough-in work. **DO NOT SCALE PLANS**. If field conditions, details, changes in equipment or shop drawing information require a significant change to the original documents, contact the owners representative for approval before proceeding.

B. All equipment locations shall be coordinated with other trades to eliminate interference with required clearances for equipment maintenance and inspections.

1. Coordinate work with other trades and determine exact routing of all duct, pipe, conduit, etc., before fabrication and installation. Coordinate with Architectural Drawings. Verify with Owner's Representative exact location of all equipment in finished areas, such as thermostat, fixture and switch mounting heights, and equipment mounting heights. Coordinate all work with the architectural reflected ceiling plans and/or existing Architecture. Mechanical and electrical drawings show design arrangement only for diffusers, grilles, registers, air terminals, lighting fixtures, sprinklers, speakers and other items. Do not rough-in contract work without reflected ceiling location plans.
2. Before rough-in for equipment furnished by Owner or in other contracts, obtain from Architect and other Contractors, approved rough-in drawings giving exact location for each piece of equipment. Do not "rough-in" services without final layout drawings approved for construction. Cooperate with other trades to insure proper location and size of connections to insure proper functioning of all systems and equipment. Obtain written authorization from the Owners representative or other contractor for any "rough-ins" that, due to project schedule, are required before approved coordination drawings are available. Any work installed without written authorization or approved coordination drawings, causing a conflict will be relocated by the electrical contractor at no expense to the Owner.
3. For equipment and connections provided in this contract, prepare rough-in drawings as follows:

    a. Existing equipment being relocated: Measure the existing equipment and prepare drawings for installation in new location.
    b. New equipment: Obtain equipment rough-in drawings and dimensions, then prepare rough-in drawings.

4. Where more than one trade is involved in an area, space or chase, all shall cooperate and install their own work to utilize the space equally between them in proportion to their individual requirements. In general, ductwork shall be given preference except where grading of piping becomes a problem, followed by piping then electrical wiring. If, after installation of any equipment, piping, ducts, conduit, and boxes, it is determined that ample maintenance and passage space has not been provided, rearrange work and/or furnish other equipment as required for ample maintenance space. Any changes in the size or location of the material or equipment supplied, which may be necessary in order to meet field conditions or in order to avoid conflicts between trades, shall be brought to the immediate attention of the Owner's Representative and approval received before such alterations are made.

C. Provide easy, safe, and code mandated clearances at controllers, motor starters, valve access, and other equipment requiring maintenance and operation. Contractor shall relocate existing work in the way of new construction. VISIT SITE BEFORE BIDDING TO DETERMINE SCOPE OF WORK. Provide new materials, including new piping and insulation for relocated work.

D. All equipment requiring service and/or access shall be provided adequate clearances for this purpose. Any clearances described in manufacturer's information, code requirements, etc. shall be taken into account in determining final rough-in positions. Reasonable access for maintenance and service shall be maintained.

3.4 EXISTING SYSTEMS AND CONDITIONS

A. Prior to beginning work inspect and test all existing electrical systems that will be affected by the work in this contract. Provide a report to the Owner indicating any problems or defects found. If no problems or system defects are submitted, the contractor shall be responsible for correcting problems found at the completion of the project that are determined to be caused by the work of this contract.

B. Inspect the entire work area for defects in the existing construction such as scratches, holes etc. Submit a complete list and photographs of existing damage, to the owner prior to beginning work. If existing damage is not documented the contractor shall repair all damage to like new condition, that is determined to have been caused by the work in this contract.

3.5 ELECTRICAL INSTALLATIONS

A. All installations shall comply with the following requirements:

1. Coordinate electrical systems, equipment, and materials installation with other building components. Be responsible for any changes in openings and locations necessitated by the equipment installed.
2. The architect shall control the placement of all wall and ceiling mounted electrical equipment and devices in all rooms with the exception of mechanical and electrical equipment rooms. When drawing details are not available, consult with the Architects representative for actual location.

3. Verify all dimensions with field measurements.
4. Arrange for all chases, slots and openings in other building components that are not indicated on drawings, to allow for electrical installations.
5. Coordinate the installation of required supporting devices and sleeves to be set in poured-in-place concrete and other structural components, as they are constructed.
6. Coordinate ordering and installation of all equipment with long lead times or having a major impact on work by other trades so as not to delay the job or impact the construction schedule. Pay close attention to equipment that must be installed prior to building enclosure.
7. Where mounting heights are not detailed or dimensioned, install systems, materials and equipment to provide the maximum headroom possible.
8. Install systems, materials and equipment to conform with approved submittal data, including coordination drawings, to greatest extent possible. Conform to arrangements indicated by the Contract Documents, recognizing that portions of the work are shown only in diagrammatic form. Where coordination requirements conflict with individual system requirements, refer the conflict to the Architect.
9. Store Materials on dry base, at least 6" above-ground or floor. Store so as not to interfere with other work or obstruct access to buildings or facilities. Provide waterproof/windproof covering. Remove and provide special storage for items subject to moisture damage. Protect against theft or damage from any cause. Replace items stolen or damaged, at no cost to Owner.
10. Set all equipment to accurate line and grade, level all equipment and align all equipment components.
11. All tolerances in alignment and leveling, and the quality of workmanship for each stage of work shall be as required by the manufacturer and subject to approval by the owners representative.
12. All finished equipment surfaces damaged during construction shall be brought to “as new” condition by touch up or repainting. Any rust shall be removed and primed prior to repainting.
13. Workmanship shall be as called for in the “Standard of Installation” published by the National Electrical Contractors Association (NECA).
14. Provide all scaffolding, rigging, hoisting and services necessary for erection and delivery of equipment and apparatus furnished into the premises. These items shall be removed from premises when no longer required.
15. No electrical equipment shall be hidden or covered up prior to inspection by the owners representative. All work that is determined to be unsatisfactory shall be corrected immediately.
16. All electrical work shall be installed level and plumb, parallel and perpendicular to other building systems and components.
17. Conceal all contract work above ceilings and in walls, below slabs, and elsewhere throughout building. If concealment is impossible or impractical, notify Owner's Representative before starting that part of the work and install only after his approval. In areas with no ceilings, install only after Owner's Representative reviews and comments on arrangement and appearance.
18. Install access panel or door where units are concealed behind finished surfaces.

3.6 PAINTING

A. This Contract includes the following :

1. Painting for all cut and patch work performed as part of Division 26, 27, and 28 contract.
2. Painting required for touch-up of surfaces damaged due to the installation of electrical work.
3. Painting as required to repair finish of equipment furnished.
4. Painting of all surface mounted raceways in finished areas.

3.7 ELECTRICAL EQUIPMENT CONNECTIONS

A. Provide complete power connections to all electrical equipment. Provide control connections to equipment where indicated on the drawings. Provide a disconnect switch ahead of each piece of equipment receiving an electrical connection in accordance with the latest version of the National Electrical Code . Ground all equipment in accordance with the latest version of the National Electrical Code.

B. Provide all power wiring, electric equipment, control wiring, switches, lights, receptacles, and connections as required for proper equipment operation of Owner-Furnished Equipment and Equipment furnished by other contracts,

C. Refer to Manufacturer's drawings/specifications for requirements of special equipment. Verify connection requirements before bidding and confirm prior to rough-in.

3.8 CLEANING

A. After all tests are made and installations completed satisfactorily:

1. Thoroughly clean entire installation, both exposed surfaces and interiors.
2. Remove all debris caused by work.
3. Remove tools, surplus, materials, when work is finally accepted.

3.9 TEMPORARY FACILITIES

A. Refer to the Standard General Conditions of the Contract for Construction and Supplemental General Conditions.

3.10 CONTINUITY OF SERVICES

A. The building will be in use during construction operations. Maintain existing systems in operation within all rooms of building at all times. Refer to "General Conditions of the Contract for Construction" for temporary facilities for additional contract requirements. Schedules for various phases of contract work shall be coordinated with all other trades and with Owner's Representative. Provide, as part of contract, temporary mechanical and electrical connections and relocation as required to accomplish the above. Obtain approval in writing as to date, time, and location for shut-down of existing mechanical/electrical facilities or services.

3.11 START UP AND OWNER INSTRUCTIONS

A. Before acceptance of the work, furnish necessary skilled labor to operate all systems by seasons. Instruct the Owners designated personnel on the proper operation and maintenance of systems and equipment. Obtain written acknowledgment from person instructed prior to acceptance repeat the instructions if asked to do so. Contractor is fully responsible for systems until acceptance, even though operated by Owner's personnel, unless otherwise agreed in writing. Provide, operating, maintenance and starting precautions and procedures to be followed by the Owner for operating systems and equipment. Mount the instruction in clear plastic holder on or adjacent to the equipment.

B. Where supervision by a manufacturer is called for, provide manufacturer’s certified technician or engineer to supervise the startup, testing and adjustment of the equipment or system. Where two or more manufacturers are involved (i.e., variable frequency drive and air handling unit) both manufacturer’s shall be present at start up. The manufacturer shall provide a written report detailing the testing and start-up including problems that occurred and their method of resolution.

C. Refer to Division 01 Specifications for additional startup and Contract Closeout requirements.

3.12 OPERATION AND MAINTENANCE MANUALS

A. Provide Operation and Maintenance Manuals. Include one copy each of approved Shop Drawings, wiring diagrams, piping diagrams, spare parts lists, as-built drawings and manufacturer's instructions. Include typewritten instructions, describing equipment, starting/operating procedures, emergency operating instructions, seasonal changeover, freeze protection, precautions and recommended maintenance procedures. Include name, address, and telephone number of supplier manufacturer Representative and service agency for all major equipment items.

B. Bind above items in a three-ring binder with name of project on the cover. Deliver to Owner’s Representative before request for acceptance. Provide copy of O&M manual in electronic format on media acceptable to the Owner. All documents shall be in searchable PDF format, with the exception of record drawings with shall be provided in AutoCAD compatible drawing format.

3.13 RECORD DOCUMENTS

A. In addition to all requirements elsewhere in the Contract Documents, prepare and provide record documents of the as-constructed work which meets the following standards:

1. Document the routing major raceway systems, location of control devices, branch circuit numbers for all devices and equipment and fuse and circuit breaker sizes for major equipment and branch circuit home runs.
2. Provide stamp on each drawings including: Company Name, Date and “Record Drawings”
3. Refer to each Division 26, 27 and 28 section for additional items to be included in the record drawings.

4. Incorporate all field changes, change orders, and other modifications into the final Record Drawings.
5. Record Drawings shall contain all corrections from construction documents to as-built conditions and shall be submitted for review and approval.
6. Drawing Format:

    a. Documents shall be provided in PDF format, or where fully developed in CAD, in AutoCAD compatible file format. Submittal media shall be as acceptable to the Owner and Engineer.
    b. Drawing scale shall not be less than 3/8" = 1'-0".

3.14 REMOVALS

A. Where existing equipment removals are called for, submit complete list to Owner's Representative. All items that Owner wishes to retain that do not contain asbestos or PCB Material shall be delivered to location directed by Owner. Items that Owner does not wish to retain shall be removed from site and legally disposed of. Removal and disposal of material containing asbestos and/or PCB's shall be in accordance with Federal, State and Local law requirements. Where equipment is called for to be relocated. Contractor shall carefully remove, clean and recondition, then reinstall. Remove all abandoned piping, wiring, equipment, lighting, ductwork, tubing, supports, fixtures, etc. Visit each room, crawl spaces and roofs to determine total Scope of Work.

B. Completely remove all piping, conduit, controls, and other devices associated with the equipment not to be reused in the new work. This includes all equipment, conduit, junction boxes, devices, panels, and all hangers, including the top connection and any fastenings to building structural systems. Patch, paint and seal all removals, openings and other penetrations in roof, walls, ceilings, floors, in an approved manner and in accordance with plans and specifications where specifically covered. Structural integrity of the building system shall be maintained. Reference shall also be made to the architectural, structural, mechanical, site, and electrical drawings and specifications for additional facilities to be demolished or handled.

3.15 ASBESTOS RECOGNITION AND PRECAUTIONS

A. The contractor shall be responsible for coordination of all required removal work, coring, cutting and patching with the owners asbestos management plan. Prior to performing such work identify areas containing asbestos. Notify the Owner so that they may make arrangements for abatement and/or containment prior to work proceeding. The contractor shall be responsible for cleaning all areas where asbestos is released due to the failure to coordinate with the asbestos management plan. Refer to Division 1 sections for further requirements.

B. The disturbance or dislocation of asbestos-containing materials causes asbestos fibers to be released into the building's atmosphere, thereby creating a health hazard to workmen and building occupants. Consistent with Industrial Code Rule 56 and the content of recognized asbestos-control work, the Contractor shall apprise all of his workers, supervisory personnel, subcontractors, Owner and Consultants who will be at the job site of the seriousness of the hazard and of proper safeguards and work procedures which must be followed, as described in New York State Department of Labor Industrial Code Rule 56.

C. Refer to Division 2 sections for further requirements.

3.16 ADDITIONAL ENGINEERING SERVICES

A. In the event the Consultant is required to provide additional engineering services as a result of substitution of equivalent materials or equipment by the Contractor, or changes by the Contractor in dimension, weight, power requirements, etc., of the equipment and accessories furnished, or if the Consultant is required to examine and evaluate any changes proposed by the Contractor for the convenience of the Contractor, then the Consultant's hourly rate and expenses in connection with such additional services shall be paid by the Contractor and shall be deducted from any moneys owed to the Contractor.

B. In the event the Consultant is required to provide additional engineering services as a result of Contractor's errors, omissions or failure to conform to the requirements of the Contract Documents, or if the Consultant is required to examine and evaluate any changes proposed by the Contractor solely for the convenience of the Contractor, then the Consultant's hourly rate and expenses in connection with such additional services shall be paid by the Contractor and shall be deducted from any moneys owed to the Contractor.

C. In the event the Consultant is required to initiate design changes due to failure of the contractor to properly coordinate with the construction schedule, and / or other trades, then the Consultant’s hourly rate and expenses in connection with such additional services shall be paid by the Contractor and shall be deducted from any moneys owned to the Contractor.

END OF SECTION

SECTION 260100 - BASIC MATERIALS AND METHODS

PART 1 - GENERAL

1.1 SCOPE

A. Minimum composition requirements and/or installation methods for the following materials and work are included in this section:

1. Miscellaneous Supports
2. Access Doors and Panels
3. Fire Stopping
4. Boxes and Cabinets
5. Equipment Pads, Bases and Supporting Devices
6. Identification
7. Arc Flash Hazard Warning Labels

1.2 SUBMITTALS

A. Product data for:

1. Boxes and Cabinets
2. Fire Stopping Materials
3. Arc Flash Hazard Warning Labels

1.3 QUALITY ASSURANCE

A. The contractor shall engage the services of a qualified installer for the installation and application of joint sealers, flashing, access panels, and cutting and patching.

B. All work shall be done in a neat and workmanlike manner. All methods of construction, details of workmanship, that are not specifically described or indicated in the contract documents, shall be subject to the control and approval of the Owner's Representative. Equipment and materials shall be of the quality and manufacture indicated. The equipment specified is based upon the acceptable manufacturers listed. Where "approved equal" is stated, equipment shall be equivalent in every way to that of the equipment specified and subject to approval.

C. Materials specified herein shall comply with the applicable requirements of :

1. The following Articles of the National Electric Code (NFPA 70)

a. 314 - Outlet, Device, Pull and Junction Boxes, Conduit bodies and fittings
b. 312 - Cabinets, Cutout Boxes and Meter socket Enclosures

PART 2 - PRODUCTS

2.1 MISCELLANEOUS SUPPORTS

A. Metal bars, plates, tubing, etc. shall conform ASTM standards:

1. Steel plates, shapes, bars, and grating - ASTM A 36
2. Cold-Formed Steel Tubing - ASTM A 500
3. Hot - Rolled Steel Tubing - ASTM A 501
4. Steel Pipe - ASTM A 53, Schedule 40, welded

B. Metal Fasteners shall be Zinc-coated (type, grade and class as required)

2.2 ACCESS DOORS AND PANELS

A. Steel access doors and frames shall be factory fabricated and assembled units, complete with attachment devices and fasteners ready for installation. Joints and seams shall be continuously welded steel, with welds ground smooth and flush.

B. Construction:

1. Frames:

   a. 16 gage steel with 1 inch wide exposed perimeter flange and adjustable masonry anchors for units installed in masonry, pre-cast, cast in place concrete, ceramic tile.
   b. 16-gage steel, perforated flanges with bead for gypsum or plaster wall board.
   c. 16-gage steel with galvanized expanded metal lath and exposed casing bead, welded to perimeter of frame for full bed plaster applications.

2. Access Doors:

   a. Provide 14 gage sheet steel flush panel doors with concealed continuous piano hinge factory installed, primed and painted, set to open 175 degrees.
   b. Provide fire rated, insulated flush panel doors, with continuous piano hinge and self-closing mechanism rated for 1 ½ hour “B” labeled, in fire rated partitions.

C. Provide flush, screwdriver operated cam locks on all access doors.

2.3 FIRE STOPPING

A. Fire-stopping for Openings Through Fire and Smoke Rated Walls and Floor Assemblies shall be listed or classified by an approved independent testing laboratory for "Through-Penetration Fire-Stop Systems”. The system shall meet the requirements of "Fire Tests of Through-Penetration Fire-Stops" designated ASTM E814.

B. Acceptable Manufacturers:

1. Dow Corning Fire-Stop System Foams and Sealants
2. Nelson Electric Fire-Stop System Putty, CLK and WRP

3. Thomas & Betts - S-100 FS500/600
4. Specified Technologies Inc. (STI)
5. Hilti Firestop Systems

2.4 BOXES AND CABINETS

A. Outlet Boxes and Covers

1. General Use Boxes shall be galvanized steel, not less than 1-1/2" deep, 4" square or octagonal, with knockouts. Outlet boxes exposed to moisture, exterior, wet or damp locations shall be cadmium cast alloy complete with threaded hubs and gasketed screw fastened covers. Minimum box size shall be as indicated in Article 314 of the National Electrical Code for the conductors and devices installed. Boxes shall be approved for the environmental condition of the location where they will be installed.
2. Boxes installed in damp or wet locations shall be of rain tight construction with gasketed cover and threaded conduit hubs. In no case shall boxes be sized smaller than as indicated in Article 314 of the National Electrical Code for conduit and conductor sizes installed. Boxes shall be approved for the environmental condition of the location where they will be installed.
3. Acceptable manufacturers:

    a. Steel City
    b. RACO
    c. Appleton
    d. Crouse Hinds

B. Floor Outlet Boxes

1. For in slab new or existing construction locations - Provide flush cover service for power or communications/data as called for. Boxes shall be suitable for carpet or tile applications with suitable flange to match finish. Stamped steel, concrete tight, fully adjustable box for above grade. Cast for below or at grade. Provide with larger knockouts where called for on applicable detail. Complete with expandable cap to prevent ingress of concrete during pour. Provide integrated carpet plate/duplex floor plate and duplex receptacle where called for.
2. For above grade applications - Provide UL listed 2-hour rated poke-thru service with power/data/low-voltage outlets. Cover shall have leveling screws with floor flange. Shall include separate metal sleeve for low-voltage and power. Provide with integrated power and low-voltage connectivity jacks where called for on applicable detail.
3. Flush floor junction boxes shall be recessed cover boxes designed for flush mounting in masonry. Provide checkered plate gasketed cover suitable for foot traffic.
4. Acceptable Manufacturers: Hubbell, Legrand

C. Pull and Junction Boxes

1. Shall be constructed of not less than 14 gauge galvanized steel with trim for flush or surface mounting in accordance with the location to be installed. Provide screw-on type covers. Boxes installed in damp or wet locations shall be of rain tight construction with gasketed cover and threaded conduit hubs. In no case shall boxes be sized smaller than as indicated in Article 314 of the National Electrical Code for conduit and conductor sizes installed. Boxes shall be approved for the environmental condition of the location where they will be installed.
2. Acceptable manufacturers:

    a. Hoffman
    b. Keystone
    c. Cooper B-Line
    d. Custom fabricated per. NEC and UL guidelines

D. Terminal and Equipment Cabinets:

1. Terminal and Equipment Cabinets shall be code gauge galvanized steel with removable end walls. Fronts shall be of code gauge steel, flush or surface type (as indicated) with concealed trim clamps, concealed hinges, flush lock, and grey baked enamel finish. Boxes and front shall be U.L. listed and shall be minimum 35"H x 24"W x 6"D. Provide removable insulated plywood terminal board mounted on inside back wall of cabinet.
2. Acceptable manufacturer:

    a. Square D "Mono-Flat"
    b. Approved equal

2.5 EQUIPMENT BASES, PADS AND SUPPORTING DEVICES

A. Supports, support hardware and fasteners shall be protected with zinc coating or treatment of equivalent corrosion resistance using approved alternative treatment, finish or inherent material characteristic. Products used for outdoor applications shall be hot dipped galvanized.

B. Provide clevis hangers, riser clamps, conduit straps, threaded c-clamps with retainers, ceiling trapeze hangers, wall brackets and spring steel clamps as applicable.

C. 14-gauge U-Channel systems with 9/16-inch diameter holes at a minimum of 1-7/8 inches on center in the top surface. Provide fittings and accessories that match channel.

D. Provide carbon steel or wedge or sleeve type expansion anchors, steel spring head toggle bolts and heat-treated steel power driven threaded stud fastening equipment as required by construction types.

E. Provided field fabricated supporting devices such as angles, channels, pipe supports, etc. All fabricated supports shall be of metal construction.

F. Acceptable Manufacturers:

1. Allied Tube
2. American Electric
3. B-Line
4. Unistrut Diversified Products
5. Cooper Industries
6. Killark Electric Mfg. Co.
7. O/Z Gedney
8. Spring City Electrical Mfg. Co.
9. Thomas & Betts Corporation

2.6 ROOF PENETRATION FLASHING AND SEALING

A. Opening through roofs shall be flashed in manner not to affect roof guarantee or bond. Engage qualified Roofing Contractor licensed by the Roofing Manufacturer, as part of contract. Provide non-ferrous flashing pieces, EDPM skirts, EDPM hoods and collars as required to make ducts, pipes, conduits, and other penetrations watertight. Where curbs are called for with respect to rectangular openings in new roofs, flashing will be done by others unless specifically indicated otherwise. Caulk and waterproof with additional material so as to seal airtight and watertight.

B. Design Equipment: RPS.

C. Acceptable Manufacturers: Pate, Shipman & Son.

2.7 IDENTIFICATION

A. Equipment Identification Nameplates

1. Machine engraved, plastic laminated labels, signs and instruction plates.
2. Material: Engraving stock melamine plastic laminate.
3. Thickness:

   a. 1/16-inch minimum thick for signs up to 20 square inches or 8 inches in length.
   b. 1/8-inch thick for larger sizes.

4. Color:

   a. Background: Black
   b. Lettering: White

5. Text:

   a. Equipment Designation: Helvetica 3/8" lettering.
   b. Supplementary Information (i.e. source, location, nominal voltage, etc.): Helvetica 3/16” lettering.

6. Identification nameplates shall be punched and permanently affixed to the equipment via stainless steel mechanical fasteners.

B. Wiring Device Labeling

1. 0.5” tall, plastic, tear resistant, printer tape label.
2. Color: Black text on clear tape.

C. Raceway & Cable Labeling

1. Adhesive marking labels for raceway. The labels shall indicate voltage and service, and be located above ceilings every 75 feet and on wall mounted conduit in mechanical and equipment rooms.
2. Colored self-adhesive vinyl tape, minimum 3 mils thick by 1 inch wide for all phase marking on cable.

D. Underground Conduit and Cabling Labeling

1. 6-inch wide, red colored, warning ribbon plastic tape compounded for direct-burial services. Ribbon shall have aluminum backing making it easy to locate using a non-ferrous locator. Ribbon shall include continuous lettering reading “CAUTION BURIED ELECTRIC LINE BELOW” or similar.

2.8 ARC-FLASH HAZARD WARNING LABELS

A. Standard Label for All Electrical Equipment:

1. Multi-colored self-adhesive vinyl label, minimum dimension 5” wide x 3” high.
2. Shall designate the arc flash hazard for equipment in accordance with NFPA 70E.
3. Label shall include the following information:

    a. Text reading: “⚠WARNING ARC FLASH & SHOCK HAZARD APPROPRIATE PPE REQUIRED”
    b. Nominal system voltage
    c. Arc Flash Boundary

B. Acceptable Manufacturers:

1. W.H. Brady Co.
2. Markal Corp.
3. National Band & Tag Company
4. Panduit Corporation
5. Cole-Flex Corporation

PART 3 - EXECUTION

3.1 ACCESS DOORS AND PANELS

A. Install access doors, sized to permit complete access for any concealed and/or inaccessible junction boxes, control and monitoring devices, duct mounted fire alarm detectors and other electrical equipment requiring access for maintenance or operation.

B. Set frames accurately in position and securely attach to supports with face panels plumb and level in relation to adjacent finish surfaces.

C. Adjust hardware and panels after installation for proper operation.

3.2 FIRE STOPPING

A. Installation of Fire-stopping for Openings Through Fire and Smoke Rated Walls and Floor Assemblies shall be as follows:

1. Provide fire-stop system seals at all locations where piping, tubing, conduit, electrical busways/cables/wires, ductwork and similar utilities pass through or penetrate fire rated wall or floor assembly. Provide fire-stop seal between sleeve and wall for dry wall construction.
2. The minimum required fire resistance ratings of the wall or floor assembly shall be maintained by the fire-stop system. The installation shall provide an air and watertight seal.
3. The methods used shall incorporate qualities that permit the easy removal or addition of electrical conduits or cables without drilling or use of special tools. The product shall adhere to itself to allow repairs to be made with the same material and permit the vibration, expansion and/or contraction of any items passing through the penetration without cracking, crumbling and resulting reduction in fire rating.
4. Provide rigid steel sleeves where non-armored cables pass through fire rated walls and barriers.

3.3 BOXES AND CABINETS

A. Consider location of outlets, wiring devices, motor control equipment and other electrical equipment shown on drawings as approximate only. Study architectural, process piping, mechanical, plumbing, structural, roughing-in, etc., drawings and note surrounding areas in which each outlet or equipment is to be located. Locate outlet and electrical equipment so that when fixtures, motors, cabinets, equipment, etc., are placed in position, outlet or electrical equipment will serve its desired purpose. Where conflicts are noted between drawings, contact Owner's Representative for decision prior to installation. Comply with Article 314 of National Electrical Code relative to position of outlet boxes in finished ceilings and walls.

B. Outlet boxes in separate rooms shall not be installed "back-to-back" without the approval of the Owner's Representative.

C. Outlet boxes shall be sized to accommodate the wiring device(s) to be installed.

D. Outlet boxes installed in plaster, gypsum board or wood paneled walls shall be installed with raised plaster covers or raised tile covers.

E. Outlet boxes installed in tile, brick or concrete block walls shall be installed with extra-deep type raised tile covers or shall be 3-1/2" deep boxes with square corners and dimensions to accommodate conductors installed.

F. Surface ceiling mounted outlet boxes shall be minimum 4" square, 1-1/2" deep, galvanized sheet metal.

G. Surface wall mounted outlet boxes shall be cast type boxes having threaded or compression type threadless hubs. Exterior boxes shall be cast type with threaded hubs and gasketed cover plates secured by non-ferrous screws.

H. Floor outlet boxes shall be installed flush with finished floor, adjust level and tilt as required. Where finished floor is terrazzo, provide boxes specifically designed for installation in terrazzo. Where floors are to receive carpet or tile, provide floor outlet with proper flange.

I. Install junction and pull boxes in readily accessible locations. Access to boxes shall not be blocked by equipment, piping, ducts and the like. Provide all necessary junction or pull boxes required due to field conditions and size as required by the National Electrical Code.

3.4 OUTLET BOX ROUGH-IN HEIGHTS:

A. Unless otherwise noted, mount devices and equipment at heights measured from finished floor to device/equipment centerline, except fire alarm as follows:

1.	Light switches	46"
2.	Receptacle outlets	18"
3.	Receptacle outlets, above hot water or steam baseboard heaters. Do not install receptacle outlets above electric baseboard heaters.	30"
4.	Receptacle outlets, hazardous areas	48"
5.	Receptacle outlets, weatherproof, above-grade	24"
6.	Secondary Clock	90"
7.	Wall Mounted Public Address Speaker	90”
8.	Horn Type Public Address Speaker	Min. 180”
9.	Large Venue Fire Alarm Speaker	Min. 180”
10.	Data outlets	18"
11.	Telephone outlets, wall mounted	46"
12.	Fire alarm manual station	46"
13.	Fire alarm audio/visual (bottom of device)	80"
14.	Branch circuit panelboards, to top of backbox	72"
15.	Distribution panelboards, to top of backbox	72"
16.	Terminal cabinets, control cabinets	72"
17.	Disconnect switches, motor starters, enclosed circuit breakers	48"
18.	Roof mounted receptacles and disconnect switches	24”
19.	Where structural or other interference’s prevent compliance with mounting heights listed above, consult Owner's Representative for approval to change location before installation.	

3.5 EQUIPMENT PADS, BASES AND SUPPORTING DEVICES

A. Hangers and Supports:

1. Provide steel angles, channels and other materials necessary for the proper support and erection of motor starters, distribution panelboards, large disconnect switches, pendant-mounted lighting fixtures, etc.
2. Panelboards, cabinets, large pull boxes, cable support boxes and starters shall be secured to ceiling and floor slab and not supported from conduits. Small panelboards, etc., as approved by Owner's Representative, may be supported on walls. Racks for support of conduit and heavy electrical equipment shall be secured to building construction by substantial structural supports.

B. Concrete Pads for Floor Mounted Equipment:

1. Provide concrete bases for all floor mounted equipment. Provide 4,000 lb. concrete, chamfer edges, trowel finish, and securely bond to floor by roughening slab and coating with cement grout. Provide a minimum of one ½" rebar dowel for every 2 square feet of base area, anchored 2" into floor and base to eliminate movement, minimum of 4 dowels per base. Bases shall be 4" high (unless otherwise indicated); shape and size to accommodate equipment, to extend 4" beyond equipment footprint in all directions. Set anchor bolts in sleeves before pouring. After anchoring and leveling, fill equipment bases with grout.

3.6 IDENTIFICATION

A. Provide equipment identification nameplates on the outside of the enclosure for all equipment indicating the following information:

1. Switchgear, Switchboards, Panelboards, Transformers, Motor Control Centers, Equipment Cabinets, Control Panels, Generators, Uninterruptable Power Supplies:

    a. Equipment designation.
    b. Source and location of the source.
    c. Nominal system voltage.

2. Contactors, Disconnect Switches, Enclosed Circuit Breakers:

    a. Equipment designation.
    b. Source and location of the source.
    c. Nominal system voltage.
    d. Location of the load that the switch or breaker serves.

3. Motor Controllers:

    a. Motor designation.
    b. Type of service.
    c. Source and location of the source.
    d. Nominal system voltage.

e. Location of the motor.

4. Transfer Switches:

a. Equipment designation.
b. Equipment designation and location of the first downstream distribution device served.
c. Normal and standby/emergency sources and location of the sources.
d. Nominal system voltage.

B. Provide equipment identification nameplates for each circuit breaker in all switchgear, switchboards and distribution panelboards listing the panelboard or equipment load connected to each device.

C. Provide wiring devices labeling of all wiring devices. Labeling shall be attached to the outside of the device face plate. Label shall indicate the following information:

1. Panelboard designation and circuit number from which it originates.

D. Provide permanent black marker labeling on all pull boxes and junction boxes indicating the following information:

1. Power & Lighting:

a. Feeder, branch circuit, and circuit numbers on cover.
b. Source(s) and location(s) of the sources.
c. Load(s) and location(s) of the load(s) served.
d. Nominal system voltage.

2. Systems:

a. System type.
b. Panelboard designation and circuit number from which it originates, if applicable.
c. Equipment location(s) from which enclosed cables originate.
d. Equipment and location(s) of the equipment served.
e. Nominal system voltage.

E. Feeders Circuits, Branch Circuits, Control Circuits:

1. 600-volts and Below:
a. Provide cable tags, wire markers, and phase identification tape as appropriate.
b. Identify circuits in each junction box, pull box, outlet box, enclosure, wireway, manhole, handhole, lighting standard base, and at each termination.
c. Identify with source panelboard, circuit number, load, and location served.
d. Include the identification of the building from which it originates for exterior circuits.

2. Above 600-volts:

    a. Cables shall be identified at each manhole, handhole, junction box, transformer, switch, and at each termination using cable tags.
    b. Identify nominal voltage, circuit number, circuit size, load served, and equipment designation/location from which it originates.
    c. Exposed conduit runs shall be identified continuously reading "DANGER – 4,160 VOLTS" or as appropriate.

F. Underground Conduits & Circuits

1. Provide warning ribbon above the underground electrical installation and 12-inches below finished grade or as appropriate.

G. Empty Conduit Runs and Conduits with Conductors for Future Use:

1. Provide cable tags.
2. Indicate proposed future use.
3. Label conduits and conductors at both ends, including location of another end.

H. Provide complete, typed directory for each panelboard listing the room number, function, etc., for each circuit. Provide updated, typed panelboard directories for all existing panelboards affected by this work.

3.7 ARC-FLASH HAZARD WARNING LABELS

A. Provide a standard arc-flash hazard warning label at all new electrical equipment including but not limited to switchboards, switchgear, panelboards, meter socket enclosures, and motor control centers.

B. Provide an arc-flash hazard warning label at the main service equipment. The design engineer will share the available fault current data with the contractor upon request. The contractor shall obtain the clearing time of the service overcurrent protective device(s) from the equipment manufacturer based on the available fault current and the time-current characteristics of the device being provided.

3.8 FLASHING AND SEALING

A. Opening through roofs shall be flashed in manner not to affect roof guarantee or bond. Engage qualified Roofing Contractor licensed by the Roofing Manufacturer, as part of contract. Provide non-ferrous flashing pieces, EDPM skirts, EDPM hoods and collars as required to make ducts, pipes, conduits, and other penetrations watertight. Where curbs are called for with respect to rectangular openings in new roofs, flashing will be done by others unless specifically indicated otherwise. Caulk and waterproof with additional material so as to seal airtight and watertight.

3.9 CUTTING AND PATCHING

A. Provide all required Cutting and Patching as outlined in the Summary of Work, Division 1 Specifications.

B. Provide priming and finish coat of paint on walls and surfaces at locations of removed raceways and equipment locations. The paint color and sheen shall match the existing surrounding finish.

