H 2 M architects + engineers

PROJECT MANUAL

WHITE PLAINS CITY SCHOOL DISTRICT
5 HOMESIDE LANE
WHITE PLAINS, NEW YORK 10605

AIR CONDITIONING AND VENTILATION UPGRADES AT MAMARONECK ELEMENTARY SCHOOL
7 NOSBAND AVENUE
WHITE PLAINS, NEW YORK 10605

SED Control #66-22-00-01-0-010-017

Project No: WPSD2205

CONTRACT H - HVAC CONSTRUCTION WORK
CONTRACT E - ELECTRICAL CONSTRUCTION WORK

FINAL BID DOCUMENT
OCTOBER 2023

H2M Architects + Engineers
2700 Westchester Ave, Purchase, NY 10577
tel 914.358.5623 fax 914.358.5624

www.h2m.com

The work must be code compliant and conform to all applicable regulations, including the New York State Uniform Fire Prevention and Building Code, The Energy Conservation Construction Code of New York State, the Regulations of the Commissioner of Education, the NYSED Manual of Planning Standards, and regulations of all State and Federal agencies with jurisdiction.

WHITE PLAINS CITY SCHOOL DISTRICT

AIR CONDITIONING AND VENTILATION UPGRADES
AT MAMARONECK ELEMENTARY SCHOOL
SED Control No. 66-22-00-01-0-010-017

CONTRACT H - HVAC CONSTRUCTION WORK
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Notice is hereby given that **SEALED PROPOSALS** for:

WHITE PLAINS CITY SCHOOL DISTRICT

AIR CONDITIONING AND VENTILATION UPGRADES
AT MAMARONECK ELEMENTARY SCHOOL
SED Control No. 66-22-00-01-0-010-017

CONTRACT H - HVAC CONSTRUCTION WORK
CONTRACT E - ELECTRICAL CONSTRUCTION WORK

will be received until **2:00 PM on Wednesday, November 8th, 2023,** at the White Plains City School District Office main entrance security desk located at 5 Homeside Lane, White Plains, NY 10605. In the event that on this date the White Plains City School District is closed to all students and all staff or has an early dismissal due to weather or any other emergency that closes all schools and offices for all students and all staff prior to 3:00 PM, bids will be due at 11:00 AM on the next day that the school district is open.

Hard copies and electronic bid documents will be available beginning on **Monday, October 16th, 2023**.

Complete Digital Sets of Bidding Documents, Plans and Specifications, may be obtained online as a download at the following website: melville.h2mplanroom for a nonrefundable fee of **One Hundred Dollars ($100.00) for each combined set of documents. Plans and Specifications may be obtained from REVplans, 28 Church Street, Unit 7, Warwick, New York 10990, upon deposit of One Hundred Dollars ($100.00)** for each combined set of documents. Checks or money orders shall be made payable to **White Plains City School District,** checks should be sent directly to REVplans. Bidder's deposit will be refunded if the set is returned to REV in good condition within thirty (30) days following the award of the contract or the rejection of the bids covered by such plans and specifications. **Non-bidders** shall receive partial reimbursement, in an amount equal to the amount of the deposit, less the actual cost of reproduction of the documents if the set is returned in good condition within thirty (30) days following the award of the contract or the rejection of the bids covered by such plans and specifications. Any bidder requiring documents to be shipped shall make arrangements with the printer and pay for all packaging and shipping costs.

Please note REVplans melville.h2mplanroom.com is the designated location and means for distributing and obtaining all bid package information. Only those Contract Documents obtained in this manner will enable a prospective bidder to be identified as an official plan holder of record. The Provider takes no responsibility for the completeness of Contract Documents obtained from other sources. Contract Documents obtained from other sources may not be accurate or may not contain addenda that may have been issued.

All bid addenda will be transmitted to registered plan holders via email and will be available at melville.h2mplanroom.com Plan holders who have paid for hard copies of the bid documents will need to make the determination if hard copies of the addenda are required for their use and coordinate directly with the printer for hard copies of addenda to be issued. There will be no charge for registered plan holders to obtain hard copies of the bid addenda.

Bids must be made on the standard proposal form in the manner designated therein and as required by the specifications that must be enclosed in sealed opaque envelopes bearing the name of the job and name and address of the bidder on the outside, addressed to: "**PURCHASING AGENT, White Plains City School District**", clearly marked on the outside, **"AIR CONDITIONING AND VENTILATION UPGRADES AT MAMARONECK ELEMENTARY SCHOOL, SED NO. 66-22-00-01-0-010-017".** The School District is not responsible for bids opened prior to the bid opening if bid number and opening date do not appear on the envelope. Bids opened prior to date and time indicated are invalid. The bidder assumes the risk of any delay in the mail, or in the handling of the mail by employees of the White Plains City School District, as well as of improper hand delivery.

Each proposal submitted must be accompanied by a certified check or bid bond, made payable to the "White Plains City School District", in an amount equal to ten percent (10%) of the total amount of the bid, as a commitment by the bidder that, if its bid is accepted, it will enter into a contract to perform the work and will execute such further security as may be required for the faithful performance of the contract. **Certification of bonding company is required for this bid, see Instructions for Bidders.**

Each bidder shall agree to hold his/her bid price for forty-five (45) days after the formal bid opening.

A pre-bid meeting and walk thru will be scheduled for 3:45pm on Thursday, October 26th, 2023, at Mamaroneck Elementary School, 7 Nosband Avenue White Plains, New York 10605. Potential bidders are asked to gather at the main entrance to the building. Potential bidders are asked to contact John Hansen, Preconstruction / Project Manager, for any pre-bid walk-thru questions:

Primary Contact
John Hansen
Preconstruction/ Project Manager
Triton Construction Company
1279 Route 300, 1st Floor, Newburgh, NY 12550
office 212.388.5700 | mobile 516.427.3160
e-mail: jhansen@tritonconstruction.net

Secondary Contact
Frederick Camilli
Lead Project Executive/Consultant
Triton Construction Company
Field Office - Eastview Middle School
350 Main Street - Room 233 | White Plains, NY 10601
office 212.388.5700 | mobile 516.252.7525
e-mail: fcamilli@tritonconstruction.net

Although the pre-bid meeting and walk-thru are **not** mandatory, it is highly recommended that all potential bidders make arrangements to visit the site.

It is the Board's intention to award the contract to the lowest qualified bidder in compliance with the specifications providing the required security who can meet the experience, technical and budget requirements. The Board reserves the right to reject any or all bids, waive any informality and to accept such bid which, in the opinion of the Board, is in the best interests of the School District.

By Order of the Board of Education

White Plains City School District

5 Homeside Lane

White Plains, NY 10605

BIDS FOR PROJECT

The Board of Education of the Owner (hereafter called School District), will receive **SEALED PROPOSALS** for:

WHITE PLAINS CITY SCHOOL DISTRICT
AC & VENTILATION AT MAMARONECK ELEMENTARY SCHOOL
White Plains
SED: 66-22-00-01-0-010-017
CONTRACT H - HVAC CONSTRUCTION WORK
CONTRACT E - ELECTRICAL CONSTRUCTION WORK

TIME AND PLACE

The sealed proposals are to be submitted at the:

WHITE PLAINS CITY SCHOOL DISTRICT
ADMINISTRATION OFFICE
5 Homeside Lane
White Plains, NY 10605

See notice to bidders for all dates and times.

REQUIRED BID SUBMISSIONS

Each bid submission shall consist of three (3) sealed envelopes containing the following items. The bidder shall carefully remove all forms from the project specification. The project manual should not be submitted or included in the bid package.

Envelope No. 1 - BID PROPOSAL:

This envelope shall be clearly marked with the name of the project, bidders name and marked "**BID PROPOSAL**" in large lettering on the envelope and shall contain the following items:

1. Certified check or Bid Bond in the amount totaling 10% of the base bid.

2. Certified letter from Bonding Company, indicating that they meet the criteria set forth in article 11 of the General Conditions.

3. Certified letter that the company bidding this project has been in business under the same name for a period of five years or longer, and is not currently disbarred from bidding or working on public works projects by the New York State Department of Labor.

4. One (1) fully executed original and one (1) copy (marked “copy”) of the following:

   a. Proposal forms (P-sheets).

   b. Non-collusive form.

   c. Hold Harmless Agreement.

   d. Certification of Compliance with the Iran Divestment Act or Declaration of Bidder’s Inability to provide Certification of Compliance with the Iran Divestment Act.

   e. Sexual Harassment Certification form.

   f. Insurance Certification.

   g. If the bid is sent by mail, the sealed envelope shall be enclosed in a separate mailing envelope with the notation "SEALED BID ENCLOSED" on the face thereof. Each bib must be accompanied by the Insurance Certification Form located in the specifications Failure to provide may result in the School District finding the bidder "non-responsive" to the bid documents.

Envelope No. 2 - BID QUALIFICATIONS:

This envelope shall be clearly marked with the name of the project, bidders name and marked “**BID QUALIFICATIONS**” in large lettering on the envelope and shall contain the following items:

1. A description of its experience with projects of comparative size, complexity and cost together with documentary evidence showing that said projects were completed to the School District's satisfaction and were completed in a timely fashion.

2. Documentation from five projects completed within the past five years:

   a. timeliness of performance of the work of the project.

   b. evidence that the project was completed to the School District’s satisfaction.

   c. whether any extensions of time were requested and if such requests were granted.

   d. whether litigation and/or arbitration was commenced by either the School District or the bidder as a result of the work of the project completed by the bidder.

   e. whether any liens were filed on the project by subcontractors or material suppliers of the bidder.

   f. whether the bidder was defaulted on the project by the School District.

   g. whether the bidder made any claims for extra work on the project, including whether said claim resulted in a change order.

3. Documentation evidencing the bidder's financial responsibility, including a certified financial statement prepared by a Certified Public Accountant.

4. Fully completed statement of bidder's qualification.

5. Fully completed list of subcontractors.

Envelope No. 3 SUB-CONTRACTOR BID QUALIFICATIONS:

Each contract shall submit with their bid, a third and separate sealed envelope containing the list of names of the subcontractors that the bidder will use to perform work and the agreed upon amounts to be paid for each of the following as applicable to the project.

After the low bid for each contract is announced, the sealed list of subcontractors submitted by the apparent low bidder shall be opened and the names of the subcontractors announced.

DETERMINATION OF BIDDERS

In the consideration and acceptance of any proposal, the School District shall be entitled to exercise every measure of lawful discretion in evaluating the financial history and ability of the Bidder and its past performance in ventures of this or similar nature. Such data will be considered either as a material or controlling factor in the acceptance of any bid submitted.

1. Bidders must prove to the satisfaction of the School District that they are reputable, reliable and responsible.

2. The School District may make any investigation it deems necessary to assure itself of the ability of the Bidder to perform the work.

3. The School District reserves the right to reject any or all proposals and to accept the proposal it deems in the best interest of the School District.

4. A tie-bid is defined as an instance where bids are received from two or more Bidders who are the low responsive Bidders, and their offers are identical. It is the policy of the District to settle the outcome of tie-bids by either drawing a name from a hat or flipping a coin within 24 hours of the bid opening. All affected firms will be notified of the tie, the time and place of the resolution of the tie and shall be invited to witness the outcome. Attendance is not mandatory. The drawing/flip will be held at the District Administration Office. Two impartial witnesses will be provided and shall be present. All attendees will acknowledge the results of the tie-breaker on the bid tabulation sheet. All firms affected by the bids will be notified of the results. The results pursuant to this provision shall be considered final.

DEPOSITS

Bidders deposit will be refunded if the set is returned in good condition within thirty (30) days following the award of the contract or the rejection of the bids covered by such plans and specifications. Non-bidders shall receive partial reimbursement, in an amount equal to the amount of the deposit, less the actual cost of reproduction of the documents if the set is returned in good condition within thirty (30) days following the award of the contract or the rejection of the bids covered by such plans and specifications.

VERBAL ANSWERS

The School District, its agents, servants, employees and the Architect/Engineer shall not be responsible in any manner for **verbal** answers to inquiries made regarding the meaning of the contract documents, drawings or the specifications prior to the awarding of the contract.

For information with reference to the work and its location during bid phase by prospective bidders' questions shall be submitted in writing to:

Cole Podolsky
Sr. Project Designer
H2M Architects + Engineers
538 Broad Hollow Road, Suite 4E
Melville, New York 11747
Phone: (63) 756-8000 ext. 1323
Fax: (631) 894-4122
E-mail: cpodolsky@h2m.com

To be given consideration, questions must be received in writing at least ten (10) days prior to the date fixed for the opening of bids.

ADDENDA AND INTERPRETATIONS

No interpretations of the meaning of the plans, specifications or other Contract Documents will be made to any bidder orally. Every request for such interpretation shall be made in writing, addressed to:

Cole Podolsky
Sr. Project Designer
H2M Architects + Engineers
538 Broad Hollow Road, Suite 4E
Melville, New York 11747
Phone: (63) 756-8000 ext. 1323
Fax: (631) 894-4122
E-mail: cpodolsky@h2m.com

To be given consideration, questions must be received in writing at least ten (10) days prior to the date fixed for the opening of bids. Any and all interpretations and any supplement instructions will be in the form of written addenda to the specifications, and will be sent by mail or faxed to each of the Contractors who has taken out the Drawings and Contract Documents.

All addenda so issued shall become part of the Contract Documents. If any addenda may materially affect the bid, as solely determined by the School District, the School District may extend the bid date.

PRE-BID INSPECTION OF SITE

Each bidder shall conduct on-site inspections of the referenced project site during the pre-bid walkthrough prior to submission of a bid proposal. The bidder shall acquaint himself/herself with all apparent conditions and characteristics of the facility with regard to assessment of required materials

quantities, evaluation of quality of existing materials, access to the site and equipment, location of underground utilities, clearances and all related information necessary to develop an understanding of the required scope of the work and all field conditions. Bidders must satisfy themselves by personal examination of the location of the proposed work and of the actual conditions and requirements of the work and shall not, at any time after the submission of the Proposal, dispute or complain of such estimate or assert there was any misunderstanding in regard to the depth or character or the nature of the work to be done. No consideration will be given for subsequent additional claims by the successful bidder after bidding with regard to apparent field conditions.

PRE-BID CONFERENCE

See Section “Notice to Bidders”

BIDDER TO BE FAMILIAR WITH PLANS AND REQUIREMENTS

It is the bidder’s responsibility to examine carefully the plans and specifications, proposal and the site upon which the work is to be performed. A proposal submitted shall be prima facie evidence that the bidder has made such examination and that he/she is familiar with all of the conditions and requirements.

PREPARATION OF PROPOSAL

The Proposal forms for project contained herein must be used in preparing bids. Failure to use said Proposal forms or the inclusion of bids not requested shall result in rejection of the bid.

No proposal shall be considered by the School District unless the bidder tendering same demonstrates that it is skilled in work of a similar nature to that envisaged in the Contract/Bidding Documents.

Each bidder shall fill out in ink (in both words and figures) and signed by an officer of the corporation in the spaces provided, its unit or lump sum bid, as the case may be, for each item in the Proposal. If there is a discrepancy between the prices in words and figures, the prices in words shall govern as unit and lump sum prices.

No bid will be considered which does not include bids for all items listed in the proposal sheets.

NAME OF BIDDER

Each bidder must state in the Proposal its full name and business address, and the full name of every person, firm or corporation interested therein and the address of every person or firm, or president and secretary of every corporation interested with it; if no other person, firm or corporation be so interested, it must affirmatively state such fact. The Bidder must also state that the Proposal is made without any connection (directly or indirectly) with any other bidder for the work mentioned in its proposal and is (in all respects) without fraud or collusion; it has inspected the site of the work, has examined the Contract, General Conditions, Specifications, Plans, all addenda, and Information for Bidders; no person acting for or employed by the school district is directly or indirectly interested therein, or in the supplies or work to which it relates or in any portion of the prospective profits thereof; it proposes and agrees if its proposal or bid is accepted, to execute a contract with the school district to perform the work mentioned in the contract, plans and specifications attached; for the amount stated in the bid proposal.

CERTIFIED CHECK OR BID BOND/BONDING CERTIFICATION

Each bid must be accompanied by either a certified check drawn on a solvent bank with an office in the State of New York, or a bid bond equal to ten percent (10 %) of the total amount of the project bid, and payable to the "WHITE PLAINS CITY SCHOOL DISTRICT**"**. This amount shall be the measure of liquidated damages sustained by the School District as a result of the failure, negligence or refusal of the Bidder to whom the contract is awarded to execute and deliver the contract. Provide a certified statement that the bonding company meets or exceeds the requirements set forth in Article 11 of the General Conditions.

A Performance and Payment bond will be required for the work. Each shall be in the amount of 100% of the contract sum. Refer to Article 11 of the General Conditions for requirements associated with such bonds.

PERMITS AND REGULATIONS

Each Contractor shall give all notices and comply with all laws, ordinances, rules and regulations bearing on the conduct of the work as drawn and specified. Each Contractor is required to observe all laws and ordinances including, but not limited to, relating to the obstructing of streets, maintaining signals, keeping open passageways and protecting them where exposed to danger, and all general ordinances affecting him, his employees, or his work hereunder in his relations to the School District or any person. Each contractor shall also obey all laws and ordinances controlling or limiting the Contractor while engaged in the prosecution of the work under this Contract.

If the Contractor observes that the drawings and specifications are at variance with laws and regulations, he/she shall promptly notify the Architect in writing and any necessary changes shall be adjusted as provided in the contract for changes in the work. If the Contractor performs any work knowing it be contrary to such laws, ordinances, rules, regulations, or specifications, or local, state or federal authorities without such notice to the Architect, he/she bear all costs arising therefrom.

CONTRACTOR'S UNDERSTANDING

It is understood and agreed that the bidder has, by careful examination, satisfied himself/herself as to the nature and location of the Work, and confirmation of the ground, the character, quality and quantity of the materials to be encountered, the character of equipment and facilities needed preliminary to and during the prosecution of the work, the general and local conditions, and all other matters which can in any way affect the work under the contract intended to be awarded.

No official, officer or agent of the School District is authorized to make any representations as to the materials or workmanship involved or the conditions to be encountered and the bidder agrees that no such statement or the evidence of any documents or plans, not a part of the contract to be awarded, shall constitute any grounds for claim as to conditions encountered. No verbal agreement or conversation with any officer, agent or employee of the School District either before or after the execution of this Contract, shall affect or modify any of the terms or obligations herein contained.

It is understood and agreed that the bidder has informed himself fully as to the conditions relating to construction and labor under which the work will be performed and agrees as far as possible to employ

such methods and means in the performance of his work so as not to cause interruption or interference with the School District's operations or any other contractor performing work at the project site.

EQUIVALENTS

A. In the Specifications, one or more kinds, types, brands, or manufacturers or materials listed are regarded as the required standard of quality and are presumed to be equal. The bidder may select one of these items or, if the bidder desires to use any kind type, brand, or manufacturer or material other than those named in the specifications, they shall indicate in writing when requested, and prior to award of contract, what kind, type, brand or manufacturer is included in the base bid for the specified item.

B. Submission for equivalents shall be submitted to the Architect prior to the award of the contract.

C. Refer to Article 6(W) of the General Conditions for submission requirements. Bidder shall provide the Architect with the same documentation as required for substituted materials as set forth in Article 6(X) of the General Conditions.

BID EVALUATION

The School District and the Architect may make such investigation as they deem necessary to determine the ability of the bidder to perform the work, and the bidder shall furnish the School District with all such additional information and data for this purpose as may be requested. The School District reserves the right to reject any bid if the evidence submitted by, or investigation of such bidder fails to satisfy the School District that such bidder is properly qualified to carry out the obligations of the Contract and to complete the work contemplated therein.

BID WITHDRAWAL

No bids may be withdrawn for a period of 45 days after opening of bids. The School District may request an extension in writing, if necessary, for bidders to hold their bid for an additional 45 days.

SCHOOL DISTRICT RESERVATION OF RIGHTS

The School District reserves the right to waive what it deems to be informalities relating to a specific bid, to waive what it deems to be technical defects, irregularities and omissions relating to a specific bid, to reject any or all bids, to request additional information from any bidder or to re-advertise and invite new bids.

CONTRACTOR'S QUALIFICATION STATEMENT (POST BID)

The apparent low bidder must submit the required pre-award submittal package described below to the School District's Construction Representative within 48 hours after the bids are opened.

Triton Construction Co., Inc.

Attn: John Hansen

1279 Route 300, 1st Floor

Newburgh, NY 12550

Phone: (212) 388-5700

Email: jhansen@tritonconstruction.net

Submissions must be emailed and must include the Project Name of this contract in the Subject Line of the Pre-Award submission email.

1. Pre-award Submittal Package
    a. Fully execute AIA-A305 Contractors Qualification Statement.
    b. Most recent financial statement by CPA.
    c. References and experience:
        (1) List of all past contracts with K-12 Public School Districts.
        (2) Provide three (3) references (Name, Title, Phone Number and email) of persons associated with three (3) different projects (public or private sector) of similar scope and size to the one identified in this contract. Additionally, include the names of two major suppliers used for each of these three (3) projects.
2. Workforce and Work Plan - Provide a detailed written Work Plan which shall / demonstrate the contractor's understanding of overall project scope and shall include, but not be limited, to the following:
    a. Sequential listing of specific project activities required to successfully complete the Work of the Contract.
        (1) Include Schedule and list Critical Milestones.
        (2) Include Phasing of the work, if required.
        (3) Include listing of long lead-time items.
        (4) Impact of weather and restricted work periods.
        (5) Signed statement from a company officer that the Project can be completed in the established construction duration listed in the contract documents.
    b. Resumes for the contractor's proposed project site supervisor and staff including qualifications for specialized expertise or any certifications required to perform the Work.
    c. Names of proposed major sub-contractors (more than 15% of the bid amount) and a listing of the related trade work and value.
    d. Any special coordination requirements with other trades or ongoing contracts under separate contract(s).
    e. Any special storage and/ or staging requirements for construction materials required for the work.
    f. Any other special requirements including those noted in the contract documents or known to the contractor / subcontractor(s).