C. All penetrations through masonry walls and floors shall be patched with Sakrete FastSet Non-Shrink 3-hour 2,000 psi Grout or equal.

D. All penetrations thru drywall where electrical materials were removed shall be patched with cores or partial pieces of 5/8" minimum thickness drywall and (3) three sanded coats of drywall compound. This shall be followed by priming and painting.

E. The following requirements apply:

1. Perform cutting, fitting and patching of electrical equipment in all following cases:

    a. To uncover work for installation of poorly coordinated or ill-timed electrical work.
    b. To remove and replace defective work.
    c. To remove and replace work not conforming to requirements of the Contract Documents.

2. Remove samples of installed work as specified for testing.
3. Install equipment and materials in existing structures.
4. Cut, remove and legally dispose of all electrical equipment, components, and materials as called for and all other items not indicated on plans but made obsolete by the installation of new work.
5. Protect the structure, furnishings, finishes and adjacent materials not being removed and maintain temporary.

END OF SECTION

SECTION 260513 - MEDIUM-VOLTAGE CABLES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide all labor, materials, tools, and equipment required for the complete installation of work called for in the Contract Documents

1.2 SCOPE

A. This section includes minimum requirements for the following:

1. Medium Voltage Conductors
2. Connectors and Terminations
3. Test Reports

1.3 SUBMITTALS

A. Provide product data for the following:

1. Medium Voltage Conductors
2. Connectors and Terminations
3. Test Reports

1.4 QUALITY ASSURANCE

A. All conductors shall be installed in a neat and workmanlike manner. All methods of construction that are not specifically described or indicated in the contract documents shall be subject to the control and approval of the Owner's Representative. Equipment and materials shall be of the quality and manufacture indicated. The equipment specified is based upon the acceptable manufacturers listed. Where "approved equal" is stated, equipment shall be equivalent in every way to that of the equipment specified and subject to approval.

B. Medium Voltage cable shall be installed, terminates, and tested by qualified individuals.

C. Materials specified herein shall comply with the applicable requirements of :

1. The following Articles of the National Electric Code (NFPA 70)

   a. 300 - Wiring Methods
   b. 310 - Conductors for General Wiring
   c. 328 - Type MV Medium Voltage Cable

2. The following U.L. Standards:

   a. UL 1072 Medium-Voltage Power Cables

PART 2 - PRODUCTS

2.1 MEDIUM VOLTAGE CONDUCTORS

A. Description:

1. To be suitable for underground distribution in conduit systems; suitable for use in wet or dry locations, direct burial, underground duct, and where exposed to sunlight.
2. Cable shall consist of single-conductor, shielded, ethylene propylene rubber (EPR) insulated, polyvinyl chloride (PVC) jacketed, rated for **[15,000]** volts, 133 percent insulation level service.

B. Construction:

1. Cable shall consist of single-conductor, shielded, ethylene propylene rubber (EPR). Insulation thickness shall be in accordance with ANSI/ICEA S-94-649 and UL 1072. A non-hydroscopic insulating shield shall be applied over the insulation for stress control. The center conductor shall be covered with a layer of extruded semiconducting compound completely covering the conductor and firmly bonded to the insulation.
2. Shielding shall consist of a semi-conducting insulating shield applied over the EPR insulation, and a 5 mil thick bare copper tape with a minimum 12.5 percent overlap applied over this shield. A non-hydroscopic separator tape may be applied over the copper tape as necessary.
3. All conductors shall be Class B, compressed or compact, soft copper stranding per ASTM B8, B496.
4. Cable and insulation shall be rated for 105 degree C temperature, with an emergency rating of 140 degree C.
5. Printing on outer jacket indicating manufacturer, conductor size, material, voltage rating, and date of manufacture.
6. All cable shall comply with the following standards: ASTM B8, ASTM B496, ICEA S-97-682, ICEA S-93-639, UL 1072 and AEIC CS8.

C. Acceptable manufacturers:

1. Kerite
2. Southwire
3. General Cable
4. Okonite
5. Prysmian

2.2 MEDIUM VOLTAGE TERMINATIONS AND SPLICES

A. Terminations and splicing for Medium Voltage Cables:

1. Cable Splicing / Termination Kits, at rated voltage, shall be provided for all cable splices and terminations. Do not field fabricate "T" splices. Kits shall include a high dielectric constant stress relief tube for maximum distribution of the electrical field, Silicone rubber terminations, mechanical ground strap assembly, shielding tape, semi conducting tape, silicone rubber tape, silicone grease and cable preparation kit.

2. The sealant between main and tap conductors shall be a heat-activated mastic to eliminate taping. A complete wraparound heat-shrinkable jacket with mechanically interlocked jacket shall surround and protect the finished splice.
3. Splicing kit shall also include the following:

    a. Provide with manufacturer recommended crimp connectors to bond conductors.
    b. Provide with manufacturer recommended grounding shields, braid, and accessories.
    c. Stress relief shielding and control tube between conductors.

4. "Y" Splice Design Make: Tyco Raychem HVSY series or Approved Equal

B. Lug Type Terminations

1. Electro-tin plated copper body
2. Internally beveled barrel end
3. Crimp areas clearly marked for hydraulic or power operated crimping tool
4. Rated for 600V thru 35 kV
5. #8 AWG to #2/0 AWG - Long barrel, compression type, one hole lug
6. #3/0 AWG and larger - Long barrel, compression type, two hole lug
7. Design Make: Burndy "Hylug" or Approved Equal

C. Termination Hardware Acceptable Manufacturers:

1. Burndy
2. Elastimold
3. General Electric
4. 3-M Company
5. PLM Industries

D. End Caps

1. Heat-shrinkable tubing available to accommodate cable sizes from #4 AWG thru 1000 KCM in 15kV and 25kV cables.
2. Design Make: Tyco Raychem or Approved Equal

PART 3 - EXECUTION

3.1 MEDIUM VOLTAGE WIRE AND CABLE

A. General

1. Install cables in raceway as called for after the entire raceway system has been completed.
2. Install splices and connections in accessible outlet, pull, and junction boxes.
3. Insulate all splices and connections with UL listed assemblies.
4. All wiring systems shall be properly grounded and continuously polarized throughout, following the color coding specified.

5. Provide insulated grounding conductor in each raceway or splice kit to combine internal grounding conductors in medium voltage conductors where cable type allows.
6. Feeder conductors shall be continuous from point of origin to load termination without splice. If this is not practical, contact the Owner's Representative and receive written approval for splicing prior to installation of feeder(s). Where feeder conductors pass through junction and pull boxes, bind and lace conductors of each feeder together. For parallel sets of conductors, match lengths of conductors.
7. Where multiple conductors are installed in a common raceway they shall be pulled simultaneously. Use of pulling compound or lubricant shall be avoided unless absolutely necessary. Where pulling lubricant is required, use UL approved compounds approved for cable type. Lubricant shall meet all OSHA and Toxic Control Act standards.

APPLICATION	CABLE TYPES	DESIGN MAKE
General purpose Construction & Maintenance	Rubber, Neoprene, Nylon, PVC, High Density, XLP, Hypalon	Ideal – Yellow 77
High Temperature Construction & Maintenance	Rubber, Neoprene, Nylon, PVC, High Density, XLP, Hypalon, Low Density Polyethylene, Semiconducting Jacket	Ideal – Yellow 190
Utility Construction & Maintenance	Rubber, Neoprene, Nylon, PVC, High Density, XLP, Hypalon, Low Density Polyethylene, Semiconducting Jacket	Aqua-Gel II
Cold Weather Construction & Maintenance	Rubber, Neoprene, Nylon, PVC, High Density, XLP, Hypalon, Low Density Polyethylene, Semiconducting Jacket	Aqua-Gel CW

8. Use pulling means including fish tape, cable, rope and basket type grips which will not damage cables or raceways.
9. Color code all conductors at all pullboxes, enclosures, and terminations.

3.2 TYPE MV MEDIUM VOLTAGE CABLE

A. Provide heat-shrink end caps on all medium voltage cable for transport, storage, and during pulling. Any water egress into cables shall be completely eliminated prior to use.

B. Cable ends shall be properly sealed against ingress of moisture and mechanically protected against damage until splices and terminations are completed (time period between cable pull and make-up of splices and terminations). Apply caps immediately after stripping to prevent the entrance of moisture.

C. Pull cable in accordance with manufacturer's recommendations, do not exceed 80 percent of maximum pulling tension.

D. When splicing cable, provide appropriate kits to bond to existing separate equipment grounding conductor or concentric neutral assembly in insulated cables.

E. Clean and flush conduit and ducts prior to pulling in cable.

F. Do not exceed manufacturer's recommendations for bending cable.

G. Train cables at termination points with slight curvature to take stress associated with thermal dimensional changes.

H. Neatly support cables at all locations and by racks in manholes. Each rack shall have cable support insulators. Secure conductors to racks with heavy duty nylon tie-wraps or other approved means.

I. Repair damage to existing cables and to electrical system that may occur due to working in or on existing manholes, as part of the contract. Clean existing cables prior to any splicing per. manufacturer requirements.

J. Cable shall be supported at four foot intervals with racks, straps, hangers or similar fittings in accordance with the manufacturer's requirements. Properly support terminations and splices; provide manhole support racks at each splice.

K. Bend radius shall not be less than five times the external diameter for cable up to and including ¾" and not less than ten times the external diameter for cables greater than ¾" in diameter.

L. Clean and prepare conductors to manufacturer requirements prior to any splicing or connector installations.

M. All medium voltage terminations shall be installed by trained contractor experienced with the method and product manufacturer. All damaged cables and/or terminations shall be repaired with approved medium voltage repair kit or replaced.

3.3 TESTS

A. Medium Voltage Feeders

1. Disconnect cable to be tested from switchgear, transformers, etc., at each end to apply voltage only to cable being tested.
2. Apply a 500 volt megger to ensure the cable is free from grounds.
3. Set Hypot sensitivity to the minimum.
4. Connect high voltage output lead to conductor and ground lead to the cable shield drain wire.
5. Raise the DC voltage in **[3kV steps for 5kV cable.][5kV steps for 15kV cable.][5kV steps for 35kV cable.]** After each step, wait until the charging current dissipates and a steady leakage current level is reached.
6. Record the leakage current for each voltage step and plot current versus voltage. Provide a separate curve for each cable.
7. Repeat steps 5 and 6 until the manufacturers recommended test voltage is reached.
8. Leakage current should plot as a relatively flat curve. If a large change appears in the slope of the curve, reduce the voltage by **[2kV for 5kV cable][4kV for 15kV cable][4kV for 35kV cable]**, and then bring the voltage back up in 500 volt increments.

9. If an unacceptable bend is found, and/or the tester trips, clean the terminations and repeat the test. If the test result is not improved, a problem exists in the cable.
10. If the cable tests to the recommended voltage level, hold the cable at this voltage for 15 minutes and plot leakage current versus time. Take reading at 0, 15, 30, 45 and 60 seconds, and then at 1 minute intervals for 15 minutes.
11. Ground conductor prior to disconnecting leads, as recommended in the hypot tester's manual.
12. Replace all new cable, terminations, and splices found faulty as part of the contract.
13. Document test results and submit for approval prior to energizing cables.

END OF SECTION

SECTION 260519 - LOW-VOLTAGE CABLES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide all labor, materials, tools, and equipment required for the complete installation of work called for in the Contract Documents.

1.2 SCOPE

A. This section includes minimum requirements for the following:

1. Low Voltage Conductors
2. Type MC Metal Clad Cable
3. 2-Hour Rated Cables
4. Connectors and Terminations

1.3 RELATED SECTIONS

A. Specification Section 260526 – Grounding.

1.4 SUBMITTALS

A. Provide product data for the following:

1. Low Voltage Conductors
2. Type MC Metal Clad Cable
3. 2-Hour Rated Cables
4. Connectors and Terminations

1.5 QUALITY ASSURANCE

A. All conductors shall be installed in a neat and workmanlike manner. All methods of construction that are not specifically described or indicated in the contract documents shall be subject to the control and approval of the Owner's Representative. Equipment and materials shall be of the quality and manufacture indicated. The equipment specified is based upon the acceptable manufacturers listed. Where "approved equal" is stated, equipment shall be equivalent in every way to that of the equipment specified and subject to approval.

B. Materials specified herein shall comply with the applicable requirements of:

1. The following Articles of the National Electric Code (NFPA 70):

a. 300 – Wiring Methods
b. 310 – Conductors for General Wiring
c. 330 – Type MC Metal Clad Cable
d. 332 – Mineral Insulated Type MI
e. 400 – Flexible Cords and Cables

f. 402 – Fixture Wires

2. The following U.L. Standards:

a. UL 83 – Thermoplastic-Insulated Wires and Cables
b. UL 44 – Thermoset-insulated Wires and Cables
c. UL 486A – Wire Connectors and Soldering Lugs for Use with Copper Conductors.
d. UL 854 – Service Entrance Cable
e. UL 1277 – Electrical Power and Control Tray Cables
f. All Other Applicable Standards

PART 2 - PRODUCTS

2.1 LOW VOLTAGE CONDUCTORS

A. General purpose feeder and branch circuit and control wiring:

1. Annealed Copper, 98% conductivity.
2. Minimum wire size:

a. #12 AWG for branch circuits
b. #14 AWG for control and signal circuits

3. Wire shall be stranded per ASTM B8.
4. 600 volt insulation for all wiring above 50 volts.
5. 300 volt insulation permitted for all wiring below 50 volts.
6. Thermal plastic with PVC insulation with nylon jacket.
7. Suitable for wet or dry locations, THHN/THWN-2 90 degree Celsius.
8. 90°C maximum operating temperature rating.
9. UL 83 Listed

B. Isolation Panel branch circuit wiring:

1. Annealed Copper, 98% conductivity.
2. Minimum wire size:

a. #12 AWG for branch circuits

3. Wire shall be stranded per ASTM B8.
4. 600 volt full colored insulation.
5. Flame-retardant Cross-linked Polyethylene (XLPE) insulation.
6. Maximum operating temperature not to exceed 90˚C in dry or wet location.
7. UL 44 Standard for Rubber Insulated Wire and Cable
8. UL Listed as Type XHHW-2, UL File # E90494

C. Flexible Power Cords:

1. NEC classified Flexible Power cord Type SOOW, designed for extra hard use.
2. Manufactured using flexible stranded annealed copper conductors.
3. Heat, moisture, UV, and oil resistant EPDM Black rubber insulated Jacket.

4. Rated -40°C to 90°C, 600 Volts. Flexible Stranding. Water Resistant 60°C
5. Available with models with 5 to 30 individual conductors in common jacket.
6. Jacket is marked with conductor count and cable type.
7. Color coded individual conductors.
8. AWG as called for.
9. Include with Kellums brand wire mesh strain relief grid added to each end to support cable,
10. Design Make: Prysmian Super Vu-Tron® Multi-Conductor or Approved Equal

D. Color Coding

1. Cable outer jackets shall be manufacturer color dyed the entire length for each phase and neutral conductor.
2. Equipment grounding conductors shall be green unless otherwise noted or approved.
3. All conductors shall be color coded according to the following schedule:

Voltage	A PHASE	B PHASE	C PHASE	NEUTRAL
208Y/120V, 3 Phase	Black	Red	Blue	White
480Y/277V, 3 Phase	Brown	Orange	Yellow	Gray
240/120V, 1 Phase	Black	Red		White

*ALL GROUNDING CONDUCTORS SHALL BE GREEN
*ALL ISOLATED GROUNDING CONDUCTORS SHALL BE GREEN WITH YELLOW STRIPE

4. All isolation panel branch circuits shall be color coded according to the following schedule:

Voltage	Isolated Cond. 1	Isolated Cond. 2	Isolated Cond. 3
1-ø circuit	Orange w/ stripe*	Brown w/ stripe*	N/A
3-ø circuit	Orange w/ stripe*	Brown w/ stripe*	Yellow w/ stripe*

*STRIPE COLOR IN ACCORDANCE WITH NEC ARTICLE 517.160

5. Switched legs shall be identified with the same color insulation as the phase leg.

E. Acceptable Manufacturers:

1. General Cable
2. Southwire
3. Okonite
4. Encore Wire
5. Prysmian

2.2 TYPE MC METAL CLAD CABLE

A. Construction:

1. Stranded or solid copper conductors, each individually insulated, and enclosed in an armor of flexible metal tape.
2. Suitable for wet or dry locations.
3. Suitable for cable tray installations.
4. Do not install direct buried, in concrete, or in the presence of corrosive vapors.
5. Provide with separate integral grounding conductor.
6. MC cable listed for Health Care facilities use per. NEC Article 517.
7. Manufactured and installed in accordance with NEC Article 330.
8. Design Make: Same as building wire.

2.3 LOW VOLTAGE CONNECTORS AND TERMINATIONS

A. Straight Splices, #26 AWG To #10 AWG

1. Nylon Insulated compression butt-splices.
2. 600 volt, 90 degree C rated.
3. Make: Burndy “Insulink”, T&B “Sta-Kon”, or approved equal

B. Straight Splices, #8 AWG and Larger

1. Two way, long barrel, compression type, copper
2. Provide heat shrink tubing over splice.
3. 600 volt rated.
4. Make: Burndy “Hylink”, T&N 54800 Series, or approved equal.

C. Pigtail Splices, #26 AWG to #10 AWG

1. Twist type pressure connector.
2. 600 volt rated, 105 degree C.
3. Size as required for number and size of conductors used.
4. Make: T&B Scotchlock, or approved equal

D. Three Way Splices, #8 AWG and Larger

1. Three way, long barrel, compression type, copper.
2. Provide tape or heat shrink tubing over splice.
3. 600 volt rated.
4. Make: Burndy “Hylink”, T&B 54700 Series, or approved equal.

E. Lug Terminations for Control and Signal Wiring.

1. Nylon insulated fork with compression termination of #26 AWG to #10 AWG.
2. Nylon insulated ring with compression termination for #8 AWG and larger.
3. 300 volt rated.
4. Make: Burndy “Insulug”, T&B “Sta-Kon”, or approved equal.

F. Lug Terminations for Power Wiring

1. Long barrel, compression type, copper body, on hole for #8 AWG to #2/0 AWG.
2. Long barrel, compression type, copper body, two hole, for #3/0 AWG and larger.
3. 600 volt rated.
4. Make:

    a. One-hole lug: Burndy “Hylug”, T&B 54900 Series, or approved equal.
    b. Two-hole lug: Burndy “Hylug”, T&B 54800 Series, or approved equal.

2.4 2-HOUR RATED CABLES

A. MI MINERAL INSULATED CABLE

1. Construction:

    a. Shall be a one, two, or three-conductor assembly as required, consisting of high-conductivity copper conductors surrounded by a highly compressed 96% pure magnesium oxide insulation.
    b. Available in single conductor sizes from 16-awg to #4/0. Available in three conductor sizes from 16-awg to #4.
    c. Capable of bend radius at 10x the external diameter of the cable.
    d. The insulation conductor assembly shall be surrounded by a continuous round, seamless copper tube providing heat and flame resistance, mechanical protection, and moisture seal.
    e. Overall copper metallic sheath suitable for grounding.
    f. Suitable for routing without raceway systems and accepts class 1 threaded termination fittings.
    g. The cable shall be rated for up to 600 volts.
    h. Cable shall be UL 2196 Listed and provide a minimum 2-hour fire rating.

2. Design Make: Pentair Pyrotenex System 1850
3. Acceptable Manufacturers:

    a. MICC (Mineral Insulated Cable Company)
    b. Omega
    c. Approved Equal

B. MI MINERAL INSULATED CABLE TERMINATIONS

1. Complete UL listed accessory kit to terminate MI Cable into equipment and junction box for final termination or splicing.
2. Includes brass threaded ferrules matching outer copper sheath diameter for each conductor.
3. Compression splicing lugs for cable to cable connection. Heat shrink tubing is included to protect uninsulated conductors at all points.
4. Brass plate with drilled and threaded holes to fit outer ferrules with uninsulated conductor passing thru center of hole for terminations.

5. Design Make: Same as MI Cable Manufacturer

C. 2-Hour Rated Type MC Cable

1. Construction:

   a. Thermoset, low smoke zero halogen silicone rubber insulated cable assembly NEC Type MC cable consisting of high-conductivity copper conductors surrounded by a continuously welded and corrugated copper outer sheath.
   b. Available in 2, 3, and 4 conductor sizes from 14-awg to #500KCM.
   c. Simple to terminate with commercially available MC connectors.
   d. Suitable for routing without raceway systems.
   e. The cable shall be rated for up to 600 volts.
   f. For use in wet locations to 90°C
   g. UL listed, NEC Type MC in accordance with UL Standard 1569.

2. Design Make: Omni Cable VITALink MC 2-hour Cable
3. Acceptable Manufacturers:

   a. Raychem
   b. Approved Equal

PART 3 - EXECUTION

3.1 LOW VOLTAGE WIRE AND CABLE

A. General

1. Install cables in raceway as called for after the entire raceway system has been completed.
2. Install splices and connections in accessible outlet, pull, and junction boxes.
3. Insulate all splices and connections with UL Labeled plastic tape, heat shrink tubing, or plastic molded caps.
4. All wiring systems shall be properly grounded and continuously polarized throughout, following the color coding specified.
5. Provide insulated green jacket grounding conductor in each raceway.
6. Provide dedicated white jacket insulated neutral conductor for each individual branch circuit. Shared neutrals are not acceptable.
7. Provide isolated grounding conductor for multi-wire computer panel “CP” branch circuits and dedicated neutral for each computer panel “CP” branch circuit.
8. Adhere to NEC de-rating requirements for raceway fill.
9. Provide stranded wire to motors, transformers, equipment, and vibrating machinery.
10. Feeder conductors shall be continuous from point of origin to load termination without splice. If this is not practical, contact the Owner's Representative and receive written approval for splicing prior to installation of feeder(s). Where feeder conductors pass through junction and pull boxes, bind and lace conductors of each feeder together. For parallel sets of conductors, match lengths of conductors.

11. Where multiple conductors are installed in a common raceway they shall be pulled simultaneously. Use of pulling compound or lubricant shall be avoided unless absolutely necessary. Where pulling lubricant is required, use UL approved compounds approved for cable type. Lubricant shall meet all OSHA and Toxic Control Act standards.

Application	Cable Types	Design Make
General Purpose Construction & Maintenance	Rubber, Neoprene, Nylon, PVC, High Density XLP, Hypalon	Ideal – Yellow 77
High Temperature Construction & Maintenance	Rubber, Neoprene, Nylon, PVC, High Density XLP, Hypalon, Low Density Polyethylene, Semiconducting Jacket	Ideal – Yellow 190
Utility Construction & Maintenance	Rubber, Neoprene, Nylon, PVC, High Density XLP, Hypalon, Low Density Polyethylene, Semiconducting Jacket	Aqua – Gel II
Cold Weather Construction & Maintenance	Rubber, Neoprene, Nylon, PVC, High Density XLP, Hypalon, Low Density Polyethylene, Semiconducting Jacket	Aqua – Gel CW

12. Use pulling means including fish tape, cable, rope and basket type grips which will not damage cables or raceways. Use approved mechanical pullers for feeders and branch circuits as required for #6 AWG cable and larger. Do not use mechanical means to pull conductors No. 8 or smaller.
13. Branch circuit conductors installed in panelboards, and control conductors installed in control cabinets and panels shall be neatly bound together using "Ty-Raps" or equivalent.
14. Reconnect branch circuit wiring at panelboards as required to obtain a balanced three phase load on the feeders.
15. Provide conduit seals in explosion proof areas as called for on the plans and as required by the National Electrical Code.

3.2 TYPE MC METAL CLAD CABLE

A. MC cable shall only be permitted for use in 6-feet maximum whips from conduit connected junction boxes above accessible ceiling areas to individual recessed luminaires. Do not daisy chain luminaires with MC cable.

B. Type MC cable may not be used for home runs to panelboards.

C. Type MC cable may not be used for any connections to wiring devices.

D. Type MC cable may not be used for connections to equipment.

E. Type MC cable may not be used for any emergency branch circuits per. Article 517 in the NEC.

F. Support cable per the National Electrical Code. Secure the cable to fixture hangers using nylon or plastic ties.

G. Bending radius shall comply with Article 330.24 of the NEC.

H. Provide insulating bushing at all termination points between the metal sheath and luminaire or junction box.

I. Type MC cable shall not be installed exposed.

3.3 2-HOUR RATED CABLE

A. Cable shall be stored in a clean dry location. Verify that cable end factory temporary seals have remained intact, that the insulation has not been exposed to air, and that no moisture has entered cable insulation. Provide manufacturer approved class 1 terminal seals immediately after stripping to prevent the entrance of moisture.

B. Shall be supported at six-foot intervals with straps, hangers or similar fittings in accordance with the manufacturers requirements.

C. Bend radius shall not be less than five times the external diameter for cable up to and including ¾" and not less than ten times the external diameter for cables greater than ¾" in diameter.

D. Terminations:

1. Field made terminations shall be made with cable manufacturer's termination kits only. Stripping tools, crimping and compression tools available from the manufacturer shall be used for proper cable termination.
2. Terminations must be completed immediately once started to avoid moisture ingress from surrounding air. Prior to completing each termination, test insulation resistance and follow manufacturer's drying procedures until insulation resistance reaches an acceptable level.
3. Connections to ferrous cabinets for single conductor cables shall incorporate brass plates ¼ inch (6mm) thick by 4 inch (100mm) wide by length as required with ½ inch (12mm), ¾ inch (19mm), 1 inch (25mm) or 1-1/4 inch (32mm) drilled and tapped holes. Install per manufacturers' instructions.
4. For applications using 90 degree C rating of cable, lugs shall be rated 90 degrees C.

3.4 CONNECTORS AND TERMINATIONS

A. Cover un-insulated splices, joints, and free ends of conductor with rubber friction tape or PVC electrical tape. Plastic insulating caps may serve as insulation.

END OF SECTION

SECTION 260526 - GROUNDING

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide a complete grounding system meeting or exceeding the requirements of Article 250 of the latest National Electrical Code. Install all raceway systems, including metal conduit, wireways, pullboxes, junction boxes, bus ducts, enclosures, and motors, to provide a continuous ground path with the lowest possible impedance.

1.2 SCOPE OF WORK

A. This section includes minimum requirements for the following:

1. Conductors
2. Hardware
3. Ground Rods
4. Molded Fusion Welds

1.3 RELATED SECTIONS

A. Specification Section 260519 – Low-Voltage Cables.

1.4 QUALITY ASSURANCE

A. All grounding systems shall be installed in a neat and workmanlike manner. All methods of construction that are not specifically described or indicated in the Contract Documents shall be subject to the control and approval of the Owner's Representative. Equipment and materials shall be of the quality and manufacture indicated. The equipment specified is based upon the acceptable manufacturers listed. Where "approved equal" is stated, equipment shall be equivalent in every way to that of the equipment specified and subject to approval.

B. Materials specified herein shall comply with the applicable requirements of:

1. The National Electrical Code, Article 250.

1.5 SUBMITTALS

A. None Required.

B. Provide product data for the following:

1. Ground Rods
2. Grounding System Test Reports.

PART 2 - PRODUCTS

2.1 CONDUCTORS

A. Exposed grounding conductors such as bars, straps, cables, flexible jumpers, braids, shunts, etc., shall be bare copper unless otherwise called for.

B. Conductors shall be copper, as called for in Specification Section 260519 - Low Voltage Cables.

C. Provide conductors with THHN/THWN insulation. Sizes #6 AWG and smaller shall have a continuous green jacket color. Conductor sizes #4 AWG and larger may have green taped bands at each end, and in all pullboxes.

D. Acceptable Manufacturers:

1. Same as for low-voltage conductors. Refer to Specification Section 260519 – Low Voltage Cables.

2.2 CONNECTORS, CLAMPS, TERMINALS

A. General: Connectors specified are part of a system. Furnish connectors and components, and use specific tools and methods as recommended by connector manufacturer to form complete connector system.

B. Splices:

1. Spring Type (for #10AWG conductors and smaller only):

   a. Rated 105° C, 600V; Buchanan/Ideal Industries Inc.'s B-Cap, Electrical Products Div./3M's Scotchlok Type Y, R, G, B, O/B+, R/Y+, or B/G+, or Ideal Industries Inc.'s Wing Nuts or Wire Nuts.

2. Indent Type with Insulating Jacket:

   a. Rated 150° C, 600V; Ideal Industries Inc.'s High Temperature Wire-Nut Model 73B, 59B.
   b. Indent Type with Insulating Jacket: Rated 105° C, 600V; Buchanan/Ideal Industries Inc.'s Crimp Connectors, Ideal Industries Inc.'s Crimp Connectors, Penn-Union Corp.'s Penn-Crimps, or Thomas & Betts Corp.'s STA-KON.
   c. Indent Type (Uninsulated): Anderson/Hubbell's Versa-Crimp, VERSAtile, Blackburn/T&B Corp.'s Color-Coded Compression Connectors, Electrical Products Div./3M's Scotchlok 10000, 11000 Series, Framatome Connectors/Burndy's Hydent, Penn-Union Corp.'s BCU, BBCU Series, or Thomas & Betts Corp.'s Compression Connectors.

3. Connector Blocks: NIS Industries Inc.'s Polaris System, or Thomas & Betts Corp.'s Blackburn AMT Series.
4. Resin Splice Kits: Electrical Products Div./3M's Scotchcast Brand Kit Nos. 82A Series, 82-B1 or 90-B1, or Scotchcast Brand Resin Pressure Splicing Method.

5. Heat Shrinkable Splices: Electrical Products Div./3M's ITCSN, Raychem Corp.'s Thermofit Type WCS, or Thomas & Betts Corp.'s SHRINK-KON Insulators.
6. Cold Shrink Splices: Electrical Products Div./3M's 8420 Series.
7. Gutter Taps: Anderson/Hubbell's GP/GT with GTC Series Covers, Blackburn/T&B Corp.'s H-Tap Type CF with Type C Covers, Framatome Connectors/Burndy's Polytap KPU-AC, H-Crimpit Type YH with CF-FR Series Covers, ILSCO's GTA Series with GTC Series Covers, Ideal Industries Inc.'s Power-Connect GP, GT Series with GIC covers, NSI Industries Inc.'s Polaris System, OZ/Gedney Co.'s PMX or PT with PMXC, PTC Covers, Penn-Union Corp.'s CDT Series, or Thomas & Betts Corp.'s Color-Keyed H Tap CHT with HTC Covers.
8. Lugs:

    a. Single Cable (Compression Type Lugs): Copper, one or 2 hole style (to suit conditions), long barrel; Anderson/Hubbell's VERSAtile VHCL, Blackburn/T&B Corp.'s Color-Coded CTL, LCN, Framatome Connectors/Burndy's Hylug YA, Electrical Products Div./3M Scotchlok 31036 or 31145 Series, Ideal Industries Inc.'s CCB or CCBL, NSI Industries Inc.'s L, LN Series, Penn-Union Corp.'s BBLU Series, or Thomas & Betts Corp.'s 54930BE or 54850BE Series.
    b. Single Cable (Mechanical Type Lugs): Copper, one or 2 hole style (to suit conditions); Blackburn/T&B Corp.'s Color-Keyed Locktite Series, Framatome Connectors/Burndy's Qiklug Series, NSI Industries Inc.'s Type TL, Penn-Union Corp.'s VI-TITE Terminal Lug Series, or Thomas & Betts Corp.'s Locktite Series.

9. Acceptable Manufacturers:

    a. Burndy
    b. T & B
    c. Erico

2.3 GROUND RODS

A. Solid copper or copper clad steel cylindrical rods, 5/8 in. minimum diameter, minimum 8 ft. long.

B. Acceptable Manufacturers:

1. Erico or Approved Equal

2.4 MOLDED FUSION WELDS

A. Dies shall be utilized to exothermically fusion weld the following connections:

1. Cable to cable (Cu to Cu conductors and Cu to a Al and Al to Al)
2. Cable to solid ground rods
3. Cable to steel Rebar
4. Cable to Flat Steel Surface

B. Parallel splice connections for pass through applications.

C. The fusion weld material shall be alloy based material compatible with both surfaces for permanent connections using molten metal that has been heated by a chemical exothermic reaction of thermite.

D. Low-Temperature 900°F Solder prohibited for connections.

E. Acceptable Manufacturers:

a. ERICO Cadweld
b. Metalweld
c. Thermoweld

PART 3 - EXECUTION

3.1 INSTALLATION

A. Raceway Systems:

1. All metal supports, cable trays, frames, sleeves, brackets, braces, etc. for the raceway system, panelboards, switchboards, switches, enclosures, starters, controls, etc., which are not rigidly secured to and in contact with the raceway system, or which are subject to vibration and loosening, shall be bonded to the raceway system. Size the bonding conductor in accordance with NEC Article 250, Table 250.122.
2. Terminate rigid conduit at all boxes, cabinets, and enclosures tightly with two locknuts and a bushing.
3. Conduit which runs to or from all boxes, cabinets, or enclosures having concentric or eccentric knockouts which partially perforate the metal around the conduit and hence impair the continuity of system ground circuits shall be provided with bonding jumpers sized in accordance with NEC Article 250, Table 250.122. Connect the bonding jumper between a grounding type bushing on the conduit and a ground bus or stud inside the box, cabinet, or enclosure.
4. Provide bonding jumpers sized in accordance with NEC Article 250, Table 250.122 for all conduit expansion joints.
5. Provide a grounding conductor in all flexible metallic conduit and liquid-tight conduit, sized in accordance with NEC Article 250, Table 250.122.
6. Provide a grounding conductor in all nonmetallic runs of conduit and raceway, sized in accordance with NEC Article 250, Table 250.122.
7. Provide isolated ground conductors of systems as called for on the plans.

B. Emergency Generators with Three Pole Transfer Switches:

1. Do NOT ground the generator neutral conductor at the generator.
2. Circuit the generator neutral to the secondary electrical distribution system neutral.
3. Connect the generator neutral system neutral so as not to negate any ground fault protective equipment applied to distribution system.
4. Connect the generator frames to system ground with conductor as sized in accordance with NEC Table 250.122.

C. Emergency Generators with Four Pole Transfer Switches, Separately Derived System:

1. Provide a separate ground system for the generator as called for.
2. Ground the neutral of the generator to ground through a service entrance type ground link at the generator switchgear, according to NEC.
3. Provide a #4/0 ground conductor connection to cold water pipe, and a size #4/0 connection to the building normal switchgear ground field.
4. Connect generator equipment frame to ground field at two points, for each generator.
5. Provide a test report of the generator ground field resistance prior to interconnecting to other system grounds.

D. Transformer Derived Secondary:

1. Solidly ground all transformer neutral conductors and enclosures to building steel, or a cold water pipe 1" or larger in size as called for in Table 250.122 of the National Electrical Code.
2. Provide an equipment grounding conductor from the point of termination back to the ground bus of the serving panelboard, switchboard, or transformer. Do not splice equipment grounding conductors.
3. Provide an equipment grounding conductors from the point of termination back to the ground bus of the serving panelboard, switchboard, transformer, or switchgear.
4. The grounding conductors contained in the interstices of interlocked armor cable shall be connected to the ground bus at every equipment termination point and to each other and to system ground; ground at every splice location.

E. Service Entrance:

1. Solidly ground the electrical service at the service entrance. Provide a grounding electrode conductor from the service entrance ground bus to all of the following grounding electrodes:

    a. Metal water pipe, ahead of the meter.
    b. Building steel
    c. Made grounding electrode grid.
    d. Concrete encased electrode (steel rebar in foundation)

2. For a grounded electric service, solidly connect the grounded (neutral) conductor to the service entrance ground bus. Do NOT make any grounding connections to any grounded conductors on the load side of the service disconnecting means.
3. Provide a bare, copper, #4/0 bonding jumper across the water meter.

F. Made Ground Grid:

1. Provide 3 ground rods, 8 feet long, driven on 10 foot centers, with top of rod 12 inches below finished grade, and located as called for on plans.
2. Connect with size #4/0 AWG copper conductors as called for.
3. Connecting conductors shall be located within 6 inches of the top of the ground rod.
4. Provide two size #4/0 AWG grounding conductors from the ground grid to the service entrance ground bus.

5. Provide one size #4/0 AWG grounding conductor from the ground grid or service entrance ground bus to the service side of nearest metallic cold water and/or sprinkler main.
6. Provide one size #4/0 AWG grounding conductor from the ground grid or service entrance ground bus to building steel.
7. Provide molded fusion welds for all below grade connections. Molds shall be new, unused, and shall be replaced when worn or broken.
8. Required ground grid resistance to earth shall be 25 ohms maximum.

G. Power Company Requirements:

1. Grounding conductor from service entrance equipment to meter enclosure per. utility standards.
2. One 5/8" diameter by 8' long ground rod and size #4/0 AWG grounding conductor at each riser pole.
3. Additional requirements per. latest power company published standards.

H. Primary Electrical Equipment:

1. Transformers:

   a. Provide two bare #4/0 AWG conductors, one from each of two ground buses, to ground.
   b. Provide one size #4/0 AWG conductor from each air terminal chamber to ground bus.
   c. Provide a grounding conductor from the neutral bushing or bushings to system ground, sized as called for, or in accordance with NEC Table 250.102(C)(1), whichever is of greater capacity.
   d. System ground conductors, usually run with phase conductors, shall be connected to the ground bus.

2. Metal Enclosed Switchgear:

   a. Two size #4/0 AWG grounding conductors from the ground bus to ground or one size #4/0 AWG ground circuit from ground bus to ground for each two compartments in continuous line-up equipment, whichever is the greater number.
   b. System ground conductors, usually run with phase conductors, shall be connected to the ground bus.
   c. Where metal enclosures are pierced or penetrated to accommodate ground conductors, seal opening around ground conductor to metal enclosure with "Duxseal" to maintain enclosure integrity.

I. Medium Voltage Conductors:

1. The grounding conductors contained in the interstices of interlocked armor cable shall be connected to the ground bus at every equipment termination point and to each other and to system ground; ground at every splice location.
2. The grounding conductor contained in raceway systems shall be connected to the ground bus at every equipment termination point and to each other and to system ground; ground at every splice location.

3. The grounding shield tape or concentric wire shields on cables shall be circuited to system ground; ground at each splice and termination.

END OF SECTION

SECTION 260533 – RACEWAYS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide all labor, materials, tools, and equipment required for the complete installation of work called for in the Contract Documents.

1.2 SCOPE

A. This section includes minimum requirements for the following:

1. Galvanized Rigid Steel Conduit (GRS)
2. Electrical Metallic Tubing (EMT)
3. Flexible Metal Conduit (FMC)
4. Liquidtight Metal Flexible Conduit (LFMC)
5. Innerduct/Electrical Non-Metallic Tubing (ENT)
6. Rigid Polyvinyl Chloride Conduit (PVC)
7. PVC Coated Rigid Galvanized Steel Conduit
8. Fittings
9. Surface Raceway
10. Power/Communications Poles
11. Wireways
12. Cable Tray
13. Cable Hangers

1.3 QUALITY ASSURANCE

A. All raceways shall be installed in a neat and workmanlike manner. All methods of construction that are not specifically described or indicated in the contract documents shall be subject to the control and approval of the Owner's Representative. Equipment and materials shall be of the quality and manufacture indicated. The equipment specified is based upon the acceptable manufacturers listed. Where "approved equal" is stated, equipment shall be equivalent in every way to that of the equipment specified and subject to approval.

B. Materials specified herein shall comply with the applicable requirements of:

1. The following Articles of the National Electric Code (NFPA 70)

a. 300 – General Requirements for Wiring Methods and Materials
b. 314 – Outlet, Device, Pull and Junction Boxes, Conduit Bodies; Fittings; and Handhole Enclosures
c. 344 – Rigid Metal Conduit: Type RMC
d. 348 – Flexible Metal Conduit: Type FMC
e. 350 – Liquidtight Flexible Metal Conduit: Type LFMC
f. 352 – Rigid Polyvinyl Chloride Conduit: Type PVC
g. 358 – Electrical Metallic Tubing: Type EMT
h. 362 – Electrical Nonmetallic Tubing: Type ENT

i. 376 – Metal Wireways
j. 378 – Nonmetallic Wireways
k. 386 – Surface Metal Raceways
l. 388 – Surface Nonmetallic Raceways
m. 392 – Cable Trays

2. The following National Electrical Manufacturers Association (NEMA) Standards:

   a. NEMA, RN1 – PVC Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit.
   b. NEMA, TC 3 – PVC fittings for use with Rigid PVC Conduit and tubing.
   c. NEMA, TC 6 & TC 8 – PVC Plastic Utilities for Underground Installation.
   d. NEMA, TC 9 & TC 10 – Fittings for PVC Plastic Utilities Duct for Underground Installation.

3. The following American National Standards Institute (ANSI) standards:

   a. ANSI-C80.1 – Electric Rigid Steel Conduit
   b. ANSI-C80.3 – Specification for Electrical Metallic Tubing, Steel

4. The following U.L. Standards:

   a. UL 1 – Flexible Metal Electrical Conduit
   b. UL 3 – Flexible Nonmetallic Tubing for Electric Wiring
   c. UL 5 – Surface Metal Raceways and Fittings
   d. UL 6 – Electrical Conduit Rigid Metal Conduit, Steel
   e. UL 360 – Liquidtight Flexible Metal Conduit
   f. UL 514B – Conduit, Tubing and Cable Fittings
   g. UL 651 – Schedule 40, 80, Type EB and A Rigid PVC
   h. UL 797 – Electrical Metallic Tubing, Steel
   i. UL 870 – Wireways, Auxilliary Gutters and Associated

1.4 SUBMITTALS

A. Provide product data for the following:

1. Conduit
2. Surface Raceway
3. Cable Trays
4. Cable Hangers

PART 2 - PRODUCTS

2.1 CONDUIT

A. Galvanized Rigid Steel Conduit (GRS)

1. Shall be hot-dipped galvanized steel, including threads.
2. Acceptable manufacturers:

a. Allied Tube
b. Atkore
c. LTV Steel
d. Steel Duct
e. Triangle
f. Wheatland

B. Electrical Metallic Tubing (EMT)

1. Electrical Metallic Tubing shall be electro-galvanized steel.
2. Acceptable manufacturers:

a. Allied Tube
b. Atkore
c. LTV Steel
d. Steel Duct
e. Triangle
f. Wheatland

C. Flexible Metal Conduit (FMC)

1. Flexible Metal Conduit shall be constructed of one continuous length of spirally wound, interlocked, zinc coated strip steel. Interior surface shall be free from burrs or sharp edges.
2. Acceptable manufacturers:

a. American Flexible Conduit Co.
b. Anaconda
c. Atkore
d. O-Z/Gedney
e. Southwire
f. Thomas and Betts

D. Liquidtight Flexible Metal Conduit (LFMC)

1. Flexible Metal Conduit shall be constructed of one continuous length of spirally wound, interlocking zinc coated strip steel. Interior surfaces shall be free from burrs and sharp edges. Provide with a liquid-tight jacket of flexible polyvinyl chloride (PVC).
2. Acceptable Manufacturers:

a. Allied
b. American Flexible Conduit
c. Atkore
d. Carlon
e. Southwire
f. Thomas and Betts

E. Innerduct/Electrical Non-Metallic Tubing (ENT)

1. This may also be referenced as Innerduct in the contract documents.
2. Size: 1 ¼" diameter corrugated wall flexible tubing unless otherwise indicated on drawings.
3. Shall be UL Listed type CMP (plenum rated), CMR (riser rated), or CMG (general purpose) as required for the installation.
4. Acceptable Manufacturers:

    a. Arnco
    b. Carlon
    c. Dura - Line
    d. VikiMatic

F. Rigid Polyvinyl Chloride Conduit (PVC)

1. Extra-heavy wall conduit: Schedule 80, constructed of polyvinyl chloride, rated for use with 90°C conductors, and UL listed for direct burial and normal above ground use.
2. Heavy wall conduit: Schedule 40, constructed of polyvinyl chloride, rated for use with 90°C conductors, and UL listed for direct burial and normal above ground use.
3. Acceptable manufacturers:

    a. Atkore
    b. Carlon
    c. Certainteed
    d. Condux
    e. Thomas & Betts

G. PVC Coated Rigid Galvanized Steel Conduit

1. Rigid Galvanized Steel Conduit with 15 mil thick plastic coating inside and outside the conduit. All threads shall be hot dipped galvanized and coated with the PVC coating. The conduit shall be bendable without damage to the interior or exterior coatings. The installed conduit system shall provide a continuous grounding path.
2. Acceptable Manufacturers:

    a. Atkore
    b. Calpipe Industries
    c. Ocal Incorporated
    d. Perma-Cote
    e. Robroy Industries

2.2 FITTINGS

A. Non-Hazardous Location Fittings:

1. Rigid galvanized steel fittings shall be fully threaded and shall be of the same material as the respective raceway system.

2. Fittings for PVC coated rigid galvanized steel conduit shall be threaded, hot dipped galvanized, and coated inside and outside with a urethane coating.
3. Fittings for electrical metallic tubing shall have plastic insulated throat type. Connection be single set screw indenter for conduits up to 2" and double set screw indenter for conduits 2" and larger.
4. Fittings for flexible metal conduit shall be center stopped, plastic insulated throat type, U.L. E-11852 listed.
5. Fittings for liquid tight flexible metal conduit shall have zinc plated steel ferrule, compression type with sealing ring.
6. Fittings for rigid non-metallic conduit shall be solvent cemented in accordance with the manufacturer's instructions.
7. Die-cast or pressure cast fittings are not permitted.
8. Provide conduit bodies types, shapes and sizes as required to suit application and NEC requirements. Conduit bodies for installation in conduit systems shall allow in-line pull outlets, make 90° bends, “T” take-offs, etc. Provide matching gasketed covers secured with corrosion-resistant screws.
9. Acceptable Manufacturers:

    a. O.Z. Gedney
    b. Steel City
    c. Thomas & Betts
    d. Crouse-Hinds
    e. Carlon

B. Class 1 Hazardous Location Fittings:

1. Class 1, Divisions 1 and 2, Group D approved.
2. For sealing in vertical or horizontal positions.
3. Nominal ½” to 4” conduit sizes, NPT threads.
4. Code required turning radius for conductors.
5. Iron alloy housing, galvanized finish with threaded seal-off fittings and plugs.
6. Large openings with threaded closures to provide easy access to conduit hubs for making dams.
7. Integral bushings in conduit hubs to protect conductor insulation from damage.
8. Accepts sealing compound UL listed for fitting. Sealing compound shall be capable o blocking explosive gasses in the raceway system. Sealing material Design Make: Hubbell Killark Celox Series.
9. Acceptable Manufacturers:

    a. Eaton EYS and EZS Series
    b. Hubbel Killark
    c. Appleton

C. Expansion Fittings

1. Galvanized steel expansion joints for RGS or EMT conduit, PVC for PVC conduit.
2. Minimum 4” movement in either direction.
3. Weatherproof for outdoor applications.

4. At expansion joints in concrete pours, provide Deflection/Expansion fittings capable of movement of ¾" in all directions from the normal**.**
5. Design Make: O.Z./Gedney, Type "AX" (exposed), "DX" (Concrete Pour)
6. Acceptable manufacturers:

    a. O.Z./Gedney
    b. Crouse-Hinds
    c. Appleton

D. Underground Ductbank Materials

1. Refer to Specification Section 260543 - Exterior Pathways for underground ductbank materials.

2.3 SURFACE METALLIC RACEWAY

A. One-Piece raceway suitable for (8) #12 AWG conductors or (2) 0.2" O.D. cables

1. Color shall be factory finished white.
2. One-piece steel construction.
3. Surface box w/ matching knockouts as requited at end(s).
4. Design Make: Wiremold 700 Series

B. Two-Piece raceway suitable for up to (9) #12 AWG conductors or (11) 0.2" O.D. Cables

1. Color shall be factory finished white.
2. Two-piece steel construction with single compartment.
3. Nominal 1-3/4" x 7/8" with snap on cover.
4. Surface box w/ matching knockouts as requited at end(s).
5. Design Make: Wiremold 2400 Series

C. Two Channel (Dual Channel) with devices suitable for up to (48) #12 AWG conductors or (50) 0.2" O.D. Cables.

1. Color shall be factory finished white.
2. Two-piece steel construction with removable front cover and divider for power and communications, length as indicated on the drawings.
3. Nominal 4-3/4" x 1-3/4" with snap on matching cover.
4. Provide wiring devices and data/audio/video outlets in the raceway as shown on plans.
5. Design Make: Wiremold 4000 Series

D. Provide miscellaneous boxes, mounting bezels, covers, entrance fittings and supports designed and manufactured by the raceway manufacturer as required making a complete job.

E. Cat.6A and optical fiber installations:

1. Cable entrance fittings shall include 1" min. minimum knockouts.
2. Provide 2" minimum radius fittings.

F. Acceptable Manufacturers:

1. Hubbell
2. Panduit
3. Wiremold
4. Mono-Systems

2.4 SURFACE NON-METALLIC RACEWAY

A. Two piece construction, manufactured of rigid PVC compound with matte texture with "off-white" finish. Provide the manufacturers standard fittings as required for the installation. All system components shall meet UL 94 requirements for nonflammable, self-extinguishing characteristics.

1. One-Piece Raceway:

   a. Hubbell Mini Trak (Design Make)
   b. Mono-Systems
   c. Panduit
   d. Approved Equal

2. Two-Piece Raceways:

   a. Provide duplex receptacles or Communication devices as specified in wiring devices and indicated on the drawings.
   b. Provide divider in raceways utilized for power and communications.
   c. Acceptable manufacturers:
   d. Hubbell Base Trak and Wall Trak
   e. Mono-Systems
   f. Panduit
   g. Approved Equal

2.5 POWER/COMMUNICATION POLES:

A. Steel with white baked enamel finish. Nominal cross section of 3"x 2 ¾" with two separate compartments.

B. One compartment shall be factory wired with (2) duplex 20A, 125V NEMA 5-20R specification grade receptacles. The wiring hardness shall contain 3-#12 conductors.

C. The second compartment shall have a 12" removable cover section with (4) knockouts for "RJ" modular jacks and one round opening with grommet for straight through communication cables.

D. Provide fittings for poles as required by the field conditions. Fittings shall include but not be limited to entrance end fittings, ceiling trim plate, pole mounting brackets, Velcro carpet gripper pad, and adhesive pads.

E. Design Make: Wiremold "30TP-4V" Series

2.6 WIREWAYS

A. Wireway shall be steel, enclosed type. Provide hinged, JIC sectional NEMA dust resistant, oil tight type where subjected to moisture, in Pump Rooms, Mechanical, Electric and Fan Rooms, exterior walls, Maintenance Shops, and similar locations. Size to meet NEC fill requirements or larger as noted on Contract Documents. Provide knockouts along runs. Provide all elbows, tees, pullboxes, fittings, hangers, reducers, supports, etc., to meet installation requirements.

B. Cover: Screw cover with full gasketing in outdoor installations.

C. Connector: Flanged.

D. Fittings: Lay-in type with removable front; captive screws drip shield in outdoor installations.

E. Finish: Electro-coated ASA-49 Gray Epoxy Paint over Phosphate Primer.

F. Acceptable manufacturers:

1. Square D "Square Duct"
2. General Electric
3. Hoffman
4. Keystone/Rees, Inc.

2.7 CABLE TRAY

A. Wire basket tray shall be constructed of heavy gauge steel wire mesh, all joints shall be welded. All welds shall be smooth and free of burrs. Maximum mesh size of 2” x 4” openings.

B. All cable tray and accessories shall be electro-plated zinc.

C. Inside dimensions of cable tray shall be 18”, 15”, or 12” wide x 4” depth.

D. Provide manufacturer supports for loading rating of 74 lbs/ft. for 118” section with supports 6-feet on center.

E. Tray shall be supported on 6-0" center switch 3/8" threaded rod and stiffener bars and shall support a total load of 75 pounds per linear foot.

F. Wire mesh cable tray shall allow cutting for custom field horizontal and vertical offsets.

G. Provide exterior grounding strap at expansion joints, crossovers and all other locations where tray continuity is interrupted.

H. Design Make: Legrand Cablofil

I. Acceptable Manufacturers:

1. Atkore Eagle Basket
2. Legrand Cablofil
3. Cooper B-Line Wire Basket
4. Mono-Systems Mono-Mesh Cable Tray Series
5. Snake Tray

2.8 CABLE HANGERS

A. Provide prefabricated, zinc coated, carbon steel hangers UL listed to support category 5, 6, 6A, optical fiber cable, and innerduct installations.

B. Hangers shall have open top with spring loaded cable retainer clip.

C. 4" high with rolled vertical and horizontal edges and a 3" deep and 2" wide support flange.

D. Flat bottom profile to reduce cable crushing in center.

E. Stackable with same model hangers below.

F. Provide beam clamps, rod fasteners, flange clips and brackets as job conditions require.

G. Design Make: Mono-Systems H-433-S or Approved Equal

PART 3 - EXECUTION

3.1 GENERAL

A. Size raceways as indicated on the drawings. Where sizes are not indicated, raceways shall be sized as required by the National Electrical Code in accordance with the quantity, size, type and insulation of conductors to be installed.

B. Provide completely independent raceway systems for normal and emergency branch circuits and feeders as required by the National Electrical Code.

C. Paint all new junction and pull boxes on the emergency power branch in a yellow color identifying them as "EMERGENCY POWER" with the panel name that supplies thru them. Label all new emergency power branch raceways at 25-feet intervals with yellow tape and text "EMERGENCY POWER" where no junction or pull boxes are present.

D. Minimum 1/2" trade size for branch circuit and fire alarm wiring.

E. Minimum 3/4" trade size for voice/data outlets, television outlets, and branch circuit "Home Runs" to panelboards.

F. Where cable quantities are identified on drawings provide telecom conduit sleeves and raceways according to the below schedule (Note this table is an estimate and the actual quantity is dependent on the installed cable diameter):

Cat. 6 Cable Qty.	Conduit Trade Size
4 Cables	¾" Conduit
6 Cables	1" Conduit
10 Cables	1¼" Conduit
20 Cables	2" Conduit
70 Cables	4" Conduit
Cat. 6A Cable Qty.	Conduit Trade Size
2 Cables	¾" Conduit

4 Cables	1” Conduit
6 Cables	1¼” Conduit
10 Cables	1½” Conduit
20 Cables	2½” Conduit
70 Cables	4” Conduit

*Refer to specification section 271000 for maximum outside diameter of UTP cabling.

G. Support raceways from building structure and wall construction. Do not support raceways from ceiling systems ductwork, piping, or equipment hangers. Do not support raceways from pre-existing conduit runs, banks, racks, hangers, etc.

H. Support outlet, pull, and junction boxes independently from building structure and wall construction. Do not support from raceways.

I. Install raceways parallel or perpendicular to building walls, floors and ceilings.

J. Install raceways concealed except in the following areas:

1. Mechanical Rooms
2. Electric Rooms
3. Manufacturing areas
4. Garage or maintenance areas
5. Unfinished basements or crawl spaces

K. Provide a code compliant ground path between all outlets and the established electrical system ground.

L. Cut raceways square, ream ends to remove burrs, and bush where necessary.

M. Coordinate all raceway runs with other trades.

N. Do not install raceways adjacent to hot surfaces or in wet areas.

O. Provide expansion fittings with external grounding straps at building expansion joints.

P. Do not install conduit horizontally in concrete block or dry wall partitions.

Q. Arrange neatly to permit access to the raceway, outlet, pull, and junction boxes, and work installed by other trades.

R. If it is necessary to burn holes through webs of beams or girders, call such points to the attention of the Owner's Representative and receive written approval both as to location and size of hole before proceeding with work. All holes shall be burned no larger than absolutely necessary.

S. Core drill, sleeve, and fire stop all penetrations through existing floors.

T. Support all raceways with malleable iron pipe clamps or other approved method. In exterior or wet locations, provide minimum ¼” air space between raceway and wall. Secure raceway

within 3 ft. of each outlet box, junction box, cabinet or fitting.

U. Provide conduit seals and explosion proof devices as indicated on the plans and as dictated by the National Electrical Code for all hazardous locations indicated on the drawings.

V. Provide green ground wire in all EMT, flexible conduit, and non-metallic conduit.

W. Do not install voice and data cabling in any surface metal raceway smaller than Wiremold V2400, except single voice outlets where cable runs straight down and no bends occur in raceway.

3.2 CONDUIT

A. EMT conduit is approved for installations in indoor dry locations only.

B. Install with a minimum of bends and offsets. Bends shall not kink or destroying the interior cross section of the raceway. Factory made bends shall be used for raceways 1" trade size and larger.

C. Provide at least one junction or pull box for each 270 degrees of bends.

D. Plug the ends of each roughed-in raceway with an approved cap or disc to prevent the entrance of foreign materials during construction.

E. Provide UL approved rain-tight and concrete-tight couplings and connectors.

F. Secure within three feet of each outlet box, junction box, cabinet or fitting.

G. Provide a #14 AWG fish wire in all "Spare" or "Empty" conduit runs to facilitate future installation of conductors.

H. Install raceways in concrete floor slabs as follows:

1. All conduit in concrete floor slabs shall be rigid galvanized steel with concrete tight threaded fittings.
2. Provide expansion fittings where conduits cross building expansion joints.
3. Install conduit below the reinforcing mesh.
4. Locate conduits to provide a minimum of 1” of concrete around conduit.
5. Obtain approval from the Owner's Representative prior to installing conduit larger than 1" trade size in concrete slabs.

I. Wherever a cluster of four (4) or more conduits rise out of floor exposed, provide neatly formed 4 in. high concrete envelope, with chamfered edges, around raceways.

J. Provide conduit supports based on the following table:

Conduit Trade Size	Type of Run	Horizontal Spacing in Feet	Vertical Spacing in Feet
½", 3/4"	Concealed	7	10
1", 1-1/4"	Concealed	8	10
1-1/2" & larger	Concealed	10	10
½", 3/4"	Exposed	5	7
1", 1-1/4"	Exposed	7	8
1-1/2" & larger	Exposed	10	10

K. Where conduits puncture roof, install pitch pockets as required in order that the roof warranty is maintained.

L. Provide (5) five empty ¾" and (1) empty 1-1/2" raceways from each flush mounted panelboard or cabinet to an area above the nearest accessible ceiling space. Make 90° turn above the ceiling, arranged for further continuation of raceway, and cap.

3.3 CLASS 1 HAZARDOUS LOCATION FITTINGS:

A. Install sealing capable Class 1 Div. X fitting at each entrance to an enclosure housing an arcing or sparking device when used in Class I, Divisions 1 and 2 hazardous locations; to be located as close as practicable and, in no case, more than 18" from such enclosures.

B. Install sealing capable Class 1 Div. X at each conduit entrance of 2" size or larger to an enclosure or fitting housing terminals, splices or taps when used in Class I, Division 1 hazardous locations; to be located as close as practicable and, in no case, more than 18" from such enclosures.

C. Install sealing capable Class 1 Div. X in conduit systems when leaving Class I, Division 1 or Division 2 hazardous locations.

D. Flood seal-off fitting with UL listed . Sealing compound for the installed fitting to blocking explosive gasses in the raceway system.

3.4 RACEWAY SYSTEM INSTALLATION:

A. Wiring above and below 600 volts, exterior below grade locations:

1. Schedule 80 Type PVC Conduit direct buried in sand bed envelope with Rigid Galvanized Steel elbows below all lawn areas and where indicated on drawings.
2. Schedule 40 Type PVC Conduit encased in concrete with Rigid Galvanized Steel elbows below pavement areas, areas subject to vehicular traffic and where indicated on the drawings.

B. Wiring above 600 volts in interior or exterior, above grade locations:

1. Rigid Galvanized Steel

C. Wiring below 600 volts in exterior, above grade locations:

1. Rigid Galvanized Steel where exposed and for the complete roof penetration
2. Final connections to rotating or vibrating equipment: Liquid Tight Flexible Metal Conduit (4-foot maximum length)

D. Wiring below 600 volts, interior above grade locations:

1. Electrical Metallic Tubing where concealed within walls, above ceilings and in unfinished or unoccupied areas.
2. Where unable to conceal in finished occupied areas: Surface Metal Raceway.
3. Electrical or Mechanical rooms where raceway is installed below 10’ AFF or exposed to potential damage: Rigid Galvanized Steel
4. Final connections to rotating or vibrating equipment: Liquid Tight Flexible Metal Conduit (4-foot maximum length)
5. Final connections to luminaires: [Flexible Metal Conduit (6-foot maximum length from EMT conduit & junction box to individual luminaire)] [MC cable (6-foot maximum length from EMT conduit & junction box to individual luminaire)]

E. Wiring below 600 volts, interior and exterior, above or below grade NEC Class I, II, III hazardous locations:

1. Rigid Galvanized Steel
2. Final connections to rotating or vibrating equipment: Liquid Tight Flexible Metal Conduit (4-foot maximum length)
3. Seal-off fittings matching the hazard category

F. Wiring below 600 volts, interior, inside corrosive environment (i.e. bus garage wash bays, swimming pool areas and pool mechanical room) locations:

1. Rigid Galvanized Steel
2. Liquid Tight Flexible Metal Conduit (6-foot maximum length)

3.5 INNERDUCT/ELECTRICAL NON-METALLIC TUBING (ENT)

A. Provide complete UL listed innerduct raceway system for all fiber optic cable installations.

B. Provide ENT raceway system for all other communication cable and conductor installations as called for in the contract documents.

C. Provide UL firestop assembly where ENT raceway passes thru fire rated assemblies.

D. Each Innerducts UL fire-resistance rating shall match the contained communications cable plenum, riser, or general purpose jacket listing. Always use the most fire-resistant Innerduct type where the work requires adherence to two or more NEC Article 770 and Article 800 installation guidelines.

1. Provide type CMP Innerduct in all duct and plenum installations.
2. Provide type CMR Innerduct in all vertical pathways where the installation pass thru a floor.

3. Provide type CMG or CM Innerduct in all single floor installations, basements, and attics not used by plenum air systems.

3.6 SURFACE RACEWAYS

A. Support with expansion anchors, concrete inserts, masonry inserts or toggle bolts as field conditions require. Provide supports at five foot centers.

B. Install a separate green ground conductor in raceway from the junction box where surface raceway begins to the ground terminal of the device, fixture or equipment being supplied.

C. Provide all fittings, connectors, elbows, tees, boxes etc. as required for the installation.

D. Submit factory drawings detailing the installation. Include a complete part list.

3.7 CABLE TRAYS

A. Hang cable tray using threaded, galvanized rod hangers, with rods extended through support steel and double-nutted. Size support member within load rating of member section; and without visible deflection. Install cable tray level and straight.

B. Provide aluminum body expansion connectors at building expansion joints. Minimum 4-inch movements, greater if expansion movement conditions warrant. Provide aluminum body expansion connectors every 100 ft. for outdoor installations. Minimum 4 in. movement, greater if expansion movement conditions warrant.

C. Provide external grounding strap at expansion joints, sleeves, crossovers and at other locations where tray UL ground patch continuity is interrupted.

D. Bond all conduits and conduit sleeves to the cable tray with listed grounding bushings as specified in section 260526.

E. Provide necessary elbows, tees, crosses, risers, offsets, fittings, reducers, connectors, clamps, rod suspension, trapeze hangers, etc., as required to make a complete job, coordinate with the manufacturer.

F. Provide conduit to tray fitting at each conduit entrance to tray.

G. Install divider in trays where conductors of different systems are carried in the same tray.

H. Provide (1) 6-inch long piece of ½" EMT conduit on each threaded rod hanger to prevent scoring of cable insulation when cable is pulled in.

I. Install fire stop wall frames around cable tray at penetrations through fire rated walls, and where called for. Seal these openings with pliable fire-resistant sealant.

END OF SECTION

SECTION 260620 - WIRING DEVICES

PART 1 – GENERAL

1.1 WORK INCLUDED

A. Provide all labor, materials, tools, and equipment required for the complete installation of work called for in the Contract Documents.

1.2 SCOPE

A. This section includes minimum requirements for the following:

1. Receptacles
2. Switches
3. Boiler Shutdown Switches
4. Coverplates

1.3 QUALITY ASSURANCE

A. All wiring devices shall be installed neatly, and parallel with building lines. Recessed devices shall be flush with the face of the wall. Provide extension rings on outlet boxes as required. All methods of construction that are not specifically described or indicated in the contract documents shall be subject to the control and approval of the Owner's Representative. Equipment and materials shall be of the quality and manufacture indicated. The equipment specified is based upon the acceptable manufacturers listed. Where "approved equal" is stated, equipment shall be equivalent in every way to that of the equipment specified and subject to approval.

1.4 SUBMITTALS

A. Provide product data for all wiring devices and cover plates.

B. Indicate selected part numbers.

C. Indicated selected color selections.

PART 2 - PRODUCTS

2.1 GENERAL

A. Wiring devices shall be heavy duty specification grade at a minimum. Standard commercial grade is not acceptable.

B. Wiring device color shall be white.

C. Wiring device color shall be:

1. White (normal branch)
2. Red (emergency or critical branch)

D. Suitable for installation in a 2-1/2" deep outlet box.

E. All receptacles and switches shall be from the same manufacturer.

F. Acceptable Manufacturers:

1. Eaton
2. Hubbell
3. Legrand Pass & Seymour
4. Leviton

G. Design Make: Pass & Seymour TR8300 Series

2.2 DUPLEX RECEPTACLES

A. 125-volt, 20-ampere, two pole, three wire, grounding, straight blade, NEMA 5-20R.

B. UL-listed PlugTail connector. Provide with right angle PlugTail connector with 6-inch stranded #12 AWG leads.

C. Nylon face with glass reinforced nylon back

D. Dielectric voltage withstands 2,000V minimum

E. Terminals Identified in accordance with UL 498

F. Thermoplastic tamper resistant shutters

G. UL 94 V2 Flame rating

H. Design Make: Pass & Seymour PTTR5362 Series with PTRA6STR PlugTail Connector

2.3 GFI RECEPTACLES

A. 125-volt, 20-ampere, two pole, three wire, grounding, straight blade, NEMA 5-20R.

B. LED trip/test indication

C. Thermoplastic tamper resistant shutters

D. UL-listed PlugTail connector. Provide with right angle PlugTail connector with 6-inch stranded #12 AWG leads.

E. Nylon face and back.

F. 2006 UL 943 revisions including “no power to the face when miswired” and “end of life indication” when unit is no longer capable of providing GFCI protection

G. Designed to trip at maximum 6mA leakage current to ground.

H. Suitable for feed through protection.

I. Design Make: Pass & Seymour PT2097TR Series with PTRA6STR PlugTail Connector

2.4 SPECIAL RECEPTACLES

A. Terminals identified in accordance with UL 498 (X, Y, Z, white, green)

B. H and cord clamp housing material: Black Nylon.

C. Terminal material: Clear Polycarbonate.

D. Contact spring material: Brass.

E. Dielectric Voltage withstands 2,000V minimum

F. Include NEMA type as called for on drawings to match equipment. At a minimum the manufacturer shall have special purpose receptacles available to meet the following NEMA connection types:

1. 125-volt, 20-ampere, 2 pole, 3 wire, grounding, Twist lock, NEMA L5-20R
2. 125-volt, 30-ampere, 2 pole, 3 wire, grounding, Twist lock, NEMA L5-30R
3. 250-volt, 20-ampere, 2 pole, 3 wire, grounding, Twist lock, NEMA L6-20R.
4. 250-volt, 50-ampere, 2 pole, 3 wire, grounding, Twist lock, NEMA L6-50R.
5. 250-volt, 50-ampere, 2 pole, 3 wire, grounding, Straight, NEMA 6-50R.
6. 250-volt, 20-ampere, 2 pole, 3 wire, grounding, NEMA 6-20R
7. 250-volt, 30-ampere, 2 pole, 3 wire, grounding, NEMA 6-30R
8. 125/250-volt, 50-ampere, 3 pole, 3 wire, grounding, NEMA 10-50R
9. 125/250-volt, 30-ampere, 4 pole, 4 wire, grounding, NEMA L14-30R (Dryer Receptacle). Plug configuration to match equipment furnished by equipment supplier.
10. 125/250-volt, 50-ampere, 4 pole, 4 wire, grounding, NEMA L14-50R (Range Receptacle). Plug configuration to match equipment furnished by equipment supplier

2.5 SWITCHES

A. 120-277 VAC, 20 ampere rated.

B. Side or back wired.

C. Quiet operation.

D. Single pole, three way, and four way as called for on the plans.

E. Design Make:

1. Single pole: Pass & Seymour PS20AC1 Series
2. Three -way: Pass & Seymour PS20AC3 Series
3. Four-way: Pass & Seymour PS20AC4 Series

2.6 KEY SWITCHES

A. 120-277 VAC, 20 ampere rated.

B. Locking type. Provide (1) key per switch, all keyed alike.

C. Side or back wired.

D. Quiet operation.

E. Single pole, three way, and four way as called for on the plans.

F. Design Make:

1. Single pole: Pass & Seymour PS20AC1_L Series
2. Three-way: Pass & Seymour PS20AC3_L Series
3. Four-way: Pass & Seymour PS20AC4_L Series

2.7 BOILER SHUTDOWN SWITCHES

A. Surface mounted push-button maintained contact (N.C.)

B. ANSI 61 gray die-cast zinc enclosure

C. Provide label “To Stop Boilers”

D. Each label has white lettering on a red background

E. Design Make: Eaton 10250T5B62-S106

F. Acceptable Manufacturers:

1. ABB
2. ASCO
3. Square D

2.8 COVERPLATES

A. Provide high impact nylon with white finish type 302 stainless steel with satin finish coverplates for general purpose flush devices.