3. Detailed Cost Estimate:
    a. A copy of Detailed Cost Estimate outlined in CSI format for the contract work.

NOTICE OF ACCEPTANCE

The School District shall give notice of acceptance of a bid by either registered or certified mail, sent within forty five (45) days after the bids have been opened unless the time to award has been extended.

SIGNING OF CONTRACT

Each Bidder to whom a contract is awarded, shall, at the office of the School District within ten (10) business days after the date of notification by either registered or certified mail of acceptance of its proposal furnish the required payment and performance bonds in an amount of 100% of the contract, and the required insurance as set forth in Article 10 of the General Conditions, and sign the contract for the work for its performance and maintenance.

INSURANCE

The amounts, types and clauses to be included in the insurance is required to be carried by the successful bidder and its contractors, are listed as set forth in Article 10 of the General Conditions.

WAIVER OF IMMUNITY

Attention is directed to the statement of non-collusion required by Article 5A of the "General Municipal Law of the State of New York" concerning Waiver of Immunity and included in the attached Agreement.

RESPONSIBILITY OF BIDDER

The attention of Bidders is directed particularly to the contract provisions whereby the Contractor will be responsible for any loss or damage that may occur to the work or any part thereof during its progress and whereby the Contractor must make good any defects or faults in the work that may occur during the progress or within two (2) years after its acceptance.

Each Contractor shall provide for the continuation of the Performance Bond as a Maintenance Bond for two (2) full years after date of final payment request at the full contract price.

The work is to be performed and completed to the satisfaction of the School District & Architect/Engineer and in accordance with the specifications annexed hereto and the plans referred to therein.

LABOR RATES

Each Bidder awarded a contract shall pay not less than the minimum hourly wage rates on those contracts as established in accordance with Section 220 of the Labor Law as shown in the schedule.

Article 8, Section 220 of the Labor Law, as amended by Chapter 750 of the Laws of 1956, provides (among other things) that it shall be the duty of the fiscal officer to make a determination of the schedule of wages to be paid to all laborers, workers and mechanics employed on public work projects, including supplements for welfare, pension, vacation and other benefits. These supplements include hospital, surgical or medical insurance, or benefits; life insurance or death benefits; accidental death or dismemberment insurance; and pension or retirement benefits. If the amount of supplements provided by the employer is less than the total supplements shown on the wage schedule, the difference shall be paid in cash to the employee.

Article 8, Section 220 of the Labor Law, as amended by Chapter 750 of the Laws of 1956, also provides that the supplements to be provided to laborers, workers and mechanics upon public work, "...shall be in accordance with the prevailing practices in the locality..." The amount for supplements listed on the enclosed schedule does not necessarily include all types of prevailing supplements in the locality, and a future determination of the Industrial Commissioner may require the Contractor to provide additional supplements.

The original payrolls or transcripts shall be preserved for three (3) years from the completion of the work on the awarded project by the Bidders awarded a contract. The School District shall receive such payroll record upon completion of project.

WHITE PLAINS CITY SCHOOL DISTRICT

Board of Education

5 Homeside Lane

White Plains, NY 10605

QUALIFICATIONS OF BIDDERS

Experience and Qualifications of the Bidder: Each bidder is required to submit the following documentation to demonstrate its experience and qualifications for the work of the Project for which a bid is submitted as well as the following Statement of Bidder's Qualifications.:

a. A description of its experience with projects of comparative size, complexity, and cost, together with documentary evidence showing that said projects were completed to the Owner's satisfaction and were completed in a timely fashion;

b. Documentation from each of the projects it has performed capital work in the last five (5) years concerning the bidder's:

(i) timeliness of performance of the work of the project

(ii) evidence that the project was completed to the Owner's satisfaction;

(ii) whether or not any extensions of time were requested by the contractor and whether or not such requests were granted;

(iv) whether litigation and/or arbitration was commenced by either the Owner or the bidder as a result of the work of the project performed by the bidder;

(v) whether any liens were filed on the project by subcontractors or material suppliers of the bidder;

(vi) whether the bidder was defaulted on the project by the owner;

(vii) whether the bidder made any claims for extra work on the project, including whether said claim resulted in a change order;

c. Documentation evidencing the bidder's financial responsibility, including a certified financial statement prepared by a certified public accountant.

d. Documentation evidencing the bidder's existence under the same name for the last five (5) years.

e. Documentation evidencing the bidder's Worker's Compensation Experience Modification.

STATEMENT OF BIDDER'S QUALIFICATIONS

IMPORTANT: BIDDERS ARE REQUIRED TO FURNISH A COMPLETE ANSWER TO ALL OF THE QUESTIONS IN THIS STATEMENT. IF ADDITIONAL SPACE IS REQUIRED TO FURNISH A COMPLETE ANSWER, BIDDER MAY ATTACH PAGES AS NECESSARY. IN THE EVENT THAT COMPLETE ANSWERS ARE NOT PROVIDED TO EVERY QUESTION, THE BID WILL BE REJECTED.

1. Name of Bidder

_____

2. Type of Business Entity (e.g., sole proprietor, partnership, corporation, LLC, etc.)

_____

3. If the bidder is a corporation, state the date and place of incorporation of the corporation.

_____

4. For how many years has the bidder done business under its present name?

_____

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

_____

_____

_____

_____

6. Have any of the persons listed in Number 5 owned/operated/been shareholders in any other companies? If so, please state name of the other companies and the individuals who owned, operated, or have been shareholders:

_____

_____

_____

_____

_____

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

_____

_____

_____

_____

_____

8. Has the bidder been found guilty of any OSHA Violations? If the answer to this question is yes, describe the nature of the OSHA violation, an explanation of remediation or other steps taken regarding such violation(s).

_____

_____

_____

_____

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

_____

_____

_____

_____

_____

10. Has the bidder been named as a party in any lawsuit arising from performance of work related to any project in which it has been engaged? If the answer to this question is yes, list all such lawsuits, the index number associated with said suit and the status of the lawsuit at the time of the submission of this bid.

_____

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

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

_____

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

_____

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14. Has the bidder, its officers, directors, owner and/or managerial employees been convicted of a crime or been the subject of a criminal indictment? If the answer to this question is yes, list the name of the individual convicted or indicted, the charge against the individual and the date of disposition of the charge.

_____

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15. Has the bidder been charged with and/or found guilty of any violations of federal, state, or municipal environmental and/or health laws, codes, rules and/or regulations? If the answer to this question is yes, list the nature of the charge against the bidder, the date of the charge, and the status of the charge at the time of the submission of this bid.

_____

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16. Has the bidder bid on any projects for the period September 1, 2012 to present? If the answer to this question is yes, list the projects bid on, whether said bid was awarded to the bidder and the expected date of commencement of the work for said project. For those projects listed, if the bidder was not awarded the contract, state whether the bidder was the lowest monetary bidder.

IMPORTANT: BIDDERS ARE REQUIRED TO FURNISH A COMPLETE LIST OF PROJECTS AS REQUIRED BY THIS QUESTION #16 WITH ITS BID. IN THE EVENT THE LIST REQUESTED IS NOT SUBMITTED WITH THE BIDDER'S BID, THE BID WILL BE REJECTED

_____

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17. Does the bidder have any projects ongoing at the time of the submission of this bid? If the answer to this question is yes, list the projects on which the bidder is currently working, the percentage complete, and the expected date of completion of said project.

IMPORTANT: BIDDERS ARE REQUIRED TO FURNISH A COMPLETE LIST OF PROJECTS AS REQUIRED BY THIS QUESTION #17 WITH ITS BID. IN THE EVENT THE LIST REQUESTED IS NOT SUBMITTED WITH THE BIDDER'S BID, THE BID WILL BE REJECTED.

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18. Have the bidder and its bond surety ever been notified by a project Owner that the Owner is contemplating declaring a default and requested a conference to discuss the performance of the contract? If the answer to this question is yes, list the projects on which such a conference was held, and the result of the conference, and the status of the project in question.

_____

_____

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_____

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

IMPORTANT: BIDDERS ARE REQUIRED TO FURNISH A COMPLETE LIST OF PROJECTS AS REQUIRED BY THIS QUESTION #19 WITH ITS BID. IN THE EVENT THE LIST REQUESTED IS NOT SUBMITTED WITH THE BIDDER'S BID, THE BID WILL BE REJECTED.

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20. Has the bidder's surety ever been contacted to provide supervisory services in connection with an on-going project. If the answer to this question is yes, list the project(s) for which the surety provided supervisory services.

IMPORTANT: BIDDERS ARE REQUIRED TO FURNISH A COMPLETE LIST OF PROJECTS AS REQUIRED BY THIS QUESTION #20 WITH ITS BID. IN THE EVENT THE LIST REQUESTED IS NOT SUBMITTED WITH THE BIDDER'S BID, THE BID WILL BE REJECTED.

_____

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_____

_____

21. Bidder's Worker's Compensation Experience Modifier: _____

Dated: By: _____
(Signature)

_____
(Print Name and Title)

Sworn to before me this

_____day of_____ , 20_____

_____
Notary Public

BIDDER'S DECLARATION:

The undersigned, as Bidder, declares that the only person or persons interested in this bid or proposal as principal or principals is or are named herein; and that no other person than herein named has any interest in this proposal or in the contract proposed to be taken; that this bid or proposal is made without any connections with any other person or persons making a bid or proposal for the same purpose; that the bid or proposal is in all respects fair and without collusion or fraud; that it has examined the site of the work and the Contract Documents; and fully understands all the same; and it proposes and agrees, if this proposal is accepted, it will contract with the WHITE PLAINS CITY SCHOOL DISTRICT in the Contract accompanying this bid to furnish all the material, implements, etc., and perform all the work required in accordance with the Contract Documents; and it will accept in full payment therefore the following sums to wit:

Acknowledgement that the foregoing Bidder's Declaration is true and factual.

_____

SIGNATURE PRINT NAME TITLE DATE

END OF SECTION 004105

Contract H - HVAC Construction Work
Contract E - Electrical Construction Work

To: **WHITE PLAINS CITY SCHOOL DISTRICT**
5 Homeside Lane
White Plains, NY 10605

For the furnishing and installing of materials for all work included under contract as follows:

Made this insert day of the month day of insert Month , 20insert year

_____

_____

_____

Bidders Declaration:

The party named as Bidder declares that the only person or persons interested in this bid or proposal as principal or principals is or are named herein; and that no other person than herein named has any interest in this proposal or in the contract proposed to be taken; that this bid or proposal is made without any connections with any other person and persons making a bid or proposal for the same purpose; that the bid or proposal is in all respects fair and without collusion or fraud; that it has examined the site of the work, the contract and specifications and the drawings referred to; and has read the Information for Bidders hereto attached; and it proposes and agrees, if this proposal is accepted, it will contract in the form as approved to perform all the work mentioned in said contract and specifications; and it will accept in full payment therefor the following sums to wit:

END OF SECTION 004116

Note: The bidder is asked to use either black ink or typewriter (black ribbon) in completing this proposal form. Each line item amount must be completed. Failure to do so will be grounds for disqualification of the bidder.

BASE BID: Contract E – Electrical Construction Work

ITEM 1 – BONDS and INSURANCES

(written in words) _____($)

ITEM 2 – DIVISION 1 – GENERAL REQUIREMENTS

(written in words) _____($)

ITEM 3 – DIVISION 1 – PROJECT SUPERVISION

(written in words) _____($)

ITEM 4 – DIVISION 2 – EXISTING CONDITIONS & DEMOLITION WORK

(written in words) _____($)

ITEM 5 – DIVISION 7 – FIRE STOPPING

(written in words) _____($)

ITEM 6 – DIVISION 8 – OPENINGS

(written in words) _____($)

ITEM 7 – DIVISION 26 – ELECTRICAL DEMOLITION

(written in words) _____($)

ITEM 8 – DIVISION 26 – GROUNDING AND BONDING

(written in words) _____($)

ITEM 9 – DIVISION 26 – SUPPORT DEVICES and HANGERS

(written in words) _____($)

ITEM 11 – DIVISION 26 – ELECTRICAL IDENTIFICATION

(written in words) _____($)

ITEM 12 – DIVISION 26 – SWITCHGEAR

(written in words) _____($)

ITEM 13 – DIVISION 26 – PANELBOARDS

(written in words) _____($)

ITEM 14 – DIVISION 26 – WIRING DEVICES

(written in words) _____ ($)

ITEM 15 – DIVISION 26 UTILITY SERVICES

(written in words) _____ ($)

ITEM 16 – DIVISION 28 – TEMPORARY CONTROLS

(written in words) _____ ($)

ITEM 17 – DIVISION 31 & 32 – EARTHWORK & EXTERIOR IMPROVEMENTS

(written in words) _____ ($)

ITEM 18 – AS-BUILT DRAWINGS

(written in words) _____ ($)

ITEM 19 – PROJECT CLOSEOUT

(written in words) _____ ($)

ALLOWANCE E1 – ALLOWANCE FOR GENERAL CONTINGENCY

(written in words) *Fifty Thousand Dollars and 00 Cents* (**$50,000.00**)

TOTAL BASE BID (ITEMS 1 –19 INCLUSIVE, PLUS ALLOWANCE E1)
(written in words) _____ ($)

Note: The WHITE PLAINS CITY SCHOOL DISTRICT is exempt from Federal, New York State and local taxes. TOTAL AMOUNT BID shall be exclusive of all taxes.

EACH BIDDER SHALL SUBMIT WITH IT'S BID A SEPARATE SEALED LIST THAT NAMES THE SUBCONTRACTORS THAT THE BIDDER WILL USE TO PERFORM WORK AND THE AGREED UPON AMOUNT TO BE PAID FOR A.) HEATING, VENTILATION AND AIR-CONDITIONING WORK, B.) PLUMBING WORK AND C.) ELECTRICAL WORK. AFTER THE LOW BID IS ANNOUNCED, THE SEALED LIST OF SUBCONTRACTORS SUBMITTED BY THE APPARENT LOW BIDDER SHALL BE OPENED AND THE NAMES OF THE SUBCONTRACTORS ANNOUNCED. ANY CHANGE OF SUBCONTRACTOR OR AGREED UPON AMOUNT TO BE PAID SHALL REQUIRE THE APPROVAL OF THE PUBLIC OWNER, UPON A SHOWING OF "LEGITIMATE CONSTRUCTION NEED" FOR SUCH CHANGE.

"LEGITIMATE CONSTRUCTION NEED" SHALL INCLUDE, BUT NOT BE LIMITED TO:

A CHANGE IN PROJECT SPECIFICATIONS,
A CHANGE IN CONSTRUCTION MATERIAL COSTS,
A CHANGE IN SUBCONTRACTOR STATUS, OR
THE SUBCONTRACTOR HAS BECOME UNWILLING, UNABLE OR UNAVAILABLE TO PERFORM THE SUBCONTRACT.

THE SEALED LISTS OF SUBCONTRACTORS SUBMITTED BY ALL OTHER BIDDERS SHALL BE RETURNED TO THEM UNOPENED AFTER THE CONTRACT AWARD.

PAYMENTS TO SUBCONTRACTORS AND MATERIAL MEN MUST BE MADE WITHIN 7 CALENDAR DAYS AS OPPOSED TO 15 CALENDAR DAYS OF THE RECEIPT OF PAYMENT FORM THE PUBLIC OWNER. FAILURE TO PAY WITHIN 7 CALENDAR DAYS WILL RESULT IN INTEREST DUE FOR ALL CALENDAR DAYS SUBSEQUENT TO THE SEVENTH DAY THROUGH THE DATE THAT PAYMENT IS MADE.

THE BIDDER UNDERSTANDS THAT THE OWNER RESERVES THE RIGHT TO REJECT ANY OR ALL BIDS AND TO WAIVE ANY INFORMALITIES IN THE BIDDING.

THE BIDDER AGREES THAT THE BID SHALL BE GOOD AND MAY NOT BE WITHDRAWN FOR A PERIOD OF **FORTY-FIVE (45)** CALENDAR DAYS AFTER THE SCHEDULED CLOSING TIME FOR RECEIVING BIDS.

THE BIDDER HAS SUBMITTED ALL REQUESTS FOR OTHER BRAND NAMES OR PRODUCTS NOT LISTED IN THE SPECIFICATIONS IN ACCORDANCE WITH ARTICLE 6(W) OF THE GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION.

SITE SUPERVISION

THE SUCCESSFUL CONTRACTOR IS TO PROVIDE FULL TIME SITE SUPERVISION FOR HIS OR HER STAFF, SUBCONTRACTORS AND SUPPLIERS FOR THE DURATION OF THIS PROJECT. A COMPETENT SUPERINTENDENT SHALL BE IN ATTENDANCE AT THE JOB SITE AT ALL TIMES WHEN WORK IS BEING PERFORMED UNDER THEIR CONTRACT. THE SUPERINTENDENT IS RESPONSIBLE TO VISIT THE JOB SITE DAILY WHEN WORK IS NOT BEING PERFORMED UNDER THEIR CONTRACT AND TO MONITOR THE OVERALL CONSTRUCTION PROGRESS. A QUALIFIED SITE SUPERINTENDENT MUST HAVE THE AUTHORITY TO REPRESENT AND MAKE DECISIONS FOR HIS OR HER COMPANY WITH REGARDS TO THE SUBJECT JOB, MUST BE ABLE TO GIVE GUIDANCE AND DIRECTION TO EMPLOYEES, SUBCONTRACTORS AND SUPPLIERS, AND MUST BE KNOWLEDGEABLE ABOUT THE WORK TO BE PROVIDED. **FAILURE TO PROVIDE A QUALIFIED SITE SUPERINTENDENT AT THE JOB SITE SHALL SUBJECT SAID PRIME CONTRACTOR TO A PENALTY OF $1,000 PER DAY FOR EVERY OCCURRENCE.**

TIME OF COMPLETION

ALL WORK UNDER THIS CONTRACT SHALL BE COMPLETED BETWEEN THE FOLLOWING HOURS, IN ACCORDANCE WITH THE FOLLOWING DATES:

WORK DAYS:	**Monday – Friday**
WORK HOURS:	**7:00 AM - 4:00 PM**
CONSTRUCTION START DATE:	**June 26, 2024**
SUBSTANTIAL COMPLETION:	**August 30, 2024**
FINAL COMPLETION:	**September 13, 2024**

IF NECESSARY, WEEKEND, HOLIDAY AND EVENING WORK SHALL BE PROVIDED TO ENSURE THE COMPLETION DATES LISTED ABOVE, AT THE SOLE COST AND EXPENSE OF THE BIDDER.

FAILURE OF THE CONTRACTOR TO COMPLETE WORK BY THE SPECIFIED TIME SHALL SUBJECT HIM/HER TO LIQUIDATED DAMAGES AS SET FORTH IN ARTICLE 13 OF THE GENERAL CONDITIONS.

THE ARCHITECT/ENGINEER SHALL ACT AS THE RECORD KEEPER OF CONTRACT DAYS; HE WILL BE THE SOLE JUDGE OF DELAYS CAUSED BY WEATHER. ONLY WEATHER DELAYS, AS ADJUDGED BY THE ARCHITECT/ENGINEER, WILL BE CONSIDERED FOR EXTENSIONS OF THE CONSTRUCTION PERIOD. THE CONTRACTOR SHALL SUBMIT A BI-WEEKLY REQUEST FOR DELAYS DUE TO WEATHER TO THE ARCHITECT/ENGINEER FOR APPROVAL. NO OTHER DELAY CLAIMS WILL BE ACCEPTED, FOR CREDIT TOWARDS THE PROJECT COMPLETION SCHEDULE, REGARDLESS OF THE SOURCE OF THE DELAY.

FAILURE OF THE CONTRACTOR TO COMPLETE ALL WORK SHOWN AND SPECIFIED IN THE CONTRACT DOCUMENTS, BY ALL OF THE SPECIFIED TIME FRAMES, SHALL SUBJECT THE CONTRACTOR TO LIQUIDATED DAMAGES, AS SET FORTH IN ARTICLE 13 OF THE GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION, IN THE SUM OF ONE THOUSAND DOLLARS ($1,000.00) PER CALENDAR DAY. SUCH DAMAGES WILL COMMENCE ON THE DAY AFTER THE COMPLETION DATE OR THE DAY AFTER ANY LISTED MILESTONE DATE IN THE NOTICE TO PROCEED.

WITHIN TEN (10) CONSECUTIVE CALENDAR DAYS AFTER THE DATE OF THE NOTICE OF AWARD, THE BIDDER SHALL EXECUTE THE CONTRACT AND FURNISH THE REQUIRED PERFORMANCE BOND, PAYMENT BOND AND INSURANCES.

THE BOARD OF EDUCATION OF THE DISTRICT RESERVES THE RIGHT TO AWARD THIS CONTRACT TO OTHER THAN THE LOW BIDDER IF THE LAW SO PERMITS.