B. Provide utility cover plates for surface mounted devices in mechanical rooms.

C. Provide gasketed weatherproof cover plates with a hinged cover on a cast aluminum outlet box for all devices in wet areas designated “WP”.

D. Provide high impact red cover plates for emergency circuits.

E. Provide high impact blue cover plates for surge suppression devices.

F. Provide high impact orange cover plates for isolated ground devices.

2.9 WEATHERPROOF COVERS

A. Impact resistant polycarbonate, NEMA 3R construction.

B. Clear cover to view the connection of the device.

C. UL listed as a weatherproof enclosure with the receptacle in use.

D. Hinged, latching cover with an opening at the bottom for a cord to exit the device.

E. Padlockable

F. Suitable for installation of a GFI protected duplex receptacle.

G. Design Make: Hubbell WP26MP

H. Acceptable Manufacturers:

1. Eaton
2. Hubbell
3. Legrand Pass & Seymour
4. Leviton

PART 3 - EXECUTION

3.1 GENERAL

A. Install devices generally where called for.

B. Coordinate exact locations of all devices with equipment, millwork, counters, fin radiation, windows, etc. and adjust locations as required as part of this contract.

C. Provide steel box for all devices.

D. Install receptacles and switches vertical, with the grounding pin down, and the toggle up in the on position.

E. Install all switches on the strike side of the door, with the edge of the outlet box approximately 3” from the door frame.

F. Do not install devices “back to back” in the same stud cavity without prior approval of the Owner. Offset devices as required to maintain code required fire rated assemblies or provide fire-stopping assembly around adjacent devices.

G. Provide plaster rings on all outlet boxes to permit flush installation of devices.

H. In all wet or damp areas, provide a surface mounted cast aluminum outlet box with threaded connections, gasketed cover, and non-ferrous screws.

I. Prior to installation and as part of the contract, relocate any device a distance of 5 feet in any direction at the request of the Owner.

J. Size outlet boxes in accordance with the NEC, based on the number and size of wires in the box.

K. Provide a coverplate on all devices.

3.2 EQUIPMENT MOUNTING HEIGHTS:

A. Refer to Specification Section 260100 – Basic Materials and Methods for mounting heights.

3.3 LABELING

A. Provide tape labels indicating panelboard and circuit on the outside of all device coverplates.

END OF SECTION

SECTION 260923 – WIRED LIGHTING CONTROLS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide complete installation, including luminaires, standards, hangers, supports, fittings, lamps, wiring, connections and controls, as indicated in the Contract Documents.

B. Provide startup of all lighting control systems by a factory certified manufacturer's representative in order to maintain all warranties. The contractor shall complete all startup request forms and complete all pre-startup installations a minimum of 2-weeks in advance or as otherwise required by the manufacturer. Provide initial system settings and owner training.

C. Provide Lighting System Functional Testing as described in this section by a factory authorized manufacturer's representative hereby referred to as the Testing Agent.

D. Refer to the General and Supplementary Conditions, Division 1 Specifications Sections for proposed phasing of this project. Provide manufacturer certified startup of all lighting control systems and Lighting System Functional Testing in each phased project area as required to turn each area over independently. The appropriate number of site visits to accomplish this phased scope of work shall be included in the base bid.

1.2 RELATED SECTIONS

A. Specification Section 019113 – Commissioning Requirements

1.3 SCOPE

A. This section includes minimum requirements for the following:

1. Room Controllers
2. Plug Load Controllers
3. Low-Voltage Switches
4. Occupancy Sensors
5. Power Packs
6. Dimmer Switches
7. Timer Switches
8. Photo Sensors
9. System Functional Testing

1.4 SUBMITTALS

A. Submit shop drawings as described in Section 260010.

B. Provide standard product data for all equipment:

1. Networked Lighting Control System Hardware and Software
2. Room Controllers, Power Packs and Wiring Diagrams
3. Plug Load Controllers
4. Low Voltage Switches
5. Occupancy Sensors
6. Dimmer Switches
7. Timer Switches
8. Photo Sensors

    a. Include data that indicates where the sensor shall be installed.

C. Lighting Control System shop drawings shall include:

1. Composite wiring and/or schematic diagram of each control circuit as proposed to be installed.
2. Show location of all devices, including at minimum sensors, room controllers, and switches/dimmer for each area on reflected ceiling plans.
3. Provide room/area details including products and sequence of operation for each room or area. Illustrate typical acceptable room/area connection topologies.
4. Network riser diagram including floor and building level details. Include network cable specifications. Illustrate points of connection to integrated systems. Coordinate integration with Owner and/or other trades.

D. Submit for approval information detailing startup of the lighting control systems and the individual(s) who will be performing this service. Include documentation from the lighting control systems manufacturer indicating that they certify said individual(s) to perform this work. Submittal will be rejected if this information is not included.

E. Submit for approval a testing plan for all lighting control systems. Testing plan shall, at a minimum, observe and record all items described in the "Lighting System Functional Testing" part of this section and the individual(s) who will be performing this service. Include documentation from the lighting control systems manufacturer indicating that they authorize said individual(s) to perform this work. Submittal will be rejected if this information is not included.

1. Lighting System Functional Testing

    a. Submittal of Functional Testing company name
    b. Light meter to be used
    c. Functional Testing Report after final adjustments are made

F. Warranty Information

1.5 QUALITY ASSURANCE

A. Lighting controls shall be standard products of manufacturers regularly engaged in the manufacture of the specific type of controls specified and shall be the manufacturer's latest standard design that complies with specification requirements. Firms installing the lighting controls shall have a minimum of five (5) years of successful installation experience on projects with interior lighting and controls work similar to the requirements of this project.

B. Codes and Standards

1. NEC:

a. Shall comply with Articles 220, 410 and 510 as applicable to installation and construction.

2. NEMA:

a. Shall comply with Standard Publication Nos. LE 1 and LE 2 as applicable to lighting equipment.

3. UL:

a. All interior lighting components shall be UL listed and labeled.
b. Comply with all applicable UL standards including UL 486A and B.

4. All work shall comply with applicable local code requirements of the authority having jurisdiction.

PART 2 – PRODUCTS

2.1 ROOM CONTROLLERS

A. Modular, stand-alone one room lighting control system (0-10V dimming and switching) with control of multiple user presets and room occupancy and daylight sensing for daylight harvesting.

B. Concealed mounting, self-contained, multi-channel lighting controller designed to communicate with occupancy and photo sensor inputs without the use of external power packs.

C. Shall allow for on-site commissioning controls via an infrared handheld remote control.

D. Lighting loads: Refer to floor plans for quantity of lighting channels per room. Where any room exceeds three channels, provide multiple room controllers networked together for proper system operation.

E. Multiple room controllers connected together in a local network must automatically arbitrate with each other, without requiring any configuration or setup, so the individual load numbers are sequentially assigned using each controller’s device ID’s from highest to lowest.

F. Each load shall at minimum be configurable to operate in the following sequences based on occupancy:

1. Auto-on/Auto-off
2. Manual-on/Auto-off

G. Manual override and LED indicated for each load.

H. Compatible with 120/277 VAC systems.

I. Maximum 20A combined 20A combined load per Room Controller.

J. All digital parameter data programmed into each room controller shall be retained in non-volatile FLASH memory within the controller itself. Memory shall have an expected life of no less than 10 years.

K. Room controller shall include:

1. Real time current monitoring
2. Efficient 250 mA switching power supply
3. RJ-45 network ports with integral strain relief and dust covers
4. One dimming output per relay

    a. The 0-10-volt output shall automatically open upon loss of power to the Room Controller to assure full light output from the controlled lighting.
    b. Each dimming output channel shall have an independently configurable minimum and maximum calibration trim level to set the dimming range to match the true dynamic range of the connected driver. The LED level indicators on connected dimmer switches shall utilize this new maximum and minimum trim.
    c. Each dimming output channel shall have an independently configurable minimum and maximum trim level to set the dynamic range of the output within the new 0—100% dimming range defined by the minimum and maximum calibration trim.
    d. Calibration and trim levels must be set per output channel.
    e. All configuration shall be digital. Devices that set calibration or trim levels per output channel via trim pots or dip-switches are not acceptable.

5. Fade rates for dimming loads shall be specific to connected switch buttons, and the load shall maintain a default value for any connected buttons that do not specify a unique value.

L. Class 2 dimming control signal: 0-10VDC, sinks up to 100mA per channel for control of compatible drivers.

M. UL 2043 Plenum rated.

N. IR window built-in to room controller for commissioning with remote control.

O. Provide (1) infrared remote control for startup, programming, and commissioning.

P. Provide with digital input/output interface that includes an isolated relay with N/O and N/C

outputs; rated for 1 Amp @ 24 VDC/VAC.

Q. Five-year warranty.

R. Design Make: Wattstopper LMRC-210 Series with LMRL-100 Isolated Relay Interface

S. Approved Equivalents:

1. Acuity nLight nPP16 series
2. Crestron ZUMLINK Series
3. Current Lighting NXRCFX Series
4. Leviton IRC Series

2.2 LOW-VOLTAGE SWITCHES FOR ROOM CONTROLLERS:

A. General

1. All switches shall be white unless noted otherwise.
2. Two RJ-45 ports for connection to the Room Controller network and other devices.
3. Two-way infrared (IR) transceiver for use with personal and configuration remote controls.
4. All digital parameter data programmed into each wall switch shall be retained in non-volatile FLASH memory within the controller itself. Memory shall have an expected life of no less than 10 years.
5. Multiple digital wall switches may be installed in a room by simply connecting the to the room controller network. No additional configuration shall be required to achieve multi-level switching.
6. Shall be of the same manufacturer as the room controller.
7. Install in single gang switch box.
8. Can be configured for automatic on or manual on (vacancy) through the room controller.
9. Five-year warranty.

B. Low-Voltage Switch

1. One button (ON/OFF) standard wall switch.
2. Design Make: Wattstopper LMSW-210 Series

C. Low-Voltage Dimmer Switch

1. One button (ON/OFF), one rocker (dimming raise/lower) with led status indicator.
2. Dimming switch with seven bi-level LED’s to indicate load levels using 14 steps.
3. Ramp rate may be adjusted for each dimmer switch.
4. Design Make: Wattstopper LMSW-211 Series

D. Low-Voltage Key Switch

1. Three-position, momentary contact, key switch
2. Ratings:

    a. 15 Amps

b. 120/277 VAC

3. Provide with a digital input/output interface as required to connect to the room controller network.
4. Design Make: Pass & Seymour 1250L Momentary Key Switch with LMIN-104 Input Interface

E. Low-Voltage Occupancy Sensor Switch with Dimmer

1. One button (ON/OFF), one rocker (dimming raise/lower) with led status indicator.
2. Sensing Range: 30 x 30ft, 40 ft radius.
3. Sensing Coverage Pattern: 180 degree viewing angle.
4. Dual technology (Ultrasonic/PIR or Microphonic/PIR). Field selectable for either setting or both. Adjustable sensitivity.
5. Adjustable time delay from 1 to 30 minutes in 1-minute increments.
6. Adjustable sensitivity from 10% to 100% in 10% increments.
7. Design Make: Wattstopper LMDW-211 Series

F. Low-Voltage LCD Graphic Switch

1. 5.7-inch diagonal high-resolution full color capacitive touch LCD display
2. Control support for lights, shades, scenes, DMX and network groups.
3. Includes up to 8 configurable screens and support for multiple button types.
4. Supports up to 16 unique scenes per room
5. Supports on-screen navigation using Tap or Swipe
6. Settings menu provides screen brightness, devices information and QR code help
7. Supports customizable image and pin-enabled lock screen.
8. Wattstopper LMGS-150 Series

2.3 OCCUPANCY SENSORS

A. General:

1. All occupancy sensor layouts have been done using the “design make” sensors. The contractor shall be responsible for providing additional sensors and all associated equipment required to provide coverage for required areas.
2. White finish.

B. Wall Mounted Sensors

1. Switchbox type (single circuit):

a. 120-277 volt, 1000/1200 watts
b. 1000 sq. ft. of coverage major motion, 300 sq. ft. of coverage minor motion, 180 degree viewing angle.
c. Passive infrared and ultrasonic technology.
d. Adjustable time delay from 5 minutes to 30 minutes.
e. Adjustable sensitivity from 20% to 100%.
f. Manual on switch operation (vacancy mode).
g. Internal photocell.

h. Decorator style.
i. Install in single gang switch box.
j. Design Make: Wattstopper DSW-301 series.
k. Acceptable Manufacturers:

1) Crestron Steinel
2) Current NX Controls
3) nLight Controls
4) Leviton

2. Switchbox Dimming Type (single circuit):

a. 120-277 volt, 1000/1200 watts
b. 900 sq. ft. of coverage, 180 degree viewing angle, passive infrared technology.
c. Adjustable time delay from 30 seconds to 30 minutes.
d. Adjustable sensitivity from 20% to 100%.
e. Manual on switch operation (vacancy mode).
f. Install in single gang switch box, décor style.
g. Internal photocell.
h. Design Make: Wattstopper DW-311 series
i. Acceptable Manufacturers:

1) Crestron Steinel
2) Current NX
3) nLight
4) Leviton

3. Switchbox type (two circuit):

a. 120-277 volt, 800/1200 watts
b. 600 sq. ft. of coverage, 180 degree viewing angle.
c. Passive infrared technology.
d. Adjustable time delay from 30 seconds to 30 minutes.
e. Adjustable sensitivity from 20% to 100%.
f. Two manual on switches for independent control of two separate circuits.
g. Decorator style.
h. Install in single gang switch box.
i. Design Make: Wattstopper PW-302 Series
j. Acceptable Manufacturers:

1) Crestron Steinel
2) Current NX
3) nLight
4) Leviton

C. Ceiling Mounted Sensors

1. Type OS-A Ceiling Mounted Sensors

a. Minimum 450 square feet of coverage, 360 degree viewing angle.

b. Passive infrared technology. Adjustable sensitivity.
c. Adjustable time delay from 5 to 30 minutes.
d. Install semi-flush in single gang switch box above the ceiling.
e. Standalone Sensors:

1) Includes an isolated relay with N/O and N/C outputs; rated for 1 Amp @ 30 VDC/VAC
2) Provide with relay power packs compatible with manual on operation and day-light operation and multi-level switching as shown on drawings.
3) Compatible with optional low voltage switch for manual-on operation.
4) Design Make: Wattstopper CI-300
5) Approved Equivalents:

a) Crestron Steinel
b) Current NX
c) Sensor Switch
d) Leviton

f. Sensors connected to Room Controllers:

1) Two RJ-45 ports for connection to the Room Controller and other devices.
2) Two-way infrared (IR) transceiver to allow remote programming through handheld commissioning tool and control by remote personal controls.
3) Load parameters including automatic/manual-on, blink warning, and daylight enable/disable when photo sensors are also connected to the Room Controller.
4) Shall be of the same manufacturer as the Room Controller
5) Design Make: Wattstopper LMPC-100 Series
6) Acceptable Manufacturers:

a) Crestron Zum
b) Current NX
c) nLight
d) Leviton

2. Type OS-B Ceiling Mounted Sensors

a. Minimum 1,000 square feet of coverage, 360 degree viewing angle.
b. Dual technology (Ultrasonic/PIR or Microphonic/PIR). Field selectable for either setting or both. Adjustable sensitivity.
c. Adjustable time delay from 5 to 30 minutes.
d. Installs surface mounted in 4” octagon J-box above the ceiling.
e. Standalone Sensors:

1) Includes an isolated relay with N/O and N/C outputs; rated for 1 Amp @ 30 VDC/VAC
2) Provide with relay power packs compatible with manual on operation and day-light operation and multi-level switching as shown on drawings.
3) Compatible with optional low voltage switch for manual-on operation.
4) Design Make: Wattstopper DT-300

5) Approved Equivalents:

a) Crestron Steinel
b) Current NX
c) Sensor Switch
d) Leviton

f. Sensors connected to Room Controllers:

1) Two RJ-45 ports for connection to the Room Controller and other devices.
2) Two-way infrared (IR) transceiver to allow remote programming through handheld commissioning tool and control by remote personal controls.
3) Load parameters including automatic/manual-on, blink warning, and daylight enable/disable when photo sensors are also connected to the Room Controller.
4) Shall be of the same manufacturer as the Room Controller
5) Design Make: Wattstopper LMDC-100 Series
6) Acceptable Manufacturers:

a) Crestron Zum
b) Current NX
c) nLight
d) Leviton

3. Type OS-C Ceiling Mounted Sensors

a. Nominal 10’ X 66’ of coverage for corridors.
b. Ultrasonic technology.
c. Adjustable time delay from 30 seconds to 15 minutes.
d. Adjustable sensitivity.
e. Manual sensor bypass.
f. Install surface mounted in single gang switch box above the ceiling.
g. Provide with relay power pack.
h. Design make: Wattstopper UT-300 series
i. Acceptable Manufacturers:

1) Crestron Steinel
2) Current NX
3) Sensor Switch
4) Leviton

2.4 LOW-VOLTAGE WIRING FOR LIGHTING CONTROLS

A. 0-10VDC Wiring

1. UL Type CMP plenum rated cable
2. 0-10VDC wiring shall be white outer jacket with 2-conductor purple and gray jacket insulation on the internal 18AWG solid copper conductors.
3. Design Make: Liberty AV Solutions 18-2C-LVBP-WHT or Approved Equal

B. Unshielded Twisted Pair (UTP) Wiring

1. UL Type CMP plenum rated cable
2. RJ-45 factory terminated RJ-45 connectors
3. ANSI/TIA-568-C.1 certified Cat. 6 Cable
4. Maximum length: 100-meters
5. Design Make: Belden, West Penn Wire, Hubbell, Leviton

PART 3 - EXECUTION

3.1 EXAMINATION:

A. Examine areas and conditions, under which luminaires are to be installed, and substrate for supporting luminaires. Notify Architect in writing of conditions detrimental to proper completion of the work. Do not proceed with work until unsatisfactory conditions have been corrected.

3.2 PRE-INSTALLATION MEETING

A. A factory authorized manufacturer's representative shall provide the electrical contractor a functional overview of the lighting control system prior to installation. The contractor shall schedule the pre-installation meeting after receipt of approved submittals to review the following:

1. Confirm the location and mounting of all digital lighting control devices, with special attention to placement of occupancy and photo sensors.
2. Review the requirements for low-voltage control wiring and termination.
3. Discuss the functionality and configuration of all products, including sequences of operation, per design requirements.

3.3 COORDINATION

A. Refer to respective reflected ceiling plan for each area. Reflected ceiling plans indicate proper luminaire location only. Locate occupancy sensors and photo sensors per the manufacturer's recommendations. Coordinate the proper arrangement with all other ceiling mounted items. Contract Documents indicate luminaire characteristics (type), quality, quantity, etc. Verify with the ceiling supplier design of actual ceiling installed in each area and coordinate compatible luminaire flange/trim type.

B. General
1. Install interior lighting controls at locations and heights as indicated, in accordance with luminaire manufacturer's written instructions, applicable requirements of NEC, NECA's 'Standard of Installation", NEMA standards, and with recognized industry practices.
2. Make installation such that the lighting controls are free of finger marks, flaws, scratches, dents or other imperfections.

3.4 DELIVERY, STORAGE, AND HANDLING

A. Luminaires and equipment shall be delivered with UL and manufacturer's labels intact and

legible in factory fabricated containers.

B. Luminaires and accessories shall be stored in protected dry locations in their original unbroken package or container. Luminaires shall be protected from dust and dampness both before and after installation. Luminaires shall be protected from paint and cleaning solvents during all phases of construction.

C. Handle interior lighting luminaires carefully to prevent damage, breaking, and scoring of finishes. Do not install damaged luminaires or components; replace with new.

3.5 SEQUENCING AND SCHEDULING

A. Coordinate with other work including ceiling type, wires/cables, electrical boxes, fittings, and raceways, to properly interface installation of interior luminaires with other trades.

B. The contractor shall provide the lighting control systems manufacturer with three weeks written notice of the system startup and adjustment date.

3.6 OCCUPANCY SENSORS

A. Provide all necessary mounting brackets, wiring, low voltage transformers and control relays required to provide control of areas indicated.

B. Provide initial time delay and sensitivity settings per owner's representative.

C. Install in location as recommended by the manufacturer.

D. Refer to "Lighting System Functional Testing" part of this section for additional information.

3.7 CONTROL WIRING

A. Provide all required low-voltage control wiring for lighting control system components.

B. Provide RJ-45 factory terminated Cat. 6 or better Unshielded Twisted Pair (UTP) cable with RJ-45 connectors to connect switching, photo control, and occupancy sensing devices on the Room Controller network. Cables shall manufacturer approved for the connectivity solution.

C. Provide 0-10VDC wiring for dimming from Room Controller and dimming switches to the drivers.

D. Control Wiring Installation:

1. All interior cabling shall be installed concealed inside the wall cavities and ceiling space.
2. Provide a continuous raceway system in accordance with NEC Article 800 for horizontal cable runs through all inaccessible ceiling (including drywall) and wall cavity spaces. All flexible raceway system runs shall be securely attached to ceiling joists and wall studs 3-feet O.C and removal and addition of cables in the future.

3. All UTP cables installed above accessible ceilings shall be supported by cable hangers spaced 4-feet on center. When installed in cable tray zip-tie to cable tray away from STP, coaxial cables, and optical fiber cables. Provide additional stacked Cable Hangers when filled greater than 50%.
4. All UTP cables installed above inaccessible ceilings or in areas without ceilings shall be installed in EMT conduit.

3.8 LIGHTING SYSTEM FUNCTIONAL TESTING

A. Lighting system functional testing shall comply with the following requirements:

1. Provide plan markup which indicates the exact location of each sensor, direction of aim, and certify on the plan that the direction of aim and placement are in compliance with manufacturer's requirements. Include this plan with the Operation & Maintenance Manuals.
2. Occupancy Sensor Controls:

    a. Certify that the occupancy sensor has been located and aimed in accordance with the manufacturer's recommendations.
    b. All devices shall be tested. Verify the following:

        1) Where occupant sensor controls include status indicators, verify correct operation.
        2) The lights and receptacles controlled by occupant sensor controls turn off or down to the permitted level within the required time upon vacancy of the space.
        3) For auto-on occupant sensor controls, the lights and receptacles controlled by occupant sensor controls turn on to the permitted level when an occupant enters the space.
        4) For manual-on occupant sensor controls, the lights and receptacles controlled by occupant sensor controls turn on only when manually activated.
        5) The lights are not incorrectly turned on by movement in adjacent areas or by HVAC operation.

3. Time – Switch Controls:

    a. Verify that timers are properly programmed with accurate weekday, weekend, and holiday schedules.
    b. Provide documentation to the Owner of time-switch controls programming including weekday, weekend, holiday schedules, and set-up and preference program settings. Include a copy in testing documentation package for approval by the Engineer.
    c. Verify correct time and date in the switch.
    d. Verify that any battery back-up is installed and energized.
    e. Verify that the override time limit is set to not more than 2 hours.
    f. Simulate occupied condition. Verify and document the following:

        1) All lights can be turned on or off by respective area control switch.

2) The switch only operates lighting in the enclosed space in which the switch is located.
3) Receptacles in the space controlled by the time-switch controls turn on.

g. Simulate unoccupied condition. Verify and document the following:

1) Non-exempt lighting turn off.
2) Manual override switch allows only the lights and receptacles controlled by the time-switch controls in the enclosed space where the override switch is located to turn on controlled lighting and receptacles for more than 2 hours.
3) Receptacles controlled by the time-switch controls turn off.

4. Create a log of deficiencies noted during testing. Correct all deficiencies and update log with corrective action records.
5. Complete and submit as part of the Operation and Maintenance Manuals the submitted and approved lighting testing plan.
6. Create a log of deficiencies noted during testing. Correct all deficiencies prior to project Commissioning Activity. Refer to Section 019113.
7. Provide records of all lighting system functional testing to the Commissioning Agent on the test form(s) provided within this section PRIOR to scheduled project functional testing.
8. Correct any deficiencies and discrepancies noted by the Commissioning Agent during their functional testing.
9. The Commissioning Agent will incorporate all final testing results into the project Commissioning Record.

B. Test Form:

1. Instruction: Contractor to complete either the following form or the form contained in the approved testing plan for each room in the project that receives lighting controls. Include completed forms in the Operation and Maintenance Manuals. Provide electronic copy of all complete testing forms and reports to the Commissioning Authority for their use.

Room Name/Number:	***Date:***	
Testing Agent's Name, Company:		
Testing Agent's Signature:		
Occupancy Sensor Controls	*Initials*	*N/A*
Verify the occupancy sensor has been located and aimed in accordance with the manufacturer's recommendations.		
Verify the status indicators on the occupancy sensor operate correctly.		
Verify the controlled lights turn OFF or down to the permitted level within the specified time.		
Verify the controlled receptacles turn OFF within the specified time.		
For auto-on occupant sensor controls: Verify the lights controlled by occupant sensor controls turn on to the permitted level when an occupant enters the space.		
For manual-on occupant sensor controls: Verify the lights controlled by occupant sensor controls turn on only when manually activated.		
Verify the receptacles controlled by occupant sensor controls turn on when an occupant enters the space.		
Verify that the controlled lights turn ON only when manually activated.		
Verify that the lights are not incorrectly turned on by movement in adjacent areas or by HVAC operation.		

Record sensitivity level and delay settings for occupancy sensor control:		
Time - Switch Controls	*Initials*	*N/A*
Verify the timers are properly programmed with weekday, weekend, and holiday schedules.		
Record time schedule as programmed:		
Verify that the time of day and day of week are properly set.		
Verify that battery back-up is installed and energized.		
Verify that the override time limit is set to not more than 2 hours.		
Simulate occupied condition:		
Verify that all lights can be turned on or off by respective area control switch.		
Verify the switch only operates lighting in the enclosed space in which the switch is located.		
Verify plug load controlled receptacles in the space turn on.		
Simulate unoccupied condition:		
Verify that all non-exempt lights turn OFF.		
Verify that the manual override switch allows only the lights in the enclosed space where the override switch is located to turn on or remain on until the next scheduled shutoff occurs.		
Verify plug load controlled receptacles in the space turn ON.		
Daylight Responsive Controls	*Initials*	*N/A*
Verify that the control sensing devices have been properly located, field calibrated, and set for accurate control set points and threshold lighting levels.		
Verify that the daylight-controlled lighting loads adjust to light levels set points in response to available daylight.		
Verify that the location of calibration adjustment equipment is readily accessible only to authorized personnel.		
Record set point (foot-candles):		
Record lighting control level with calibrated light meter (foot-candles):		
Record cut-off time (minutes):		
Record fade rate (units/second):		
Demand Responsive Controls	*Initials*	*N/A*
Record the maximum setpoint that has been established for the space.		
Record the measured general lighting maximum illumination level of the space.		
Simulate a demand response signal and record the measured illumination level in the same location as the prior step.		
Verify the demand response illumination level is not greater than 80 percent of the baseline measurement.		
Simulate the end of a demand event and verify controls automatically return lighting to their normal operational output.		

3.9 TRAINING

A. Upon completion of the system startup, the factory-authorized technician shall provide the proper training to the owner's personnel on the adjustment and maintenance of the lighting control system. Include sign-in sheet with Operation & Maintenance Manuals.

3.10 WARRANTY

A. All lighting controls equipment included in this section shall be fully tested and guaranteed for a period of five years after Owner's Representative written acceptance.

END OF SECTION

SECTION 262213 – MEDIUM VOLTAGE DISTRIBUTION TRANSFORMERS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide all labor, materials, tools, and equipment required for the complete installation of work called for in the Contract Documents.

1.2 SCOPE

A. This section includes minimum requirements for the following:

1. Relocation of existing medium voltage distribution transformer.

1.3 QUALITY ASSURANCE

A. All low voltage power distribution equipment shall be installed in a neat and workmanlike manner. All methods of construction that are not specifically described or indicated in the Contract Documents shall be subject to the control and approval of the Owner's Representative. Equipment and materials shall be of the quality and manufacture indicated. The equipment specified is based upon the acceptable manufacturers listed. Where "approved equal" is stated, equipment shall be equivalent in every way to that of the equipment specified and subject to approval.

B. Materials and installation practices specified herein shall comply with the applicable requirements of:

1. The following Articles of the National Electric Code (NFPA 70)

   a. 240 – Overcurrent Protection
   b. 450 – Transformers

2. The following National Electrical Manufacturers Association (NEMA) Standards:

   a. NEMA ST 20-2014 – Dry Type Transformers

3. The Code of Federal Regulations 10:

   a. CFR 431 – Distribution Transformer Efficiency

4. The following U.L. Standards:

   a. UL1561 – Dry Type Transformers

PART 2 - PRODUCTS

2.1 RELOCATE EXISTING MEDIUM VOLTAGE TRANSFORMER IN BOILER ROOM

A. N

PART 3 - EXECUTION

3.1 GENERAL

A. Provide identification for all equipment and devices as indicated in section 260100.

B. Provide miscellaneous bolts, washers, nuts, clips, lockwashers, hardware, etc. as required to install equipment.

C. Unload, move, handle, set in place, install, erect, assemble, connect, test etc. all items ad required.

D. Provide minimum NEC working clearance for all equipment.

E. Verify cable/lug sizes for terminations. Where a feeder is sized larger the lug provide replacement lug or in line splice as directed by Owner's Representative.

3.2 DRY TYPE TRANSFORMERS

A. Adjust enclosure tensioning hardware to mitigate vibration

B. Provide a 4" concrete housekeeping pad.

C. Bolt transformers to floor or pad utilizing vibration isolators.

D. Install transformers with sufficient Code required clearances.

E. Do not install transformers under or over panelboards per NEC

F. All conduit connections to transformers shall be made with liquidtight flexible conduit. Provide green insulated grounding conductor.

END OF SECTION

SECTION 262400 - SWITCHBOARDS AND PANELBOARDS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide all labor, materials, tools, and equipment required for the complete installation of work called for in the Contract Documents.

1.2 SCOPE

A. This section includes minimum requirements for the following:

1. Circuit Breakers
2. Branch Circuit Panelboards
3. Enclosed Circuit Breakers
4. Bus Ducts

1.3 QUALITY ASSURANCE

A. All low voltage power distribution equipment shall be installed in a neat and workmanlike manner. All methods of construction that are not specifically described or indicated in the Contract Documents shall be subject to the control and approval of the Owner's Representative. Equipment and materials shall be of the quality and manufacture indicated. The equipment specified is based upon the acceptable manufacturers listed. Where "approved equal" is stated, equipment shall be equivalent in every way to that of the equipment specified and subject to approval.

B. Materials and installation practices specified herein shall comply with the applicable requirements of:

1. The following Articles of the National Electric Code (NFPA 70):

   a. 240 - Overcurrent Protection
   b. 368 - Busways
   c. 404 - Switches
   d. 408 - Switchboards and Panelboards

2. The following National Electrical Manufacturers Association (NEMA) Standards:

   a. NEMA AB 1 1993 - Molded Case Circuit Breakers and Molded Case Switches
   b. NEMA BU 1 - Busways
   c. NEMA PB 1 - Panelboards
   d. NEMA PB 1.1 - Instructions for Safe Installation, Operation, and Maintenance of Panelboards Rated 600 Volts or less.
   e. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum)
   f. NEMA 250 - Enclosures for Electrical Equipment

3. The following American National Standards Institute (ANSI) standards:

a. ANSI/NETA-2025 ATS for Electrical Power Equipment and Systems
b. ANSI C37 – Low-Voltage Power Operated Circuit Breakers
c. ANSI/IEEE C12.1 Code for Electric Metering

4. The following U.L. Standards:

a. UL 50 - Enclosures for Electrical Equipment
b. UL 67 - Panelboards
c. UL 98 - Enclosed and Dead-Front Switches
d. UL 489 - Molded Case Circuit Breakers and Circuit Breaker Enclosures
e. UL 857 - Underwriters Busway Standard
f. UL 891 – Standard for Switchboards
g. UL 943 - Standard for Ground Fault Circuit Interrupters
h. UL 1066 - Low-Voltage Power Operated Circuit Breakers

1.4 SUBMITTALS

A. Provide product data including voltage, current, interrupting rating, and enclosure type for the following:

1. Thermal Magnetic Molded Case Circuit Breakers
2. Electronic Trip Molded Case Circuit Breakers
3. Electronic Trip Insulated Case Circuit Breakers
4. Branch Circuit Panelboards
5. Distribution Panelboards
6. Switchboards, including the following:

a. Dimensioned plans and elevations.
b. Internal and External Connection Diagrams.
c. Power and control wiring diagrams.
d. Bill of Materials
e. Any modifications made to the switchboard or distribution system design to accommodate manufacturer's standard equipment.
f. Where utility equipment is required in the switchboard, show required modifications to the switchboard, and submit drawings reviewed and approved by the utility company.

7. Enclosed Circuit Breakers
8. Load Centers
9. Service Entrance Power Monitor
10. Surge Protective Devices
11. Bus Ducts

1.5 MINOR MODIFICATIONS

A. Provide modifications to circuit breaker trip rating within the frame size at no additional cost, until shop drawings are reviewed and submitted.

PART 2 - PRODUCTS

2.1 CIRCUIT BREAKERS

A. General

1. UL 489 listed.
2. Below 250Amps – Unless otherwise noted, operation shall be from a fixed thermal magnetic trip unit. Permanent trip unit containing individual thermal and magnetic trip elements.
3. 250Amps and above - Include field adjustable electronic Long Time, Short Time, and Instantaneous trip unit.
4. 400Amps and above - Include field installed interchangeable rating plugs.
5. Provide an over-center, trip-free handle to provide quick-make, quick-break contact action.
6. Provide multi-pole breakers with common trip.
7. When the circuit breaker has tripped, the handle shall move to a position between the "on" and "off" positions. Provide a visual indication that the circuit breaker has tripped.
8. The ampere rating shall be clearly marked on the face of the circuit breaker.
9. Series rated fuse/circuit breaker installations are not acceptable.
10. Make provisions to add circuit breaker handle locks.
11. Circuit breakers shall have voltage, ampere, and interrupting ratings as called for on the Panelboard Schedule.
12. New circuit breakers installed in existing panelboards shall be UL listed for use in panelboard and match or exceed interrupting ratings.

B. Thermal Magnetic Molded Case Branch Circuit Breakers

1. Molded case circuit breakers shall be constructed of a glass reinforced insulating material. All current carrying components shall be completely insulated and isolated from the outside of the circuit breaker.
2. 60°C terminal temperature rating for circuit breakers rated 125 amperes or below.
3. 75°C terminal temperature rating for circuit breakers rated above 125 amperes.
4. All 20 and 30 ampere, single pole circuit breakers shall be UL listed for switching duty.
5. Circuit breakers shall be bolt-on. Plug-on acceptable in load centers on residential applications only.
6. Circuit breakers rated 250 amperes and below shall be UL listed HACR type.
7. Where ground fault circuit breakers are required, provide a shunt trip circuit breaker with a zero sequence sensing ground fault module.
8. Design Make: Square D QOB (250 volt), EH, EHB (480 volt), I-Line style (600 volt)
9. Acceptable Manufacturers:

    a. ABB
    b. Eaton
    c. Siemens
    d. Square D

C. Standard Function Electronic Trip Molded Case Circuit Breakers

1. Microprocessor based true RMS sensing current sensing device with accuracy to the

thirteenth harmonic.

2. Sensor frame and rating plug size shall be as indicated on the Panelboard Schedule.
3. UL listed to carry 80% of the ampere rating continuously.
4. Provide the following time/current response adjustments:

    a. Long Time Pickup
    b. Long Time Delay
    c. Short Time Pickup
    d. Short Time Delay (I2t IN only)
    e. Instantaneous Pickup
    f. Ground Fault Pickup

5. Provide a means to cover the trip unit adjustments in accordance with NEC Article 240-6(b).
6. Provide trip indication for overload, short circuit, and ground fault trips.
7. Tripping system shall be equipped with an externally accessible test port for use with a Universal Test Set. Disassembly of the circuit breaker shall not be required for testing.
8. Includes remote device with communication link cable for manual GFI trip simulation and testing of circuit breaker. Shall be able to identify trip information from trip unit memory.
9. Include on-site factory authorized technician for startup and configuration of trip unit and GFI trip to open circuit breaker.
10. Design Make: Square D HX, JX, LX, MX, PX, RX
11. Acceptable Manufacturers:

    a. ABB
    b. Eaton
    c. Siemens
    d. Square D

2.2 BRANCH CIRCUIT PANELBOARDS

A. 240 Volt rated, maximum 400 amperes.

B. Copper bus bars with high dielectric thermoplastic insulators.

C. Provide continuous current ratings, short circuit current ratings, branch circuit breakers, main circuit breaker or main lugs, and flush or surface trims as called for on the Panelboard schedule.

D. Provide nameplate on each panelboard indicating voltage, current, phase, wire, and short circuit rating.

E. 100% rated neutral of the same material as the main bus.

F. Provide ground bus of the same material as the main bus.

G. Interior trim shall be dead front construction, with pre-formed metal twist-outs covering unused mounting space.

H. Enclosures shall be nominal 20” wide by 6” deep, galvanized steel construction with removable

end walls and knockouts.

I. Fronts

1. Surface or flush mounted as called for on the Panelboard Schedule.
2. ANSI 49 gray electrodeposited enamel.
3. Fronts shall be one piece with door, and continuous hinge to the enclosure.
4. Provide cylindrical tumbler type lock with catch and spring loaded stainless steel door pull. All locks shall be keyed alike.
5. Provide a clear plastic directory card holder on the inside of the door.

J. Design Make: Square D NQ Series

K. Acceptable Equivalents:

1. Eaton Pow-R-Line Series
2. ABB ReliaGear Series
3. Siemens P1 Panelboard Series

2.3 ENCLOSED CIRCUIT BREAKERS

A. Circuit breakers shall be as specified above.

B. Ratings as indicated on plans and as required by the installation.

C. Short Circuit Withstand ratings of the assembly shall be equal to that of the circuit breaker.

D. Provide NEMA rated enclosure as called for on the drawings, and as required by the environment.

E. Externally operable handle, with provisions for padlocking in the OFF and On position.

F. Gray baked enamel finish except for stainless steel, NEMA 4X enclosures.

G. Knockouts at the top and bottom of NEMA 1 enclosures.

H. Design Make: Square D

I. Acceptable Manufacturers:

1. ABB
2. Eaton
3. Siemens
4. Square D

PART 3 - EXECUTION

3.1 GENERAL

A. Provide identification for all equipment and devices as indicated in section 260100.

B. Provide miscellaneous bolts, washers, nuts, clips, lockwashers, hardware, etc. as required to install equipment.

C. Unload, move, handle, set in place, install, erect, assemble, connect, test etc. all items ad required.

D. Provide minimum NEC working clearance for all equipment.

E. Verify cable/lug sizes for terminations. Where a feeder is sized larger the lug provide replacement lug or in line splice as directed by Owner's Representative.

3.2 CIRCUIT BREAKERS

A. Install circuit breakers in panelboards and switchboards as called for on the plans and as recommended by the manufacturer.

B. Provide all required manufacturer approved bus fingers and mounting adapters as required to connect new circuit breakers to mains bussing in the panelboard and distribution panelboard.

C. Adjust circuit breaker pick-up level and time delay settings to the values called for on the drawings indicated in the coordination study designated by the Engineer.

D. Submit documentation that a qualified representative from the equipment manufacturer has inspected and approved the installation.

E. Provide on-site factory authorized technician for startup and configuration of all trip units.

3.3 BRANCH CIRCUIT AND DISTRIBUTION PANELBOARDS

A. Securely support all panelboard enclosures to walls. Install true and level.

B. Install panelboards with top of the highest circuit breaker handle at 6'-6" to the centerline.

C. Provide (5) five empty ¾" conduits and (1) one empty 1 ½" conduit from each flush mounted panelboard backbox to the accessible ceiling space. Make 90º turn above the ceiling, arranged for further continuation of raceway, and cap.

D. Make all branch circuit and feeder connections.

E. Provide channel support between the wall and backbox for panelboards installed on outside walls.

F. Tighten all bolt and lug connections using a torque wrench or screwdriver per the manufacturer's recommendations.

G. Measure steady state load currents on each panelboard feeder. Rearrange branch circuits in the panelboard to balance the load within 20% of each other. Maintain proper phasing.

H. Provide identification as required per section 260100.

3.4 SWITCHBOARDS

A. Verify equipment location before ordering or installing switchboards.

B. Provide all required on site field disassembly and reassembly of switchboard framing members, end and side panels, and bussing for equipment with dimensions larger than what is shown on the plans. Include factory representative on site review of the reassembled equipment to maintain the UL listing.

C. Provide a 4" high concrete pad as follows:

1. Constructed of 3000 psi concrete.
2. Pad shall extend 4" beyond all sides of the switchboard, except in the back for switchboards mounted tight against the wall.
3. Provide 6" x 6" #4 welded wire mesh.
4. Securely bond pad to floor by roughing the floor and coating with cement grout.

D. Provide a drip pan above the switchboard wherever exposed piping is present. Provide a 1 ¼" copper pipe from the pan to the floor drain.

E. Provide grounding bushings at all conduits terminating at the switchboard.

F. Provide all power and control wiring as required.

G. Provide copper color-coded control wire with crimp spade to screw terminals for all control wiring. Wire shall be UL listed for switchboard use.

H. Paint all nicks, scratches, unpainted bolt heads, etc., with two coats of paint.

I. Prior to energizing, thoroughly clean the switchboard, insulators and bus.

J. Prior to energizing, obtain the services of a qualified manufacturer's representative to test the switchboard for correct installation.

K. Provide identification as required per Section 260100.

3.5 ENCLOSED CIRCUIT BREAKERS

A. Install enclosed circuit breakers in locations shown on plans. Install true and level.

B. Tighten all bolt and lug connections using a torque wrench or screwdriver per the manufacturer's recommendations.

C. Provide identification as required per section 260100.

END OF SECTION

SECTION 262913 - SWITCHES, CONTACTORS AND MOTOR CONTROLLERS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide all labor, materials, tools, and equipment required for the complete installation of work called for in the Contract Documents.

1.2 SCOPE

A. This section includes minimum requirements for the following:

1. Disconnect Switches
2. Lighting Contactors
3. Motor Control Equipment
4. Low Voltage Fuses

1.3 QUALITY ASSURANCE

A. All low voltage power distribution equipment shall be installed in a neat and workmanlike manner. All methods of construction that are not specifically described or indicated in the Contract Documents shall be subject to the control and approval of the Owner's Representative. Equipment and materials shall be of the quality and manufacture indicated. The equipment specified is based upon the acceptable manufacturers listed. Where "approved equal" is stated, equipment shall be equivalent in every way to that of the equipment specified and subject to approval.

B. Materials and installation practices specified herein shall comply with the applicable requirements of:

1. The following Articles of the National Electric Code (NFPA 70)

   a. 240 - Overcurrent Protection
   b. 404 – Switches
   c. 430 – Motors, Motor Circuits, and Motor Controllers

2. The following National Electrical Manufacturers Association (NEMA) Standards:

   a. NEMA AB 1 1993 - Molded Case Circuit Breakers and Molded Case Switches
   b. NEMA PB 1.1 - Instructions for Safe Installation, Operation, and Maintenance of Panelboards Rated 600 Volts or less.
   c. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum)
   d. NEMA 250 - Enclosures for Electrical Equipment

3. The following American National Standards Institute (ANSI) standards:

   a. ANSI/IEEE C12.1 Code for Electric Metering

4. The following U.L. Standards:

    a. UL 50 - Enclosures for Electrical Equipment
    b. UL 98 - Enclosed and Dead-Front Switches

1.4 SUBMITTALS

A. Provide product data including voltage, current, interrupting rating, and enclosure type for the following:

1. Disconnect Switches
2. Lighting Contactors
3. Motor Control Equipment
4. Low Voltage Fuses

1.5 MINOR MODIFICATIONS

A. Provide modifications to fuse sizes within the frame size at no additional cost, until shop drawings are reviewed and submitted.

1.6 FIELD SUPERVISION

A. Provide field supervision and start-up by a qualified representative of the equipment manufacturer. Provide certification that the equipment has been installed in accordance with the manufacturer's requirements.

PART 2 - PRODUCTS

2.1 DISCONNECT SWITCHES

A. Three pole, single throw, or as called for on the drawings.

B. Quick-make, quick-break switch operating mechanism.

C. Mechanical service life (switching cycles) / typical: 10000

D. Heavy duty, 600VAC rated, current rating as called for on the drawings.

E. Defeatable dual cover interlock external override mechanism to open the disconnect switch door without opening the disconnect switch.

F. All current carrying parts shall be plated to resist corrosion.

G. Lugs shall be removable and rated for 75°C temperature rating.

H. Switch blades shall be visible when the switch is in the open position and the door is open.

I. Switch shall be padlockable in the OFF and ON positions.

J. Provide fusible switches with rejection type fuse holders and fuses as indicated on the plans or as per fed equipment requirements.

K. Provide with 120V rated auxiliary interlock contacts controlled off handle position for all elevator disconnect switches.

L. Enclosure shall be steel with gray baked enamel paint unless otherwise noted on the drawings.

M. Provide NEMA type enclosures as called for on the drawings. Unless otherwise noted, all rooftop and exterior switches shall be NEMA type 3R.

N. NEMA type 1 enclosures shall be equipped with knockouts.

O. Design Make: Square D

P. Acceptable Manufacturers:

1. ABB
2. Eaton
3. Siemens
4. Square D

2.2 MOTOR CONTROL EQUIPMENT

A. General

1. Provide motor starters, disconnect switches, etc., as listed on the Electric Equipment and Control Schedule on the drawings.
2. Starters, contactors and controllers shall comply with NEMA standards having general purpose NEMA 1 or 1B enclosure unless otherwise called for. Provide explosion proof, weather resistant or watertight construction as required. Starters shall be minimum NEMA size 0 with overloads in each phase sized per NEC, nameplate motor full load amperage, service factor, and motor operating conditions.
3. Pad lock arrangements shall be provided to lock the disconnect device in the "off" position. Magnetic starters shall be provided with a control power transformer with 120V secondary and primary and secondary fusing and be sized to accept the loads imposed there on. Starters shall have transformer type pilot lights and 6 volt long life bulbs. Each starter subject to electrical interlock and/or automatic control shall have necessary auxiliary contacts.
4. Auxiliary devices: Provide pushbutton stations, pilot lights, devices, relays, transformers, selector switches, electric thermostats, auxiliary starter contacts as required for functions called for. Provide separate relay for each speed to operate electric dampers or other devices as required for multispeed motor circuit.
5. Manual Motor Starter: Provide all starters with thermal overload(s); and pilot light(s), and handle lock-out provisions. Gang starter with selector switch for multispeed applications. Provide single or 2-pole as required:

    a. 120 volt, single-pole, surface mounted: Square-D FG-1P.
    b. 120 volt, single-pole, flush mounted: Square-D FS-1P.
    c. 240 volt, two-pole, surface mounted: Square-D FG-2P.
    d. 240 volt, two-pole, flush mounted: Square-D FS-2P.
    e. 120 volt, single-pole, two speed, surface mounted: Square-D FG-11P.
    f. 120 volt, single-pole, two speed, flush mounted: Square-D FS-101P.

g. 240 volt, two-pole, two-speed, surface mounted: Square-D FG-22P.
h. 240 volt, two-pole, two-speed, flush mounted: Square-DFS-202P.
i. 120 volt, single-pole, H-O-A selector, surface mounted: Square-D FG-72P.
j. 120 volt, single-pole, H-O-A selector, flush mounted: Square-D FS-72P.
k. 240 volt, two-pole, H-O-A selector, surface mounted: Square-D FG-72P.
l. 240 volt, two-pole, H-O-A selector, flush mounted: Square-D FS-72P.
m. 120 volt, single-pole, surface mounted, explosion proof: Square-D FR-1H.
n. 240 volt, two-pole, surface mounted, explosion proof: Square-D FR-2H.
o. Manual Motor Starter - Speed Controller: Shall be similar to "Manual Motor Starter", above, except two-gang with motor speed control sized to handle motor indicated, with positive full on and full off bypass of speed control unit.

6. Manual Starter with Relay: Shall be similar to "Manual Motor Starter", above, except two-gang with relay sized for load indicated, and hand-off-automatic switch. Connect relay for 120V operation on load side of starter in "automatic" mode. Coordinate connection of Form C maintained contact for control with Mechanical Contractor.

B. Magnetic Starters

1. Shall be single-speed, across-the-line type rated in accordance with NEMA standards, sizes and horsepower ratings.
2. Starters shall be mounted in NEMA 1 enclosures unless otherwise indicated.
3. Magnetic starters shall be equipped with double break silver alloy contacts; all contacts shall be replaceable without removing starter or disconnecting power wiring.
4. Starter shall have straight-through wiring. Coils shall be of molded construction and shall be replaceable from the front without removing starter.
5. Overload relays shall be melting alloy type with replaceable control circuit module. Thermal units shall be of one-piece construction and interchangeable. Starter shall be inoperative if thermal unit is removed.
6. Provide hand-off-auto selector switch**,** start-stop pushbuttons and "run" pilot light in cover. Wire for maintained contact unless otherwise noted.

C. Combination Magnetic Starter: Shall be similar to "Magnetic Starter", above, except shall include fusible circuit breaker disconnect switch connected ahead of starter. The disconnect handle shall be in control of the disconnect device with the door open or closed. Disconnect handle shall be clearly marked as to whether the disconnect device is "on" or "off".

D. Combination Two-Speed Magnetic Starter: Shall be similar to "Combination Magnetic Starter", above, except with two starters, and six thermal overload units coordinated to match torque and horsepower characteristics of the motor. Starter shall be designed for variable torque operation, and shall be provided with high-low-off-auto selector switch and high and low pilot lights mounted in the cover. Wire for maintained contact unless otherwise noted.

E. Combination Reduced Voltage Magnetic Starter: Shall be similar to "Combination Magnetic Starter", above, except auto-transformer closed transition reduced voltage type with auto-transformer protection by winding over-temperature device.

F. Packaged Control Unit: Shall be furnished under Division 22 or 23, and connected by Electrical Contractor. Generally consists of one or more starters, disconnect switches and additional control devices prewired.

G. Contactor: Shall be similar to "Magnetic Starter", above, except without thermal overload units.

H. Duplex Motor Controller

1. General Operation

a. Controller consists of two starters in a common enclosure with separate fused disconnect switches for each starter.
b. An integral alternation circuit shall be provided which alternately operates first one motor and then the other on each successive closing of an external control device.
c. If one motor is running and its associated disconnect is opened, an overload relay trips or the starter is de-energized for any reason; the other motor will automatically be started.

2. Magnetic starters shall be single-speed; across-the-line type rated in accordance with NEMA standards, sizes and horsepower ratings.
3. Magnetic starters shall be mounted in NEMA 1 enclosures unless otherwise indicated.
4. Magnetic starters shall be equipped with double break silver alloy contacts; all contacts shall be replaceable without removing starter or disconnecting power wiring.
5. Overload relays shall be melting alloy type with replaceable control circuit module. Thermal units shall be of one-piece construction and interchangeable. Starter shall be inoperative if thermal unit is removed.
6. Provide hand-off-auto selector switch**,** start-stop pushbuttons and "run" pilot light in cover for each motor. Wire for maintained contact unless otherwise noted.
7. Provide one fused control circuit transformer.
8. Controller shall be prewired with a terminal block for connection of external control devices.

I. Design Make: Square D Class 8XXX

J. Acceptable Manufacturers:

1. ABB
2. Eaton
3. Siemens
4. Square D

2.3 LIGHTING CONTACTORS

A. 480V rated contacts, minimum of 30A or larger rating as called for on the drawings.

B. Electrically operated, electrically held.

C. Provide with 120V coil.

D. Provide with NEMA 1 enclosure or enclosure type if specified otherwise on drawings.

E. Provide with number of poles as called for on the drawings.

F. Shall be field convertible for NO/NC operation.

G. Design Make: Square D Class 8903

H. Acceptable Manufacturers:

1. ABB
2. Eaton
3. Siemens
4. Square D

2.4 LOW VOLTAGE FUSES

A. All fuses rated 600 volts and below shall be rejection type dual-element, time-delay type. Provide one complete set of fuses for all fusible disconnect switches, plus (3) spare fuses of each size. Deliver spare fuses to the Owner and obtain receipt.

B. Design Make: Fuses 600 amperes and below: Bussman Type FRN-R (300 volts), Type FRS-R (600 volts) or Approved Equal.

PART 3 - EXECUTION

3.1 GENERAL

A. Provide identification for all equipment and devices as indicated in section 260100.

B. Provide miscellaneous bolts, washers, nuts, clips, lock washers, hardware, etc. as required to install equipment.

C. Unload, move, handle, set in place, install, erect, assemble, connect, test etc. all items ad required.

D. Provide minimum NEC working clearance for all equipment.

E. Verify cable/lug sizes for terminations. Where a feeder is sized larger the lug provide replacement lug or in line splice as directed by Owner's Representative.

3.2 DISCONNECT SWITCHES

A. Install disconnect switches in locations shown on plans. Install true and level.

B. Tighten all bolt and lug connections using a torque wrench or screwdriver per the manufacturer's recommendations.

C. Provide identification as required per Section 260100.

D. Provide fuses in all fusible switches.

E. All roof mounted disconnect switches shall be a minimum NEMA 3R rating.

F. Provide stainless steel hardware strut channel racking for all roof mounted disconnect switch supports. Do not install disconnect switches on roof curbs below the roof flashing level. Maintain roof warranty for all disconnect switch and associated raceway support installations.

G. Disconnect switches may be mounted to HVAC equipment where approved by the equipment manufacturer and not interfere with access panel or internal components.

3.3 LOW VOLTAGE FUSES

A. Install low voltage fuses in disconnect switches as called for on the plans.

B. Turn all spare fuses over to the Owner and obtain receipt.

3.4 MOTOR CONTROL EQUIPMENT

A. Provide overload and fuses. Coordinate sizes with Division 22 or 23 contractor.

B. Terminate control wiring. Coordinate with Division 22 or 23 contractor.

C. Prior to releasing the starter and disconnect order the Division 26 contractor shall obtain verification in writing from the Division 22 and 23 contractors that all starter and disconnect sizes and types are correct. The Division 26 contractor shall bear all cost if written approval is not obtained prior to releasing the order and size changes are required.

END OF SECTION

SECTION 262923 – ADJUSTABLE-SPEED DRIVES

PART 1 – GENERAL

1.1 WORK INCLUDED

A. Provide all labor, materials, tools, and equipment required for the complete installation of work called for in the Contract Documents.

B. All Adjustable Speed Drives will be furnished and installed by the Electrical contractor. The Electrical contractor shall provide all internal control wiring jumpers, communication card installation and network settings communicate with the temperature control system, overload settings, and factory startup.

C. The Division 22 and 23 contractors will furnish all adjustments and programming temperature controls system settings and sequences.

1.2 SCOPE

A. This section includes minimum requirements for variable speed motor controls referred to as Adjustable Speed Drives (ASD) also referred to as Variable Frequency Drives (VFD) or Variable Speed Drives (VSD).

B. The drive manufacturer shall supply the drive and all necessary options as specified. All drives installed on this project shall be from the same manufacturer and have a common user interface (control panel). The manufacturer shall have been engaged in the production of this type of equipment for a minimum of 15 years. Drives that are manufactured by a third party and "brand labeled" shall not be acceptable. Drive manufacturers who do not build their own power boards and assemblies, or do not have full control of the power board manufacturing and quality control, shall be considered as a "brand labeled" drive.

C. This section includes minimum requirements for the following:

1. Adjustable Speed Drives

1.3 QUALITY ASSURANCE

A. All adjustable speed drives shall be installed in a neat and workmanlike manner. All methods of construction that are not specifically described or indicated in the Contract Documents shall be subject to the control and approval of the Owner's Representative. Equipment and materials shall be of the quality and manufacture indicated. The equipment specified is based upon the acceptable manufacturers listed. Where "approved equal" is stated, equipment shall be equivalent in every way to that of the equipment specified and subject to approval.

B. Each drive shall be subjected to the following test and quality control procedures.

1. Each new product design shall undergo a 4000-hour pre-production burn-in test. A minimum of ten units shall be used to accumulate this entire time. Each unit shall be temperature cycled between 32 and 100 degrees Fahrenheit.

2. Every ASD shall be functionally tested under motor load. During this load test the ASD shall be monitored for correct phase current, phase voltages, and motor speed. Correct Current Limit operation shall be verified by simulating a motor overload. Manufacturing test data on each drive shall be recorded and stored by the manufacturer.
3. Verification of proper factory presets shall performed on 100% of all parameters to ensure proper microprocessor settings. Verification that the proper factory settings are loaded correctly in the drive shall be done via the drive serial interface port. Any parameter changes that are required after the addition of options such as communication cards or bypass shall be verified in addition to the drive only defaults.
4. All options shall be functionally tested including operation of a motor in the bypass mode if supplied. Proper sizing and adjustment of the integral motor overload shall be set and verified.

C. Referenced Standards and Guidelines:

1. Institute of Electrical and Electronic Engineers (IEEE)

   a. IEEE 519-2014, IEEE Recommended Practice and Requirements for Harmonic Control in Electric Power Systems

2. Underwriters Laboratories

   a. UL 508, 508A, 508C
   b. UL 61800, 61800-5-1, 61800-5-2
   c. UL 1995

3. The Association of Electrical Equipment and Medical Imaging Manufacturers (NEMA)

   a. NEMA ICS 7-2014, Adjustable Speed Drives

4. International Electrotechnical Commission (IEC)

   a. EN/IEC 61800

5. National Electric Code (NEC)

   a. NEC 430.120, Adjustable-Speed Drive Systems

6. CSA Group

   a. CSA C22.2 No. 274

D. Qualifications:

1. Drives shall be UL labeled as a complete assembly. The base ASD shall be UL listed for 100 kA SCCR when installed in accordance with the manufacturer's guidelines.
2. The base drive shall be SEMI-F47 certified. The drive must tolerate voltage sags to 50% for up to 0.2 seconds, sags to 70% for up to 0.5 seconds, and sags to 80% for up to one second.

1.4 SUBMITTALS

A. Provide a summary list of all ASD's with the following information:

1. Bill of materials.
2. Dimension drawings.
3. Wiring diagrams.
4. Product data sheets including:

    a. Integrated electrical protection.
    b. Agency certifications.
    c. Environmental tolerances.
    d. Electrical characteristics including harmonic performance
    e. Enclosure material and rating.
    f. Control (inputs, outputs, power supplies).
    g. Motor lead length @ 8 kHz carrier frequency.

5. List of all operator interface devices.
6. List of any exceptions to this specification.

1.5 START-UP SERVICE AND TRAINING

A. ASD's shall not be powered up without authorization from the ASD manufacturer. The contractor shall notify the ASD manufacturer when the units have been installed and shall schedule startup by a factory trained and authorized technician. This technician shall complete a startup report that records all ASD data, settings and a checklist of tests and observations. A copy of this test report shall be forwarded to the project Commissioning Authority and included in the Operation and Maintenance Manual.

B. The ASD factory trained, and authorized technician shall make all final adjustments as required for proper operation. Coordinate with the mechanical contractor and equipment vendors as required.

C. Provide one 2-hour training session on site by a ASD factory trained and authorized technician. This session shall review all operation and maintenance requirements plus the fundamentals of ASD's and their application to AC motors.

1.6 OPERATION AND MAINTENANCE MANUALS

A. Provide one copy of complete documentation for each type of adjustable speed drive installed. Documentation shall be bound and included in the Operation and Maintenance Manuals required in this Specification. Documentation shall include the following:

1. Wiring diagrams
2. Schematics
3. Operating and maintenance manuals
4. Local service representative
5. Emergency on sight technical support information
6. Recommended maintenance procedures
7. Recommended spare parts list

PART 2 - PRODUCTS

2.1 COMMON ADJUSTABLE SPEED DRIVE CAPABILITIES

A. The drive package as specified herein shall be enclosed in a UL Type enclosure (enclosures with only NEMA ratings are not acceptable), completely assembled and tested by the manufacturer to ISO9001 standards.

B. The drive shall provide full rated output from a line of +10% to -10% of nominal voltage. The drive shall continue to operate without faulting from a line of +25% to -25% of nominal voltage.

1. Drives shall be capable of continuous full load operation under the following environmental operating conditions:

    1) Ambient temperature -15 to 40° C (5 to 104° F).
    2) Altitude 0 to 1000 m (0 to 3,300 ft) above sea level.
    3) Humidity 5 to 95%, non-condensing.

2. Supply Connection:

    a. Voltage and power range:

        1) 3-phase
        2) Frequency: 48 to 63 Hz
        3) Fundamental power factor: 0.98
        4) Efficiency at rated power: 98%

3. Motor Connection:

    a. Supported motor types:

        1) Asynchronous motor
        2) Permanent magnet motor
        3) SynRm

    b. Voltage:

        1) 3-phase
        2) From 0 to supply voltage
        3) Frequency: 0 to 400 Hz

C. All drives shall utilize the same Advanced Control Panel (keypad) user interface.

1. Plain English text

    a. The display shall be in complete English words for programming and fault diagnostics (alpha-numeric codes are not acceptable).
    b. Safety interlock and run permissive status shall be displayed using predetermined application specific nomenclature, such as: Damper end switch, smoke alarm, vibration trip, and overpressure.

c. Safety interlock, run permissive, and external fault status shall have the option of additional customized project specific terms, such as: AHU-1 End Switch, Office Smoke Alarm, CT-2 Vibration.

2. The control panel shall include at minimum the followings controls:

   a. Four navigation keys (Up, Down, Left, Right) and two soft keys to simplify operation and programming.
   b. Hand-Off-Auto selections and manual speed control without having to navigate to a parameter.
   c. Fault Reset and Help keys. The Help key shall include assistance for programming and troubleshooting.

3. Multiple Home View screens shall be capable of displaying up to 21 points of information. Customizable modules shall include bar charts, graphs, meters, and data lists. Displays shall provide real time graphical trending of output power, frequency, and current within selectable intervals of 15/30/60 minutes and 24 hours.
4. The control panel shall display the following items on a single screen; output frequency, output current, reference signal, drive name, time, and operating mode (Hand vs Auto, Run vs Stop). Bi-color (red/green) status LED shall be included. Drive (equipment) name shall be customizable.
5. There shall be a built-in time clock in the control panel. The clock shall have a battery backup with 10 years minimum life span. Daylight savings time shall be selectable.
6. I/O Summary display with a single screen shall indicate and provide:

   a. The status/values of all analog inputs, analog outputs, digital inputs, and relay outputs. Drives that require access to internal or live components to measure these values, are not acceptable.
   b. The programmed function of all analog inputs, analog outputs, digital inputs, and relay outputs.
   c. The ability to force individual digital I/O high or low and individual analog I/O to desired value, for increased personal protection during drive commissioning and troubleshooting. Drives that require access to internal or live components to perform these functions, are not acceptable.

7. The drive shall automatically backup parameters to the control panel. In addition to the automatic backup, the drive shall allow two additional unique backup parameter sets to be stored. Backup files shall include a time and date stamp. In the event of a drive failure, the control panel of the original drive can be installed on the replacement drive, and parameters from that control panel can be downloaded into the replacement drive.
8. The control panel shall display local technical support contact information as part of drive fault status.
9. The control panel shall be removable, capable of remote mounting.
10. The control panel shall have the ability to store screen shots, which are downloadable via USB.
11. The control panel shall have the ability to display a QR code for quick access to drive information.
12. The LCD screen shall be backlit with the ability to adjust the screen brightness and contrast, with inverted contrast mode. A user-selectable timer shall dim the display and save power when not in use.

13. The control panel shall include assistants specifically designed to facilitate start-up. Assistants shall include: First Start Assistant, Basic Operation, Basic Control, and PID Assistant.
14. Primary settings for HVAC shall provide quick set-up of all parameters and customer interfaces to reduce programming time.
15. The drive shall be able to operate with the control panel removed.

D. All drives shall have the following hardware features/characteristics as standard:

1. Two (2) programmable analog 4-20mA inputs shall accept current or voltage signals. Current or Voltage selection configured via control panel. Drives that require access to internal components to perform these functions, are not acceptable.
2. Two (2) programmable analog 4-20mA outputs. At least one of the analog outputs shall be adjustable for current or voltage signal, configured via control panel. Drives that require access to internal components to perform these functions, are not acceptable.
3. Three (3) programmable Form-C relay outputs. The relay outputs shall include programmable on/off time delays. The relays shall be rated for a continuous current rating of 2 Amps. Maximum switching voltage of 250 VAC / 30 VDC. Open collector and Form-A relays are not acceptable. Drives that have less than (3) Form-C relay outputs shall provide an option card to provide additional relay outputs.
4. Drive terminal blocks shall be color coded for easy identification of function.
5. The drive shall include an isolated USB port for interface between the drive and a laptop. A non-isolated USB port is not acceptable.
6. An auxiliary power supply rated at 24 VDC, 250 mA shall be included.
7. The drive shall have cooling fans that are designed for field replacement. The primary cooling fan shall operate only when required and be variable speed for increased longevity and lower noise levels. Drives whose primary cooling fans are not variable speed, shall include a spare cooling fan.
8. The overload rating of the drive shall be 110% of its normal duty current rating for 1 minute every 10 minutes, 130% overload for 2 seconds every minute.
9. The input current rating of the drive shall not be greater than the output current rating. Per NFPA 70 430.122, drives with higher input current ratings may require the upstream wiring, protection devices, and source transformers to be upsized.
10. Circuit boards shall be coated per IEC 60721-3-3; Chemical gasses Class 3C2 and Solid particles Class 3S2.
11. Earth (ground) fault detection shall function in both modulating (running) and non-modulating modes.
12. Coordinated AC transient surge protection system consisting of 4 MOVs (phase-to-phase and phase-to-ground), a capacitor clamp, and internal chokes. The MOVs shall comply with UL 1449 4th Edition. Drives that do not include coordinated AC transient surge protection shall include an external TVSS/SPD (Transient Voltage Surge Suppressor/Surge Protection Device).
13. The drive shall include a robust DC bus to provide short term power-loss ride through. The DC bus Joule to drive kVA ratio shall be 4.5 J/kVA or higher. An inertia-based ride through function should help maintain the DC bus voltage during power loss events. Drives with control power ride through only, are not acceptable.

E. All drives shall have the following software features as standard:

1. A Fault Logger that stores the last 16 faults in non-volatile memory.

    a. The most recent 5 faults save at least 9 data points, including but not limited to: Time/date, frequency, DC bus voltage, motor current, DI status, temperature, and status words.
    b. The date and time of each fault and fault reset attempt shall be stored in the Fault Logger.

2. An Event Logger that stores the last 16 warnings or events that occurred, in non-volatile memory.

    a. Events shall include, but not limited to: Warning messages, checksum mismatch, run permissive open, start interlock open, and automatic reset of a fault.
    b. The date and time of each event's start and completion points shall be stored in the Event Logger.

3. Programmable start method. Start method shall be selectable based on the application: Flying-start, Normal-start, and Brake-on-start.
4. Programmable loss-of-load (broken belt / coupling) indication. Indication shall be selectable as a control panel warning, relay output, or over network communications. This function to include a programmable time delay to eliminate false loss-of-load indications.
5. Motor heating function to prevent condensation build up in the motor. Motor heating adjustment, via parameter, shall be in "Watts." Heating functions based only on "percent current" are not acceptable.
6. Advanced power metering abilities shall be included in the drive. Drives without these data points, must include a separate power meter with each drive.

    a. Instantaneous output power (kW)
    b. Total power, broken down by kWh.
    c. Time based kWh metering for: current hour, previous hour, current day, and previous day.
    d. Energy saving calculation shall be included that shows the energy and dollars saved by the drive.

7. The drive shall include a motor flux optimization circuit that will automatically reduce applied motor voltage to the motor to optimize energy consumption and reduce audible motor noise.
8. Run permissive circuit - There shall be a run permissive circuit for damper or valve control. Regardless of the source of a run command, the Drives shall provide a dry contact closure that will signal the damper to open. When the damper is fully open, an end-switch shall close, allowing the drive to run the motor.

    a. The drive shall also include a programmable start delay, for when an end-switch is not provided.