THE UNDERSIGNED HEREBY ACKNOWLEDGES RECEIPT OF THE FOLLOWING ADDENDA (IF ANY):

ADDENDUM NO.	DATED
_____	_____
_____	_____

SPECIFIC DAMAGES WILL BE ASSESSED AND DEDUCTED FROM AMOUNTS OTHERWISE DUE THE CONTRACTOR FOR ADDITIONAL INSPECTION (FIELD) AND CONTRACT ADMINISTRATION (OFFICE) TIME EXPENDED BY THE ARCHITECT/ENGINEER AND/OR OTHER CONSTRUCTION EMPLOYEE(S) HIRED TO ADMINISTER OR OBSERVE THE CONTRACT, SHOULD THE CONTRACTOR COMPLETE THE CONTRACT BEYOND THE CONTRACT COMPLETION PERIOD SPECIFIED ABOVE.

SUCH DEDUCTION SHALL BE IN ACCORDANCE WITH THE ARCHITECT, ENGINEER'S, AND/OR OTHER CONSTRUCTION EMPLOYEE(S) STANDARD HOURLY BILLING RATES IN EFFECT AT THE TIME FOR THE SCHOOL DISTRICT.

THE REQUIREMENTS OF THE PROPOSAL HAVE BEEN COMPLETELY READ, UNDERSTOOD AND ACKNOWLEDGED BY THE BIDDER.

BIDDER: _____

BIDDER'S ADDRESS: _____

SIGNED BY: _____ TITLE: _____

DATE: _____

Telephone number where the contractor or a competent representative can accept a telephone message and provide a reasonable reply as soon as possible, but not later than twenty-four (24) hours:

DAY: (___) _____ NIGHT: (___) _____

FAX: (___) _____

FEDERAL I.D. NO. OR SOCIAL SECURITY NO.: _____

Note: The bidder is asked to use either black ink or typewriter (black ribbon) in completing this proposal form. Each line item amount must be completed. Failure to do so will be grounds for disqualification of the bidder.

BASE BID: Contract H – HVAC Construction Work

ITEM 1 – BONDS and INSURANCES

(written in words) _____($)

ITEM 2 – DIVISION 1 – GENERAL REQUIREMENTS

(written in words) _____($)

ITEM 3 – DIVISION 1 – PROJECT SUPERVISION

(written in words) _____($)

ITEM 4 – DIVISION 2 – EXISTING CONDITIONS & DEMOLITION WORK

(written in words) _____($)

ITEM 5 – DIVISION 7 – FIRE STOPPING

(written in words) _____($)

ITEM 6 – DIVISION 23 – PIPE, VALVES, FITTINGS, PIPE HANGERS AND SUPPORTS

(written in words)_____($)

ITEM 7 – DIVISION 23 – MECHANICAL SYSTEM IDENTIFICATION

(written in words)_____($)

ITEM 8 – DIVISION 23 – BALANCING OF AIR SYSTEMS

(written in words)_____($)

ITEM 9 – DIVISION 23 – PIPING & DUCTWORK INSULATION

(written in words)_____($)

ITEM 10 – DIVISION 23 – CONTROLS

(written in words) _____($)

ITEM 11 – DIVISION 23 – STEAM SPECIALTIES

(written in words) _____($)

ITEM 12 – DIVISION 23 – SHEET METAL WORK

(written in words)_____($)

ITEM 13 – DIVISION 23 – DIFFUSERS, REGISTERS AND GRILLES

(written in words) _____ ($)

ITEM 14 – DIVISION 23 – BOILERS

(written in words) _____ ($)

ITEM 15 – DIVISION 23 – AIR COOLED CONDENSING UNITS

(written in words) _____ ($)

ITEM 16 – DIVISION 23 – UNIT VENTILATOR

(written in words) _____ ($)

ITEM 17 – DIVISION 23 – FINNED-TUBE RADIATION HEATERS

(written in words)_____ ($)

ITEM 18 – AS-BUILT DRAWINGS

(written in words) _____ ($)

ITEM 19 – PROJECT CLOSEOUT

(written in words) _____ ($)

ALLOWANCE H1 – ALLOWANCE FOR GENERAL CONTINGENCY

(written in words) *Seventy Thousand Dollars and 00 Cents* (**$70,000.00**)

TOTAL BASE BID (ITEMS 1 –19 INCLUSIVE, PLUS ALLOWANCE H1)
(written in words) _____ ($)

ALTERNATES

The contractor shall clearly state whether cost indicated is to be added to or deducted from the base bid cost. Failure to clearly state same will be grounds for disqualification of the bidder.

All work included under this heading shall be subject to the general conditions of the project. All construction, workmanship and finishes required by the alternates shall be as specified in the applicable sections of the specifications manual.
The undersigned proposes and agrees that should the following alternates be accepted and included in the contract, the amount of the TOTAL BASE BID will be revised as follows. The undersigned further agrees that should the following Alternates be accepted at a subsequent date, after the base bid contract is awarded, due to additional funds provided to the school district through a Smart Schools Bond Act, the alternate bid prices indicated shall be held and honored for a period of one year from the date of contract signing.

NUMBER	DESCRIPTION	COST
ALT-H1 (Add)	**Contractor to provide all general construction and demolition work associated with the removal and disposal of existing radiator control valves, and associated items where indicated in drawings. Contractor to provide and install new DDC ready radiator control valves and**	**($)**

	associated items where indicated in drawings. New control valves shall be integrated with existing BMS and local thermostats. See drawings for more details. This alternate shall include all material and labor for this work.	

Note: The WHITE PLAINS CITY SCHOOL DISTRICT is exempt from Federal, New York State and local taxes. TOTAL AMOUNT BID shall be exclusive of all taxes.

EACH BIDDER SHALL SUBMIT WITH IT'S BID A SEPARATE SEALED LIST THAT NAMES THE SUBCONTRACTORS THAT THE BIDDER WILL USE TO PERFORM WORK AND THE AGREED UPON AMOUNT TO BE PAID FOR A.) HEATING, VENTILATION AND AIR-CONDITIONING WORK, B.) PLUMBING WORK AND C.) ELECTRICAL WORK. AFTER THE LOW BID IS ANNOUNCED, THE SEALED LIST OF SUBCONTRACTORS SUBMITTED BY THE APPARENT LOW BIDDER SHALL BE OPENED AND THE NAMES OF THE SUBCONTRACTORS ANNOUNCED. ANY CHANGE OF SUBCONTRACTOR OR AGREED UPON AMOUNT TO BE PAID SHALL REQUIRE THE APPROVAL OF THE PUBLIC OWNER, UPON A SHOWING OF "LEGITIMATE CONSTRUCTION NEED" FOR SUCH CHANGE.

"LEGITIMATE CONSTRUCTION NEED" SHALL INCLUDE, BUT NOT BE LIMITED TO:

A CHANGE IN PROJECT SPECIFICATIONS,
A CHANGE IN CONSTRUCTION MATERIAL COSTS,
A CHANGE IN SUBCONTRACTOR STATUS, OR
THE SUBCONTRACTOR HAS BECOME UNWILLING, UNABLE OR UNAVAILABLE TO PERFORM THE SUBCONTRACT.

THE SEALED LISTS OF SUBCONTRACTORS SUBMITTED BY ALL OTHER BIDDERS SHALL BE RETURNED TO THEM UNOPENED AFTER THE CONTRACT AWARD.

PAYMENTS TO SUBCONTRACTORS AND MATERIAL MEN MUST BE MADE WITHIN 7 CALENDAR DAYS AS OPPOSED TO 15 CALENDAR DAYS OF THE RECEIPT OF PAYMENT FORM THE PUBLIC OWNER. FAILURE TO PAY WITHIN 7 CALENDAR DAYS WILL RESULT IN INTEREST DUE FOR ALL CALENDAR DAYS SUBSEQUENT TO THE SEVENTH DAY THROUGH THE DATE THAT PAYMENT IS MADE.

THE BIDDER UNDERSTANDS THAT THE OWNER RESERVES THE RIGHT TO REJECT ANY OR ALL BIDS AND TO WAIVE ANY INFORMALITIES IN THE BIDDING.

THE BIDDER AGREES THAT THE BID SHALL BE GOOD AND MAY NOT BE WITHDRAWN FOR A PERIOD OF **FORTY-FIVE (45)** CALENDAR DAYS AFTER THE SCHEDULED CLOSING TIME FOR RECEIVING BIDS.

THE BIDDER HAS SUBMITTED ALL REQUESTS FOR OTHER BRAND NAMES OR PRODUCTS NOT LISTED IN THE SPECIFICATIONS IN ACCORDANCE WITH ARTICLE 6(W) OF THE GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION.

SITE SUPERVISION

THE SUCCESSFUL CONTRACTOR IS TO PROVIDE FULL TIME SITE SUPERVISION FOR HIS OR HER STAFF, SUBCONTRACTORS AND SUPPLIERS FOR THE DURATION OF THIS PROJECT. A COMPETENT SUPERINTENDENT SHALL BE IN ATTENDANCE AT THE JOB SITE AT ALL TIMES WHEN WORK IS BEING PERFORMED UNDER THEIR CONTRACT. THE SUPERINTENDENT IS RESPONSIBLE TO VISIT THE JOB SITE DAILY WHEN WORK IS NOT BEING PERFORMED UNDER THEIR CONTRACT AND TO MONITOR THE OVERALL CONSTRUCTION PROGRESS. A QUALIFIED SITE SUPERINTENDENT MUST HAVE THE AUTHORITY TO REPRESENT AND MAKE DECISIONS FOR HIS OR HER COMPANY WITH REGARDS TO THE SUBJECT JOB, MUST BE ABLE TO GIVE GUIDANCE AND DIRECTION TO EMPLOYEES, SUBCONTRACTORS AND SUPPLIERS, AND MUST

BE KNOWLEDGEABLE ABOUT THE WORK TO BE PROVIDED. **FAILURE TO PROVIDE A QUALIFIED SITE SUPERINTENDENT AT THE JOB SITE SHALL SUBJECT SAID PRIME CONTRACTOR TO A PENALTY OF $1,000 PER DAY FOR EVERY OCCURRENCE.**

TIME OF COMPLETION

ALL WORK UNDER THIS CONTRACT SHALL BE COMPLETED BETWEEN THE FOLLOWING HOURS, IN ACCORDANCE WITH THE FOLLOWING DATES:

WORK DAYS:	**Monday – Friday**
WORK HOURS:	**7:00 AM - 4:00 PM**
CONSTRUCTION START DATE:	**June 26, 2024**
SUBSTANTIAL COMPLETION:	**August 30, 2024**
FINAL COMPLETION:	**September 13, 2024**

IF NECESSARY, WEEKEND, HOLIDAY AND EVENING WORK SHALL BE PROVIDED TO ENSURE THE COMPLETION DATES LISTED ABOVE, AT THE SOLE COST AND EXPENSE OF THE BIDDER.

FAILURE OF THE CONTRACTOR TO COMPLETE WORK BY THE SPECIFIED TIME SHALL SUBJECT HIM/HER TO LIQUIDATED DAMAGES AS SET FORTH IN ARTICLE 13 OF THE GENERAL CONDITIONS.

THE ARCHITECT/ENGINEER SHALL ACT AS THE RECORD KEEPER OF CONTRACT DAYS; HE WILL BE THE SOLE JUDGE OF DELAYS CAUSED BY WEATHER. ONLY WEATHER DELAYS, AS ADJUDGED BY THE ARCHITECT/ENGINEER, WILL BE CONSIDERED FOR EXTENSIONS OF THE CONSTRUCTION PERIOD. THE CONTRACTOR SHALL SUBMIT A BI-WEEKLY REQUEST FOR DELAYS DUE TO WEATHER TO THE ARCHITECT/ENGINEER FOR APPROVAL. NO OTHER DELAY CLAIMS WILL BE ACCEPTED, FOR CREDIT TOWARDS THE PROJECT COMPLETION SCHEDULE, REGARDLESS OF THE SOURCE OF THE DELAY.

FAILURE OF THE CONTRACTOR TO COMPLETE ALL WORK SHOWN AND SPECIFIED IN THE CONTRACT DOCUMENTS, BY ALL OF THE SPECIFIED TIME FRAMES, SHALL SUBJECT THE CONTRACTOR TO LIQUIDATED DAMAGES, AS SET FORTH IN ARTICLE 13 OF THE GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION, IN THE SUM OF ONE THOUSAND DOLLARS ($1,000.00) PER CALENDAR DAY. SUCH DAMAGES WILL COMMENCE ON THE DAY AFTER THE COMPLETION DATE OR THE DAY AFTER ANY LISTED MILESTONE DATE IN THE NOTICE TO PROCEED.

WITHIN TEN (10) CONSECUTIVE CALENDAR DAYS AFTER THE DATE OF THE NOTICE OF AWARD, THE BIDDER SHALL EXECUTE THE CONTRACT AND FURNISH THE REQUIRED PERFORMANCE BOND, PAYMENT BOND AND INSURANCES.

THE BOARD OF EDUCATION OF THE DISTRICT RESERVES THE RIGHT TO AWARD THIS CONTRACT TO OTHER THAN THE LOW BIDDER IF THE LAW SO PERMITS.

THE UNDERSIGNED HEREBY ACKNOWLEDGES RECEIPT OF THE FOLLOWING ADDENDA (IF ANY):

ADDENDUM NO.	DATED
_____	_____
_____	_____

SPECIFIC DAMAGES WILL BE ASSESSED AND DEDUCTED FROM AMOUNTS OTHERWISE DUE THE CONTRACTOR FOR ADDITIONAL INSPECTION (FIELD) AND CONTRACT ADMINISTRATION (OFFICE) TIME EXPENDED BY THE ARCHITECT/ENGINEER AND/OR OTHER CONSTRUCTION EMPLOYEE(S) HIRED TO ADMINISTER OR OBSERVE THE CONTRACT, SHOULD THE CONTRACTOR COMPLETE THE CONTRACT BEYOND THE CONTRACT COMPLETION PERIOD SPECIFIED ABOVE.

SUCH DEDUCTION SHALL BE IN ACCORDANCE WITH THE ARCHITECT, ENGINEER'S, AND/OR OTHER CONSTRUCTION EMPLOYEE(S) STANDARD HOURLY BILLING RATES IN EFFECT AT THE TIME FOR THE SCHOOL DISTRICT.

THE REQUIREMENTS OF THE PROPOSAL HAVE BEEN COMPLETELY READ, UNDERSTOOD AND ACKNOWLEDGED BY THE BIDDER.

BIDDER: _____

BIDDER'S ADDRESS: _____

SIGNED BY: _____ TITLE: _____

DATE: _____

Telephone number where the contractor or a competent representative can accept a telephone message and provide a reasonable reply as soon as possible, but not later than twenty-four (24) hours:

DAY: (___) _____ NIGHT: (___) _____

FAX: (___) _____

FEDERAL I.D. NO. OR SOCIAL SECURITY NO.: _____

Enclosed in the bid package is a certified check or bid bond for ten percent (10%) of the total amount of each of the school project bid as required by the foregoing "Information for Bidders."

On the signing of such contract by the Bidder, the bidder hereby agrees to furnish the indemnifying bonds as provided in the General Conditions.

The Bidder hereby further agrees that in the event of its failure or refusal to enter into a contract in accordance with this bid within ten (10) business days after due notice from the Board of Education that the contract has been awarded to it and is ready for signature, as given in accordance with the Information for Bidders and/or its failure to execute and deliver the bond for the full amount of the contract price, as provided in said Information for Bidders, the Bidder's check or bid bond which is herewith deposited with the Board shall (at the option of said Board) become due and payable as ascertained and liquidated damages for such default; otherwise, said check or bid bond will be returned to the undersigned.

The full names and residences of all persons and parties interested in the foregoing bid as principals are as follows:

Name	**Address**
_____	_____
_____	_____
_____	_____

Name of Bidder: _____

Business Address of Bidder: _____

_____

END OF SECTION 004116.19

INSURANCE CERTIFICATION

Your insurance representative must complete the form below to be considered for the award of this bid or project, and it is important that you complete the Bidder's Acknowledgement section of this form. Please note that this Insurance Certification for must accompany your bid submission for your bid to be considered.

Insurance Representative's Acknowledgement:

We have reviewed the insurance requirements set forth in the Supplementary Conditions Article 10 & 11 of the specifications and can provide such insurance to our insured in accordance with such requirements in the event the contract is awarded to our insured and provided our insured pays the appropriate premium.

Insurance Representative:

Address:

_____

Are you an agent for the companies providing the coverage? Yes _____ No _____

Date:_____ _____

Insurance Representative's Signature

Bidder's Acknowledgement:

I acknowledge that 1 leave received the insurance requirements of this bid and have considered the costs, if any, of procuring the required insurance and will be able to supply the insurance required in accordance with the bid, if it is awarded. I understand that this Insurance Certification form must be submitted with my bid and my inability to provide the required insurances may result in the rejection of my bid, and the WHITE PLAINS CITY SCHOOL DISTRICT may award the contract to the next lowest/responsive bidder.

Name: _____

Address: _____

_____

Date: _____ _____

Bidder's Signature

NON-COLLUSIVE FORM BIDDING CERTIFICATE
BID PROPOSAL CERTIFICATIONS

Firm Name _____

Business Address _____

Telephone Number _____ Date of Bid _____

I. General Bid Certification

The bidder certifies that he will furnish, at the prices quoted, the materials, equipment and/or services as proposed on this Bid.

II. Non-Collusive Bidding Certification

The following statement is made pursuant to Section 103-D of the General Municipal Law, as amended by Chapter 675 of the Laws of 1966, and Section 139-D of the State Finance Law, as amended by Chapter 675 of the Laws of 1966, and Section 2604 of the Public Authorities Law, as amended by Chapter 675 of the Laws of 1966.

By submission of this bid proposal, the bidder certifies that he/she is complying with Section 103-d of the General Municipal Law as follows:

Statement of non-collusion in bids and proposals to political subdivision of the state. Every bid or proposal hereafter made to a political subdivision of the state or any public department, agency or official thereof where competitive bidding is required by statute, rule, regulation, or local law, for work or services performed or to be performed or goods sold or to be sold, shall contain the following statement subscribed by the bidder and affirmed by such bidder as true under the penalties of perjury:

Non-collusive bidding certification.

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

l. The prices in this bid have been arrived at independently without collusion, consultation, communication, or agreement, for the purpose of restricting competition, as to any matter relating to such prices with any other bidder or with any competitor;

2. Unless otherwise required by law, the prices which have been quoted in this bid have not been knowingly disclosed by the bidder and will not knowingly be

disclosed by the bidder prior to opening, directly or indirectly, to any other bidder or to any competitor; and,

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

(b) A bid shall not be considered for award nor shall any award be made where (a) (1) (2) and (3) above have not been complied with; provided, however, that if in any case the bidder cannot make the foregoing certification, the bidder shall so state and shall furnish with the reasons therefor. Where (a) (1) (2) and (3) above have not been complied with, the bid shall not be considered for award nor shall any award be made unless the head of the purchasing unit of the political subdivision, public department agency or official thereof to which the bid is made or his designee, determines that such disclosure was not made for the purpose of restricting competition.

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

(c) Any bid hereafter made to any political subdivision of the state or any public department, agency or official thereof by a corporate bidder for work or services performed or to be performed or goods sold or to be sold, where competitive bidding is required by statute, rule, regulation, or local law, and where such bid contains the certifications referred to in subdivision II of this section, shall be deemed to have been authorized by the board of directors of the bidder, and such authorization shall be deemed to include the signing, and submission of the bid and the inclusion therein of the certificate as to non-collusion as the act and deed of corporation.

(d) The person signing this Bid or Proposal certifies that he has fully informed himself/herself regarding the accuracy of the statements contained in this certification, and under the penalties of perjury, affirms the truth thereof, such penalties being applicable to the Bidder as well to the person signing in his/her behalf."

Signature of Bidder: _____

(Signature of bidder or authorized representative of a corporation)

Title: _____

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

_____

HOLD HARMLESS AGREEMENT

In accordance with Article 12 of the General Conditions, Indemnification, the Contractor will berequired to sign the following "Hold Harmless" Agreement with the BOARD OF EDUCATION. Compliance with the foregoing requirements for insurance shall not relieve the Contractor from liability set forth under the Indemnity Agreement.

The undersigned hereby agrees to defend, indemnify, and save harmless the BOARD OF EDUCATION, its officers and employees from and against any and all liability, loss, damages, claims for bodily injury and/or property damages, cost and expense, including counsel fees, to the extent permissible by law, that may occur or that may be alleged to have occurred in the course of the performance of this agreement by the contractor,whether such claims shall be made by an employee of the contractoror by a third party, the contractor covenants and agrees that he / she will pay all costs and expenses arising therefrom and in connection therewith, and if any judgment shall be rendered against the Owner, Architect/Engineer & Construction manager, in any such litigation, the Contractor shall at his / her own expense satisfy and discharge the same.

By:_____
(Signature of Authorized Representative of Corporation)

_____
(Print Name and Title)

_____
(Date)

CERTIFICATION OF COMPLIANCE WITH THE IRAN DIVESTMENT ACT

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

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

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

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

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

_____ of the _____ Corporation and that neither

the Bidder/ Contractor nor any proposed subcontractor is identified on the Prohibited Entities List.

_____

(SIGNED)

SWORN to before me this

_____ day of _____

201___

Notary Public: _____

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

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

Name of the Bidder: _____

Address of Bidder: _____

Has bidder been involved in investment activities in Iran? _____

Describe the type of activities including but not limited to the amounts and the nature of the investments (e.g. banking, energy, real estate) _____

_____

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

Have the investment activities ended? _____

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

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

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

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

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

_____

_____

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

the _____ Corporation and the foregoing is true and accurate.