9. Start interlock circuit - Four separate start interlock (safety) inputs shall be provided. When any safety is opened, the motor shall be commanded to stop. The control panel will display the specific safety(s) that are open. The status of each safety shall be transmitted over the network communications. Wiring multiple safeties in series is not acceptable.
10. External fault circuit – Three separate external fault inputs shall be provided. This circuit shall have the same features and functionality as the start interlock circuit, except it shall require a manual reset before the drive is allowed to operate the motor.
11. The drive shall include a switching frequency control circuit that reduces the switching frequency based on actual drive temperature, and allows higher switching frequency settings without derating the drive. It shall be possible to set a minimum and a target switching frequency.
12. The drives nameplate horsepower shall be fully rated at 8kHz switching frequency with a minimum motor lead length of 150 feet.
13. Visual function block adaptive programming allowing custom control schemes, minimizing the need for external controllers. I.e. cooling tower staging logic. A free software tool shall be used to configure adaptive programming.
14. The ability to automatically restart after an over-current, over-voltage, under-voltage, external fault, or loss of input signal protective trip. The number of restart attempts, trial time, and time between attempts shall be programmable. Each of these faults may have automatic restart individually disabled via a parameter selection.
15. Three (3) programmable critical frequency lockout ranges to prevent the drive from operating the load continuously at an unstable speed/load.
16. Seven (7) programmable preset frequencies/speeds.
17. Two independently adjustable accel and decel ramps with 1 – 1800 seconds adjustable time ramps.
18. PID functionality shall be included in the drive.

    a. Programmable “Sleep” and “Wake up” functions to allow the drive to be started and stopped based on the level of a process feedback signal.
    b. The drive shall include an independent PID loop for customer use, assigned to an Analog Output. This PID loop may be used for cooling tower bypass valve control, chilled water valve, etc.

19. At least 4 parameter user sets that can be saved to the permanent memory and recalled using a digital input, timed function, or supervision function.
20. Drive shall be compatible with an accessory that allows the control board to be powered from an external 24 VDC/VAC source, allowing the drive control to remain powered by a UPS during an extended power outage.
21. A computer-based software tool shall be available to allow a laptop to program the drive. The drive shall be able to support programming without the need for line voltage. All necessary power shall be sourced via the laptop USB port.
22. The drive shall include a fireman’s override mode. Upon receipt of a contact closure from the Fire Alarm Life Safety system, the drive shall operate in a dedicated Override mode distinct and separate from the drive’s Normal operation mode. The following features will be available in the drive override function:

    a. The Override mode shall be secured by password to prevent changes once programmed.
    b. The drive shall ignore external inputs and commands not defined as part of the override function.

c. Override operation mode shall be selectable between: single frequency, multiple fixed frequencies, follow an analog input signal, PID control, or come to a forced stop.
d. High priority safeties shall stop the drive and lower priority safeties shall be ignored in Override mode.
e. The drive shall be configurable to receive from 1 to 3 discrete digital input signals and operate at up to three discrete speeds.

23. The drive shall have multi-pump functionality and an intelligent master/follower configuration for controlling up to 8 parallel pumps equipped with drives. The drive shall have a parameter synchronization feature to program the PID, multi-pump, and AI parameters in all parallel drives. The functionality to start and stop the pumps based on capacity, operating time or efficiency of the pump to ensure each pump is operated regularly.

    a. The multi-pump functionality shall control:

        1) Flow Control
        2) Pressure Control
        3) Pump Alternation

F. Security Features

1. The drive manufacture shall clearly define cybersecurity capabilities for their products.
2. The drive shall include password protection against parameter changes.

    a. There shall be multiple levels of password protection including: End User, Service, Advanced, and Override.
    b. The drive shall support a customer generated unique password between 0 and 99,999,999.
    c. The drive shall log an event whenever the drive password has been entered.
    d. The drive shall provide a security selection that prevents any “back door” entry. This selection even prevents the drive manufacturer from being able to bypass the security of that drive.
    e. A security level shall be available that prevents the drive from being flashed with new firmware.

3. The “Hand” and “Off” control panel buttons shall have the option to be individually disabled (via parameter) for drives mounted in public areas.

G. Network Communications

1. The drive shall have an EIA-485 port with removable terminal blocks. The onboard protocols shall be BACnet MS/TP, Modbus, and Johnson Controls N2.
2. The drive shall have the ability to communicate via two protocols at the same time, one onboard protocol and one option card-based protocol. Once installed, the drive shall automatically recognize any optional communication cards without the need for additional programming.
3. The drive shall not require a power cycle after communication parameters have been updated.

4. The drive's relay output status, digital input status, analog input/output values, Hand-Auto status, warning and fault information shall be capable of being monitored over the network. The drive's start/stop command, speed reference command, relay outputs and analog outputs shall be capable of being controlled over the network. Remote drive fault reset shall be possible.

H. Disconnect – A circuit breaker shall be provided on all drives. The disconnect shall be door interlocked and padlockable. Drive short circuit protection shall be included on all packaged units that include a disconnecting means. All disconnect configurations shall be UL Listed by the drive manufacturer as a complete assembly and carry a UL508 label. Disconnect packages manufactured by anyone other than the drive manufacturer, are not acceptable.

I. Bypass – All drive/bypass configurations shall be UL Listed by the drive manufacturer as a complete assembly and carry a UL508 label. Bypasses manufactured by anyone other than the drive manufacturer, are not acceptable.

1. The drive and bypass package shall be a complete factory wired and tested bypass system consisting of a padlockable disconnect device, drive output contactor, bypass contactor, and drive input fuses.
2. The drive and bypass package shall have a UL listed short circuit current rating of 100 kA, for 240 VAC and 480 VAC systems, and this rating shall be indicated on the rating label.
3. The bypass control shall be powered by a three-phase switch mode power supply with a voltage tolerance of +30%, -35%. Single-phase power supplies and control power transformers (CPT) are not acceptable.
4. All bypass packages shall utilize a dedicated LCD bypass control panel (keypad) user interface. The bypass control panel must be a separate display from the drive control panel. Bypass packages that use a single shared drive/bypass control panel are not acceptable, due to that control panel acting as a single point of failure.

    a. The bypass shall include a two-line, 20-character LCD display. The display shall allow the user to access parameters and view:

        1) Bypass input voltage, current (Amps) and power (kW)
        2) Bypass faults, warnings, and fault logs
        3) Bypass operating time and energy consumption (resettable)

    b. The bypass control panel shall include the following controls:

        1) Four navigation keys (Up, Down, Enter, Escape)
        2) Bypass Hand-Off-Auto, Drive mode / Bypass mode selectors, Bypass fault reset

    c. The following LED indicating lights or control panel display indications shall be provided.

        1) Drive mode selected, Bypass mode selected
        2) Drive running, Bypass running
        3) Drive fault, Bypass fault

d. Safety interlock and run permissive status shall be displayed using predetermined application specific nomenclature, such as: Damper end switch, smoke alarm, vibration trip, and overpressure.

5. All bypasses shall have the following hardware features/characteristics as standard:

   a. Six (6) digital inputs and five (5) Form-C relay outputs. The digital inputs shall be capable of accepting both 24 VDC and 24 VAC. The bypass control board shall include an auxiliary power supply rated 24 VDC, 250 mA.
   b. Drive isolation fuses shall be provided. Bypass designs which have no such fuses, or that only incorporate fuses common to both the drive and the bypass are not acceptable. Third contactor "isolation contactors" and service switches are not an acceptable alternative to drive isolation fuses.
   c. The bypass shall be able to detect a single-phase input power condition while running in bypass, disengage the motor, and provide a single-phase input power indication.
   d. The bypass shall be designed for stand-alone operation and be completely functional in both Hand and Automatic modes, even if the drive and/or drive's control board has failed. Network communications shall remain functional. Bypass systems that do not maintain full functionality in the event of a drive failure, are not acceptable.

6. All bypasses shall have the following software features as standard:

   a. Programmable loss-of-load (broken belt / coupling) indication shall be functional in drive and bypass mode.
   b. The bypass shall also support run permissive and start interlock control functionality, including start delay, as previously specified in the drive section.
   c. The bypass control shall monitor the status of the drive and bypass contactors and indicate when there is a welded contactor contact or open contactor coil.
   d. The bypass shall include a selection for either manual or automatic transfer to bypass. The automatic transfer mode shall allow the user to select the specific drive fault types that result in an automatic transfer to bypass. The automatic transfer mode shall not allow a transfer to bypass on motor related faults. Automatic transfer schemes that do not differentiate between fault types, are not acceptable.
   e. The bypass shall include the ability to select the operating mode of the system (Drive/Bypass) from either the bypass control panel or digital input.
   f. The bypass shall include a supervisory control mode that monitors the value of the drive's analog input (feedback). This feedback value is used to control the bypass contactor on/off state. The supervisory mode shall allow the user to maintain hysteresis control over applications such as cooling towers and booster pumps.
   g. Selectable Class 10, 20, or 30 electronic motor overload protection shall be included in both drive and bypass mode.
   h. The drive and bypass shall be designed to operate as an integrated system when in Override mode. Whether operating in drive or bypass mode, the low priority safeties will be ignored, and high priority safeties will be followed. External start/stop commands will be ignored. There shall be four selectable Override modes:

      1) Bypass only, with two smoke control modes:

         a) Fixed pre-configuration of digital inputs

b) Configurable high/low priority safeties and faults, to allow configuration to meet needs of local Authority Having Jurisdiction.

2) Drive only
3) Drive then transfer to bypass, in the event of a drive fault
4) Force to Stop

7. The bypass relay output status, digital input status, warning and fault information can be monitored over the network. Status information shall be monitored, including; operating mode (drive vs bypass), current drawn in bypass mode, broken belt, and phase-to-phase voltage. The bypass start/stop command, force to bypass command, and relay outputs shall be capable of being controlled over the network.

2.2 ADJUSTABLE SPEED DRIVE

A. Technology and Harmonics Performance:

1. The standard ASD shall produce an adjustable AC voltage / frequency output. It shall be of the pulse-Width Modulated (PWM) technology and shall consist of a 6-pulse minimum full-wave diode bridge converter to convert incoming AC utility power to DC power, a capacitor filter/storage network and an inverter power transistor switching output section. The microprocessor controller generating inverter output shall include the internal base driver and specified protection and sensing circuits. The ASD waveform generator shall be IGBT based and capable of extended carrier frequency operation.
2. Provide all standard adjustable speed drives less than 25 horsepower with dual (positive and negative DC link) chokes equivalent to 5% to reduce the harmonics to the power line.
3. Harmonic Performance: THD <45% above 60% load

B. Design Make: ABB ACH580 Series

C. Acceptable Equivalents:

1. Danfoss VLT HVAC Series
2. Eaton PowerXL DH1 HVAC Series
3. Yaskawa HV600 Series

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install incoming 60Hz power conductors and frequency modulated conductors in separate conduits.

B. Electrical contractor to provide fire alarm fan shut down relay connection between I/O's "12" and "18". Provide normally closed connection such that the connected air handler supply or return fan motor stops when the fan shut down relay is actuated. This relay shall be installed in series with the DDC system start/stop signal.

C. Install ASD in an accessible location. Refer to contract documents for more information.

D. Motor lead lengths shall not exceed manufacturers recommendations as described in part 2 of this section.

E. Provide all start up services and training as described in part 1 of this section.

F. Completely assemble and provide connections to all terminal or terminal strips and any miscellaneous control devices.

G. Input and motor leads for each ASD shall be in a separate dedicated steel conduit.

H. Adjust drive controls in accordance with manufacturer's requirements. Switching frequency shall have an initial set point of 6 KHz.

I. Coordinate entire installation, including communications interface with the temperature control contractor prior to ordering ASD.

J. When the ASD is located remotely from the motor and the associated disconnect switch, provide an interlock in the disconnect switch and provide 2-#12AWG in ½" C from the ASD to the interlock. This shall be interfaced to disable the ASD prior to disconnection of power to the motor.

3.2 COORDINATION

A. Provide motor overload programming for connected load. Coordinate sizes with Division 22 or 23 contractor.

B. Prior to releasing the adjustable speed drive order the Division 26 contractor shall obtain verification in writing from the Division 22 and 23 contractors that all sizes and types are correct. The Division 26 contractor shall bear all cost if written approval is not obtained prior to releasing the order and size changes are required.

3.3 WARRANTY

A. The drive product warranty shall be 24 months from the date of installation and programming. The warranty shall include parts, on-site labor, and travel time and travel costs, or replacement of the complete drive as determined by the drive manufacturer's technical support representative.

END OF SECTION

SECTION 263200 - PACKAGED GENERATOR ASSEMBLIES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide labor, materials, equipment and services to perform operations required for the complete installation and related Work as required in Contract Documents.

1.2 SCOPE

A. Provide temporary trailer mounted generator backup the existing life-safety Automatic Transfer Switch and provide Temporary Power to the Boiler Room area for construction activities. The temp. generator shall be run 12 hours a day during occupied building hours Monday to Friday for 2-weeks. The temporary power requirements shall be 100Amps at 3P/4W 120/208V. The electrical contractor shall relocate the existing 5kV transformer and reenergize the existing switchboard in the boiler room during the period the temp. generator is in use. The electrical contractor shall provide the temp. generator for additional time and no additional cost should they fail to relocate and reenergize the 5kV transformer and switchboard in the 2-week perior.

1. Locate the generator outside the Boiler Room, locate so exhaust fumes to not enter outside air ventilation intakes. Locate generator a min. of 25-feet from outside air intakes.

2. Include all required over-current protection, temporary power cables, start/stop control wiring, and base mounted diesel fuel tank.

3. Provide diesel fuel fill and refilling to run the temporary generator. Include on-site fuel refills as required.

4. Provide required 120V and 208V construction power and receptacles in the boiler room for use by the other prime contractors until normal power is restored.

B. Provide ACCEPTABCE TESTING as specified on the existing Cummins natural gas emergency generator after it is reconnected following completion of the work in the boiler room and natural gas piping reconnection. The existing generator will be without service for duration while the normal power 1,600 Amp 120/208V MDP is off-line for its associated transformer relocation.

C. This section includes minimum requirements for the following:

1. Temporary Rental Generator
2. Testing and Recommissioning of existing Emergency Generator
3. Training

1.3 QUALITY ASSURANCE

A. Manufacturers of all equipment in the complete system shall be firms regularly engaged in manufacture of engine driven standby generator systems, of types, ratings and characteristics

required, whose products have been in satisfactory use in similar service for not less than 5 years.

B. The System Supplier shall meet the following:

1. Be a firm that has been engaged in supervising installation of and servicing engine generator sets for a minimum of 15-years.
2. Maintain a factory authorized service organization with factory trained service technicians.
3. Be domiciled and have a full-service branch within a 75-mile radius of the project.
4. Maintain a stock of standard spare parts and offer 24-hour service availability, 7 days a week. The supplier shall have sufficient parts inventory to maintain over the counter availability of at least 90% of any required parts. The generator set supplier shall guarantee 100% parts availability within 48 hours from the time an order is entered with the dealer.
5. Own a fleet of trailer mounted generator sets with unit's comparable one being supplied, available for use by the Owner to prevent extended down time.

C. The System Installer shall be qualified with at least 5 years of successful installation experience on projects with engine generator system installation work similar to that required for project.

1.4 SYSTEM DESCRIPTION AND OPERATION

A. The existing generator(s) in this project is NFPA 110 defined Level 1, Type 10, and Class X operational run-time.

B. The generator set start-stop sequence shall be initiated manually or automatically from a transfer switch auxiliary contact. The control system shall automatically engage the cranking motor, sense engine starting speed, disengage the motor, and arm the engine protection circuit.

C. The generator set shall immediately shut down in the event of overspeed, low oil pressure, high water temperature and overcrank. Cause of shutdown shall be indicated by a light on the generator and remote annunciator. System logic shall prevent restart until fault is cleared. There shall be a provision for manual and emergency shutdown.

D. Utility Power Failure: Each generator set shall automatically start upon failure of normal source voltage within 10 seconds. The generator(s) will be given a start signal from a utility voltage sensing device at the ATS(s). Provide a field adjustable from 3 to 30 seconds delay time control between normal source failure and engine starting.

E. The system shall transfer loads from normal source power to emergency source when engine-generator reaches 90% of its rated voltage.

F. The system shall automatically open transition retransfer emergency loads from emergency generator to normal source ten minutes after normal source has reached 90% or more of normal voltage. Provide a 5-to-25-minute adjustable timer. If emergency generator fails while supplying load, retransfer emergency loads from emergency generator to normal source instantaneously when normal source has 90% or more of normal voltage.

G. The system shall run the engine for a period of five minutes after retransfer of emergency loads to normal source. The engine-generator will then shut down, automatically resetting and leaving all controls ready for the next emergency start condition.

H. Maintenance and Operational Testing:

1. All Maintenance and Operational Testing shall be done in accordance with NFPA 110.
2. The system shall use a time clock to automatically exercise engines once each week for 30 Minutes. The ATS time clock contacts shall simulate loss of normal voltage, start engine, and shut engine down five minutes after the test is complete. The load shall not transfer to the emergency source during the exercise time. Provide a selector switch to permit cycling engine-generator under load or no-load conditions. The exact test times shall be coordinated with the owner.
3. The system shall use a time clock to automatically exercise the emergency power system once each month for 30 Minutes. The ATS time clock contacts shall simulate loss of normal voltage, start engine, and shut engine down five minutes after test is complete. The load(s) shall open transition transfer to the emergency source during the exercise time.

I. Motors shall be started across-the-line unless otherwise called for.

1.5 SUBMITTALS

A. Submit shop drawings on equipment and accessories to include the following:

1. Factory tests and field supervision reports as called for.
2. Data sheet for temporary generator and fueling system.

1.6 FIELD SUPERVISION

A. Submittal shall state the address of the nearest vendor’s place of business, telephone number and name of person to contact for field service.

B. Provide field supervision/service at no additional cost to cover inspection, test, and start-up of this equipment.

C. Submittal shall state the amount of field supervision/service recommended by vendor to cover critical points of installation, inspection, test, and start-up.

D. The complete installation shall be checked for procedural and operational compliance by a representative of the system manufacturer's authorized local dealer. The engine lubricating oil and antifreeze, as recommended by the system manufacturer, shall be provided by the generator set dealer.

E. The system manufacturer's dealer representative shall be present to assist the Contractor during start-up, systems check, adjusting, and any site testing required after the installation is complete.

PART 2 - PRODUCTS

2.1 RENTAL TEMPORARY GENERATOR

A. Provide temporary trailer mounted diesel generator parked outside the boiler room with all required over-current protection, temporary power cables, start/stop control wiring, and base mounted diesel fuel tank.

B. Engine - Diesel Fuel:

1. Water-cooled diesel, to operate on #2 diesel fuel.
2. Min. six cylinder, turbo charged, four cycle, 1800 rpm.
3. Continuous stand-by rating of 100kW/125kVA, alternator voltage set to 120/208V Y.
4. Dual output circuit breakers or temporary fused disconnects connected to single output meeting the sizes on the one-line diagram,
5. Individual injection type fuel pump per cylinder with replaceable fuel filter element.
6. Gear driven pumps:

    a. Fuel transfer pump, capable of lifting fuel against the head pressure and deliver fuel at constant pressure to the injection pumps.
    b. Jacket water
    c. Lubricating oil

7. Full pressure lubrication system with gear type oil pump, full flow oil filter with replaceable filter element, equipped with spring-loaded bypass valve as an insurance against stoppage of lubricating oil in the event filter becomes clogged; water cooled oil cooler and thermostat.
8. One or more oil or dry type air cleaners of sufficient capacity to protect engine working parts from dust and dirt.
9. Provide a unit mounted radiator, fan, engine-driven centrifugal water circulating pump, and closed coolant recovery system shall be provided. The radiator and cooling system shall be capable of providing sufficient cooling capabilities for full rated load operation in 126 degrees F ambient at 600 feet of altitude above sea level with 0.25” water external air restriction. Blower fan, fan drive, and belts protected for personnel protection per OSHA standards.
10. 12V or 24V battery starting system per manufacturer's standard.
11. Provide 50/50 solution of ethylene glycol for engine closed loop cooling system.
12. Woodward, electronic governor. Engine speed shall be controlled the governor to maintain alternator frequency with +/-1% from no load to rated alternator output and +/-0.25% steady state. Adjustment of speed shall be from a locking screwdriver operated potentiometer on the control panel face.

C. Overcurrent Protection:

1. General

    a. Provide two generator output molded case circuit breakers, three pole, long time and instantaneous trip unit, to completely protect the generator from overloads; frame & trip size as called for on drawings.

b. Circuit breakers shall be mounted and connected in a guarded drip proof enclosure meeting NEMA 1, IP 22 and IEC 144.
c. Provide metal barrier between circuit breakers.

2.2 STARTING CONTROLS

A. Provide engine automatic starting control as follows:

1. Starting cycle initiated by auxiliary contact in automatic transfer switch panel.
2. Open fuel pump and cooling water supply solenoid valves.
3. Synchronous motor-driven or pneumatic timer providing adjustable number of cranking cycles (1 to 4) of ten seconds crank and ten seconds rest, or continuous cranking cycle of up to 75 seconds.
4. Positive cranking disconnect relay preventing cranking after engine fires.
5. Automatic engine shutdown.
6. Close fuel pump and cooling water supply solenoid valves.
7. If high water temperature, overspeed, low lubricating oil pressure, or engine overcranking lockout contacts operate, one audible alarm must operate and there must be visual indication of particular contact that operated; reset button.
8. Common fault contacts, 10 ampere contact rating, number as required, wired to terminal board for remote alarm signal.
9. Incorporate in engine-generator control cabinet.

2.3 GENERATOR MOUNTED FUEL TANK

A. Integral base mounted fuel tank on same trailer as generator. Fueling capacity min. to run generator at full load for 24-hours.

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS:

A. Completely coordinate installation, assure that elements of the system are compatible, operational and correct.

B. Provide rigging to unload, move, and set in place engine-generator. Provide concrete pad as detailed on the drawings. Field verify, before bidding, rigging method to be used to install generator in building. Provide all necessary cutting and patching of existing walls to rig generator into building. If necessary provide factory authorized representative to disassemble and reassemble generator to rig unit into building.

C. Provide miscellaneous bolts, washers, nuts, clips, lockwashers, small hardware, etc., of durium or equal rust resistant material, to make installation complete.

D. Refer to "Grounding" section of specifications.

E. Install equipment plumb, level, and true.

F. Connect diesel oil piping to engine-generator set and comply with manufacturer's instructions.

G. Fill cooling system with 50 percent glycol (anti-freeze) solution, per manufacturer's recommendations.

3.2 WIRING

A. Provide all required power and control wiring and raceways between engine-generator set, transfer switch, battery charger, louvers, dampers, controls, jacket heaters, control panel heaters, remote annunciation, coolers, batteries, sub-base fuel tank, heaters and all other various and related equipment.

B. Comply with Manufacturer's Instruction Books.

C. Maintain phasing standards as called for.

D. Provide long-barrel, two-hole, compression lugs for all normal and emergency power cables.

E. Color code and identify control and power wires and cables as called for.

F. Provide copper, 600-volt insulation minimum, control wiring; do not splice.

G. Provide "crimp-on" type terminals for control wire terminations, as called for.

H. Provide liquid-tight jacketed flexible conduit for all connections to engine, generator, and to day tank.

I. Provide green equipment grounding conductor in each conduit run.

3.3 ACCEPTANCE TESTING

A. Prestart Checks:

1. Oil level
2. Water level
3. Battery connection and charge condition
4. Air start supply pressure (if so equipped)
5. Engine to control interconnects
6. Engine generator intake/exhaust obstructions
7. Engine room ventilation obstructions
8. Removal of all packaging materials

B. Initial Test:

1. Tests shall be performed in accordance with the following:

    a. The quantity of engine-generator sets intended to be operated simultaneously shall be tested simultaneously with building load for the period identified in this section.
    b. The test load shall be all loads that are served by the Emergency Power Supply System (EPSS). There is no minimum loading requirement for this portion of the test.

c. The time delay on start shall be observed and recorded.
d. The cranking time until the prime mover starts and runs shall be observed and recorded.
e. The time taken to reach operating speed shall be observed and recorded.
f. The engine start function shall be confirmed by verifying operation of the initiating circuit of all transfer switches supplying EPSS loads.
g. The time taken to achieve a steady-state condition with all switches transferred to the emergency position shall be observed and recorded.
h. The voltage, frequency, and amperes shall be recorded.
i. The prime mover oil pressure and water temperature shall be recorded.
j. The load test with building load shall:

1) Be continued for not less than 1.5 hours.
2) Have the run time recorded.

k. When normal power is restored to the building or facility, the time delay on retransfer to normal power for each switch with a minimum setting of 5 minutes shall be recorded.
l. The time delay on the prime mover cooldown period and shutdown shall be recorded.
m. After completion of the initial test, the prime mover shall be allowed to cool for not less than 5 minutes.

C. Full-Load Test:

1. A load shall be applied for a 1-hour, full-load test. The building load shall be permitted to serve as part of all of the load, supplemented by a load bank of sufficient size to provide a load equal to 100 percent of the nameplate kW rating of the engine-generator set, less applicable derating factors for site conditions.
2. With full load applied, the coolant temperature of the engine-generator set shall stabilize at a constant value relative to outdoor ambient temperature at least 30 minutes prior to completion of the test.
3. The full-load test shall be initiated after the initial test described above by any method that starts the prime mover and, upon reaching rated rpm, picks up not less than 30 percent of the nameplate kW rating for the first 30 minutes, not less than 50 percent of the nameplate kW rating for the next 30 minutes, and 100 percent of the nameplate kW rating for the next 60 minutes, less applicable derating factors for site conditions. A unity power factor shall be permitted for on-site testing, provided that rated load tests at the rated power factor have been performed by the manufacturer of the engine-generator set prior to shipment.
4. The following shall be recorded:

a. The cranking time until the prime mover starts and runs shall be observed and recorded.
b. The time taken to reach operating speed shall be observed and recorded.
c. The time taken to achieve a steady state condition with all switches transferred to the emergency position shall be observed and recorded.

5. The following shall be recorded at fifteen-minute intervals:

    a. Voltage, frequency and amperage.
    b. Prime mover oil pressure and water temperature.

6. Any method recommended by the manufacturer for the cycle crank test shall be utilized to prevent the prime mover from running. The complete crank/rest cycle required by NFPA 110 shall be observed.
7. The battery charge rate shall be recorded at 5-minute intervals for the first 15 minutes or until charge rate stabilization.
8. All safety functions shall be tested on site as required by NFPA 110 and recommended by the manufacturer.
9. The following shall be made available to the authority having jurisdiction at the time of the acceptance test:

    a. Evidence of the prototype test as required by NFPA 110.
    b. A certified analysis that verifies the torsional vibration compatibility of the rotating element of the prime mover and generator as required by NFPA 110.
    c. A letter from the manufacturer stipulating compliance and performance with NFPA 110.
    d. The manufacturer's certification of a rated load test at rated power factor with the ambient temperature, altitude, and fuel grade recorded.

D. Should these tests indicate that the equipment does not meet the specified performance requirements, National Electric Code and Local codes, the cost of all corrective measures shall be borne by the contractor.

END OF SECTION

SECTION 265100 – LIGHTING

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide complete installation, including luminaires, standards, hangers, supports, fittings, lamps, wiring, and connections as indicated in the Contract Documents. Types of luminaires in this project include LED.

B. Refer to the General and Supplementary Conditions, Division 1 Specifications Sections for proposed phasing of this project.

C. Refer to Specification Section 019113 for commissioning requirements related to this project.

D. Refer to section 260923 for Wired Lighting Controls.

1.2 SCOPE OF WORK

A. This section includes minimum requirements for the following:

1. LED Luminaires
2. LED Drivers
3. Lamps
4. Emergency Driver
5. Automatic Load Control Relay
6. Branch Circuit Emergency Lighting Transfer Switch
7. Diffusers
8. Light Poles and Standards

1.3 SUBMITTALS

A. Submit shop drawings as described in Section 260010. All luminaire types and components shall be submitted in a single complete brochure which shall be in the form of a soft cover binder with each luminaire separated by an identified index tab. Information on each luminaire shall include:

1. Manufacturer and Catalog Number.
2. Dimensioned Construction Drawing(s).
3. Standard Catalog "Cut" Sheet.
4. Lumen Output
5. CRI and Kelvin Temperature
6. Lens/Louver Type.
7. Driver w/ Dimming Technology
8. Lamp Type.
9. Lumen Loss Information

B. Emergency Driver

C. Automatic Load Control Relay [ALCR]

D. Branch Circuit Emergency Lighting Transfer Switch [BCELTS]

E. Light Poles and Standards

F. Warranty Information

1.4 QUALITY ASSURANCE

A. Luminaires shall be standard products of manufacturers regularly engaged in the manufacture of the specific type luminaires specified and shall be the manufacturer's latest standard design that complies with specification requirements. Firms installing the luminaires shall have a minimum of five (5) years of successful installation experience on projects with interior lighting work similar to the requirements of this project.

B. Codes and Standards

1. NEC:

   a. Shall comply with Articles 220, 410, 510 and 700 as applicable to installation and construction.

2. NEMA:

   a. Shall comply with Standard Publication Nos. LE 1 and LE 2 as applicable to lighting equipment.

3. UL:

   a. All interior lighting luminaires and components shall be UL listed and labeled.
   b. Comply with all applicable UL standards including UL 486A and B.

4. CBM:

   a. Fluorescent and HID ballasts shall comply with Certified Ballast Manufacturers Association standards and carry the CBM label.

5. All work shall comply with applicable local code requirements of the authority having jurisdiction.

C. Verify the availability of all luminaires proposed to be used in the execution of the work prior to submitting for approval. The discontinuance of production of any luminaire after such approval has been granted shall not relieve the Contractor from furnishing an approved luminaire of comparable quality and design at no additional cost.

D. Luminaires shall be as specified in the "Luminaire Schedule." Luminaire types, characteristics, photometrics, finishes, etc., correspond to the first manufacturer, and associated catalog number, listed in the "Luminaire Schedule." Provide a sample luminaire from the factory for any products not listed as acceptable for approval. The Owner's Representative reserves the right to disapprove any luminaire type submitted which is not equal in quality, appearance or performance to the luminaire specified.

E. All luminaires shall meet the Total Luminaire Efficiency (TLE) requirements of the New York State Energy Conservation Construction Code.

PART 2 - PRODUCTS

2.1 LED LUMINAIRES

A. General:

1. Manufacturers shall be a registered with the Department of Energy (DOE) as a Quality Advocate and taken the pledge to be listed on the LED lighting facts website.
2. Luminaire measurements have been standardized and are in compliance with IESNA Standard LM-79 test procedure.
3. LED’s have been standardized and are in compliance with IESNA Standard LM-80 and demonstrate L70 life after 50,000 hours.
4. Luminaires shall be either Energy Star certified, or Design Lights Consortium (DLC) listed to qualify for NYSERDA or Utility provider rebate incentives. Submitted luminaires not currently on the DLC or Energy Star listed products list (http://www.designlights.org/) will be rejected.
5. Manufacturers shall prove color consistency across all LED’s via 3 step MacAdam Ellipse.
6. Luminaires shall be tested at an ambient temperature of +25 degrees for a minimum of 6000hrs.
7. Maximum junction temperature of 80°C.
8. Minimum drive current of 350mA. Maximum drive current of 700mA.
9. All LED luminaires shall have a minimum Color Rendering Index (CRI) of 80.
10. Luminaires shall a minimum 5-year warranty.
11. Refer to Luminaire Schedule on drawings for complete Luminaire makes and models.

2.2 LED DRIVERS

A. Dimmable Driver (0-10v):

1. Drivers shall be of the constant current type.

    a. Voltage: 120/277 as noted on drawing
    b. Driver Current: 350mA – 700mA.
    c. 0-10v dimming capable down to 10%.

d. 0-10v dimming capable down to 1%.
e. Maximum THD: 10%
f. Minimum Power Factor: 0.9

2. Acceptable Manufacturers.

a. eldoLED - ECOdrive
b. Signify Advance – Xitanium
c. Osram Sylvania – Optotronic
d. Lutron Hi-lume

2.3 LAMPS

A. LED Replacement Lamps

1. LED T8 32W Replacement

a. LED replacement for fluorescent T8 lamps shall be 16w, bypass style. All lamps shall have a minimum CRI of 80, a minimum of 110 lumens per watt and meet all requirements of the New York State Energy Conservation Construction Code.
b. Correlated Color Temperature of 4,000K (Kelvin)
c. LED replacement for 2-ft Fluorescent T8 lamps – 8 Watts, 1050 rated lumens, 50,000hr lamp life, 160 beam angle, 131 LPW, 80 CRI, not dimmable.
d. LED replacement for 4-ft Fluorescent T8 lamps – 16 Watts, 2050 rated lumens, 50,000hr lamp life, 160 beam angle, 114 LPW, 80 CRI, not dimmable.
e. LED replacement for Fluorescent T8 lamps with driver is acceptable as an alternative to bypass type lamps. At time of submittal contractor shall supply lamp and driver information sheet.
f. Acceptable Manufacturers:

1) Green Creative
2) TCP Lighting
3) Philips Lighting
4) Approved Equal

2. Type A-19 Replacement lamp shall have the following characteristics:

Wattage	Initial lumens	Efficacy	Color Temperature	CRI	Avg. rated life	Equivalent Incandescent Wattage
6	480	80 lm	3000	80	25,000 hrs	40
9	800	88 lm	3000	80	25,000 hrs	60
15	1600	106 lm	3000	80	25,000 hrs	100

3. Type BR30 Replacement lamp shall have the following characteristics:

Wattage	Initial lumens	Efficacy	Color Temperature	CRI	Avg. rated life	Equivalent Incandescent Wattage
13	1400	63 lm	3000	83	25,000 hrs	65

4. Type CA11 Replacement candelabra lamp with E12 base shall have the following characteristics:

Wattage	Initial lumens	Efficacy	Color Temperature	CRI	Avg. rated life Based on L70	Equivalent Incandescent Wattage
4	300	75 lm	3000	80	15,000 hrs	60

5. Type CA11 Replacement candelabra lamp with E26 medium screw base shall have the following characteristics:

Wattage	Initial lumens	Efficacy	Color Temperature	CRI	Avg. rated life	Equivalent Incandescent Wattage
5	300	60 lm	3000	80	15,000 hrs	60

6. Type MR16 2-Pin GU5.3 base replacement lamp shall have the following characteristics for use on 12 Volt system:

Wattage	Beam Spread	Initial lumens	Efficacy	Color Temperature	CRI	Avg. rated life (Hrs)	Equivalent Incandescent Wattage
4	25°	300	60 lm	2700	82	25,000	20
4	35°	300	60 lm	2700	80	25,000	20
7	25°	500	55 lm	3000	80	25,000	50
7	35°	500	66 lm	3000	80	25,000	50

7. Type PAR 38 Replacement flood lamp E26 medium screw base

Wattage	Beam Spread	Initial lumens	Efficacy	Color Temperature	CRI	Avg. rated life (Hrs)	Equivalent Incandescent Wattage
12	12°	660	55 lm	2700	82	25,000	40
12	25°	660	55 lm	2700	82	25,000	40
12	35°	660	55 lm	2700	82	25,000	40

Wattage	Beam Spread	Initial lumens	Efficacy	Color Temperature	CRI	Avg. rated life (Hrs)	Equivalent Incandescent Wattage
18	12°	1200	70 lm	3000	90	50,000	60
18	25°	1200	70 lm	3000	90	50,000	60
18	40°	1200	70 lm	3000	90	50,000	60

Wattage	Beam Spread	Initial lumens	Efficacy	Color Temperature	CRI	Avg. rated	Equivalent Incandescent

						life (Hrs)	Wattage
26	12°	1500	58 lm	3000	82	50,000	100
26	25°	1500	58 lm	3000	82	50,000	100
26	40°	1500	58 lm	3000	82	50,000	100

8. Acceptable Replacement Lamp Manufacturers

    a. General Electric
    b. Philips
    c. Sylvania/Osram

2.4 EMERGENCY DRIVER

A. Emergency Ballast shall be installed in conjunction with LED Driver intended for normal luminaire operation. Contains internal battery that shall automatically switch over to power designated lamp(s) upon loss of normal power via internal voltage sensing device. Battery shall be maintenance free, nickel-cadmium type, and be an integral part of ballast assembly. Life expectancy of battery shall be minimum of seven years.