_____

SWORN to before me this SIGNED

_____ day of _____

201___

Notary Public: _____

WHITE PLAINS CITY SCHOOL DISTRICT

AC & VENTILATION AT MAMARONECK ELEMENTARY SCHOOL

SEXUAL HARASSMENT CERTIFICATION

The following certification must be submitted with all bids submitted after January 1, 2019 pursuant to N.Y. State Finance Law § 139-1(1)(a).

"By submission of this bid/proposal, each Bidder and each person signing on behalf of any Bidder certifies, and in the case of a joint bid each party thereto certifies its own organization, under penalty of perjury, that the Bidder has and has implemented a written policy addressing sexual harassment prevention in the workplace and provides annual sexual harassment prevention training to all of its employees. Such policy shall, at a minimum, meet the requirements of Section 201-g of the Labor Law."

Dated: _____ _____

(Signature Here)

_____

(Signatory's Name Printed)

_____

(Name of Bidder)

THIS FORM MUST BE COMPLETED BY BIDDER AND INCLUDED IN SEPARATE SEALED ENVELOPE MARKED "SUB CONTRACTORS LIST"

(I) PLUMBING AND GAS FITTING
Subcontractor Name:
Type of Work:
Agreed upon amount to be paid subcontractor:

(II) STEAM HEATING, HOT WATER HEATING, VENTILATING AND AIR CONDITIONING APPARATUS
Subcontractor Name:
Type of Work:
Agreed upon amount to be paid subcontractor:

(III) ELECTRIC WIRING AND STANDARD ILLUMINATING FIXTURES
Subcontractor Name:
Type of Work:
Agreed upon amount to be paid subcontractor:

AGREEMENT
WHITE PLAINS CITY SCHOOL DISTRICT
AIR CONDITIONING AND VENTILATION
UPGRADES AT MAMARONECK
ELEMENTARY SCHOOL

AGREEMENT made as of the day of in the year of Two Thousand and Twenty Three.

BETWEEN the Owner
(Name and address)

White Plains City School District
5 Homeside Lane
White Plains, New York 10605

and the Contractor:
(Name and address)

The Project is:
(Name and location)

AIR CONDITIONING AND VENTILATION UPGRADES AT MAMARONECK ELEMENTARY SCHOOL
7 Nosband Avenue
White Plains, New York 10605

The Architect is:
(Name and address)

H2M architects + engineers
2700 Westchester Avenue
Suite 415
Purchase, NY 10577

The Owner and Contractor agree as set forth below.

ARTICLE 1
THE CONTRACT DOCUMENTS

The Contract Documents consist of this Agreement, Conditions of the Contract (General Conditions, Special Provisions and other Conditions), Drawings, specifications, Addenda issued prior to execution of this Agreement, other documents listed in Article 9 of this Agreement and Modifications issued after execution of this Agreement; these form the Contract, and are a part of the Contract as if attached to this Agreement or repeated herein. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations or agreements, either written or oral. An enumeration of the Contract Documents, other than Modifications, appears in Article 9.

ARTICLE 2
THE WORK OF THIS CONTRACT

The Contractor shall execute the entire Work described in the Contract Documents or reasonably inferable by the Contractor as necessary to produce the results intended by the Contract Documents, except to the extent specifically indicated in the Contract Documents to be the responsibility of others.

ARTICLE 3
DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

3.1 The date of commencement of the work and substantial completion of the work of this contract shall be in accordance with the schedule set forth in the Project Manual.

3.2 Time is of the essence respecting the contract documents and all obligations thereunder.

3.3 Upon the execution of this Agreement, the Contractor shall provide the Owner with copies of all contracts entered into between the Contractor and subcontractors or material suppliers. The Contractor’s obligation to provide the Owner with said contracts shall continue for the duration of the Project.

ARTICLE 4
CONTRACT SUM

4.1 The Owner shall pay the Contractor in current funds for the Contractor's performance of the Contract the Contract Sum of (written contract amount), subject to additions and deductions as provided in the Contract Documents.

4.2 The Contract Sum is based upon the following alternates, if any, which are described in the Bid Proposal Form (attached hereto) and are hereby accepted by the Owner:

(Insert Alternates)

4.3 Unit prices are as set forth in the proposal sheets.

ARTICLE 5
PROGRESS PAYMENTS

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

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

All progress payments shall be based upon an estimate and a certificate, made by the Architect, of the materials furnished, installed and suitably stored at the site and the work done by the Contractor, and payment shall be made in installments of ninety-five percent (95%) of the amount certified as earned so that, at the completion of the work, there will be a retainage of five percent (5%) of the Total Contract Sum. Retainage shall be paid to the Contractor upon final completion of the work of this contract. All progress payments made previous to the last and final payment shall be based on estimates and the right is hereby reserved by the Architect for the Owner to make all due and proper corrections in any payment for any previous error.

The Contractor shall submit with each application for payment the following:

1. A current Sworn Statement from the Contractor setting forth all subcontractors and materialmen with whom the Contractor has subcontracted, the amount of such subcontract, the amount requested for any subcontractor or materialman in the application for payment and the amount to be paid to the Contractor from such progress payment;

2. Commencing with the second (2nd) Application for Payment submitted by the Contractor, duly executed so-called "after the fact" waivers of mechanics' and materialmen's liens from all subcontractors, materialmen and, when appropriate, from lower tier subcontractors, establishing receipt of payment or satisfaction of payment of all amounts requested on behalf of such entities and disbursed prior to submittal by the Contractor of the current Application for Payment, plus sworn statements from all subcontractors, materialmen and, where appropriate, from lower tier subcontractors, covering all amounts described in this Paragraph 5.2;
3. Such other information, documentation and materials as the Owner or the Architect may require.

5.3 Payment shall not be released to the Contractor until the Owner receives the following documentation:

1. Certified payroll for employees and employees of subcontractors performing work on the Project.

2. Copies of invoices submitted to the Contractor by its subcontractors and/or material suppliers.

ARTICLE 6
FINAL PAYMENT

Final payment, constituting the entire unpaid balance of the Contract Sum, shall be made by the Owner to the Contractor when (1) the Contract has been fully performed including compliance with all provisions of the Contract Documents except for the Contractor's responsibility to correct nonconforming Work under Article 15(B) of the General Conditions and to satisfy other requirements, if any, which necessarily survive final payment; and (2) a final Certificate for Payment has been issued by the Architect; such final payment shall be made by the Owner not more than 30 days after the issuance of the Architect's final Certificate for Payment, or as follows or as soon thereafter as is practicable.

ARTICLE 7
MISCELLANEOUS PROVISIONS

7.1 Where reference is made in this Agreement to a provision of the General Conditions or another Contract Document, the reference refers to that provision as amended or supplemented by other provisions of the Contract Documents.

7.2 The Contractor represents and warrants the following to the Owner (in addition to any other representations and warranties contained in the Contract Documents) as an inducement to the Owner to execute this Agreement, which representations and warranties shall survive the execution and delivery of this Agreement, any termination of this Agreement and the final completion of the Work:

1. that it and its Subcontractors are financially solvent, able to pay all debts as they mature and possessed of sufficient working capital to complete the Work and perform all obligations hereunder;

2. that it is able to furnish the plant, tools, materials, supplies, equipment and labor required to complete the Work and perform its obligations hereunder;

3. that it is authorized to do business in the State of New York and the United States and properly licensed by all necessary governmental and public and quasi-public authorities having jurisdiction over it and over the Work and the Project;

4. that its execution of this Agreement and its performance thereof is within its duly authorized powers;

5. that its duly authorized representative has visited the site of the Project, is familiar with the local and special conditions under which the Work is to be performed and has correlated on-site observations with the requirements of the Contact Documents; and

6. that it possesses a high level of experience and expertise in the business administration, construction, construction management and superintendence or projects of the size, complexity and nature of the particular Project, and that it will perform the Work with the care, skill and diligence of such a contractor.

The foregoing warranties are in addition to, and not in lieu of, any and all other liability imposed upon the Contractor by law with respect to the Contractor's duties, obligations and performance hereunder. The Contractor's liability hereunder shall survive the Owner's final acceptance of and payment for the Work. All representations and warranties set forth in this Agreement, including without limitation, this Paragraph 7.2, shall survive the final completion of the Work or the earlier termination of this Agreement. The Contractor acknowledges that the Owner is relying upon the Contractor's skill and experience in connection with the Work called for hereunder.

ARTICLE 8
TERMINATION OR SUSPENSION

8.1 The Contract may be terminated by the Owner as provided in the General Conditions.

8.2 The Work may be suspended by the Owner as provided in the General Conditions.

ARTICLE 9
ENUMERATION OF CONTRACT DOCUMENTS

9.1 The Contract Documents, except for Modifications issued after execution of this Agreement, are enumerated as follows:

9.1.1 The Agreement is this executed Agreement Between Owner and Contractor.

9.1.2 The General Conditions are the General Conditions of the Contract for Construction as set forth in the Project Manual and attached hereto.

9.1.3 The Specifications are as set forth in the Project Manual and indexed in Exhibit "B" hereto.

9.1.4 The Drawings are those as indexed in Exhibit "C" hereto.

9.1.5 The Addenda, if any, are as follows:

This Agreement is entered into as of the day and year first written above and is executed in at least three original copies of which one is to be delivered to the Contractor, one to the Architect for use in the administration of the Contract, and the remainder to the Owner.

OWNER	**CONTRACTOR**
White Plains City School District 5 Homeside Lane White Plains, NY 10605	
By_____ (Signature)	By_____ (Signature)
_____ (Printed name and title)	_____ (Printed name and title)

GENERAL CONDITIONS

of the

CONTRACT for CONSTRUCTION

TABLE OF CONTENTS

GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION

The within document includes detailed provisions concerning the capital improvement work to be performed by the Contractors engaged by the School District. This document contains provisions which relate particularly to capital improvement projects in the school district setting in New York State. The document is incorporated by reference into all contracts to be awarded and should be reviewed carefully by the Contractor to whom the award of contract is made. Consultation with an attorney and insurance representative is advised.

ARTICLE 1
DEFINITIONS

A. "Addendum" or "Addenda" refers to revised drawings and/or written requirements for the capital improvement work issued by the Architect prior to the time indicated for submission of a bid by a contractor.

B. "After Hours" refers to the time before or after the hours school is in session. During this time, students and staff may occupy portions of the facility or building, but may be redirected as required to allow for the completion of work by a contractor.

C. The "Architect" is the design professional engaged by the School District to perform design related functions respecting the capital improvement projects to be performed in the School District.

D. "Board of Education" refers to the Board of Education of the School District.

E. "Central Administration" refers to the Superintendent of Schools, his/her Assistant Superintendents, and Director of Plant & Facilities.

F. The "Construction Manager" is the entity engaged by the School District to act as its representative during the course of construction of the Project.

G. "Contract Documents" refers to all drawings, sketches, specifications, addenda, field directives and all other written or drawn descriptions of the products, labor and materials to be provided for the Project.

H. The "Contractor" refers to the entity engaged by the School District to perform all or a part of the capital improvement project on its behalf.

I. The "Drawings" are the plans, elevations, sections, details, schedules and diagrams developed by the Architect for the capital improvement projects to be performed in accordance with the project manual of which these General Conditions of the Contract for Construction form a part.

J. The "Off Hours" refers to a period of time during which the school facility or building shall be unoccupied, to be a duration of no less than 24 hours.

K. The "Owner" refers to the Board of Education or its designee.

L. The "Project" refers to the entire capital improvement project to be performed in accordance with the project manual and may include work by the Owner.

M. The "Project Manual" is the bound document which is issued simultaneously with the project Drawings and includes the Notice to Bidders, Information to Bidders, Bid Proposal Form, Prevailing Wage Rate schedule and the written requirements for labor, materials, equipment, construction systems and the like necessary for the Contractor to complete the capital improvement work for which it has been engaged.

N. A "Subcontractor" is a person or entity who has a direct contract with the Contractor to provide material and/or labor for the project on or off the site, or to otherwise furnish labor, material or other services with respect to a portion of the Contractor's work. A "Sub-subcontractor" is a person or entity who has a direct or indirect contract with a Subcontractor engaged by the Contractor to perform a portion of the Subcontractor's work at the site, or to otherwise furnish labor, material or other services with respect to a portion of the Subcontractor's work.

O. The term "Specialist" or "Specialty Contractor" as used in these specifications shall mean an individual or firm of established reputation, or, if newly organized, whose personnel have previously established a reputation in the same field, which is regularly engaged in, and which maintains a regular force of workers skilled in either manufacturing or fabricating items required by the Contract, installing items required by the Contract, or otherwise performing work required by the Contract.

P. "Accepted", "directed" "permitted," "requested," "required," and "selected" mean, unless otherwise explained, "accepted by the Architect and/or Owner" "directed by the Architect and/or Owner," "permitted by the Architect and/or Owner," "requested by the Architect and/or Owner," "required by the Architect and/or Owner," and "selected by the Architect and/or Owner." However, no such implied meaning will be interpreted to extend the Architect's responsibility into the Contractor's area of construction supervision.

Q. "As accepted" "or acceptable substitute", and "for review" mean the Architect is the sole judge of the quality and suitability of the proposed substitutions. Where used in conjunction with the Architect's response to submittals, requests, applications, inquiries, reports, and claims by the Contractor, the meaning will be held to the limitations of the Architect's responsibilities and duties as stated in the General Conditions. In no case will "accepted by the Architect" be interpreted as an assurance to the Contractor that the requirements of the Contract Documents have been fulfilled.

R. "Furnish" means supply and deliver to the Project site or other designated location, ready for unloading, unpacking, storing, assembly, installation, application, erection, or other form of incorporation into the Project, and maintained ready for use. Supply and deliver products requiring additional or supplemental fitting, assembly, fabrication, or incorporation into other elements of the Project directly to the fabricator, installer or manufacturer as required.

S. "Install" means unload, unpack, use, fit, attach, assemble, apply, place, anchor, erect, finish, cure, protect, clean, and similar operations required to properly incorporate work into the Project.

T. "Provide" means furnish and install.

U. "Replace" means remove designated, damaged, rejected, defective, unacceptable, or non- conforming work from the Project and provide new work meeting the requirements of the Contract Documents in place thereof.

V. "Unusual" refers to means and methods beyond any conventional or generally accepted standard of work or installation, generally requiring a standard of care and protection as outlined by a manufacturer's guidelines and recommendations.

W. The word "include", in any form other than "inclusive", is non-limiting and is not intended to mean 'all-inclusive.

ARTICLE 2
CONTRACTOR'S REPRESENTATIONS

A. Upon submission of its bid to the Owner, the Contractor expressly represents:

1. The Contractor represents and warrants that it performed a detailed investigation of the site(s) and that such investigation was sufficient to disclose the conditions of the site(s) at which work is to be performed by it and all improvements thereon, and the conditions under which the work is to be performed, including, but not limited to (a) the location, condition, layout and nature of the project site and surrounding areas; (b) the cost of labor, materials and equipment necessary to perform the work, the availability; (c) the areas of the work which will cause a disruption to the necessary and proper operation of the facilities by the Owner; and (d) other pertinent limitations on the performance of its work.

2. The Contractor represents and warrants that it has carefully studied and compared the drawings and pertinent provisions of the project manual and that any errors, omissions, ambiguities, discrepancies or conflicts found in said documents have been brought to the attention of the Architect for clarification prior to the Contractor's

submission of its bid. If, in the interpretation of Contract Documents, requirements within the Drawings and Specifications conflict, or it appears that the Drawings and Specifications are not in agreement, the requirement to be followed shall be decided by the Architect. Where there is a discrepancy in quantity, the Contractor shall provide the greater quantity; where there is a discrepancy in quality, the Contractor shall provide the superior quality. Addenda supersede the provisions that they amend.

3. Each trade contractor certifies to be experienced and familiar with the requirements and conditions imposed during the construction of similar work in the area. This includes, but is not limited to, the requirement of normal "out of sequence" or "come back" work for the removal of plant, equipment, temporary wiring or plumbing, etc. This "out of sequence" work may also include phasing of construction activities to accommodate the installation of the work at various locations and orderly fashion and the completion of work at various locations and/or levels at various times. This "phasing", "out of sequence", or "come back" work shall be done at no cost to other trade contractors, the Owner, Architect or the Construction Manager.

B. The Contractor warrants to the Owner that (1) the materials and equipment furnished under its contract will be of good quality and new, and of recent manufacture, unless otherwise required or permitted by the Contract Documents, (2) that its work will be free from defects not inherent in the quality required or permitted, and (3) that its work will conform with the terms and conditions of its agreement with the Owner. Work not conforming to these requirements, including substitutions not properly approved and authorized, shall be considered defective and shall be removed and replaced at the Contractor's cost and expense. If required by the Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

C. Except as to any reported errors, inconsistencies or omissions, and to concealed or unknown conditions, by executing the Agreement, the Contractor represents the following:

1. The drawings and accompanying specifications found in the project manual issued simultaneously with said drawings are sufficiently complete and detailed for the Contractor to (a) perform the work required to produce the results intended by the Owner and (b) comply with all the requirements of its contract with the Owner.

2. The work required to be performed by the contractor including, without limitation, all construction details, construction means, methods, procedures and techniques necessary to perform its work, use of materials, selection of equipment and requirements of product manufacturers are consistent with: (a) good and prevailing and accepted industry standards applicable to its work; (b) requirements of any warranties applicable to its work; and (c) all laws, ordinances, regulations, rules and orders which bear upon the Contractor's performance of its work.

3. The Drawings and Specifications for the Contract have been prepared with

care and are intended to show as clearly as is practicable the work required to be done. Work under all items in the Contract must be carried out to meet field conditions to the satisfaction of the Architect and Owner and in accordance with his instructions and the Contract Drawings and Specifications.

4. All dimensions shown on the Drawings are for bidding purposes only. It is the responsibility of the Contractor to verify all dimensions in the field to insure proper and accurate fit of materials and items to be installed.

D. The representations set forth herein shall survive expiration and/or termination of the Contractor's agreement with the Owner.

ARTICLE 3
CONTRACTOR'S CONSTRUCTION PROCEDURES

A. 1. The Contractor shall be solely responsible for and have control over construction means, methods, techniques, sequences and procedures required for the proper execution of its work on the project. Where the drawings and/or project manual make reference to particular construction means, methods, techniques, sequences or procedures or indicate or imply that such are to be used in connection with the Contractor's work, such reference is intended only to indicate that the Contractor's work is to produce at least the quality of the work implied by the operations described, but the actual determination as to whether or not the described operations may be safely or suitably employed in the performance of the Contractor's work shall be the sole responsibility of the Contractor. All loss, damage, liability, or cost of correcting defective work arising from the employment of a specific construction means, method, technique, sequence or procedure shall be borne solely by the Contractor.

2. Neither the Architect nor the Owner will have control over or charge of and will not be responsible for construction means, methods, techniques, sequences or procedures, or for safety precautions and programs in connection with the Work, since these are solely the Contractor's responsibility as provided herein.

3. The Contractor shall provide and pay for all labor, materials, equipment, tools, construction equipment and machinery, rigging, water, heat, utilities, light, transportation, and other facilities and services necessary for proper execution and completion of its work, whether temporary or permanent and whether or not incorporated or to be incorporated in its work.

B. The Contractor shall be responsible for coordinating the work of its own forces and the work of subcontractors engaged by it to perform the work of the project on its behalf. The Contractor shall supply to its own work forces and subcontractors engaged by it to perform portions of its work copies of the drawings and project manuals for the work to be performed by such individuals/entities on its behalf. The Contractor shall review any

specified or installation procedure with its employees and/or subcontractors, including those recommended by any product manufacturer, prior to the commencement of the relevant portion of the work to be performed. The Contractor shall be responsible to the Owner for the acts and/or omissions of the Contractor's employees, the Contractor's Subcontractors, the Contractor's material suppliers, and/or their respective agents and employees, and any other persons performing portions of the work on behalf of the Contractor.

C. The Contractor shall be responsible for the inspection of portions of the project performed by its own work force and/or subcontractors engaged by it for the purpose of determining that said work is in proper condition to receive subsequent work.

D. The Contractor shall perform its work in accordance with the standards of the construction industry applicable to work in the locale in which work is to be performed.

E. The Contractor shall only employ labor on the project or in connection with its work capable of working harmoniously will all trades, crafts and any other individuals associated with the capital improvement work to be performed. There shall be no strikes, picketing, work stoppages, slowdowns or other disruptive activity at the project for any reason by anyone employed or engaged by the Contractor to perform its portion of the work. There shall be no lockout at the project by the Contractor. The Contractor shall be responsible for providing the manpower required to proceed with the work under any circumstance. Should it become necessary to create a separate entrance for a contractor involved in a labor dispute, all costs associated with creating that entrance shall be borne by the contractor involved in the dispute. Such costs shall include, but not be limited to, signage, fencing, temporary roads and security personnel as deemed necessary by the Owner for the safety of the occupants of the site.

F. 1. If the Contractor has engaged the services of workers and/or subcontractors who are members of trade unions, the Contractor shall make all necessary arrangements to reconcile, without delay, damage or cost to the Owner and without recourse to the Architect or the Owner, any conflict between its agreement with the Owner and any agreements or regulations of any kind at any time in force among members or councils which regulate or distinguish what activities shall not be included in the work of any particular trade.

2. In case the progress of the capital improvement work to be performed by the Contractor is effected by any undue delay in furnishing or installing any items or materials or equipment required pursuant to its agreement with the Owner because of a conflict involving any such labor agreement or regulation, the Owner may require that other material or equipment of equal kind and quality be provided pursuant to a Change Order or Construction Change Directive but in no case shall the amount of such change be charged by the Contractor to the Owner as an additional cost to perform the capital improvement work pursuant to its contract.