B. All emergency ballasts shall be inverter type with Class 2 Output.

C. UL listed metal enclosure.

D. UL 924 listed for Emergency Lighting and Power Equipment

E. Temperature Operation: 20°C to +55°C

F. Shall include an emergency test switch with LED indicator remotely mounted in outlet box in ceiling above or adjacent to luminaire.

G. Recessed LED Downlight Luminaire LED performance – Shall up to 300 lumens minimum of 90 minutes on an output voltage of 30-130VDC. Design Makes: LED – Bodine BSL17 Series

H. Linear style LED Strip LED performance – Shall up to 1,000 lumens minimum of 90 minutes on an output voltage of 15 - 52 VDC. Design Makes: LED – Bodine BSL310 Series

I. Acceptable Manufacturers.

    a. Bodine BSL Series
    b. IOTA Engineering
    c. Dual-lite

2.5 AUTOMATIC LOAD CONTROL RELAY

A. Automatic Load Control Relay:

1. Mounts in standard 4” square backbox.
2. Input circuit is always from emergency power with a normal power sensing circuit.
3. Single circuit over-ride.

4. Output: Connection to AC ballast/driver.
5. 0-10 VDC / DALI dimmer override to full brightness upon loss of normal power.
6. Line voltage bypass/shunt.
7. Rated: 120-277V, 10-amps for single luminaire installation only
8. UL 924 listed for Emergency Lighting and Power Equipment
9. UL 2043 listed for plenum installation.
10. Integral, unit mounted test switch.
11. Minimum 5-year limited warranty
12. Design Make: Evenlite ELCD 924 Series
13. Approved Equals:

    a. Current Lighting NX Controls ALCR1277 Series
    b. Isolite ELCD 924 Series
    c. Myers Emergency Power Systems EPC-2-D Series
    d. Bodine GTD10DIM Series
    e. Leviton ECS Series

2.6 BRANCH EMERGENCY LIGHTING TRANSFER SWITCH

1. Transfer switch shall be installed in conjunction with normal and emergency power circuits intended for switched and automatic emergency luminaire operation. Designed to automatically switch over to emergency circuit upon loss of normal power via internal voltage sensing device.
2. Allows standard switching of Luminaire on normal power circuit.
3. Inputs:

    a. Normal power switched circuit
    b. Normal power unswitched circuit
    c. Emergency power unswitched circuit

4. Output: Connection to lighting circuit maximum of 16 amps
5. 0-10 VDC / DALI dimmer override to full brightness upon loss of normal power
6. Short circuit withstand rating capability of 10kA.
7. Rated: 120-277V, 20-amps for multiple luminaires on the circuit
8. UL 1008 Listed Transfer Switch.
9. Integral, unit mounted test switch.
10. Minimum 3-year warranty limited warranty.
11. Design Make: Evenlite ELCD1008

12. Approved Equals:

    a. Current Lighting NX Controls UL1008CELTS series
    b. Isolite ELCD 1008 series
    c. Myers Emergency Power Systems EPC-D-F-ATS Series
    d. Bodine GTD20A series
    e. Leviton ECD series

2.7 DIFFUSERS

A. Lenses:

1. Extruded 100 percent virgin acrylic material with a minimum weight of ten ounces per square foot.
2. Type 12 - Clear material with 0.125 inch overall thickness with .080 Inch penetration comprised of 3/16 inch square based female cones aligned 45 degrees to the length and width of the panel.
3. Type 19 - Clear material with 0.156 inch overall thickness with 0.080 inch penetration comprised of 3/16 inch square based male cones aligned parallel and perpendicular to the length and width of the panel.
4. White matte - White material with 0.125 inch overall thickness.
5. While overlay - White material with 0.040 inch overall thickness.
6. The maximum deflection at the center of a 2 foot x 4 foot lens shall be no greater than 0.250 inch. Arched or warped lenses will not be accepted.
7. Parabolic Louvers

    a. Medium cell louver - One piece injection molded acrylic, with all parabolic surfaces prepared with a primary undercoat, highly specular vacuum metalized finish, and encapsulated in a protective acrylic lacquer coating. Cell dimensions shall be nominal 1-1 /2 inches x 1-1 /2 inches x I inch deep, and shall provide approximately 38 degree shielding with a louver efficiency of not less than 52 percent. This louver shall have a VCP index rating of 0.93 for semi-specular silver finish. Panel finish shall be specular silver.

8. Baffles and Louvers

    a. Cross Baffle - Constructed of 0.050 inch aluminum with one-way blades to provide 45 degree shielding. Blades 1-1/2 inches high and spaced 1-1/2 inches apart. While enamel finish. Side shields for support of the blades. Width to extend the full width of the lighting unit and of lengths to form a continuous baffle with no visible joints. Where inside and outside comers are required, the blades shall be mitered.
    b. Parabolic Baffle - Constructed of 0.050 inch aluminum with one-way blades to provide 45 degree shielding. Blades 1-1/2 inches high and spaced 1-1/2 Inches apart. Clear anodized finish. Side shields for support of the blades. Width to extend the full width of the lighting unit and lengths to form a continuous baffle with no visible joints. Where inside and outside comers are required, the blades shall be mitered.
    c. Directional Louver - Constructed and fabricated of aluminum with a "cold bonding joint method for integral vibration free and precise alignment of cells. Louver finish shall be custom color as directed by the Architect.

2.8 LIGHT POLES AND STANDARDS

A. Metal Pole Lighting Standards: Provide metal, raceway-type, lighting poles and standards, of sizes and types indicated, comprised of shafts and tenon joints. Equip with grounding connections readily accessible from handhole base access doors; and construct of the following materials and additional construction features:

1. Material: Aluminum Galvanized steel
2. Configuration: Anchor base type with hand hole and cover.
3. Metal Lighting Standard Accessories: Provide accessories for metal lighting standards, including anchor bolts, as recommended by lighting standard manufacturer, of sizes and materials needed to meet erection and loading application requirements.
4. Provide metal seamless square anchor bolt cover to match pole construction.
5. Provide pole with adequately sized reinforced handhole complete with matching cover 18" above grade level. Weld 1/2' grounding nut on shaft with accessibility from handhole. Design poles to withstand loads developed by 100 MPH wind pressure, as adjusted for height above ground level, structural shapes and cable wire loading.

B. Integrated Controls: Provide Qty. (2) wireless remote controls to make control adjustments for all required photocell sensor setpoints, occupancy sensor sensitivity, and associated delays.

C. All exterior light poles shall include integral surge-arrestors to protect the luminaire and driver. Surge Arrestor Design Make: Ditek DTK-DL Series.

2.9 LUMINAIRE SCHEDULE

A. Luminaire schedule is found on the drawings.

PART 3 - EXECUTION

3.1 EXAMINATION:

A. Examine areas and conditions under which luminaires are to be installed, and substrate for supporting luminaires. Notify Architect in writing of conditions detrimental to proper completion of the work. Do not proceed with work until unsatisfactory conditions have been corrected.

3.2 COORDINATION

A. Refer to respective reflected ceiling plan for each area. Reflected ceiling plans indicate proper luminaire location only. Locate occupancy sensors and photo sensors per the manufacturer's recommendations. Coordinate the proper arrangement with all other ceiling mounted items. Contract Documents indicate luminaire characteristics (type), quality, quantity, etc. Verify with the ceiling supplier design of actual ceiling installed in each area and coordinate compatible luminaire flange/trim type.

B. General

1. Install interior luminaires at locations and heights as indicated, in accordance with luminaire manufacturer's written instructions, applicable requirements of NEC, NECA's 'Standard of Installation", NEMA standards, and with recognized industry practices.
2. Provide luminaires and/or luminaire outlet boxes with hangers to properly support luminaire weight. Submit design of hangers, method of fastening, other than indicated or specified herein, for review by Engineer.
3. Make installation such that the luminaire is free of finger marks, flaws, scratches, dents or other imperfections.
4. Arrangement

    a. Align edges of luminaires with walls or other building elements. Where indicated by dimensions or indicated on Drawings, maintain indicated arrangement.
    b. For wall to wall installed luminaires, field measure length required after completion of the wall construction and prior to ordering the luminaires. Fabricate in largest lengths allowable.

5. Recessed Mounting

    a. Verify ceiling construction and material prior to ordering luminaires. Provide plaster frames for plaster ceilings and flanged frames for drywall ceiling. Provide necessary mounting hardware and accessories to adapt luminaire to ceiling construction. Provide gaskets, trims, flanges, etc. as required to prevent light leaks around trim. Where installing 'lay-in' type luminaires, each Luminaire shall be supported completely independent of the ceiling system by way of 12-AWG galvanized steel support wires. Support wires shall be attached from all four corners of the Luminaire housing to the building structure. Each support shall be capable of supporting 100 pounds. Provide saddle hangers or tie bars attached to runners or between crossbars of ceiling systems as a safety measure. Provide mounting splines or other positive means of maintaining alignment and rigidity.

6. Stem Mounting

    a. Use self-aligning hangers in canopies for hanging luminaires true to vertical. Do not deface ceiling or walls. Locate hangers at intersections of joints or at centers of blocks in rooms with patterned type ceiling materials such as acoustic tile. Use hangers capable of supporting four times luminaire weight. Align continuous rows of luminaires maintaining luminaires level without rotation about the longitudinal axis. Rigidly support outlet box independent of ceiling system from building structure. Where obstructions prevent direct support of outlet, provide offset or trapeze hangers of outlet box. Stem shall be supported directly from building structure on centers as called for by the manufacturer. There shall be a minimum of two stems per individual four-foot luminaire, and three stems per individual eight foot luminaire for steel luminaires. Extruded aluminum luminaires shall have hangers as called for by the manufacturer.
    b. Provide brackets from the manufacturer of the same finish and material as the luminaires to present a seamless continuous row mounting appearance. Provide continuous row mounting brackets between all adjoining luminaires.

7. Surface Ceiling Mounting

    a. Mount surface luminaires tight to surface without distorting surface. Space luminaires in continuous rows to correspond to ceiling joint intersections. Continuous row luminaires may be fed by a single outlet where luminaires contain approved wireways and suitable wiring is used. Provide hangers for each luminaire, each rated to support four times the luminaire weight. Provide offset or trapeze hangers where required. Supports shall be provided on a maximum of 4-foot centers with a minimum of two hangers per individual four foot luminaire and three hangers per individual eight foot luminaire. Hangers shall be supported from the building structure and independently from ceiling system or other building services.
    b. Fasten luminaires securely to structural supports.

3.3 DELIVERY, STORAGE, AND HANDLING

A. Luminaires and equipment shall be delivered with UL and manufacturer's labels intact and legible in factory fabricated containers.

B. Luminaires and accessories shall be stored in protected dry locations in their original unbroken package or container. Luminaires shall be protected from dust and dampness both before and after installation. Luminaires shall be protected from paint and cleaning solvents during all phases of construction.

C. Handle interior lighting luminaires carefully to prevent damage, breaking, and scoring of finishes. Do not install damaged luminaires or components; replace them with new.

3.4 SEQUENCING AND SCHEDULING

A. Coordinate with other work including ceiling type, wires/cables, electrical boxes, fittings, and raceways, to properly interface installation of interior luminaires with other trades.

3.5 REUSE AND REPAIR OF EXISTING LUMINAIRES

A. Reuse existing luminaires only where called for. Perform the following work, as required, to upgrade existing luminaire. Replace faulty, leaking, or noisy ballast. Replace broken, damaged, worn, or faulted lamp sockets. Provide new luminaire wire. Provide new acrylic lens system to match existing, where existing is broken. Re-lamp luminaires. Completely damp clean lens and interior of luminaires.

B. If ballasts have leaked, remove material deposited in luminaire. Assume material was PCB contamination, or a test samples to show material is not PCB and submit a report. Dispose of material as required by EPA, including clean-up materials used. Dispose of ballast which does not have non PCB label in PCB containers and have containers taken to EPA approved incinerators. Follow all EPA regulations for transporting material.

C. New luminaires may be provided to replace existing luminaires scheduled to remain or be reused, subject to shop drawing approval.

3.6 REMOVAL OF BALLAST IN EXISTING LUMINAIRES

A. Assume ballast contains PCB materials unless labeled otherwise or test samples to show materials are not PCB; submit test report. Remove all ballast from existing luminaires indicated on contract documents. Dispose of all ballast which do not have non-PCB labels in PCB containers and pay all costs to have containers taken to EPA approved incinerators and disposed of per all EPA regulations. Follow all EPA regulations for transporting containers and materials. If ballast has leaked in the existing luminaire, remove material deposited in luminaire and dispose of those materials as listed above. Provide Certificate of Disposal and all associated paperwork to Owner's representative.

3.7 REMOVAL OF LAMPS IN EXISTING LUMINAIRES

A. Assume all fluorescent lamps contain Mercury materials unless labeled otherwise or test samples to show materials do not contain Mercury and submit test report. Remove all lamps from existing luminaires indicated on contract documents. Dispose of all lamps which do not have non-Mercury labels in compliance with the requirements of the New York State Department of Environmental Conservation and all applicable Federal Laws. Follow all regulations for transporting materials. Provide Certificate of Disposal and all associated paperwork to Owner's representative.

3.8 LIGHT POLES AND STANDARDS

A. Paint all scratch marks on poles with factory supplied touch-up paint.

B. Locate the surge-arrestor in the light pole base for accessibility.

3.9 EMERGENCY DRIVERS

A. Provide separate non-switch conductor from line side of lighting circuit to each emergency driver voltage sensing input. Refer to manufacturers wiring diagram.

B. Connect all emergency drivers to allow switching unless luminaire is specifically shown to be used as a night light.

C. Provide adhesive 1" diameter round red sticker on all luminaires with internal emergency drivers.

D. Provide remote test switch or testing means for all emergency drivers accessible from below ceiling.

3.10 AUTOMATIC LOAD CONTROL RELAYS

A. Provide normal and emergency branch circuit wiring and connect per the manufacturer's wiring diagram. Units shall be wired to allow local switching and/or dimming under normal conditions. Upon loss of normal power, local switching and/or dimming shall be bypassed, overriding the controlled luminaires to full brightness regardless of the switched input state.

B. Provide panelboard/circuit labeling on the device or unit mounted junction box to indicate the normal and emergency branch circuits connected to it. Labeling shall not obscure the integral test switch or LED indicators.

C. Install the device in an accessible location suitable for the environment in which it is listed. Document the installed location on the as-built drawings.

3.11 BRANCH CIRCUIT EMERGENCY LIGHTING TRANSFER SWITCHES

A. Provide normal and emergency branch circuit wiring and connect per the manufacturer's wiring diagram. Units shall be wired to allow local switching and/or dimming under normal conditions. Upon loss of normal power, load output power shall be automatically transferred to the emergency input thus entering the emergency mode of operation. In emergency mode, all local switching and/or dimming shall be bypassed, overriding the controlled luminaires to full brightness regardless of the switched input state.

B. Provide panelboard/circuit labeling on the device or unit mounted junction box to indicate the normal and emergency branch circuits connected to it. Labeling shall not obscure the integral test switch or LED indicators.

C. Install the device in an accessible location suitable for the environment in which it is listed. Document the installed location on the as-built drawings.

3.12 LAMPS

A. Provide lamps in all luminaires.

B. Replace any lamp whose color is determined to be unsatisfactory. Replace all lamps which are found to have failed during the 12 month warranty period.

C. All lamps shall be new and unused. If permanent lighting system is used for temporary construction lighting, lamps shall be replaced upon turn over to Owner.

D. Furnish stock or replacement lamps amounting to 15%, but not less than 4 lamps in each case, of each type and size lamp used in each type luminaire. Deliver replacement stock as directed to Owner's storage space.

3.13 SPARE PARTS

A. Provide the following spare parts to the owner with sign-off receipt prior to job close-out:

1. (6) 48" 1,900 lumen T-8 LED Replacement Lamps

3.14 WARRANTY

A. All lighting and lighting controls equipment included in this section shall be fully tested and guaranteed for a period of five years after Owner's Representative written acceptance.

3.15 FINAL CLEANING

A. Prior to acceptance, damp clean diffusers, glassware, trim, reflectors, lamps, louvers, lens and similar objects of all luminaires. Remove all dirt, corrosion, foreign material, finger marks, and blemishes. Replace all burned out lamps and failed components.

END OF SECTION

SUNY ERIE COMMUNITY COLLEGE NORTH CAMPUS
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COMMUNICATION SYSTEMS SPECIFICATIONS
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SECTION	**DESCRIPTION**
271000	HORIZONTAL AND BACKBONE COMMUNICATION CABLING

SECTION 271000 - HORIZONTAL AND BACKBONE COMMUNICATION CABLING

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide all labor, materials, tools, and equipment required for the complete installation of work called for in the Contract Documents. This work includes sleeves, raceways, cable hangers, connectors, outlets, patch panels, termination, testing, and labeling.

1.2 SCOPE OF WORK

A. Horizontal cabling includes 6A UTP for all data outlets from the Communications Equipment Room (CER) to the outlets as called for on the drawings. The horizontal cabling includes all horizontal cables, patch panels, patch cables, termination, testing, and mechanically terminated jacks/inserts and faceplates in the work area and the mechanical termination in the CER.

B. Provide the below installed patch cable installations. Turn all unused patch cables over to owners IT representative at end of project and obtain sign off sheet to include with O&Ms.

1. Provide (12) Cat. 6A 3-foot Patch Cables

C. Provide the below installed spare UTP cable installations. Utilization of all installed spare cables shall be at the direction of the architect and engineer and will be tracked during construction on spreadsheet.

1. Provide (2) installed spare cat. 6A cables. Each installed cable shall include up to 300-feet of specified cat. 6A cable with termination, testing, and labeling at each end. Provide up to 20-feet of V2400 surface metal raceway, surface metal backbox, outlet, and RJ-45 cat. 6A jack at station end for each cable. Provide required supports and sleeves for distribution.

2. Installed spare UTP cable log spreadsheet template:

Quantity of Remaining spare Cat. 6A installations	Date	Building Name	Spare Cat. 6A cables installed	Room Number Cables Installed

D. This section includes minimum requirements for the following:

1. Cat. 6A Cabling
2. Cat. 6A Patch Cables
3. Copper Connecting Hardware
4. 100 Ohm UTP Cable Testing

1.3 QUALITY ASSURANCE

A. All cable shall be installed in a neat and workmanlike manner. All methods of construction that are not specifically described or indicated in the contract documents shall be subject to the control and approval of the Owner's Representative. Equipment and materials shall be of the quality and manufacture indicated. The equipment specified is based upon the acceptable manufacturers listed. Where "approved equal" is stated, equipment shall be equivalent in every way to that of the equipment specified and subject to approval.

B. Provide with the submittals, documentation from an independent testing agency indicating that the complete assembly including cable and termination hardware has been tested and meets the performance criteria called for.

C. Provide contractor or sub-contractor experienced in all telephone and fiber splicing and trained and experience with the fusion splicing equipment to be used on this project.

D. Materials and work specified herein shall comply with the applicable requirements of:

1. ANSI/TIA/EIA – 568-A
2. ANSI/TIA/EIA – 568-C
3. ANSI/TIA/EIA – 569-B
4. NFPA 70 - 2014
5. BICSI Telecommunications Distribution Methods Manual
6. FCC 47 CFR 68
7. NEMA - 250
8. NEC - Articles 770 and 800

1.4 SUBMITTALS

A. Manufacturers catalog sheets, specifications and installation instructions for all products in this section.

B. Fusion splicing kits, pigtails, and splice trays.

C. Test results for all telephone and data UTP cable, and fiber splicing, new fiber cable installations performed in this project. Submit immediately upon completion of cable installation for review and include second copy in final O&M manuals.

PART 2 - PRODUCTS

2.1 GENERAL

A. Provide an end-to-end connectivity solution in which all horizontal cabling and connecting hardware are made by the same manufacturer. At a minimum, all connecting hardware and UTP patch panels shall be from the same manufacturer. Refer to specification section 271100 for additional information regarding patch panels.

2.2 CAT. 6A CABLING (100 OHM UNSHIELDED TWISTED PAIR)

A. Shall be Category 6A type cable compliant with the requirements of the most current edition of the TIA/EIA-568-B.2-10-2008 standard.

B. Physical Characteristics:

1. Shall be CMP, plenum rated.
2. Conductor shall be 23 AWG solid bare annealed copper.
3. Outer jacket color shall be blue.
4. Category marking shall be printed every one foot. Footage indicators shall also be provided on jacket.
5. The diameter of the insulated conductor shall be .023 in. maximum.
6. Shall consist of (4) twisted pairs.
7. Shall be suitable for the environment in which they are to be installed.
8. The color coding of pairs shall be:

Pair 1	W-BL; BL
Pair 2	W-O; 0
Pair 3	W-G; G
Pair 4	W-BR; BR

9. The overall diameter of the cable shall be no greater than 0.295 inches.
10. The ultimate breaking strength measured in accordance with ASTM D 4565 shall be 400 N minimum.
11. Cable shall withstand a bend radius of 1 inch at -20 degrees Celsius without jacket or insulation cracking.

C. Transmission Characteristics:

1. Cable shall be tested & characterized to 625 MHz.

a. Cable shall exhibit a PSNEXT loss of at least the following:

Frequency MHz	NEXT dB
1.0	73.3
4.0	64.3
10.0	58.3
16.0	55.2
20.0	53.8
31.25	50.9

62.5	46.4
100.0	43.3
200	38.8
250	37.3
300	36.1
400	34.3
500	32.8
625	31.4

b. Cable shall exhibit an Attenuation loss of less than the following:

Frequency MHz	Attenuation dB
1.0	2.1
4.0	3.8
10.0	5.9
16.0	7.5
20.0	8.4
31.25	10.5
62.5	15.0
100.0	19.1
200	27.6
250	31.1
300	34.3
400	40.1
500	45.3
625	51.2

c. Cable shall exhibit a Return loss according to the following:

Frequency MHz	Return Loss (dB)
1	20.0
4	23.0
10	25.0
16	25.0
20	25.0
31.25	23.6
62.5	21.5
100	20.1
200	18.0
250	17.3
300	16.8
400	15.9
500	15.2
625	14.5

D. Design Make: Belden 10GX13 Series

E. Acceptable Manufacturers:

1. Belden
2. CommScope
3. Leviton BERK-TEK
4. Optical Cable Corporation (OCC)
5. Prysmian
6. Superior Essex

2.3 CAT. 6A PATCH CABLES

A. Meets all above requirements for 100 OHM unshielded twisted pair cable (Cat. 6A cable), except stranded conductors.

B. Factory terminated RJ-45 male at both ends with strain relief at ends of the cable.

C. Ultra-small diameter patch cord.

D. 1-foot in length.

E. Outer jacket color shall be as noted in this section above.

F. Design Make: Belden CAD110XXX Series

G. Acceptable Manufacturers:

1. Legrand
2. Panduit

2.4 COPPER CONNECTING HARDWARE

A. Color shall be electric white or ivory unless otherwise noted below.

B. Physical Characteristics

1. Faceplates shall be provided with labels and plastic label protector strip.
2. Faceplates shall be modular keystone jack type, 4-port minimum or 1-gang opening with mounting bezels to accept combination keystone jacks and multimedia jacks.
3. Each jack shall be an individually constructed unit and shall snap mount into the faceplate keystone opening.
4. Jack housings shall be high impact 94 V-0 rated thermoplastic.
5. Jacks shall have a temperature rating of -10 °C (14°F) to 60°C (140 °F) in conformance with ANSI/TIA/EIA-568-A.
6. Jack housings shall fully encase and protect printed circuit boards and IDC fields.
7. Housing shall be ultrasonically welded for tamper resistance.
8. Modular jack contacts shall accept a minimum of 2500 mating cycles without degradation of electrical or mechanical performance.
9. UTP jack IDCs shall accept a minimum of 20 re-terminations without degradation of electrical or mechanical performance.
10. Contacts will maintain a minimum vertical deflection force of 100 grams over deflection window.
11. Modular jack contact wires shall be formed flat for increased surface contact with mated

plugs.

12. Modular jack contacts shall be constructed of Beryllium copper for maximum spring force and resilience.
13. Jack termination shall follow the industry standard 110 IDC. Includes insulated barrier between IDC contacts.
14. Jacks shall have a designation indicating the cable type on the nose which can be plainly seen from the front of the faceplate.
15. Jacks shall utilize a paired punch down sequence. Cable pair twists shall be maintained up to the IDC, terminating all conductors adjacent to its pair mate to better maintain pair characteristics designed by the cable manufacturer.
16. Jacks shall terminate 22-26 AWG stranded or solid conductors.
17. Jacks shall include wire retention stuffer cap that hold terminated wires in place and allow the conductors to be visually inspected in the IDC housing.
18. Jacks shall be color code marked with both T-568A and T-568B wiring.

C. RJ-45 Jack Design Makes:

1. Cat. 6A Data Jacks +18" AFF (Orange Colored)
2. Cat. 6 Data Jacks +18" AFF (Orange Colored)
3. Voice Jacks at +18" AFF (Blue Colored)
4. Voice Jacks +48" AFF in Plastic Wall Mount Phone Bracket with Metal Ears – Belden AX102902 w/ Blue Cat. 6 Jack
5. Design Make: Belden AX10XXXX Series

D. Multimedia & Accessory Jack Design Makes:

1. Blank Jack Snap-In –Belden AX102262
2. HDMI coupler – Belden AX105345-XX
3. USB 3.0 Coupler, A to A – Belden AX105342-XX
4. Other components and mounting bezels/inserts as required for special mounting conditions and for floor boxes, surface raceways and modular furniture.

E. Faceplate Design Makes:

1. Single Gang 4-Port Faceplate w/ ID Windows – Belden AX102249
2. Single Gang Faceplate for Combination Multimedia & Data Jacks – Belden AX101747. Provide with required bezels/inserts

F. Acceptable Manufacturers:

1. Belden
2. Hubbell
3. Panduit
4. Legrand Ortronics

2.5 100 OHM UTP TESTER

A. User Interface

1. 240 x 320 backlit LCD display

2. Date stamp of all tests
3. Tone generation audio warning

B. Physical interface shall be modular RJ-45 connector and a serial port with DB-9 connector.

C. Shall test cable for compliance with the following standards:

1. TIA Category 3, 5E, 6 and 6A: 100 Ohm
2. ISO/IEC 11801 and EN 50173 Class C and D: Link
3. ISO/IEC 11801 and EN 50173 Class C and D (new): Permanent Link or Channel
4. Aus/NZ Class C and D: Basic Link or Channel
5. STP cabling, (IBM Type 1, 150 □)
6. ANSI TP-PMD IEEE 802.3 10BASE5, 10BASE2: Ethernet with coaxial cabling
7. IEEE 802.3 10BASE-T, 100BASE-TX, 1000BASE-T: Ethernet with twisted pair cabling
   IEEE 802.5: Token Ring, 4 Mbps or 16 Mbps

D. Shall perform the following tests as a minimum:

1. NEXT, NEXT @ Remote
2. Wire Map
3. Characteristic Impedance
4. Length
5. DC Loop Resistance
6. Propagation Delay Return Loss (RL), RL @ Remote
7. Delay Skew
8. Attenuation
9. Attenuation-to-Crosstalk Ratio (ACR), ACR @ Remote
10. Power Sum ACR, PSACR @ Remote
11. ELFEXT, ELFEXT @ Remote
12. Power Sum ELFEXT, PSELFEXT @ Remote
13. Power Sum NEXT, PSNEXT @ Remote

E. Shall use injector for complete wire mapping and TDR for determining cable length.

F. Shall measure NEXT for all six pair combinations and Attenuation on all four pairs from 1.0 to 500 MHz.

G. Design Make: Fluke “DSX-5000” or Approved Equal

H. Acceptable Manufacturers:

1. WaveTek
2. Lantek

2.6 LABELING

A. All labels shall be typed on self-adhesive label strips where a plastic protector is not present on the termination equipment.

B. All letters and numbers shall be capital and the same font, black colored text on white background, closest to size 12 ARIAL FONT as possible.

C. Label Maker Design Make: DYMO or Approved Equal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Horizontal Cable Runs:

1. All interior cabling shall be installed concealed inside the wall cavities and ceiling space.
2. Provide a continuous raceway system in accordance with NEC Article 800 for horizontal cable runs through all inaccessible ceiling (including drywall) and wall cavity spaces. All flexible raceway system runs shall be securely attached to ceiling joists and wall studs 3-feet O.C and removal and addition of cables in the future.
3. UTP Cables shall be supported by independent Cable Hangers 3-foot on center or in Cable Tray. When installed in cable tray Velcro bundle UTP cabling and optical fiber cabling separate from all other system cabling. Provide additional stacked Cable Hangers when filled greater than 50%. Do not install UTP cabling or Optical Fiber Cabling in same cable hanger as fire alarm or speaker cabling.
4. STP Cables shall be supported by Cable Hangers 3-foot on center or in Cable Tray. When installed in cable tray Velcro bundle STP cabling separate from all other system cabling. Provide additional stacked Cable Hangers when filled greater than 50%. Do not install STP cabling in same cable hanger as fire alarm or speaker cabling.
5. In finished locations provide surface raceway for cabling installations from ceiling down to outlet or device where cabling cannot be concealed in construction. Provide conduit to outlet and devices for all exposed no-finished installations in mechanical rooms, gymnasiums, auditoriums, and rooms without accessible ceilings from Cable Hangers and Cable Tray.
6. Refer to specification section 260533 – Raceways for maximum cable fill and supporting hardware specifications.
7. Where larger cable quantities are required to share a single raceway refer to EIA/TIA-569 Conduit Sizing Table 4.4-1.
8. All new device outlets in finished areas shall be flush mounted in the walls.
9. Provide surface raceway for all wiring installations in unfinished areas and conduit for all areas with no ceiling open to the structure.
10. All exterior cabling shall be run in direct buried conduit.
11. Provide separate pathways for all control, video, and signal wiring from 120V branch circuiting.
12. Provide all sleeves as required for routing of cables.
13. Provide firestopping at all firewall and floor penetrations.
14. Do not untwist UTP and STP cable pairs more than 0.5 in. when terminating.

15. Provided inner duct as required to route A/V signal cabling in plenum ceiling spaces. Inner duct shall be 1 ½" diameter, plenum rated, and have pull tape. Design Make: Carlon CH4X1C-350.
16. Cable shall have no physical defects such as cuts, tears or bulges in the outer jacket. Cables with defects shall be replaced.
17. Install cable in neat and workmanlike manner. Neatly bundle and tie all cable in at terminations.
18. Maintain the following clearances from EMI sources.

    a. Power, Fire Alarm, and Audio cable - 6 in.
    b. Luminaires - 12 in.
    c. Transformers - 36 in.

19. Do not install with more than 110N pull force.

3.2 UTP CABLE TESTING

A. General

1. All cables and termination hardware shall be 100% tested for defects in installation and to verify cabling system performance under installed conditions according to the requirements of each applicable ANSI/TIA/EIA section listed above for each cable type.
2. All pairs of each installed cable shall be verified prior to system acceptance. Any defect in the cabling system installation including but not limited to cable, connectors, feed through couplers, patch panels, and connector blocks shall be repaired or replaced in order to ensure 100% useable conductors in all cables installed.
3. The testing parameters called for in this section shall apply for up to 90 meters of horizontal cable, a work area equipment cord, an RJ45 outlet and 2 cross connect connections in the closet.
4. The test parameters shall include Wire Map, Length (report only), Attenuation and NEXT.
5. Wire Map - The wire map test shall verify pair to pin termination at each end and check for connectivity errors. The wire map shall indicate the following for each of the eight conductors:

    a. Continuity to the remote end
    b. Shorts between any two or more conductors
    c. Crossed pairs
    d. Reversed Pairs
    e. Split Pairs
    f. Any other miswiring

6. Attenuation - The link attenuation and NEXT of all cables shall be tested. The link is the sum of the attenuation of all connecting hardware, patch and equipment cords, and cable. The following tables indicate the acceptable values:

Attenuation			
Frequency (MHz)	**Category 3 (dB)**	**Category 5e/6 (dB)**	**Category 6A (dB)**
1.0	3.2	2.0	2.1

4.0	6.1	4.1	3.8
10.0	10.0	6.5	5.9
16.0	13.2	8.2	7.5
20.0	-	9.3	8.4
31.25	-	11.7	10.5
62.5	-	17.0	15.0
100.0	-	22.0	19.1
155	-	28.1	24.1
200	-	32.4	27.6
300	-	41.0	34.3
350	-	44.9	37.2
400	-	-	40.1
500	-	-	45.3
625	-	-	51.2

PS Next (worst pair to pair)			
Frequency (MHz)	**Category 3 (dB)**	**Category 5e/6 (dB)**	**Category 6A (dB)**
1.0	40.1	70.3	73.3
4.0	30.7	61.2	64.3
10.0	24.3	55.3	58.3
16.0	21.0	52.2	55.2
20.0	-	50.7	53.8
31.25	-	47.8	50.9
62.5	-	43.3	46.4
100.0	-	40.3	43.3
155	-	37.4	40.4
200	-	35.7	38.8
300	-	33.1	36.1
350	-	32.1	35.1
400	-	-	34.3
500	-	-	32.8
625	-	-	31.4

B. Data reporting and accuracy

1. General: a Pass or Fail result for each parameter shall be determined by the allowable limits for each parameter. If the test result of a parameter is closer to the test limit than the accuracy of the tester it shall be marked with an asterisk. Data at all measured points shall be uploaded to a P.C. and printed on a laser printer.
2. Wire Map: Wire map tests shall be marked “Pass” if wiring is determined correct.
3. Length: Test results shall be reported in meters.
4. Attenuation: Report the attenuation value and the frequency at point of failure or the highest frequency passed. Measured attenuation values lower than 3dB used for a pass/fail determination. Report the attenuation per unit length for links longer than 15 meters. Attenuation shall be measured from 1 MHz to 16 Mhz (Category 3) or 350 Mhz (Category 5e/6) or 500 MHz (Category 6A) in the steps listed in the tables above.
5. NEXT: Report the NEXT value and “pass or fail” for samples based on the following:

Frequency Range (MHz)	Maximum Step Size (MHz)
1-31.35	0.15
>31.25-100	0.25

C. Submit copies in binder format and 4 copies on compact disks containing all summary reports, full plot data test results, tester software tools required to view and inspect and print any selection of the test reports, spreadsheets, end to end reports and as built drawings called for at the completion of job.