3. The Contractor shall ensure that its work continues uninterrupted during the pendency of a labor dispute.

4. The Contractor shall be liable to the Owner for all damages suffered by the Owner occurring as a result of work stoppages, slowdowns, disputes or strikes.

G. The Contractor shall enforce strict discipline and good order among the Contractor's employees and its Subcontractors' work forces and other persons carrying out the performance of its work. The Contractor shall not permit employment of unfit persons or persons not skilled in tasks assigned to them. The Owner reserves the right to object to any person to be hired or who is employed by the Contractor. Upon the request of the Owner, said person shall be removed from the Project and not again be assigned to perform the Contractor's work without the written permission of the Owner.

H. Within one (1) week after a Notice to Proceed is received, the Contractor shall employ a competent, full-time Project Manager and On Site Superintendent to be approved by the Owner or its representative, and such necessary assistants who shall be in attendance at each project site whenever and wherever work is in progress to provide for the expeditious completion of the work. Said Project Manager and On Site Superintendent shall be employed until punchlist and closeout of the Project. To the extent work is being performed contemporaneously at different facilities within the School District, the Contractor shall assign different superintendents for each facility at which work is being performed. The Project Manager and On Site Superintendent assigned by the Contractor shall not be changed except with the consent of Owner, unless the Project Manager or On Site superintendent or such assistant proves to be unsatisfactory to the Contractor and/or ceases to be in its employ. The Project Manager and On Site Superintendent shall represent the Contractor, and communications given to the Project Manager or On Site Superintendent, whether verbal or written, shall be as binding as if given to the Contractor. Oral communications to the superintendent(s) or his/her assistant(s) and/or project manager shall be confirmed in writing by the Owner, or Architect. The Contractor shall forward to the Owner a copy of the resumes for each of its superintendents, project managers and their assistants. The Owner or the Architect shall have the right to have any supervisory or management staff removed from the project with or without cause.

I. Each Contractor shall provide, or otherwise see that, the project manager, or on site superintendent site managers, and/or responsible workers of each Contractor and major subcontractor are equipped with cellular phones and radios. Each Contractor shall provide the Owner and the Architect with the number for each phone and worker.

J. The Contractor's supervisory personnel, including superintendents and their assistants, shall be versed in the English language. In the event the Contractor's supervisory personnel, superintendents and/or their assistants are not versed in the English language, the Contractor shall employ the services of a full-time on-site interpreter

to facilitate communications with such supervisory personnel, superintendents and/or assistants.

K Prior to the commencement of work, the Contractor shall provide the Construction Manager and the Architect with:

1. a written list of the names, addresses and telephone numbers of the members of its organization who can be contacted in the event of an off-hours emergency at the building site, including cellular telephone numbers and personal/home telephone numbers.

2. a written list of subcontractors, sub-subcontractors, suppliers and vendors with names, addresses, telephone numbers, and descriptions of the work they shall perform or furnish.

3. The name, address and telephone number of the bonding company, banking and insurance company for the Prime Contractor employed by the Prime Contractor including the name, address and telephone number of each bonding company's primary contact representative for this project.

4. Detailed subcontractor schedules indicating the approximate quantity of shop drawings, sequence, timing and man loading.

5. A cash flow projection for the life of the project, including a schedule and graph showing the amount of work projected to be completed each month or billing period and a dollar value for the anticipated billings each month or billing period. This shall be completed after an agreed upon schedule of values has been approved by the Construction Manager.

L. 1. Tests, inspections and approvals of portions of the Contractor's work required by the drawings and/or specifications shall be made at an appropriate time. Unless otherwise provided, the Contractor shall consult with the Architect and the Construction Manager concerning the need for testing and/or inspection of its work pursuant to the Contract Documents and, after consulting with the Architect and Construction Manager, the Construction Manager shall advise the Owner to make arrangements for such tests, inspections and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority. The Owner shall bear all costs associated with the tests, inspections or approvals required by the drawings and/or specifications except as set forth in subparagraph 3 hereof.

2. Tests, inspections and approval of portions of the Contractor's work required by laws, ordinances, rules, regulations or orders of public authorities or governmental agency having jurisdiction shall be made at an appropriate time. The Contractor shall consult with

the Architect and the Construction Manager concerning the need for testing and/or inspection of its work pursuant to law, ordinance, regulation or orders of public authorities or governmental agencies and shall advise the Owner in writing that it has made arrangements for such tests, inspections and approvals with the appropriate public authority or governmental agency. The Contractor shall be solely responsible for making timely notice of the need for a test, inspection and/or approval with the relevant public authority or governmental agencies and shall bear all costs associated with such testing, inspection or approval required by such public authority or governmental agency.

3. If the Architect, the Construction Manager, the Owner, or public authorities or governmental agencies having jurisdiction determine that portions of the Contractor's work require additional testing, inspection or approval due to the Contractor's failure to perform its work in accordance with the requirements of the Contract Documents and/or laws, ordinances, rules, regulations or orders of public authorities or governmental agencies having jurisdiction, the Architect and the Construction Manager will advise the Owner of the need for such additional inspections or tests and the Owner shall make arrangements for such additional testing, inspection or approval by an entity acceptable to the Owner. The Contractor shall bear the costs of such additional testing as provided in Article 14.

M. The Contractor shall, if required by ordinances, laws, codes, rules and/or regulations of the governing agencies having jurisdiction over this project, retain a licensed professional engineer to supervise the construction of this project including, but not limited to, foundations, structural work, soils, welding, reinforced masonry and the like.

N. The Contractor recognizes and acknowledges that the within project is governed by and subject to the provisions of New York State General Municipal Law, section 101, governing the award of contracts on public improvement projects. As such, the Contractor recognizes and acknowledges that other contractors will be performing work on the project in conjunction with it. As such the Contractor agrees to cooperate with such other contractors performing work on the project and shall perform its work as follows:

1. The Contractor shall not interfere with the erection, installation or storage upon the premises of any work, materials, supplies or equipment which is to be performed and furnished by other contractors, and the Contractor shall properly connect and coordinate its work therewith.

2. The Contractor shall not commit or permit any act which will interfere with the performance of the work of any other contractor performing work on the project. If the Contractor sustains any damage through any act or omission of other contractors having a contract with the Owner for the performance of work upon the site or of work which may be necessary to be performed for the proper execution of the work to be performed hereunder, or through any act or omission of a subcontractor of such contractor, the Contractor shall promptly notify the Owner and the Construction Manager of such damage.

3. The Contractor agrees to defend and indemnify Owner, Architect, Construction Manager, Consultants and Sub-consultants, from all claims made against any of them arising out of Contractor's acts or omissions **or** the acts or omissions of any subcontractor of the Contractor which have caused damage to the Owner, Architect, Construction Manager or other contractor(s) on the project. The Owner's right to indemnification hereunder shall in no way be diminished, waived or discharged, or by the exercise of any other remedy provided for by the contract or by law. Further, the Owner shall withhold from an offending contractor's contract sum an amount sufficient to cover such damage and all expenses and costs associated with the damage sustained.

4. When the work of the Contractor or its subcontractors overlap or dovetail with that of other Contractors, materials shall be delivered and operations conducted to carry on the work continuously, in an efficient, workmanlike manner.

5. In case of interference between the operations of different Contractors, the Construction Manager will be the sole judge of the rights of each Contractor and shall have the authority to decide in what manner the work may proceed, and in all cases its decision shall be final. Any decision as to the method and times of conducting the work or the use of space as required in this paragraph shall not be basis of any claim for delay or damages by the Contractor.

6. The Contractor, including its subcontractors, shall keep itself informed of the progress of other contractors and shall notify the Architect or Owner's Representative immediately in writing of lack of progress on the part of other contractors where such delay will interfere with its own operations. Failure of the Contractor to keep informed of the work progressing on the project and failure to give notice of lack of progress by others shall be construed as acceptance by the Contractor of the status of the work as being satisfactory for proper coordination with the Contractor's own work.

7. Delays or oversights on the part of any contractor or subcontractor in getting any or all of their work done in the proper way, thereby causing cutting, removing and replacing work already in place, shall not be the basis for a claim for extra compensation.

8. If part of the Contractor's work depends for proper execution or results upon construction or operations by the Owner or another contractor, the Contractor shall, prior to proceeding with that portion of its work, promptly report to the Architect apparent discrepancies or defects in such other construction that would render it unsuitable for such proper execution and results. Failure of the Contractor so to report shall constitute an acknowledgment that the Owner's or other contractor's completed or partially completed construction is fit and proper to receive the Contractor's work.

9. The Contractor shall promptly correct discrepancies or defects in its work which have been identified by other contractors as affecting proper execution and results of the work of such other Contractor.

O. 1. The Contractor shall comply with and give notices required by laws, ordinances, rules, regulations and lawful orders of public authorities or governmental agencies bearing on performance of the Work. If the Contractor fails to give such notices, it shall be liable for and shall indemnify and hold harmless (a) the Owner, its consultants, employees, officers and agents, (b) the Architect and its consultants, employees, officers and agents, and/or (c) the Construction Manager and its consultants, employees, officers and agents against any resulting fines, penalties, judgments, or damages, including reasonable attorney's fees, imposed on or incurred by the parties indemnified hereunder.

2. The Contractor shall pay any costs or fees incurred and any fines or penalties imposed as a result of any violation, including any costs or fees incurred by the Owner due to such violation. If the Contractor observes any discrepancies between portions of the Contract Documents, the Contractor shall promptly notify the Architect and Owner in writing, and necessary changes shall be accomplished by appropriate modification to the drawings and/or specifications.

3. If the Contractor performs Work knowing it to be contrary to laws, statutes, ordinances, building codes, and rules and regulations without such notice to the Architect and Owner, the Contractor shall assume full responsibility for such Work and shall bear the attributable costs and shall bear the total cost for correction of same.

4. If the Contractor fails to give such notices, it shall be liable for and shall indemnify and hold harmless (1) the Owner, its consultants, employees, officers and agents, (2) the Architect and its consultants, employees, officers and agents, and (3) the Construction Manager, its consultants, employees, officers and agents, against any resulting fines, penalties, judgments, or damages, including reasonable attorney's fees, imposed on or incurred by the parties indemnified hereunder. The Contractor shall pay any costs or fees incurred in such compliance and any fines or penalties imposed for violation thereof and any costs or fees incurred by the Owner due to such violation.

P. The Contractor recognizes and acknowledges that job meetings will be held at the job site weekly unless otherwise designated by the Owner or the Architect. The Contractor shall have responsible representation at the MANDATORY weekly job meetings held at the Construction Manager's job office. These meetings will be held to arrange for satisfactory coordination of all trades on the project so as not to impede job progress. Contractors or subcontractors failing to attend job meetings shall be responsible for delays and/or expenses incurred due to coordination difficulty.

Q. The Contractor shall provide copies of its daily construction reports to the Construction Manager's Field Superintendent. These reports shall be submitted no later than 10:00 am the following workday. The daily reports shall provide detailed information concerning the Contractor's activities and operations, including work activities on site and manpower. A "Daily Construction" form is included in these specifications and shall be

used for reporting these activities. In addition, the Contractors are to submit a Two Week Look Ahead schedule for upcoming work. A "Two Week Look Ahead" form is included in these specifications for the Contractor's use.

ARTICLE 4
CONTRACTOR'S USE OF SITE

A. The Contractor shall confine operations at the site to the areas at which construction is to be performed and to such areas permitted by law, ordinances, permits and as set forth in detail in the project manual and drawings forming a part of its contract with the Owner.

B. Five (5) days after receipt of the Notice to Proceed, the Contractor shall provide two (2) copies of a videotaped recording of all existing conditions to the Construction Manager. This taping shall provide a record of all existing buildings, grounds, exterior conditions and interior conditions. The Contractor shall schedule a representative of both the Owner and the Construction Manager to be present at this taping. In the absence of this record, the Contractor shall be responsible for paying the costs associated with any and all repairs in an area where the Contractor is working or has worked, as may be deemed necessary by the Owner or the Construction Manager.

C. The occupied portion of any school building shall always comply with the minimum requirements necessary to maintain a certificate of occupancy.

D. General Safety and Security Standards for Construction Projects:

1. All construction materials shall be stored in a safe and secure manner.

2. Fences around construction supplies or debris shall be maintained.

3. Gates shall always be locked unless a worker is in attendance to prevent unauthorized entry.

4. During exterior renovation work, overhead protection shall be provided for any sidewalks or areas immediately beneath the work site or such areas shall be fenced off and provided with warning signs to prevent entry.

5. The Contractor shall exert utmost care and diligence when working in or near any existing buildings or sitework. The absence of protection around such items shall not excuse the Contractor from its liability to provide protection. Any damage to existing buildings, sitework or facilities shall be repaired and charged to the Contractor responsible for the damage.

6. The Contractor shall be responsible for the removal and replacement of existing ceiling tiles and grid in areas of the existing building where its work is required

and new ceilings are not scheduled for installation. In the event that the existing ceilings are damaged and cannot be replaced to the satisfaction of the Owner, the responsible contractor shall be liable for the costs of replacing in kind, the existing ceilings with new tile and grid.

7. All disconnect and/or tie-in work involving any utilities that would interfere with the ongoing operations of the Owner shall be completed after hours when the facility is not in use. The performance of this work shall be projected on all schedules required to be prepared by the Contractor. Additionally, the Contractor shall give the Construction Manager and the Owner at least forty-eight (48) hours advance notice of its intention to perform this type of work. All overtime and standby personnel necessary to complete these tie-ins shall be the responsibility of the Contractor performing the work.

E. 1. Separation of construction areas from occupied spaces: Construction areas which are under the control of a contractor and therefore not occupied by district staff or students shall be separated from occupied areas. Provisions shall be made to prevent the passage of dust and contaminants into occupied parts of the building. Periodic inspection and repairs of the containment barriers must be made to prevent exposure to dust or contaminants. Gypsum board must be used in exit ways or other areas that require fire rated separation. Heavy duty plastic sheeting may be used only for a vapor, fine dust or air infiltration barrier, and shall not be used to separate occupied spaces from construction areas. Methods of dust and fume control shall include, but not be limited to:

a. Adequate ventilation;
b. Wetting down;
c. Keeping bags of insulating materials, cement, etc., closed.
d. Controlled mixing of materials under field conditions;
e. Special attention should be utilized in sawing of insulation and certain acoustical materials and storage of materials.
f. Job housekeeping must be maintained;
g. Advising all personnel of hazardous conditions, including supervisors and workers;

Each contractor is responsible for instituting the above policies to insure minimal impact to surrounding occupied areas.

2. A specific stairwell and/or elevator should be assigned for construction worker use during work hours. In general, workers may not use corridors, stairs or elevators designated for students or school staff.

3. Large amounts of debris must be removed by using enclosed chutes or a similar sealed system. There shall be no movement of debris through halls of occupied spaces of the building. No material shall be dropped or thrown outside the walls of the building.

4. All occupied parts of the building affected by renovation activity shall be cleaned at the close of each workday. School buildings occupied during a construction project shall maintain required health, safety and educational capabilities at all times that classes are in session.

F. 1. Storage space will be allotted to the Contractor by the Owner, to the extent such space, in the sole discretion of the Owner is available. The Contractor shall be responsible for securing appropriate space for its material with the Construction Manager prior to delivery. If insufficient space is available on the site, the Contractor shall provide local off-site storage, storage containers, etc. at its own cost and expense. Should any of the material stored on-site obstruct the progress of any portion of the work or the project, this material shall be removed by the Contractor without reimbursement of cost, from place to place or from the premises, as the Construction Manager may direct.

2. The Contractor shall schedule delivery of materials and equipment to minimize long term storage at the Project, to prevent overcrowding of construction spaces, and to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft and other losses.

3. The Contractor shall deliver materials and equipment to the Project 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 installation. The Contractor shall inspect materials and equipment upon delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected. The Contractor shall store products to allow for inspection and measurement of quantity or counting of units. The Contractor shall store materials in a manner that will not endanger the Project structure. The Contractor shall store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation. The Contractor shall comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.

4. The Contractor shall not unreasonably encumber the site with materials or equipment during the performance of its work. Only materials and equipment which are to be used directly in the performance of the Contractor's work shall be brought to and stored on the premises of the School District. After equipment is no longer required for its work, the Contractor shall promptly remove such equipment from the premises of the School District. The Contractor shall be solely responsible for the protection of construction materials and equipment stored on the premises from weather, theft, damage and all other adversity. The Contractor shall at all times provide the proper housekeeping to minimize potential fire hazards, and shall provide approved spark arresters on all steam engines, internal combustion engines and flues.

5. A construction entrance will be designated for deliveries. A separate entrance will be established for entering and exiting the site only. All deliveries shall be scheduled and coordinated with the Construction Manager and the Owner's Security department. Unexpected or uncoordinated deliveries may be turned away by the Owner or the Construction Manager at the discretion or necessity of the Owner. The Owner's enforcement of this provision shall not be construed by any contractor or subcontractor as the basis for a claim of delay in time or monetary damages alleged to have been incurred as a result of refusal of delivery.

6. The Contractor for General Construction shall provide necessary and required security measures to adequately safeguard the construction site from vandalism and intrusion of unauthorized persons. The Contractor for General Construction shall submit its means and methods of security to the Construction Manager for review and comment. The project site(s) must be secured 24 hours a day, 7 days a week including holidays. The General Construction Contractor's failure to secure the site as required by this paragraph will result in the Owner engaging the services of such necessary personnel so as to provide such security. No notice will be given the Contractor for General Construction of the Owner's intention to engage such security services and all costs and expenses associated with the Owner's security of the site in this regard will be back charged to the Contractor for General Construction. While the Owner may have security guards patrolling the project areas, the function of such security guards is not for the purpose of specifically guarding the Contractor's property or operations of work.

G. The Contractor's right to entry and use of the School District premises arises solely from the permission granted by the Owner pursuant to the agreement between the Contractor and the Owner. This permission shall be deemed to be withdrawn upon the termination of the Contractor's agreement with the Owner.

H. 1. The Contractor shall be required to perform its work with no interruption to the School District's operations, including its administrative and business operations. Any work which will interfere with the School District's operations and/or which is to be performed when the School District's facilities are in operation shall be performed on evenings and weekends. Additionally, the Contractor shall conduct its work in compliance with federal, state, county or local ordinances. All costs incurred by the Owner to make the facilities available during evening and weekends shall be borne by the Contractor. The Owner reserves the right to determine what work will "interfere" with its operations and said determination shall be final.

2. The Contractor may request access to the site during times beyond the work hours permitted. Approval is solely at the discretion of the Owner. If approval is given, the Contractor is responsible for paying all additional costs incurred by the Owner, Architect and the Construction Manager for providing the site to the Contractor during the additional time periods.

3. In the event the Contractor fails to complete all work under this contract by said scheduled dates, the Contractor will not be permitted to perform any work during normal school hours. Such work shall only be performed after school hours, Saturdays, Sundays, holidays or periods when school is unoccupied at no additional cost of any kind to the Owner. In addition to damages incurred by the Owner in connection with the Contractor's delay, the Contractor shall be liable for all costs incurred by the Owner to provide staff, Architect and Construction Manager personnel as required to make facility accessible by Contractor and perform inspections during such off hours.

4. The Owner shall not be responsible for any overtime charges incurred by the Contractor during the course of this project. Any and all costs associated with work which is performed at hours requiring the payment of such overtime by the Contractor to its workers shall be the Contractor's responsibility.

I. Construction and maintenance operations shall not produce noise in excess of 60 dba in occupied spaces or shall be scheduled for times when the building or affected building spaces are not occupies or acoustical abatement measures shall be taken.

J. The Contractor shall provide all required temporary access walkways, both interior and exterior, and the like necessary to complete its work. The Contractor shall maintain an unobstructed condition at all entrances and/or exits from present buildings. No equipment, other than equipment with rubber tires, will be allowed on any existing or new pavement, UNLESS THE CONTRACTOR HAS OBTAINED THE PRIOR APPROVAL OF THE CONSTRUCTION MANAGER AND THE PAVEMENT HAS BEEN FIRST PROTECTED WITH PLANKING OR BY OTHER MEANS APPROVED BY THE CONSTRUCTION MANAGER.

K. The Contractor and any entity for whom the Contractor is responsible shall not erect any sign on the premises of the School District without the prior written consent of the Owner, which may be withheld at the sole discretion of the Owner.

L. 1. Without the prior approval of the Owner, the Contractor shall not permit any workers to use any existing School District facilities, including, without limitation, lavatories, toilets, entrances and parking areas other than those designated by the Owner. Employees, vehicles, and equipment of the Contractor and of all others engaged by the Contractor for the performance of its work shall enter onto the premises of the School District for which construction work is to be performed only at those locations designated or approved by the Construction Manager. The parking for construction personnel shall be limited to the designated trailer park area only. Failure to abide by this rule will result in towing of cars at the expense of the contractor who employs the individual.

2. The Contractor shall ensure that its work, at all times, is performed in a manner that affords reasonable access to both vehicles and individuals, to the premises of the School District and all adjacent areas. The Contractors' work shall be performed, to the

fullest extent possible, in such a manner that areas in and around the construction area shall be free from all debris, building materials and equipment likely to cause hazardous conditions, and do not close or obstruct walkways, roadways or other occupied facilities or facilities to be used by the Owner. Without limitation to any other provision of the agreement between the Contractor and the Owner, the Contractor shall use its best efforts to minimize any interference with the occupancy of areas, buildings, entrances, and parking areas in and around the premises at which work is being performed. Free access to fire hydrants and standpipe connections shall be maintained at all times during construction operations, and portable fire extinguishers shall be provided by the Contractor and made conveniently available throughout the construction site.

3. The Construction Manager, in conjunction with the Owner and the Architect, shall designate locations at the site at which the Contractor, its subcontractors and employees may utilize in connection with its work. The Contractor's employees and the employees of the Contractor's Subcontractors and others engaged by the Contractor to perform its work are prohibited from trespassing or leaving any vehicle on any property not assigned by the Owner as set aside for the use of the Contractor. The Contractor's employees and the employees of the Contractor's Subcontractors and others engaged by the Contractor to perform its work are prohibited from leaving any vehicle on any property not assigned by the Owner as set aside for the use of the Contractor. The Contractor's employees and the employees of the Contractor's Subcontractors and other engaged by the Contractor to perform its work are restricted to the immediate area at which work is to be performed. Only persons having official business will be admitted to the construction site. NO COMMUNICATION BETWEEN THE CONTRACTOR, ITS EMPLOYEES, SUBCONTRACTORS' EMPLOYEES, OR OTHERS ENGAGED BY THE CONTRACTOR FOR THE PERFORMANCE OF ITS WORK AND STUDENTS OR STAFF WILL BE PERMITTED.

4. The Contractor, its employees, its Subcontractors and their employees or agents, and all others engaged by the Contractor in connection with the performance of its work are required to wear photographic identification badges at all times. The Contractor shall provide such individuals with said photographic identification badges. These badges shall be worn so as to be readily and easily visible. All workers and representatives of the Contractor, its subcontractors or suppliers shall wear these badges while on school property. The information on these badges shall be as prescribed by the Owner and the Construction Manager. Each person seen without a photo identification badge (or otherwise failing to comply with this requirement in the opinion of the Owner or the Construction Manager) shall be ordered to leave school property. No warnings shall be necessary. The Contractor(s) and their subcontractor(s) employing the offending person(s) shall be solely responsible for making-up and paying for any loss of production or required progress in the Work resulting from this action (including any claims by other Contractors dependent on the work of this Contractor). All parties agree that any action taken to enforce this requirement shall not be construed by any Contractor or its subcontractors or suppliers as the basis for a claim (for either time or money) for delay to the Work or to the Contractor,

its Subcontractors, or Suppliers.

5. Without limitation of any other provision of the agreement between the Owner and Contractor, the Contractor shall use its best efforts to comply with all rules and regulations promulgated by the Owner in connection with the use and occupancy of the premises of the School District. The Contractor shall immediately notify the Owner in writing if during the performance of its work, the Contractor finds compliance with any portion of such rules and regulations to be impracticable, setting forth the problems of such compliance and suggesting alternative through which the same results intended by such portion of the rules and regulations can be achieved. The Owner may, in the Owner's sole discretion, adopt such suggestions, develop new alternatives or require compliance with the existing requirements of the rules and regulations.

M. No drinking of alcoholic beverages, smoking or use of controlled substances is permitted on the grounds. The Contractor shall insure that none of its or its Subcontractors, its employees, agents, and/or consultants report to the site impaired by alcohol or controlled substances. The Contractor bears the responsibility of determining if its, or its subcontractors, employees are in any way impaired and whether the safety of the public, the employees of other Contractors and their Subcontractors, the Owner, Architect, or Construction Manager are jeopardized. Each contractor shall provide drinking water for its own employees.

N. The Contractor's employees, representatives, agents and consultants, and all of its Subcontractors' employees, representatives, agents and consultants at the site are to refrain from using indecent language. All doing so will be removed from the site. Artwork or decoration found on vehicles belonging to Contractor or Subcontractor employees parked on or near the school property which contain indecent language or pictures shall either be covered or removed from the location.

O. The Contractor's employees, representative, agents and consultants, and all of its Subcontractors' employees, representatives, agents and consultants at the site are to wear shirts, long pants and proper footwear.

P. Each contractor shall keep the premises and surrounding area in which it is working free from accumulation of waste materials or rubbish caused by the performance of all of the work being performed on-site and in the buildings. On a daily basis at the conclusion of work on the project, each contractor shall clean the areas in which it has performed work and shall remove all waste, materials, rubbish, its tools, construction equipment, machinery and surplus materials. Each Contractor shall broom sweep all construction areas in which it has performed worked every day. The Construction Manager shall perform an inspection each afternoon to determine that the work areas of the contractors have been properly cleaned. In the event the work areas are not cleaned, the Construction Manager shall advise the offending contractor to provide cleaning as required herein. If any contractor fails to keep the site safe and clean within four (4) hours of being notified by the Construction

Manager, either verbally or in writing, the Construction Manager will have the cleanup work performed and back charged to the offending contractor without further notification to the Contractor. The cost of such cleaning company, together with the cost of any custodial costs of the School District, at prevailing overtime rates plus 15% will be charged to the offending contractor. Notice to field personnel shall be deemed notice to the Contractor.

Q. The Contractor shall provide ventilation of enclosed areas during construction as may be required to permit proper curing and drying out and to prevent excessive humidity, moisture and condensation. Ventilation shall be by natural or artificial means as required by conditions involved.

R. The Contractor shall be responsible for the control of chemical fumes, gases and other contaminates produced by welding, gasoline or diesel engines, roofing, paving, painting, etc. to ensure that they do not enter occupied portions of the building or air intakes.

S. The Contractor shall be responsible to ensure that activities and materials which result in "off-gassing" of volatile organic compounds such as glues, paints, furniture, carpeting, wall covering, drapery, etc. are scheduled, cured or ventilated in accordance with manufacturers' recommendations before a space can be occupied.

T. From the commencement to the completion of the Project, the Contractor shall keep the parts of the work and the buildings free from accumulation of water no matter what the source or cause of water.

U. 1. The General Contractor shall construct temporary partitions where shown on drawings or where otherwise required for safety of the public or to prevent dust from entering occupied areas. Partitions shall be dust-proof from floor to slab or structure above (if existing condition is a drop in tile ceiling, Contractor shall remove tile and install partition to structure above). In addition to framing and sheetrock, the Contractor shall install fire resistant plastic partitions on the work area side of its work. If an access door is required, an alternating 3 layer plastic system shall be used. The door shall be a standard hollow metal door with lockset and closer. Keys shall be distributed to the Owner's other contractors, the Owner and the Architect.

2. Where a contractor other than the General Contractor is the only contractor scheduled to perform work in a particular area of the site at any given time, the responsibilities allocated to the General Contractor in subdivision 1 of this paragraph U shall be performed by such other contractor.

3. All cutting and welding performed within an occupied building or adjacent to a window or intake vent shall be performed during off hours.

V. 1. The Contractor shall control the safe handling and storage of all welding

materials, acetylene and oxygen tanks, and other equipment required for welding and cutting work at the job site. Such storage shall be in compliance with OSHA regulations.

2. Welding materials and equipment shall be removed promptly from the premises upon completion of the welding and cutting work.

W. The Contractor shall be responsible for all costs incurred by the Owner caused by false security/fire alarms set off by the Contractor. Costs shall include custodial response charges etc.

X. The Contractor shall be responsible for broken glass, and at the completion of the Work shall replace such damaged or broken glass. After damaged or broken glass has been replaced, the Contractor shall remove all labels, wash and polish both sides of all glass. In addition to general broom cleaning, the General Contractor shall perform the following final cleaning for all trades at completion of the Work:

1. Remove temporary protections;
2. Remove marks, stains, fingerprints and other soil or dirt from painted, decorated and natural finished woodwork and other Work;
3. Remove spots, plaster, soil and paint from ceramic tile, marble and other finished materials, and wash or wipe clean;
4. Clean fixtures, cabinet work and equipment, removing stains, paint, dirt and dust, and leave same in undamaged, new condition;
5. Clean aluminum in accordance with recommendations of the manufacturer; and
6. Clean all floors thoroughly in accordance with recommendations of the manufacturer.

ARTICLE 5
SUBCONTRACTORS

A. 1. As soon as practicable after receipt of Letter of Intent to Award, Notice to Proceed or other form of official notice of award of the Contract, but not more than ten (10) days after receipt of official notice of award of the Contract, the Contractor shall furnish the Owner and the Architect, in writing, with (1) the name, trade and subcontract amount for each Subcontractor and (2) the names of all persons or entities proposed as manufacturers of the products identified in the Specifications (including those who are to furnish materials or equipment fabricated to a special design) and, where applicable, the name of the installing Subcontractor. Copies of all Subcontractor contracts, fully executed, are to be provided to the Construction Manager, including but not limited to all addenda, appendices, and/or exhibits including scope of work sheets. All such subcontracts shall be submitted to the Construction Manager within ten (10) days of the Owner's award of the contract to the Contractor.

2. Upon review of the Contractor's list of Subcontractors, the Architect will advise the Contractor in writing stating whether or not the Owner, the Construction Manager or the Architect, after due investigation, accepts or rejects, any proposed Subcontractor. Subcontractors will not be acceptable unless, when requested by the Architect, evidence is furnished that the proposed subcontractor has satisfactorily completed similar subcontracts as contemplated under this prime contract, and has the necessary experience, personnel, equipment, plant, and financial ability to complete the subcontract in accordance with the intent to the Documents. As verification of financial ability, the Owner reserves the right to request and receive up to five (5) years worth of financial statements, bank references, bond/insurance company references and all other information required to assess financial ability.

3. If the Owner, Construction Manager or Architect has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner, Construction Manager and Architect have no objection. No increase in the Contract Sum shall be allowed where a sub-contractor is rejected by the Architect, Construction Manager or Owner who is (1) deemed unqualified to perform the particular work subcontracted by the Contractor, (2) does not have the necessary experience, personnel, equipment, plant and financial ability to complete the subcontract, or (3) has a history of poor performance in work of similar nature. Upon receipt of a rejection of a subcontractor by the Owner, Construction Manager or Architect, the Contractor shall have the right to request a meeting with the Architect, Construction Manager and the Owner to discuss the reasons it believes the subcontractor is qualified to perform the work. Upon review of such reasons, the Owner, Construction Manager or Architect shall re-consider its determination and shall advise the Contractor of its determination upon such review. If the Owner, Construction Manager or Architect still finds that such subcontractor does not meet the requirements above-stated, it shall advise the Contractor. The Owner, Construction Manager or Architect's determination upon such review shall be final and binding on the Contractor and its Subcontractor and the Contractor hereby waives any and all claims it or its subcontractor might have against the Owner, the Construction Manager and/or the Architect concerning the rejection of such Contractor and shall require its subcontractors to execute such similar waiver in its agreement with the Contractor.

4. The Contractor shall not change a Subcontractor, person or entity previously selected if the Owner, Construction Manager or Architect makes reasonable objection to such change.

B. By appropriate agreement, the Contractor shall require each Subcontractor to be bound to the Contractor by terms of the Contractor's agreement with the Owner, and to assume toward the Contractor all the obligations and responsibilities which the Contractor, by said agreement, assumes toward the Owner and Architect. Each subcontract agreement shall preserve and protect the rights of the Owner, Construction Manager and Architect under the Contractor's agreement with the Owner so that subcontracting thereof will not prejudice such rights, and shall allow the Subcontractor, unless specifically provided

otherwise in the subcontract agreement, the benefit of all rights, remedies and redress against the Contractor that the Contractor, by its agreement with the Owner, has against the Owner. However, the Subcontract agreement between the Contractor and Subcontractor shall not provide, nor shall this Agreement be deemed to provide any rights, remedies or redress by the Subcontractor(s) against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors.

C. The Contractor shall promptly notify the Owner, Construction Manager and Architect of any material defaults by any Subcontractors and/or whether it has terminated its agreement with any of its subcontractors for any reason.

D. The Contractor hereby assigns all of its rights in its agreements with its Subcontractor(s) and hereby does assign, transfer and set over to the Owner all of its rights and/or interests in its agreements with its Subcontractor(s), but only in the event of termination of the Contractor's agreement with the Owner pursuant to Article 17, paragraph A of these General Conditions of the Contract for Construction and only to the extent the Owner implements its rights to take such assignment of contract by notifying the Subcontractor in writing of its intention to do so. Such an assignment is subject to the prior rights of the surety, if any, obligated to the Owner pursuant to a performance bond submitted in connection with the Contractor's work.

E. If the Work in connection with a subcontract has been suspended for more than ninety (90) days after termination of the Contract by the Owner and the Owner accepts assignment of such subcontract, the Subcontractor's compensation shall not be adjusted for any increase in direct costs incurred by such Subcontractor as a result of the suspension.

F. It shall be the Contractor's responsibility, when sub-contracting any portion of his work, to arrange or group items of work under particular trades to conform with then prevailing customs of the trade, regardless of the particular Divisions and Sections of the Specifications in which the work is described.

G. All subcontracts must be in writing.

ARTICLE 6
CONTRACTOR'S USE OF DRAWINGS/SPECIFICATIONS

A. The Agreement between the Owner and Contractor, and all documents incorporated therein by reference, including but not limited to, the drawings and project manual shall be signed by the Contractor and the Owner.

B. The intent of the agreement between the Owner and the Contractor is to include all items necessary for the proper execution and completion of the work to be performed by the Contractor. The documents comprising the agreement between the Contractor and the Owner are complementary, and what is required by one shall be as binding as if required by all.

C. 1. In the event of inconsistencies within or between parts of the agreement between the Contractor and the Owner or between the agreement between the Contractor and the Owner and applicable standards, codes and ordinances, the Contractor shall (a) provide the better quality or greater quantity of Work or (b) comply with the more stringent requirement; either or both in accordance with the Architect's interpretation.

2. On the Drawings, given dimensions shall take precedence over scaled measurements and large scale drawings over small scale drawings.

3. Before ordering any materials or performing any of its work, the Contractor and each Subcontractor shall verify measurements at the Project site and shall be responsible for the correctness of such measurements. No extra charge or compensation will be allowed on account of differences between actual dimensions and the dimensions indicated on the Drawings. Any difference which may be found shall be submitted to the Architect for resolution before proceeding with the performance of the work.

4. If a minor change in the Work is found necessary due to actual field conditions, the Contractor shall submit detailed drawings of such departure for the approval by the Architect before making the change.

5. Drawings, in general, are made to scale, but all working dimensions shall be taken from the figured dimensions or by actual measurements at the job and in no case by scaling. The Contractor shall study and compare all Drawings and verify all figures before laying out or constructing the work and shall be responsible for any and all errors in his work which might have been avoided thereby. Whether or not an error is believed to exist, deviation from the Drawings and the dimensions given thereon shall be made only after approval in writing is obtained from the Architect.

6. In the event addendum (a) are issued and contain changes to the Drawings and/or Specifications, the provisions in the addendum (a) supersede previously issued Drawings and/or Specifications.

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

E. Unless otherwise stated in the agreement, words and abbreviations which have well-known technical or construction industry meanings are used in the agreements in accordance with such recognized meanings.

F. The Contractor, and all Subcontractors, shall refer to all of the Drawings, including those showing the work of others performing work in connection with the project,

including but not limited to the General Contractor (if any), the Plumbing Contractor, the Heating, Ventilation, Air Conditioning Contractor, Electrical Contractor and other specialized trades, and to all of the Divisions of the Project Manual, and shall perform all work reasonably inferable therefrom as being necessary to produce the indicated results.

G. All indications or notations on the drawings which apply to one of a number of similar situations, materials or processes shall be deemed to apply to all such situations, materials or processes wherever they appear in the Work, except where a contrary result is clearly indicated by the drawings or project manual. All work mentioned or indicated in the drawings or project manual shall be performed by the Contractor unless it is specifically indicated therein that the work is to be performed by others.

H. The Drawings, Specifications and other documents prepared by the Architect are instruments of the Architect's service through which the Contractor's work is to be performed. The Contractor may retain one contract record set during the course of the project. Neither the Contractor nor any Subcontractor, Sub-subcontractor or material or equipment supplier shall own or claim a copyright in the Drawings, Specifications and other documents prepared by the Architect, and unless otherwise indicated the Architect shall be deemed the author of them and will retain all common law, statutory and other reserved rights, in addition to the copyright. All copies of them, except the Contractor's record set, shall be returned or suitably accounted for to the Architect, on request, upon completion of the Work.

I. The Drawings, Specifications and other documents prepared by the Architect, and copies thereof furnished to the Contractor, are for use solely with respect to this Project. They are not to be used by the Contractor or any Subcontractor, Sub-subcontractor or material or equipment supplier on other projects without the specific written consent of the Owner and Architect. The Contractor, Subcontractors, Sub-subcontractors and material or equipment suppliers are granted a limited license to use and reproduce applicable portions of the Drawings, Specifications and other documents prepared by the Architect appropriate to and for use in the performance of its work pursuant to its agreement with the Owner. All copies made under this license shall bear the statutory copyright notice, if any, shown on the Drawings, Specifications and other documents prepared by the Architect. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with this Project is not to be construed as publication in derogation of the Architect's copyright or other reserved rights.

J. The Owner shall furnish surveys describing physical characteristics of the site, upon written request of the Contractor and to the extent such survey is in existence at the time of said request, legal limitations and utility locations for the project sites. Nothing herein shall be construed as requiring the Owner to generate any document which it does not possess at the time of the request by the Contractor. In the event that the survey provided does not clearly delineate the metes and bounds of the Owner's property, the Contractor shall stop work and immediately notify the Architect, Construction Manager and the Owner. The

Contractor shall NOT proceed with its work until it receives written permission from the Construction Manager and/or the Architect. The Contractor shall be fully responsible for all costs arising from non-compliance with this provision. Any delays associated with this provision shall not serve as a basis for a claim by the Contractor.

K. From the basic data established by the Owner, the General Contractor shall establish reference control points and complete the layout of the work. Each Contractor is responsible for utility markouts as it pertains to the scope of their work and maintain markout during work. Sketch of layout with reference points to be given to Construction Manager and Architect at the time of markout.

L. The Contractor shall be responsible for all measurements that may be required for execution of the work to the exact position and elevation as prescribed in the specifications, shown on the drawings, or as the same may be modified at the direction of the Architect to meet changed conditions.

M. The General Contractor shall be responsible for the establishment of points, wall and partition lines required by the various Prime Contractors and subcontractors in laying out their work.

N. Each Contractor shall furnish such stakes and other required equipment, tools and materials, and all labor as may be required in laying out any part of the work from the base lines and bench marks established by the Owner.

O. 1. The General Construction Contractor shall establish a baseline and benchmark system for each building addition, area of renovation or component using the services of a licensed professional surveyor. The surveyor(s) employed to establish this system or to extend and maintain an existing benchmark system for the work of other trades shall have not less than five years experience in performing construction surveys similar to the work they will perform for this project. The remaining Contractors and their respective subcontractors shall be responsible for extending these lines, levels and grades, and for performing all layout for their own work. The Contractor is solely responsible for any damage or loss due to incorrect extension of lines, level or grades in their layout. The Contractor and its subcontractors shall be responsible for the accuracy with respect to the layout of their work. Any discrepancies or errors in the drawings, perceived by another contractor or subcontractor shall be immediately reported to the Construction Manager. If any corrections are necessary, they shall be executed in accordance with the terms and provisions of these General Conditions.

2. The Contractor and its subcontractors shall be responsible to offset or to protect their markings from anything that may disturb them.

3. Every contractor shall work off the lines and elevations established and maintained as the baseline and benchmark system.

4. Each Contractor is responsible for the accuracy of his own work.

P. The Architect may require that construction work be suspended at any time when location and limit marks established by the Contractor are not reasonably adequate to permit checking completed work or the work in progress.

Q. Except for the basic building permit, the Contractor shall be responsible for securing and maintaining for the life of the project: all permits, P.E. Licenses, connection fees, inspections, etc. applicable to, or customarily secured for the work. This provision includes any permits to be issued in the name of the Contractor required for the work. Originals of all permits are to be issued in the name of the Contractor as required for the work. The Contractor shall furnish the Construction Manager with original copies of all permits prior to the commencement of the work, and shall prominently display a copy of all permits at a location approved by the Construction Manager.

R. The Contractor shall take field measurements and verify field conditions and shall carefully compare such field measurements and conditions and other information known to the Contractor with the Contract Documents before commencing activities. Errors, inconsistencies or omissions discovered shall be reported to the Architect at once.

S. The exactness of grades, elevations, dimensions, or locations given on any Drawings issued by the Architect, or the work installed by other contracts, is not guaranteed by the Architect or the Owner. The Contractor shall, therefore, satisfy itself as to the accuracy of all grades, elevations, dimensions, utilities and locations. In all cases of interconnection of its Work with existing or other work, it shall verify at the site all dimensions relating to such existing or other work. Any errors due to the Contractor's failure to so verify all such grades, elevations, locations or dimensions shall be promptly rectified by the Contractor without any additional cost to the Owner.

T. 1. The Contractor shall give the Architect timely notice of any additional design drawings, specifications, or instructions required to define its work in greater detail, or to permit the proper progress of its work. To the extent the Architect advises the Contractor that the existing design drawings, specifications and/or instructions given are sufficiently detailed for the Contractor to perform its work, the Architect shall be under no obligation to further clarify or define the work to be performed. In all other circumstances, the Architect shall issue a field order which responds to the request for information.

2. Requests for Information (RFIs) are for requests on clarifications or questions on contract drawings and specifications, not contract terms, scheduling items, or general correspondence, nor, as a means to describe or request approval of alternate construction means, methods or concepts or substitution or materials, systems means and methods. The Contractor shall fill all RFIs out in accordance with the provisions of the Project Manual. Neither the Architect nor the Construction Manager shall fill said forms out on the

Contractor's behalf.