3.3 LABELING

A. Label each and every termination port for all new cables.

B. Label all new patch panels.

C. Label all new Racks and Cabinets with the CER, Wiring Closet, MDF, or IDF name.

D. UTP Cabling

1. Jack or Outlet termination - All labels shall be typed indicating the CER, Patch Panel Name, and Port Number. Example for CER A, Patch Panel B, port 11: "AB11".
2. Wiring Closet, Data Closet, MDF, or IDF termination: Label all termination ports with [Room Number]-[Cable Number]. Examples "128-01", "128-02", etc. If the cable is run to equipment such as a Fire Alarm Panel or Public Address System label it as [Room Number]-[Equipment Name].
3. Label all Patch Panels in order of top to bottom starting with A.
4. If the UTP cable is run to a separate building, label the UTP Patch Panel with the Building Name in addition to the Patch Panel Name.

E. Provide ground braid across all copper backbone cable sheath openings at splice enclosures. If an existing splice enclosure is reused and is found to be missing proper grounding/bond per this section, provide labor and materials to bring it up to these standards.

END OF SECTION

SUNY ERIE COMMUNITY COLLEGE NORTH CAMPUS
KITTINGER HALL BOILER ROOM UPGRADES
DIVISION 28
ELECTRONIC SAFETY AND SECURITY SPECIFICATIONS
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SECTION	**DESCRIPTION**
283100	FIRE DETECTION AND ALARM SYSTEM

SECTION 283100 - FIRE DETECTION AND ALARM SYSTEM

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide all labor, materials, tools, and equipment required for the complete installation of work called for in the Contract Documents.

B. Labeling of addressable devices to be approved by owner and each addressable device shall be provided with a custom label designation (e.g. M1-44) in black text on an adhesive backed plastic label. Labeling on device to be by Electrical Contractor (EC).

C. During the periods of active construction, within the project area, the contractor shall remove any and all existing smoke detectors and provide temporary heat detectors in their place. Upon completion of construction new detectors shall be provided at these locations. Refer to floor plans for additional information.

1.2 DESCRIPTION OF WORK

A. The buildings in this project each have an existing Simplex 4100ES series fire alarm system. Modify and expand the existing fire alarm control panel, point addressable initiation device signaling line circuit (SLC), and non-point addressable notification appliance circuit (NAC).

B. This section includes minimum requirements for the following:

1. Fire Alarm Control Panel
2. Remote Annunciator Panel
3. Notification Appliance Circuit Extender Panel
4. Monitor Modules
5. Control Modules
6. Input Modules
7. Manual Pull Stations
8. Photoelectric Smoke Detectors
9. Fixed Temperature Heat Detectors
10. Carbon Monoxide Detectors
11. Projected Beam Smoke Detector
12. Audible/Visual Signal Devices
13. Visual Signal Devices
14. Digital Communicator

1.3 QUALITY ASSURANCE

A. All installations shall be accompanied in a professional manner by qualified personnel regularly engaged in have a minimum of 5 year of experienced in this type of Work. All fire alarm installers shall possess a state license for installation of fire alarm systems where required.

B. All raceways shall be installed in a neat and workmanlike manner. All methods of construction that are not specifically described or indicated in the contract documents shall be subject to the control and approval of the Owner's Representative. Equipment and materials shall be of the quality and manufacture indicated. The equipment specified is based upon the acceptable manufacturers listed. Where "approved equal" is stated, equipment shall be equivalent in every way to that of the equipment specified and subject to approval.

C. Materials specified herein shall comply with the applicable requirements of:

1. The following Articles of the National Electric Code (NFPA 70)

   a. Article 760 - Fire Alarm Systems

2. The following National Fire Protection Agency (NFPA) standards:

   a. NFPA 72 - National Fire Alarm Code
   b. NFPA 90A - Installation of Air Conditioning and Ventilating Systems
   c. NFPA 101 - Life Safety Code

3. The following U.L. Standards:

   a. UL 864/UOJZ, APOU - Control Units for Fire Protective Signaling Systems
   b. UL 268 - Smoke Detectors for Fire Protective Signaling Systems
   c. UL 268A - Smoke Detectors for Duct Applications
   d. UL 521 - Heat Detectors for Fire Protective Signaling Systems
   e. UL 228 - Door Holders for Fire Protective Signaling Systems
   f. UL 464 - Audible Signaling Appliances
   g. UL 1638 - Visual Signaling Appliances
   h. UL 38 - Manually Activated Signaling Boxes
   i. UL 346 - Waterflow Indicators for Fire Protective Signaling Systems
   j. UL 1481 - Power Supplies for Fire Protective Signaling Systems

1.4 SUBMITTALS

A. Provide standard product data for all equipment indicating the type, size, rating, style, catalog number, and listing of the equipment.

B. Provide calculations for sizing all batteries and power supplies. System Power and battery charts with performance graphs and voltage drop calculations to assure that the system will operate per the prescribed backup time periods and under all voltage conditions per UL and NFPA standards.

C. Provide power supply calculations listing total current and inrush total current for FACP, and all Notification Appliance Power Supplies and Power Extender Panels.

D. Architectural floor plans and drawings showing system details including specific location of FACP, all system devices, device device ID label addresses, raceway sizes, raceways routings cabling in raceways, end of line devices, power supplies and any other system components.

E. Provide a complete riser diagram indicating all devices with addresses, number of initiation and signal loop circuits, class of wiring system, and type of wiring.

1.5 SYSTEM DESCRIPTION

A. Point addressable fire alarm system with manual and automatic initiation devices.

B. System shall be supervised to continuously monitor the integrity of the circuit conductors and power supplies.

C. Performance of the fire alarm system circuits shall be in accordance with Class B, Style B operation for Initiating Device Circuits (IDC) and Class B, Style Y operation for Notification Appliance Circuits (NAC's).

D. The fire alarm control panel shall permit on-site programming to accommodate facility expansions, renovations, or fire alarm system modifications. All memory shall be non-volatile.

E. The control panel shall have 24 VDC output power supplies for notification appliance circuits. System shall be capable of adding additional power supplies as required to power all notification appliances.

F. Summary Reports:

1. The Fire Alarm Control Panel shall be capable of displaying and printing summary reports. The summary reports shall include:

   a. A list of all alarm points not in their normal state.
   b. A list of all points in the system, including their current status.
   c. A list of data for all control by event programs.
   d. A list of data for all time initiated programs.

G. Alarm Priority:

1. Alarms shall be processed at three levels of priority:

   a. Fire alarms shall have the highest priority.
   b. Other alarms that require interaction by the attendant shall have the second level of priority.
   c. Monitored points which do not require interaction by the attendant shall be the lowest level of priority.

H. System Access:

1. Access to the system shall be controlled by at least three levels of security to prevent programming modifications by unauthorized personnel.

   a. The lowest level of access, shall permit the attendant to view the system display, print alarms and perform life safety control by event functions. The Attendant has minimal access to the system functions.

b. The mid-level access shall permit the attendant to change user programmable parameters.
c. The highest level of access shall permit the modification of system software. This level shall be accessed only by a qualified representative of the equipment manufacturer.

1.6 SEQUENCE OF OPERATION

A. Upon an abnormal condition on the fire alarm system, the appropriate LED (alarm, supervisory, or trouble) shall flash. The panel audible alarm shall pulse for alarm conditions and sound steadily for trouble or supervisory conditions. All abnormal events shall be logged into the database, along with the date and time.

B. Operation of any smoke detector, heat detector, or manual pull station alarm initiating device shall cause the following to happen:

1. Sound all audible alarm signals throughout the building in a temporal Code. Activate all visual strobe lights throughout the building. Strobes shall continue to operate until Fire Alarm Control Panel is reset.
2. Display the points in alarm on the LCD display at the fire alarm control panel and at all remote alarm annunciator panels and print at all system printers. The visual indication shall remain until the alarm condition is reset.
3. Notify the UL listed central station via dial up digital communicator.
4. Notify the UL listed central station via dial up digital communicator.
5. Operate alarm relay contacts to release all magnetically held doors throughout the building.
6. Operate the fan shut-down relay for the HVAC systems in the same smoke compartment or smoke zone.
7. Operate all smoke dampers in the same smoke compartment or smoke zone. Dampers shall close 30 seconds after their respective fan systems have shut down.
8. Subsequent initiating alarms shall repeat the respective sequence of operations.

C. Operation of any carbon monoxide detector shall cause the following to happen:

1. Signal an alarm signal to the fire alarm control panel and remote annunciator.
2. All carbon monoxide detector self-contained audible base shall provide an temporal code 4 alarm.
3. All addressable fire alarm panel connected carbon monoxide detectors shall be interconnected to trip all amber lens visible strobes in white housing in the same building. Alarms shall continue until Fire Alarm Control Panel is reset.
4. All addressable fire alarm panel connected carbon monoxide detectors shall be interconnected to trip other CO detector self-contained audible alarms in the same building. Alarms shall continue until Fire Alarm Control Panel is reset.
5. Notify the UL listed central station via dial up digital communicator.
6. Notify the UL listed central station via dial up digital communicator.
7. Subsequent initiating alarms shall repeat the respective sequence of operations.

D. Operation of any sprinkler system supervisory device shall cause the following to happen:

1. Sound a district pulsed audible alarm at the fire alarm control panel.

2. Flash the yellow common trouble LED.
3. Display the points in alarm on the LCD display at the fire alarm control panel and at all remote alarm annunciator panels and point at all system printers. The visual indication shall remain until the alarm condition is reset.
4. Notify the UL listed central station via dial up digital communicator.
5. Notify the UL listed central station via dial up digital communicator.
6. Subsequent supervisory alarms shall repeat the respective sequence of operations.

E. The Fire Alarm System wiring and power supplies shall be electrically supervised and report trouble conditions to the fire alarm control panel. Any opens, shorts or grounds on the system wiring shall cause the following to happen:

1. Sound a distinct pulsed audible alarm at the fire alarm control panel.
2. Flash the yellow common trouble LED.
3. Display the points in alarm on the LCD display at the fire alarm control panel and at all remote alarm annunciator panels and point at all system printers. The visual indication shall remain until the alarm condition is reset.
4. Notify the UL listed central station via dial up digital communicator.
5. Notify the UL listed central station via dial up digital communicator.
6. Subsequent trouble alarms shall repeat the respective Sequence of Operation.

F. Alarm Silencing:

1. Pressing the “Alarm Silence” button shall cause all notification appliances to be deactivated. A yellow LED located in the fire alarm control panel shall illuminate to indicate the alarm has been silenced.

PART 2 - PRODUCTS

2.1 FIRE ALARM CONTROL PANEL

A. Existing to remain Simplex 4100ES.

2.2 NOTIFICATION APPLIANCE CIRCUIT (NAC) EXTENDER PANEL

A. Existing to remain Simplex 4009 IDNAC or Approved Equal

2.3 MANUAL PULL STATIONS

A. Semi-flush, single action, break glass type.

B. Constructed of red lexan with raised white lettering reading “Pull For Fire”.

C. Upon activation, handle shall lock in the alarm condition. A key shall be required to reset the manual pull station. Cylinders shall be keyed to match the fire alarm control panel.

D. Unless directly connected to a central station alarm service, municipal alarm system, or local fire alarm dispatch station, provide a clearly legible sign above each manual pull station stating “Local Alarm Only - Call Fire Department By Telephone”.

E. Provide U/L listed NFPA approved STI lexan covers for all pull stations.

F. Provide intelligent monitor module.

G. Design Make: Simplex 4099 Series

2.4 PHOTOELECTRIC SMOKE SENSOR

A. Detector shall operate on a light scattering principal. The detector shall have a photo-optic chamber with an infrared light emitting diode and a high speed light sensing photo diode. Capable of sensing visible products of combustion.

B. Alarm conditions shall be indicated by a steady red glow from the LED mounted on the sensor.

C. Sensor shall be microprocessor based, with electronic point addressing to indicate to the system which device is in alarm.

D. The sensor shall be continuously monitored to measure any changes in sensitivity due to dirt, smoke or humidity. Any buildup of foreign material shall cause trouble signal at the control panel indicating that maintenance is required.

E. Sensor shall be capable of automatic device mapping and day/night sensitivity adjustment.

F. Sensors shall be twist lock mounted to a separate base provided with screw terminals for field wiring. The detector shall be tamper resistant and shall be removable only with a special tool.

G. Provide U/L Listed NFPA approved wire guards in Gym.

H. Provide auxiliary relays and 24 VDC power for elevator capture or smoke evacuation control where indicated.

I. Design Make: Simplex True Alarms 4098 Series

2.5 FIXED TEMPERATURE HEAT DETECTOR

A. Self-restoring thermal detector.

B. Rated at 135°F fixed temperature. Provide 200°F fixed temperature in boiler room and as indicate on plans.

C. Design Make: Simplex True Alarms 4098 Series

2.6 ADDRESSABLE CARBON MONOXIDE (CO) DETECTOR

A. The FACP shall receive separate trouble status, current threshold conditions, and alarms from the CO and smoke or heat detectors.

B. Flush mounts over a standard 4”x4” two-gang backbox.

C. Audible alarm for CO signal shall be different than smoke alarm signal.

D. Single analog addressable consumes only one address. CO detector receive both communications and sensor power from the FACP battery backed power source.

E. Alarm conditions shall be indicated by a steady red glow from the LED mounted on the sensor.

F. Sensors shall be twist lock mounted to a separate base provided with screw terminals for field wiring. The detector shall be tamper resistant and shall be removable only with a special tool.

G. CO detector allows interconnection where provided with a separate addressable input module or single piece audible base/CO detector. Combination systems shall be listed in accordance with UL 2075 and UL 864.

H. Includes CO gas warning module (temporal code 4) for a repeated sequence of four cycles of 100 msec on with 100 msec off, followed by 5 seconds off per NFPA 720, Standard for the Installation of Carbon Monoxide (CO) Warning Equipment in Dwelling Units.

I. UL 2034 CO alarm detection.

J. Design Make: Simplex, System Sensor, or Approved Equal.

2.7 ADDRESSABLE OUTPUT MODULE

A. Addressable device with a form “C” dry relay contact used to control external appliances such as door closers, fans, dampers etc.

B. Provide a remote LED alarm and key operated test switch for each damper connection. Install remote test switches in visible (below ceiling space) and accessible locations adjacent each damper.

C. Relay contact rating:

1. 24 VDC = 2amps (pilot duty)
2. 120 Vac = .5 amps

D. Polling and alarm/active status provided by on board red and green LEDs.

E. Design make: Simplex 4090 Series

2.8 ADDRESSABLE INPUT MODULE

A. Addressable device used to connect 2 class B analog initiating device circuits.

B. Input circuit wiring requirements

1. Maximum allowable wire resistance - 50 ohms per circuit
2. Maximum allowable wire capacitance - .1uF per circuit

C. Polling and alarm/active status provided by on board red and green LEDs.

D. Design make: Simplex 4098 Series

2.9 DUCT TYPE SMOKE DETECTORS

A. Smoke detector shall be solid state, unipolar type with dual chamber construction and operate on the ionization principle.

B. Capable of detecting both visible and non-visible products of combustion.

C. Self-compensating circuitry to provide stability against aging and dust.

D. Field adjustable sensitivity, pre-set in the factory.

E. Enclosure suitable for mounting on an air duct, with a sampling tube that extends into the duct air stream.

F. Suitable for installation within an air-duct system with air velocities from 300-4,000 feet per minute.

G. Provide a remote LED alarm and key operated test switch for each duct smoke detector. Install remote test switches in visible (below ceiling space) and accessible locations adjacent each duct smoke detector.

H. Design Make: Simplex True Alarms 4098 series

2.10 VISUAL SIGNAL DEVICE

A. Provide backbox for recessed installations except for installations on existing walls.

B. 24 VDC.

C. Visual strobe shall have the following characteristics:

1. ADA compliant.
2. Adjustable White light output of 15, 30 or 75 candela as indicated on drawings. If no setting is indicated on the drawings set to 75cd.
3. Flash rate from 1 Hz to 3 Hz.
4. Pulse duration of 0.2 seconds.
5. Housing color: Red
6. Label on housing: Red text “FIRE”
7. Provide with wireguard when installed in Gym, Gym Halls, and Locker Rooms.

D. Design Make: Simplex 49VO Series

2.11 CARBON MONOXIDE VISUAL SIGNAL DEVICE

A. Provide backbox for recessed installations.

B. 24 VDC.

C. Visual strobe shall have the following characteristics:

1. Amber colored snap in lens.

2. Set to 75 candela.
3. Flash rate from 1 Hz to 3 Hz.
4. Pulse duration of 0.2 seconds.
5. Housing color: White
6. Label on housing: Red text "ALERT"

D. Design Make: Simplex TrueAlert 49VO-WWA-A (-BA) Addressable Notification Appliances.

2.12 AUDIO-VISUAL SIGNAL DEVICE

A. Provide backbox for recessed installations except for installations on existing walls.

B. 24 VDC.

C. Audio output shall be rated for 93 dB at 10', 520Hz compatible. For extensions to existing systems field verify audible alarm type in existing building and provide to match existing signal type.

D. Visual strobe shall have the following characteristics:

1. ADA compliant.
2. Adjustable White light output of 15, 30 or 75 candela as indicated on drawings. If no setting is indicated on the drawings set to 75cd.
3. Flash rate from 1 Hz to 3 Hz.
4. Pulse duration of 0.2 seconds.
5. Housing color: Red
6. Label on housing: Red text "FIRE"
7. Provide with wireguard when installed in Gym, Gym Halls, Locker Rooms, and Bathrooms.

E. Design Make: Simplex 49AV series

2.13 MAGNETIC DOOR HOLDERS

A. Magnetic door holders shall be provided as part of the electrical contract.

B. Provide surface mounted 24VDC or 120 VAC. Power shall be from separate power supply and not the FACP.

C. Electrical Contractor shall mount and connect all magnetic door holders.

2.14 BATTERIES AND CHARGER

A. Existing to remain.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:

1. During installation and testing, and prior to the system being put into service, all manual stations shall be appropriately marked "NOT IN SERVICE" by the Contractor.
2. Provide all 120 volt, 60 cycle AC required to power the system and all remote power supplies.
3. Wiring to all initiation and signal circuits shall be two wire class B. A fault on a circuit loop shall cause a trouble alarm to initiate for its associated zone at the fire alarm control panel.
4. All wiring shall conform to N.E.C. Articles 725 and 760, and to NFPA-72, "National Fire Alarm Code".
5. Detection and initiating equipment shall be listed by UL or approved by FM.
6. Install smoke detectors a minimum of 3 feet away from any air supply or return diffuser.
7. All surface mounted devices shall be mounted on a special box furnished by fire alarm equipment manufacturer. Total assembly shall be secure, smooth contour and have no protrusions.
8. Where detectors are installed on wood or masonry surfaces, attach brackets directly to the surface with tamperproof fasteners. Where detectors are installed on suspended ceilings, provide additional supports in the ceiling, such as channel support system, angle iron or additional runner bars. Fasten the additional supports rigidly to the ceiling runner bar system. Attach bracket to the supports with tamperproof fasteners. Install metal spacers between the bracket and supports so that the ceiling tiles will not be a part of the support system.
9. Mount FACP and all sub panels at working height.
10. Provide and wire fan shutdown relay contacts in series with starters ahead of all control devices.
11. All controlled devices such as smoke dampers, fire dampers, elevator control and door control shall be supervised to within 4’ of the controlled device.

B. Audible/Visible Device Installation:

1. Field verify audible alarm type in existing building and provide to match existing signal type.
2. Visual strobes shall be 75-candela output in all other locations unless otherwise noted.
3. Devices shall be installed at eighty inches (80") minimum above the floor, or six inches (6") below the ceiling, whichever is lower, in accordance with ADA guidelines.
4. Audible devices intended for operation in public spaces shall have a sound level of not less than seventy-five (75) dBA at ten feet (10'), nor more than 110 dBA at the minimum hearing distance from the device.
5. Audible devices intended for operation in private spaces shall have a sound level of not less than forty-five (45) dBA at ten feet (10'), nor more than 110 dBA at the minimum hearing distance from the device.

6. All audible emergency alarm signals shall be at least 15 dbA over the existing sound level within a space or shall exceed the maximum sound level by 5 dbA for at least 60 seconds, whichever is louder. Within areas occupied by persons with hearing impairments, audible emergency alarms must have the intensity and frequency to provide notification of an alarm condition.
7. Do not exceed 80% loading on any NAC power circuit.

C. Wiring:

1. Install all wiring in accordance with manufacturer's recommendations and the National Electric Code.
2. All interior wiring in exposed finished locations shall be installed in surface metal raceway. All interior wiring installed above accessible corridor ceiling tiles shall be run in EMT conduit. All interior wiring installed in unfinished basements, mechanical rooms, boiler rooms, and electrical rooms shall be installed inside EMT conduit. Paint all junction box covers in the raceway system RED. All surface metal raceway backboxes shall be RED factory enclosures.
3. All wire shall be copper.
4. Type AC or MC Fire Alarm Cable is not permitted as a wiring method for this project.
5. Wire and cable shall be #14 AWG size, solid copper, THHN/TWN for horns, manual stations, smoke or heat detectors, waterflow switches, valve supervisory switches and other initiating and indicating devices. Communication loop wiring shall be shielded in accordance with the Manufacturer's recommendations.
6. Wiring shall be continuous from device to device. Splicing shall be accomplished by use of terminal blocks in locked cabinets keyed alike with the fire alarm control unit, or junction boxes. No connections or splices shall be made underground.
7. Control cabinets shall not be used as pull boxes or raceways. Wiring gutters and locked terminal cabinets shall be used.
8. The Fire Alarm System wiring shall be installed in a workmanlike manner, subject to the approval of the project manager.
9. All harnessing of wires shall be accomplished by use of approved nylon tie wraps.
10. All wiring shall be numbered and color coded in accordance with this Specification.
11. Tests of all wiring shall be conducted for proper connection, continuity, and resistance to ground. The minimum allowable resistance between any two conductors or between conductors and ground is one (1) megohm as checked by a "megger" after all conduit, conductors, detector bases, etc. have been installed, but before the detector devices are plugged into the base or end-of-line devices installed.

D. Routing:

1. All fire alarm system conduits shall be installed either parallel or perpendicular to building structural members.
2. All fire alarm system conduits shall be provided at a height so as not to obstruct any portion of a window, doorway, stairway, or a passageway, and shall not interfere with the operation of any existing mechanical or electrical equipment.
3. All fire alarm system conduits and cable shall be routed to minimize the potential for physical damage, either mechanical or by fire.
4. All fire alarm system junction boxes, pull boxes, terminal cabinets, control enclosures and device backboxes shall be readily accessible for testing, service and maintenance.

E. Wall, Floor and Ceiling Penetrations:

1. All conduit penetrations of walls shall be provided with escutcheon plates on either side of the wall.
2. All conduit penetrations of walls, floors, and ceiling shall be sealed around the conduits, restoring the walls, floors and ceilings to their original condition, fire resistance and integrity.

F. Concealment:

1. Conduit shall be concealed except where shown on the drawings.
2. All conduit, raceways, junction boxes, panels, electrical enclosures, relays and device backboxes shall be concealed in ceiling spaces, electrical shafts or closets in all finished areas.
3. Conduit, raceways, junction boxes, panels, electrical enclosures, relays and device backboxes may be exposed in unfinished areas.
4. All fire alarm system components, including devices, junction boxes, electrical enclosures, relays and device backboxes shall be provided so as to be readily accessible for inspection, testing, service and maintenance.

G. Terminations:

1. All fire alarm conductor terminations shall be on numbered terminals or terminal strips. All fire alarm conductor terminations shall be within junction boxes, device backboxes, terminal cabinets, control panels or other satiable metal enclosures. Terminals and terminal strips shall be suitable for the size and number of conductors connected to them.
2. All connections and end-of-line devices shall be accessible for inspection, testing and servicing.
3. Terminations to terminals other than barrier/pressure plate type terminals shall use crimp-on ring-type or Y-type spade connectors.
4. Splices shall be permitted only when routing of existing conductors prohibits point-to-point terminations in existing junction boxes, terminal cabinets, etc. All such splices shall be provided with new terminal strips with proper labeling in junction boxes, terminal cabinets, etc.

H. Mounting and Labeling of Devices:

1. All fire alarm devices shall be rigidly mounted, using appropriate backboxes, to building structural members, permanent walls, ceilings or fixtures designed for the purpose.
2. All devices shall be labeled with device address or device count as appropriate. Label shall be sticky back type attached to base of device. Label identification shall be consistent with As-Built drawings.

I. Color Coding and Wire Numbering:

1. All conductors entering and leaving terminal cabinets and junction boxes shall be numbered in a logical and consecutive manner.
2. All conductors shall be color coded. Color coding shall be by wire insulation, not taping or banding. The numbering and color coding shall be continuous for each circuit wire.

3. Wires shall be numbered at each connection, termination, and junction point. Wire numbering tags shall be Brady Perma-Code, Westline, or equal.
4. Color coding shall be as follows:

CIRCUITS	COLOR CODES
Alarm Initiating Circuits	Yellow (-) and Orange (+), red (alarm) blue (alarm)
Horns, 24VDC	Slate (-) and Brown (+)
Smoke Detector	Yellow (-) Orange (+) red (alarm) blue (alarm)
Heat Detectors, Pull Stations	Purple (alarm) Black (alarm), connected to the same zone
Fan Shutdown	Blue (-) White (+)
Strobes, 24VDC	Violet (-) and Pink (+)
System AC Power	Black and White
Sprinkler Horn	Black and White
Valve Supervision	Orange and Yellow
DC Power, Door holds	Black (-) and Red (+)

3.2 INTERRUPTIONS TO EXISTING FIRE ALARM SYSTEM

A. General:

1. Do not remove any portion of the existing fire alarm system from operation while installing new work without written approval of the Owner's Representative.
2. Pupil occupied spaces must have existing systems maintained during school operation.
3. In order to accomplish the above requirements, temporary wiring and relocations of some existing and/or new equipment may be necessary. These temporary locations should approved by the Owner's Representative and arranged so as to avoid safety problems.

3.3 TESTING

A. General:

1. After complete installation of the equipment and submittal of as-built drawings, the Contractor shall perform complete tests of the system. After these tests have been completed, the Contractor shall request final acceptance inspection and tests in the presence of the Project Manager and local authority. Coordination of final acceptance test date and times with those to be present is the responsibility of the Contractor. The Contractor shall demonstrate that all conditions of the plans and specifications have been met. The tests shall include proper operation of all devices and testing of supervised circuits. The installation will be checked against the as-built drawings. The Contractor shall furnish all testing materials and instruments. A punch list will be developed and the Contractor shall correct punch list items. There will be a reinspection of punch list items. If additional reinspections are found necessary to assure compliance with the Contract, they shall be made at the Contractor's expense.

    a. The Contractor shall provide, at no additional cost to the Contract price, the following services by the Manufacturer's representative:

        1) Prior to the final inspection, "pre-test" the entire fire alarm system to assure that all new equipment is properly installed and functions in accordance with plans and specifications.
        2) The Manufacturer's representative shall certify that the entire new and existing installation was tested and performed satisfactorily.

2. Final acceptance tests shall be coordinated by the contractor and performed in the presence of the owner’s representative as follows:

    a. Operation of the fire alarm control panel and indicating components in accordance with factory recommended procedures.
    b. Operational tests of all devices (i.e., detector, waterflow indicator, manual pull box, and valve supervisory device) in accordance with the factory recommended procedures.
    c. Audible/visible testing of all indicating appliances. Tests shall include sound level (dBa) and light intensity (lumens). Audible testing shall be performed and documented for each space with any doors closed.
    d. Checks of each initiating circuit or device address for correct indications at the control unit, and any remote annunciator.
    e. A checkout report shall be prepared by the contractor and submitted to the Owner’s Representative. The checkout report shall include a listing of detector sensitivity for each detector. The report shall summarize the results of all tests and shall serve as the contractor's certification that the system is properly installed and fully functioning

B. Installation contractor shall provide a “Statement of Compliance Letter” to Authority Having Jurisdiction prior to scheduling any acceptance testing, per NYS Fire Code. “Statement of Compliance Letter” shall indicate that the fire alarm system was installed per all applicable codes and standards as well as per the contract documents. Acceptance testing shall not be scheduled without providing the “Statement of Compliance Letter” to the AHJ.

C. The complete fire protection system shall be fully tested and guaranteed for a period of one year after Owner's Representative written acceptance.

D. Prior to acceptance testing the contractor shall complete and submit the “Record of Completion” form as identified in NFPA 72.

E. An acceptance test of the complete system shall be conducted by the contractor and fire alarm equipment vendor/installer as directed by the owner after the system has performed a 100% Pre-Test. Submit a written test report from an authorized representative of the equipment manufacturer that each device and overall system operation has been 100% tested and approved.

F. Coordinate all testing of sprinkler tamper, pressure, and flow switches with the fire protection contractor.

3.4 IDENTIFICATION

A. All system devices shall be labeled in the field.

B. For each smoke detector, heat detector, flame detector, duct mounted type smoke detector, manual pull station and/or other alarm initiating device, provide the following:

1. Adhesive backed, vinyl cloth, numbered labels, identifying the device specifically by system address.
2. Labels shall be white background color with solid black numbers. Numbers shall be not less than 5/8" high x 1/8" stroke wide.
3. Design Equipment: Seton Nameplate Co.- Style M3847 or equivalent.

C. For each shut down relay and/or auxiliary control relay and for specific remote lamps, provide the following:

1. Adhesive backed, engraved lamicoid type labels specifically identifying what the fan shut down relay is shutting down, what relay is controlling or what the remote lamp is connected to.
2. Labels shall be black face with white sandwich color, nom: 1/2" tall x 2" wide, with capital letters not less than 3/16" tall engraved into the surface.
3. Design Equipment: Local fabrication by contractor.

D. Provide labels for all smoke detectors that activate elevator recall, smoke hatch operation or fireman’s car operation.

E. All labels shall be visible once device is installed.

F. Provide label on each power supply indicating power supply designation, 120 volt panel and associated circuit breaker number.

G. All concealed covers for all system outlet and pull boxes installed shall be factory or field painted red.

1. On the inside face of each outlet box cover, Contractor shall provide labeling, indicating; System address, Circuit Number, Horn/Speaker/Strobe Circuit Number, etc.

H. Provide identification of each circuit breaker feeding on each FACP, Notification Appliance Power Supply Panel and Notification Appliance Power Supply Extender Panel indicating that the circuit feeds the fire alarm system per NFPA 72 by marking in RED “Fire Alarm System”.

3.5 CLEANING AND ADJUSTMENT

A. Remove paint splatters and other spots, dirt, and debris. Clean unit internally using methods and materials recommended by the manufacturer.

B. Occupancy Adjustments: Within one year of the date of Substantial Completion, provide on-site assistance in adjusting sound levels, controls, and sensitivities to suit the actual occupied conditions.

3.6 PROGRAMMING REQUIREMENTS

A. Provide documentation of all FACP messages. FACP messages must be approved by the engineer and owners representative, prior to start of system programming. Provide Custom messages as directed.

B. FACP descriptors utilize room/space designations and numbers to be used by the facility after occupancy and those descriptors shall be approved by the engineer and Owner’s representative. Descriptors shall be no longer than (1) full line of characters on the FACP display and shall contain the room number and room use type.

C. Contractor shall allow for two fire alarm system re-programming as directed by the Owner’s representative. Contractor shall include all time and travel expenses for (2) two all day site visits for system re-programming during the warranty period.

D. Provide all required alarm and supervisory alarm output settings to the owners selected central monitoring agency.

3.7 RECORD DOCUMENTS

A. Provide complete set of as-built record drawings and documents.

B. Record Documents shall include all documents required by the Submittal Section of this specification updated to reflect as-built project conditions.

C. Prior to request for final payment submit a quantity of bound Operator Manuals that shall include as a minimum:

1. All documents required by the Submittal Section of this specification updated to reflect as-built project conditions
2. Bill of Material.
3. Instruction report stating when instruction was given and who was in attendance, signed by the Owner's Representative. Provide written operator instructions for basic system operation, interpretation of system outputs, operation of manual evacuation signaling and ancillary controls and the use of drill functions (if applicable).

4. Detailed description of routine maintenance and testing as required and recommended for each type of device installed. Maintenance guide shall include:

    a. Listing of each individual device that requires periodic testing and maintenance.
    b. Step by step procedures for the testing and maintenance for each device listed.
    c. Schedule for the testing and maintenance as recommended by NFPA 72 for each device listed.

5. Submit a written test report from an authorized representative of the equipment manufacturer that each device and overall system operation has been 100% tested and approved. Certificate of Completion, Fire Alarm System Inspection and testing form and all other system acceptance documents as described in NFPA-72.

3.8 WARRANTY AND INSTRUCTION

A. The complete fire protection system shall be fully tested and guaranteed for a period of one year after Owner's Representative written acceptance.

END OF SECTION