U. The Contractor shall, prior to the start of any portion of the Work:

1. review any specified construction or installation procedures, including those as may be recommended by the proposed manufacturer.

2. advise the Architect if the specified procedure(s) deviates from good construction practice.

3. advise the Architect if following said procedure(s) will affect any warranty, including the contractor's general warranty.

4. advise the Architect of any objections the Contractor may have to the specified procedure(s).

5. propose any alternative procedure(s) which the Contractor will warrant.

V. 1. To the fullest extent possible, the Contractor shall provide products of the same kind, from a single source. When two or more items of same material or equipment are required (pumps, valves, air conditioning units, etc.), they shall be of the same manufacturer. Product manufacturer uniformity does not apply to raw materials, bulk materials, pipe, tube, fittings (except flanged and grooved types), sheet metal, wire, steel bar stock, welding rods, solder, fasteners, motors for dissimilar equipment units, and similar items used in the work, except as otherwise indicated. The Contractor shall provide products which are compatible within systems and other connected items. If Contractor is given option of selecting between two or more products for use on Project, product selected shall be compatible with products previously selected, even if previously selected products were also options.

2. The Contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors. If a dispute arises between contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.

3. With respect to sitework materials, all products submitted for use and incorporated into this project shall be on the Approved List of Materials and Equipment published by the NYSDOT Materials Bureau, most recent edition.

4. All products submitted for use and incorporated into this project shall be asbestos free.

W. Equivalents. In the Specifications, one or more kinds, types, brands, or manufacturers or materials are regarded as the required standard of quality and are presumed to be equal. The Contractor may select one of these items or, if the contractor desires to use any kind type, brand, or manufacturer or material other than those named in the specifications, they shall indicate in writing, and prior to award of contract, what kind, type, brand or manufacturer is included in the base bid for the specified item. The Contractor shall follow the submission requirements for substitutions as set forth in Article
6.X below.

X. 1. Substitutions. If the Contractor desires to substitute any kind, type, brand, or manufacturer of material other than those named in the Specifications, the Contractor shall request in writing that it be permitted to make a substitution for the specified manufacturer or materials and shall indicate the following:

a. For which specified material or equipment the request for substitution is being made;

b. What kind, type, brand, or manufacturer is sought to be substituted for the specified items;

c. Written documentation evidencing that the substituted material or equipment meets or exceeds the specifications for materials and/or equipment set forth in the project manual. Such documentation shall include, but not limited to, a full explanation of the proposed substitution, together with a submittal of all supporting data including technical information, catalog cuts, warranties, test results, installation instructions, operating procedures, significant qualities of proposed substitution (e.g. performance, weight, size, durability and visual effects), and other like information necessary for a complete evaluation of the substitution. Additionally, the Contractor shall provide material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated. All such data shall be provided to the Architect and Owner at the Contractor's sole expense. The Contractor's written explanation shall also include a list of reasons the substitution is advantageous and necessary, including the benefits to the Owner and the project in the event the substitution is acceptable. Additionally, the Contractor shall submit to the Architect information describing in specific detail how the proposed substituted product differs from the quality and performance required by the base specifications, and such other information as may be required by the Owner or the Architect.

d. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.

e. Samples, where applicable or requested.

f. Detailed comparison of Contractor's Construction Schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating lack of availability or delays in delivery.

2. By making said requests in conformance with procedures established herein and elsewhere in the Project Manual, the Contractor:

a. Represents that a representative of it has personally investigated the proposed substitute product and has determined that it is equal to or superior in all respects to that specified.

b. Represents that the warranty for the substitution will be the same, or greater than, that applicable to the specified product.

c. Certifies that the cost data is complete and includes all related costs under this contract, including professional services necessary and/or required for the architect and engineers to implement said substitution and waives any and all claims for additional costs related to the substitution which subsequently become apparent.

d. Represents that it will coordinate the installation of the accepted substitute, making all such changes to the drawings effected by the change, including but not limited to the electrical, plumbing, site work and heating and ventilating specifications as may be required for the work to be complete in all respects.

e. An affidavit stating that (1) the proposed substitution conforms and meets all the requirements of the pertinent Specifications and the requirements shown on the Drawings and (2) the Contractor accepts the warranty and correction obligations in connection with the proposed substitution as if originally specified by the Architect; and the proposed substitution will have no effect on the construction schedule.

3. Proposals for substitutions shall be submitted in triplicate to the Architect in sufficient time to allow the Architect no less than fourteen (14) working days of award of contract for review.

4. No substitutions will be considered or allowed without the Contractor's submittal of complete substantiating data and information as stated hereinbefore.

5. All proposed substitutions shall be submitted to the Architect within fourteen (14) working days of the award of the contract to the Contractor. *(This provision 6(X)(5) shall not apply to equivalents.)*

Y. 1. Submittal of shop drawings, product data, material safety data sheets, samples or similar submittals shall be in accordance with the provisions of the project manual.

2. The Contractor represents and warrants that all shop drawings have been prepared by persons and entities possessing expertise and experience in the trade for which the shop drawing is prepared and, if required by the Architect or applicable law, by a licensed engineer, job specific, reviewed by Contractor and stamped by the Contractor.

3. If the Contractor elects to perform its work without approvals, such work shall be at the Contractor's own risk and expense.

4. By approving and submitting shop drawings, product data, samples and similar submittals, the Contractor represents that the Contractor has determined and verified materials, field measurements and field construction criteria related thereto and has checked and coordinated the information contained within such submittals with the requirements of its work.

5. The Contractor shall not be relieved of responsibility for deviations from requirements of its work by the Architect's approval of shop drawings, product data, samples or similar submittals unless the Contractor has specifically informed the Architect in writing of such deviation at the time of submittal and the Architect has given written approval to the specific deviation. The Contractor shall not be relieved of responsibility for errors and/or omissions in the shop drawings, product data, samples or other of its submittals to the Architect, by the Architect's approval thereof.

6. The Architect shall review, approve, reject or take other appropriate action respecting submittals made by the Contractor as set forth in the Project Manual. The Architect shall check for conformance with information given in the drawings and project manual and the design concept expressed in the agreement between the Owner and the Contractor. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities or for substantiating instructions for installation or performance of equipment or systems designed by the Contractor, all of which remain the responsibility of the Contractor. Further, the Architect's review shall not constitute approval of safety precautions or, unless otherwise specifically stated by the Architect, of construction means, methods, techniques,

sequences or procedures.

The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component. When professional certification of performance characteristics of materials, systems or equipment is required by the Contract Documents, the Architect shall be entitled to rely upon such certification to establish that the materials, systems or equipment will meet the performance criteria required by the Contract Documents.

7. Upon the Architect's rejection of the Contractor's shop drawings, product data, samples and/or other documentation submitted by the Contractor to the Architect, the Contractor shall review the rejection and re-submit such shop drawing, product data, sample and or other document in accordance with the Architect's instruction. The Contractor shall direct the Architect's specific attention in writing or on re-submitted shop drawings, product data, samples, or similar submittals, to revision which have been made, including revisions not specifically requested by the Architect. Resubmission of rejected documents shall be performed within ten (10) calendar days. No claim for delay or cost shall be accepted as a result of rejected documents.

8. When professional certification of performance criteria of materials, systems or equipment is required of the Contractor, the Architect shall be entitled to rely in a reasonable and professional fashion upon the accuracy and completeness of such calculations and certifications provided, however, if the Architect, in its reasonable and professional judgment considers it advisable, the Architect shall verify the accuracy and completeness of any and all such calculations and/or certifications. In the event any and all such calculations and/or certifications are found to be inaccurate and/or incomplete by the Architect, the Contractor shall assume full responsibility and bear all costs attributable or related thereto, including, without limitation, the expense of the Architect's additional services associated with the verification of such calculations and/or certifications and the expense of the Architect's additional service made necessary by the failure of such calculations and/or certifications to be accurate or complete.

9. If the Architect is required to review the Contractor's submittal more than twice, the Contractor shall bear the cost and expense associated with such additional review as set forth in the Project Manual.

Z. The Architect will interpret and decide matters concerning performance under and requirements of the drawings and/or technical specifications on written request of the Contractor. Such interpretations may, at the Architect's option, be issued in the form of additional drawings or instructions indicating in greater detail the construction or design of the various parts of the Contractor's work. Such drawings or instructions may be forwarded by the Architect to the Contractor by field order, construction change directive or other notice to the Contractor. The Contractor shall execute the work for which it requested an interpretation in accordance with such additional drawings or instructions

without additional cost or extension of its contract time. After a decision has been rendered by the Architect on a matter for which the Contractor sought the Architect's interpretation of the drawings and/or technical specifications, the Contractor shall proceed with the work as directed by the Architect. Failure to proceed with the work in accordance with the Architect's interpretation may be used as a basis for termination of the Contractor's contract pursuant to Article 17 of these General Conditions.

AA. The Contractor shall maintain at the site one record copy of the Drawings, Specifications, Addenda, Change Orders and other Modifications, in good order and marked currently to record changes and selections made during construction, and in addition approved Shop Drawings, Product Data, Samples and similar required submittals. These shall be available to the Architect and the Construction Manager and shall be delivered to the Construction Manager for submittal to the Owner upon the completion of its work.

BB. The Contractor shall maintain at the site, and shall make available to the Owner, Construction Manager and Architect, one record copy of the Drawings (the "Record Drawings") in good order. The Record Drawings shall be prepared and updated during the prosecution of the Contractor's work. The prints for Record Drawing use will be a set of black line prints provided by the Architect to the Contractor at the start of construction. The Contractor shall maintain said set in good condition and shall use colored pencils to mark up said set with "record information" in a legible manner to show: (i) deviations from the Drawings made during construction; (ii) details in the work not previously shown; (iii) changes to existing conditions or existing conditions found to differ from those shown on any existing drawings; (iv) the actual installed position of equipment, piping, conduits, light switches, electric fixtures, circuiting, ducts, dampers, access panels, control valves, drains, openings, and stub-outs, etc.; (v) architectural and/or structural changes in the design; and (vi) such other information as either Owner or Architect may reasonably request. At the completion of the work, Contractor shall transfer all information on record drawings to reproducible drawings with new information clouded and noted. Such drawings shall be stamped with the Contractor's name and "AS-BUILT" in the lower right hand corner. The colored record drawing and the as-built reproducible drawing shall be forwarded to the Construction Manager for delivery to the Owner. Final payment and any retainage shall not be due and owing to Contractor until the Record and/or As Built drawings receive the approval from the Architect and the Owner (and all other closeout requirements are met).

CC. The Contractor shall maintain all approved permit drawings in a manner so as to make them accessible to government inspectors and other authorized agencies. All approved drawings shall be wrapped, marked and delivered to the Owner within sixty (60) days of final completion of the Contractor's work.

DD. Each Prime Contractor shall be furnished, free of charge, 3 copies of the Contract Documents and Project Manuals, including all Addenda. Any and all additional copies will be furnished to the Contractor at the cost of reproduction, postage and handling.

ARTICLE 7

CONTRACTOR'S SAFETY/SECURITY PROGRAM

A. 1. The Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the performance of its work. Prior to beginning any work, the contractor shall submit a copy of its corporate safety plan to the Owner and the Construction Manager. Two (2) weeks after receipt of the Notice to Proceed, the Contractor shall provide a Site Safety/Logistics Plan to the Construction Manager. The Site Safety/Logistics Plan should minimally include locations of the eight- foot high temporary fence and gates, traffic plans for deliveries and removals, refuse container locations, crane locations, pick locations, boom radium, and lift locations, stockpiles, toilet locations, site water and power locations, and safety. This plan shall also show the location of all staging and storage areas, clearly separating construction and school areas. The logistical information represented by the construction documents shall serve as a minimal guide. Each contractor is required to submit their corporate safety policy within ten (10) days of receipt of the Notice to Proceed. Said policy must minimally meet OSHA standards and define details concerning the maintenance of a safe work environment. The Contractor shall make the participation of its subcontractors in its safety program mandatory. A list of key personnel, with addresses and telephone numbers for emergency purposes shall be forwarded to the Construction Manager and Architect. The Owner and the Construction Manager shall establish a fire coordination procedure and shall forward same to the Contractor for its use during the performance of its work.

2. Effective July 1, 2008, all laborers, workers, and mechanics employed in the performance of the work of this Project shall be certified as having successfully completed a course in construction safety and health approved by the United States Department of Labor's Occupational Safety and Health Administration that is at least ten (10) hours in duration.

The Contractor and its subcontractors shall conduct their operation in accordance with the Safety Guides for Construction as issued by the SED, and, the Contractors' Safety Program.

3. All safety equipment including hard hats and weather protective gear required for the Contractor to perform its work are to be supplied by the Contractor and/or its subcontractors. Within the designated construction areas, the Contractor's employees, superintendents, and/or other agents, and its subcontractors, employees, superintendents, and/or other agents are required to wear hard hats and other required and/or essential safety equipment. Each person seen without a hard hat, or otherwise failing to comply with this requirement, will be ordered to leave the project. No prior warnings will be given by the Owner or Construction Manager and Architect. The Contractor and its subcontractors

shall be solely responsible for making up and paying for any loss of production or required progress resulting from the removal of personnel from the project as set forth herein including any costs incurred by the Owner in connection with the work of other contractors.

4. The Contractor and its subcontractors shall provide blankets and auxiliary fire protection as part of its construction safety program to prevent damage to adjacent work or materials as a result of its welding or burning operations. Additionally, as part of its construction safety program, the Contractor and its subcontractors shall provide a fire watch, with a fire extinguisher, which is acceptable to the Owner and the Construction Manager.

5. The Construction Manager and/or Owner reserve the right to have all operating equipment periodically inspected by an independent inspector whose finding will be binding. The Prime Contractor, at its own expense, must make corrections within two (2) working days of receiving a written report.

6. All flagmen required for deliveries to the site are to be furnished by the Contractor or its Subcontractors responsible for the delivery. Any and all deliveries crossing the site or student traffic areas shall be escorted by flagmen. All flagmen shall wear orange vests.

B. The Contractor shall schedule weekly safety meetings and each of its subcontractors must be properly represented at such meetings. The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents. The Contractor shall notify the Construction Manager in writing its "OSHA Competent Person Regarding Safety". Said person must be an individual capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Construction Manager and Architect. The Contractor shall take all necessary steps to prevent its employees from disturbing and/or damaging the facility and shall be responsible for preventing the escape of fires set in connection with the construction. The Contractor shall notify its employees and subcontractors of the location of the nearest fire alarm box at all locations where the work is in progress. On a weekly basis, the Contractor shall submit to the Construction Manager and Architect minutes of its safety meetings, which minutes shall include a list of the individuals present at such meetings.

C. The Contractor and each of its subcontractors shall conduct its/their operation in accordance with all applicable laws, regulations and order of local, state and federal governments. The Contractor agrees, in order that the work will be completed with the greatest degree of safety to conform to the requirements of the Occupational Safety and Health Act of 1970 (OSHA) and the Construction Safety Act of 1969, including all standards

and regulations that have been since or shall be promulgated by the governmental authorities which administer such acts.

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

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

F. The Contractor shall take reasonable precautions for the safety and protection of employees at the project site and other person who may be affected by its work, including but not limited to students, staff, employees and agents of the Owner, the Construction Manager and the Architect.

G. The Contractor shall protect and secure its work and the materials and/or equipment to be utilized in connection with its work, whether stored on or off the site and whether in its care, custody and control or that of its Subcontractors, subcontractors to its subcontractors, or material suppliers.

H. The Contractor shall take all steps necessary to protect all property at or adjacent to the site, including but not limited to trees, shrubs, lawns, walks, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course of construction.

I. All delivery vehicles/trucks/machinery/etc. permitted on the site must be equipped with back-up alarms and enter through the designated access points. The Contractor's failure to demonstrate this ability will result in cancellation of delivery or stoppage of work. All delays associated with this cancellation will be the responsibility of the contractor responsible for the work involved.

J. All crane picks, materials delivery, etc. must be coordinated so as not to lift over any occupied area of the building. If absolutely necessary, this work shall be done on off hours to insure the safety of the building occupants. Crane location must approved by the Construction Manager to insure the safety of building occupants.

K. The Owner or Construction Manager reserves the right to have all hoisting equipment periodically inspected by an independent inspector whose findings will be binding. The Contractor, at its own expense, must make corrections cited by the inspector before continuing work. The Owner or Construction Manager will not assume any responsibility for the safe operation of any hoisting equipment by exercising this right. The Contractor and/or its subcontractor(s) shall cooperate with the inspector by allowing time

for the inspection. The Contractor shall be notified twenty four (24) hours prior to the time of the inspection. These inspections do not release the Contractor if its responsibility to provide all engineering, permits and inspections as required by OSHA or the New York State Education Department prior to use of any hoisting equipment.

L. The Construction Manager, the Owner, and/or the Architect will not assume any responsibility for the safe operation of any cranes or equipment by exercising this right. The Contractor and its subcontractors shall cooperate with the inspector by allowing time for inspection. The Contractor will be notified 24 hours prior to the time of the actual inspection. The Contractor is obligated to perform all engineering, obtain permits, and to have all hoisting equipment inspected as required by OSHA, Village, Town, County, State, and Federal regulations as well as any other agency having jurisdiction. Copies of all inspection reports and certificates must be transmitted to Construction Manager as soon as possible.

M. The Contractor shall use the entrances designated on the site logistic plans and drawings for personal vehicles, trucks, equipment, deliveries and the like.

N. All interior temporary partitions and emergency egress barriers (if required) are to be installed on an after hours basis (weekends/school holidays).

O. 1. When use or storage of hazardous materials or equipment or unusual construction methods are necessary to perform its Work, the Contractor shall obtain the Owner and the Construction Manager's consent for the use of such materials, equipment or unusual construction methods. In the event the Owner determines that the use of such hazardous material or equipment or unusual construction methods can be performed by the Contractor with alternative means, methods and/or techniques, the Contractor shall employ such alternate means of prosecuting its work at no additional cost to the Owner.

2. In the event the Owner approves the use or storage of such hazardous materials, equipment or unusual construction methods, the Contractor shall provide for the Owner's and the Construction Manager's use a full set of safety instructions relating to all such materials. Additionally, when the Owner and/or the Construction Manager reviews the use of storage of such hazardous materials, equipment and or unusual construction methods, the Contractor shall exercise the highest degree of care and carry on such activities under supervision of properly qualified personnel.

3. Transportation, storage, and use of explosives shall be in strict accordance with all local, state and federal regulations, statutes, and requirements. All safety precautions as set forth in the "Manual of Accident Prevention in Construction" published by the Associated General Contractors of America, Inc. shall be observed.

4. The Contractor is responsible for its own storage and personnel trailers at the site. The Contractor will be required to supply man trailers and storage box trailers as

required. All costs related to delivery, construction, protection, power, etc. for said trailers is the responsibility of the contractor utilizing the space. The Owner WILL NOT PROVIDE STORAGE SPACE. The placement of personnel and/or storage trailer will be strictly limited to pre-determined locations. The Contractor shall obtain the written approval of the placement of any trailer or storage box from the Construction Manager.

P. During construction, the General Contractor shall be responsible for maintaining a watertight structure. This shall include additions and existing buildings. The contractor shall be responsible for temporary roofing, tarps and other protection at roofs, cavity walls, etc. Should the contractor fail to provide adequate protection, causing flooding, damage or other disturbance to the existing building, contractor shall be responsible for all costs associated with clean up and repairs. Inasmuch as flooding and damage have safety implications to the general public, clean up and repairs may be made by the Owner without warning to the Contractor. Administration costs incurred by the Owner and Architect will also be back charged to the Contractor. The Contractor, by entering into contract with the Owner agrees to be liable for these costs.

Q. When all or a portion of the Contractor's work is suspended for any reason, the Contractor shall securely fasten down all coverings and protect the work, as necessary, from injury by any cause.

R. 1. The Contractor shall promptly remedy damage and loss to all property of the Owner, or adjacent to the Owner's property (other than damage or loss covered by insurance) caused in whole or in part by the Contractor, a Subcontractor, a Sub- subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable, except damage or loss attributable to acts or omissions of the Owner or Architect or anyone directly or indirectly employed by either of them, or by anyone for whose acts either of them may be liable, and not attributable to the fault or negligence of the Contractor.

S. Title to all completed or partially completed work at the job site, and to all materials delivered to and stored at said job site which are intended to become a part of the completed work covered by the agreement between the Contractor and the Owner, shall be in the name of the Owner. Notwithstanding the foregoing, and prior to acceptance of the completed work by the Owner, the Contractor shall be liable for all loss of or damage to said completed work, partially completed work, materials furnished by the Contractor, and/or materials or equipment furnished by others, the custody of which has been given to the Contractor, arising from any cause other than those against which the Owner herein undertakes to carry insurance. In the event of loss or damage from cause other than those against which the Owner undertakes to carry insurance, the Contractor shall replace or repair the said work or materials at his own cost and expense, to the complete satisfaction of the Owner, the Construction Manager and the Architect.

T. The Contractor shall promptly report in writing to the Owner, the Architect and the Construction Manager all accidents arising out of or in connection with the Work which cause

death, person injury, or property damage, giving full details and statements or any witnesses. In addition, if death, serious personal injuries, or serious property damages are caused, the accident shall be reported immediately by telephone or messenger to the Owner, Construction Manager and the Architect.

U. In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury or loss.

V. Any and all fines or citations levied against the Owner, Architect, or Construction Manager due to the failure of the Contractor to comply with regulations of any governing authority, shall be paid for by the Contractor. This shall include any interest or late charges which accrue due to the Contractor's failure to remit payment upon receipt of such levies.

W. The Contractor shall indemnify and hold harmless the Owner, Construction Manager and Architect from any and all claims, damages, losses, suits, obligations, fines, penalties, costs, charges and expenses which may be imposed upon or incurred by or asserted against any of them by reason of any act or omission of such Contractor or any subcontractor or any person or firm directly or indirectly or indirectly employed by such Contractor, with respect to violations of OSHA requirements, rules and/or regulations.

X. The Contractor acknowledges that the Labor Law of the State of New York, and regulations adopted thereunder, place upon both the Owner and Contractor certain duties and that liability for failure to comply therewith is imposed on both the Owner and Contractor regardless of their respective fault. The Contractor hereby agrees that, as between the Owner and the Contractor, and to the extent permitted by law, the Contractor is solely responsible for compliance with all such laws and regulations imposed for the protection of persons performing the Contract.

Y. The Contractor shall indemnify and hold harmless the Owner, Architect, and Construction Manager, of and from any and all liability for violation of such laws and regulations and shall defend any claims or actions which may be brought against the Owner as the result thereof. In the event that the Contractor shall fail to refuse to defend any such action, the Contractor shall be liable to the Owner for all costs of the Owner, Architect or Construction Manager in defending such claim or action and all costs of the Owner, including attorney's fees, in recovering such defense costs from the Contractor.

Z. The Contractor and its subcontractors shall indemnify and hold harmless the Owner, Construction Manager and Architect from any and all claims, damages, losses, suits, obligations, fines, penalties, costs, charges and expenses which may be imposed upon or incurred by or asserted against any of them by reason of any act or omission of such Contractor or any subcontractor or any person or firm directly or indirectly employed by such Contractor, for the act and/or omissions of any Contractor or Subcontractor that resulted in an incident and/or accident causing personal injury and/or property damage.

ARTICLE 8

CHANGES IN THE WORK

A. Without invalidating the agreement between the Owner and the Contractor, and without notice to the Contractor's surety, the Owner may, at any time or from time to time, order additions, deletions or revisions in the Contractor's work. Such additions, deletions or revisions will be authorized by field order, change order, or construction change directive.

B. Field Orders are an interpretation of the contract drawings and/or specifications which order minor changes in the Contractor's work which will not result in an increase or decrease in the Contractor's total contract sum. From time to time, the Architect may issue field orders to the Contractor. The work included in such field order shall be performed by the Contractor at no additional cost to the Owner and shall not form the basis for a claim for an extension of time of the Contractor's time to complete its work. Hence, the Contractor shall perform the work included in field orders so as to cause no delay to its work and/or the work of other contractors engaged by the Owner in connection with the project. All field orders shall be given to the Contractor and the Construction Manager by the Architect in writing.

C. 1. When the Owner or Architect in association with the Construction Manager request that the Contractor perform work which is not included in the contract drawings or specifications and which will result in additional cost to the Owner, the Architect shall request that the Contractor submit its proposal for performing such additional work. The Contractor shall submit its proposal to the Construction Manager and Architect for review. The Contractor's proposal shall include a complete itemization of the costs associated with performing its work including labor and materials. All proposals for any work that a Contractor, its subcontractor(s) or subcontractor(s) of subcontractor(s) perform in connection with additional work shall be submitted using the following format and in no event shall the total for overhead and profit on any change order exceed fifteen percent (15%) of the cost of the work.

1.	Materials (Itemized Breakdown) including quantities and cost	
2.	Labor (Itemized Breakdown)	
3.	Subtotal (Add lines 1 and 2)	
4.	Credit for work not required due to additional or changes to the work reflected in the within change order (if any)	
5.	Overhead (10% x line 3)	
6.	Subtotal (Add lines 3 through 5)	
7.	Sub-Contract Work (include itemized breakdown.	

	Sub-Contractor(s) overhead and profit allowed is 10%	
8.	Subtotal (Add lines 6 and 7)	
9.	Profit (5% x line 8)	
10.	Subtotal (add lines 8 and 9)	
11.	Rental Value of Equipment (Itemized Breakdown)	
12.	Actual additional charges for bonds	
13.	TOTAL CHANGE ORDER (Add lines 10, 11 and 12)	

2. All proposals submitted by the Contractor without the itemization indicated herein will be returned to the Contractor for re-submission by the Contractor. For any work performed by the Contractor's own forces, fifteen percent (15%) for overhead and profit will be allowed for labor and material related costs. Costs to which overhead is to be applied shall be limited to cost of labor and materials including the cost of delivery. Under no circumstances shall any change order proposal exceed fifteen percent (15%) of the cost of overhead and profit.

The Contractor shall not be entitled to recover overhead and profit on the rental value of equipment and machinery. "Equipment and machinery" shall not include (1) tools customarily used by the contractor's trade, including but not limited to hand tools, and/or (2) equipment and machinery already on site and being utilized by the Contractor for the original scope of work.

The Contractor shall submit with its change order proposals actual invoices from its insurance broker reflecting actual additional costs associated with the procurement of bonds.

3. The Contractor's subcontractor's proposal for any work it is to perform in connection with the additional work shall only include ten percent (10%) for the subcontractor's overhead and profit including sub-subcontracted work. The Contractor is entitled to five percent (5%) on work performed by its subcontractor in accordance with paragraph C (1) of this Article 8. Costs to which overhead is to be applied shall be limited to cost of labor and materials including the cost of delivery. Under no circumstances shall the Contractor or the Contractor's subcontractor(s) be entitled to be reimbursed for overtime, except when specifically approved by the Owner in writing and not as an Extraordinary Measure as set forth in Article 13, and in such event the Contractor shall be paid for by the Owner on the basis of premium payment.

4. Notwithstanding the foregoing, work which is performed pursuant to an allowance included in the Contractor's base contract, the provisions of Article 9, paragraph B, concerning itemization of such work shall be controlling.

5. a. A change in the Contract Sum shall be accomplished only by a written Change Order. Accordingly, no course of conduct or dealings between the parties, nor express or implied acceptance of alterations or additions to the Work, whether or not there is, in fact, any unjust enrichment to the Work, shall be the basis of any claim as defined in Article 18 of these General Conditions to an increase in any amounts due under the Contract Documents or a change in any time period provided for in the Contract Documents. **No**

amount shall be payable by the Owner to the Contractor for performance of work without a written and fully executed Change Order.

b. Upon the Contractor's completion of the change order work, and prior to payment being made to the Contractor for such work, the Contractor shall provide the Owner with the following information:

1. Certified payrolls itemizing the labor actually utilized in connection with the change order work.

2. Copies of invoices from subcontractors supplying work in connection with the change order work.

D. 1. When the Owner or Architect request that portions of the Contractor's work originally included in the contract drawings or specifications be deleted and which will result in a reduction of the Contractor's original contract sum, the Architect shall request that the Contractor submit its proposal for deleting the scope of such work from its contract. The Contractor's proposal shall include a complete itemization of the costs associated with deducting such work including labor and materials and shall be submitted using the format set forth in Article 8, paragraph C(1) of these General Conditions of the Contract for Construction or the schedule of values, whichever is greater. The Contractor shall not be entitled to retain its overhead and/or profit for such work nor shall any of its subcontractors which were to perform the work being deducted from the Contractor's scope of work. Additionally, the Contractor shall reflect the reduced cost of premiums on bonds which are to be supplied herein as a result of such change. When both additions and credits covering related Work or substitutions are involved in a change, the allowance for overhead and profit shall be figured on the basis of net increase/decrease with respect to that change.

2. The Owner may in its sole discretion deduct and/or reduce the scope of the Contractor's contract with or without any specific reasons therefor.

E. 1. In the event the Contractor and the Owner cannot agree on the sum by which its contract with the Owner is to be increased or reduced based upon changes to the scope of the work as described in Article 8, the Architect shall issue a construction change directive reflecting the deduction and/or reduction of the scope of the Contractor's contract and the Contractor will (a) in the case of additional work to be performed by the Contractor, perform such additional work in an expeditious manner so as not to delay the work of this or other contractors working at the site, and (b) in the case of work to be deducted from the scope of the Contractor's work, refrain from taking any steps in connection with the work associated with the deduction and/or reduction of the scope of

the Contractor's work. The construction change directive shall include (a) a description of the work being added or deducted from the Contractor's scope of work; (b) the amount the Owner has determined to be the cost associated with the additional work or deduction and/or reduction of the scope of the Contractor's contract until the Owner and the Contractor agree upon the increase or decrease in the Contractor's contract sum, or until a claim filed by the Contractor has been determined; (c) the extent to which the contract time will be adjusted as a result of the change in the scope of work. Any claims must be filed in accordance with the requirements set forth in Article 18 of these General Conditions. Failure to timely file any claim in accordance with requirements set forth therein shall constitute a waiver of such claim.

2. In the event the Contractor and the Owner reach agreement on the amount by which the Contractor's contract sum is to be increased or decreased based upon changes to the scope of the Contractor's work as described in Article 8, the Architect, Owner, Construction Manager and Contractor shall sign a change order reflecting such agreement. The change order shall include (a) the description of the change in the scope of the Contractor's work; (b) the amount of the adjustment to the Contractor's contract sum, if any; and (c) the length of time by which the time to complete the contract will be adjusted, if any. Agreement between the Owner and the Contractor in connection with any change order shall constitute a final settlement of all matters relating to the change in the Contractor's work as reflected in said change order, including but not limited to, all direct and indirect costs associated with such change and any and all adjustments to the Contractor's contract sum and the construction schedule. All such change orders for which the Owner and the Contractor have reached agreement shall be included as a separate line item in the Contractor's applications for payment as if originally part of the Contractor's agreement with the Owner.

F. Neither the Owner, the Construction Manager nor Architect may issue instructions to the Contractor to change the amount of the Contract, except by properly executed Change Orders. Instructions are issued by the Owner or the Construction Manager through the Architect, to the Contractor. The instructions shall not be carried out by the Contractor prior to a written order in the form of a Change Order, signed by the Owner, Architect and Contractor, authorizing a change in the Contract amount or an adjustment to the Contract Sum. No amount shall be payable by the Owner to the Contractor for performance of work without an executed Change Order.

ARTICLE 9
PAYMENTS

A. 1. Prior to commencing its work on the project and within one (1) week of receipt of a Notice to Proceed, the Contractor shall submit to the Construction Manager and the Architect, a schedule of values which includes the amount of money it has allocated in its bid price for the following items of work which are applicable to the Contractor's work.

Said schedule of values shall include each of the CSI division sections reflected in the specifications and applicable to the contract for which the Contractor has been awarded the contract, together with the requirements for bonds/insurance (based upon actual invoice amount), general conditions, meeting attendance and meeting documentation (at least two (2) percent of the contract sum), shop drawing/product data/sample submissions (at least one (1) percent of contract sum), labor and materials on line items as applicable, temporary utilities and services, HVAC balance reports, coordination drawings, punchlist (at least one (1) percent of the contract sum), warranties/guarantees and close out of the project (at least three (3) percent of the contract sum), and allowance, where applicable.

2. Any schedule of values which fails to include sufficient detail, is unbalanced or exhibits "front loading" of the value of the Contractor's work will be rejected. Furthermore, if the schedule of values has been approved by the Construction Manager and the Architect and is subsequently used, but later is found by the Construction Manager or Architect to be improper for any reason, sufficient funds shall be withheld from the Contractors' future applications for payment to ensure an adequate reserve (exclusive of normal retainage) to complete the Contractor's work.

3. The schedule of values shall be drafted so as to reflect multiple construction sites, multiple locations within each site, additions versus renovations of work, and the like so as to satisfy any New York State Education Department requirements for the project.

4. The Schedule of Values prepared by the Contractor must be approved by the Construction Manager and the Architect prior to the payment of any sums due the Contractor.

B. The Contractor shall include in its contract sum all allowances stated in the specifications. However, the Contractor's costs for unloading and handling at the site, overhead, profit and other expenses contemplated for the stated allowance amounts shall be included in its contract sum and not in the allowances.

C. The Contractor shall submit its applications for payment to the Construction Manager and the Architect on a periodic basis. The form to be used by the Contractor shall be AIA 702/CMa and 703/CMa approved by the Construction Manager, the Architect and the Owner for use in connection with the Contractor's work. The form shall be divided in sufficiently in the same form as the Contractor's schedule of values and shall reflect in separate line items for the work:

1. Total value of the work listing labor and material separately
2. Percentage of work completed at the time of submission of the application for payment
3. Value of the work completed at the time of submission of the application for payment
4. Percent of previous amount billed

5. Previous amount billed
6. Current percent completed;
7. Value of work completed to date
8. Percent remaining to be completed by the Contractor; and
9. Value of work remaining to be completed by the Contractor

D. 1. Payments to the Contractor shall be based upon materials and equipment delivered and suitably stored at the site and/or incorporated into the Contractor's work, together with the labor utilized by the Contractor in connection with its work. The Contractor may be paid for materials and/or equipment which has been delivered to the Owner's facilities but which, at the time of submission of its application for payment, has not yet been incorporated into the Contractor's work upon such conditions and requirements as the Owner, the Construction Manager and/or the Architect may advise the Contractor it must satisfy.

2. The Construction Manager and Architect shall review the application for payment submitted by the Contractor and shall advise the Contractor of any adjustments to be made thereto. The Construction Manager and/or the Architect may make such adjustments under the following circumstances:

a. the Contractor's failure to remedy defective work;
b. the filing of third party claims or reasonable evidence that there is a probability that such claims will be filed;
c. receipt by the Owner of a notice of withholding from the New York State Department of Labor or other administrative agencies having jurisdiction over the project;
d. the Contractor's failure to make proper payments to its subcontractors or material suppliers for labor, materials and/or equipment;
e. reasonable evidence that the Contractor will not complete its work for the unpaid balance of the remaining monies on its contract;
f. damages caused to the Owner, Construction Manager, the Architect or another contractor as a result of the Contractor's performance of its work;
g. reasonable evidence that the Contractor will not complete its work in accordance with its agreement with the Owner, and/or that the remaining monies available on the Contractor's contract will not be sufficient to cover actual or liquidated damages for the anticipated delay;
h. the Contractor's failure to carry out its work in accordance with the contract drawings and/or specifications;
i. the Contractor's failure to notify the Architect of errors or inconsistencies between and among the contract drawings and specifications;
j. the Contractor's and/or its subcontractors' failure to comply with the requirements for maintaining record drawings;
k. the Architect's and/or the Construction Manager's discovery or observation of work which has been previously paid for by the Owner which is defective

and/or incomplete;

l. such other acts and/or omissions by the Contractor in connection with the performance of its work.

m. The amount requested exceeds the percent completion of work on the site.

3. After any such adjustments are made to the Contractor's application for payment, the Contractor shall submit four (4) copies of the final draft of its application for payment to the Construction Manager and Architect, which shall be accompanied by the following documentation:

a. a current Contractor's lien waiver and duly executed and acknowledged sworn statement showing all Subcontractors and material suppliers with whom the Contractor has entered into subcontracts, the amount of each such subcontract, the amount requested for any Subcontractor and material suppliers in the requested progress payment and the amount to be paid to the Contractor from such progress payment, together with similar sworn statements from all such Subcontractors and material suppliers;

b. duly executed waivers of public improvement liens from all Subcontractors and material suppliers and lower tiered Subcontractors or material suppliers establishing payment or satisfaction of payment of all amounts requested by the Contractor on behalf of such entities or persons in any previous Application for Payment; and AIA Form G706 or G706A.

c. Certified payroll for employees of the Contractor and employees of subcontractors performing work on the Project.

d. Copies of invoices submitted to the Contractor by its subcontractors and/or material suppliers.

e. Such other information which the Owner, Construction Manager and/or the Architect request the Contractor furnish in connection with its application for payment.

4. Upon submission of its application for payment, the Contractor represents that it is entitled to payment in the amount for which it seeks payment.

5. The Owner shall make payment to the Contractor within forty-five days of receipt of the Contractor's requisition of payment unless such requisition of payment is not in accordance with the terms of the Construction Documents.

6. Upon receipt of payment by the Owner, the Contractor shall promptly make

payment to each of its subcontractors and/or material suppliers for which it has received payment from the Owner. This provision does not obligate the Architect, the Construction Manager and/or the Owner to ensure payment to the Contractor's subcontractors and/or material suppliers.

7. a. In the event a subcontractor and/or material supplier files with the Owner a public improvement lien, the Owner shall withhold payment on previously certified applications for payment which have not yet been paid or subsequent applications for payment submitted by the Contractor an amount equal to 150% of the amount set forth in such public improvement lien. This provision is in addition to and does not supersede the indemnity provisions set forth in Article 12 of these General Conditions.

b. The Owner may release any payment withheld due to the filing of a public improvement lien if the Contractor obtains security acceptable to the Owner or a lien bond which is : (1) issued by a surety acceptable to the Owner, (2) in form and substance satisfactory to the Owner, and (3) in an amount not less the 150% of such lien claim. The cost of the premiums for any such bond posted shall be borne solely by the Contractor. By posting a lien bond or other acceptable security, however, the Contractor shall not be relieved of its obligations pursuant to these General Conditions, including but not limited to the indemnity provisions set forth in Article 12 of these General Conditions.

E. 1. The Contractor shall not be entitled to payment for materials and/or equipment stored off the site unless previously approved in writing by the Owner, Architect, and/or the Construction Manager and upon the Contractor meeting any and all conditions which the Owner, the Architect and/or Construction Manager may impose in connection with such materials and/or equipment, including but not limited to insurance for such materials and cost of storage and transportation associated with such materials and/or equipment. No payment will be made for "commodity type" stored materials such as block, studs, sheetrock, roofing, insulation, piping, fittings, conduit work, etc.

2. In connection with materials and/or equipment stored off the project site, the Contractor must submit with its application for payment the following information:

a. Type of material must be specifically identified by the Contractor;

b. The Contractor must furnish an invoice from its supplier showing the total value of material and/or equipment being stored off site and must provide the bill of lading for such material and/or equipment;

c. The Contractor must provide a Certificate of Insurance in a form approved by the Owner for the full value of the item plus 10%.

d. The Contractor must execute a security agreement, together with an executed UCC-1 form;

e. The materials must be stored in a bonded warehouse;

f. The Contractor must furnish a bill of sale for stored material and/or equipment;

The Contractor still has liability for all materials whether paid or not until installed.

3. Any and all materials and/or equipment for which the Contractor has been paid shall be titled in the Owner upon installation by the Contractor and shall be stored in a bonded facility. For payment to be made to the Contractor, the Contractor must provide the Owner with a waiver of lien and general release from its supplier in connection with its provisions of such materials and/or equipment. Notwithstanding payment by the Owner, any and all warranties and/or guarantees required by this agreement shall not begin to run until the Contractor has completed all of its work.

4. Prior to payment by the Owner, the Contractor may be required to provide the Architect and the Construction Manager with an opportunity to visually inspect the materials and/or equipment for the purpose of determining that such materials are in fact in storage, are the materials specified for the Contractor's work and for any other purpose which the Owner, Construction Manager and/or Architect deem necessary for payment to be made to the Contractor.

F. If the Owner is entitled to reimbursement or payment from the Contractor under or pursuant to its agreement with the Owner, including but not limited to these General Conditions of the Contract for Construction, such payment shall be made promptly upon demand by the Owner. Notwithstanding anything contained herein to the contrary, if the Contractor fails to promptly make any payment due the Owner, or the Owner incurs any costs and expenses to cure any default of the Contractor or to correct defective work, the Owner shall have an absolute right to offset such amount against the Contract Sum and may, in the Owner's sole discretion, elect either to: (1) deduct an amount equal to that which the Owner is entitled from any payment then or thereafter due the Contractor from the Owner, or (2) issue a written notice to the Contractor reducing the Contractor's contract sum by an amount equal to that which the Owner is entitled.

G. The Contractor may not assign any monies due or to become due to it pursuant to its agreement with the Owner without the Owner's written consent. Any such assignment shall be in a form acceptable to the Owner. If the Contractor attempts to make such an assignment without such consent from the Owner, the Contractor shall nevertheless remain legally responsible for all obligations under its agreement with the Owner.

H. Progress payments and all other payments shall be made in accordance with Section 106 (b) of the General Municipal Law.

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I. At the same time the Contractor submits its insurance certificate to the Owner and the Construction Manager, it shall also submit to the Construction Manager the labor rates of each category of labor for which it and/or its subcontractors shall employ (either directly or indirectly). This information shall be itemized in the format shown below:

Contractor's Name					
Contractor's Address					
Contractor's Office Phone No.					
Contractor's Fax No.					
Contractor's Email Address					
Labor Rate Breakdown					
Worker's Title		**Journeyman**	**1.5 Rate**	**Foreman**	**1.5 Rate**
Base Hourly Rate					
Payroll Tax & Insurance:	% Per Hr.				
FICA					
Federal Unemployment					
State					
Workers Compensation					
Disability					
Other (Explanation Required)					
Subtotal					
Benefits:	$ Per Hr.				
Vacation					
Health & Welfare					
Pension					
Annuity					
401(k) Fund					
Other (Explanation Required)					
Other (Explanation Required)					
Subtotal					
Hourly Labor Rate					

ARTICLE 10
INSURANCE REQUIREMENTS

A. The Contractor, at its sole cost and expense, shall provide the Owner with the following insurance coverage whether the operations to be covered thereby are through the Contractor or by a Subcontractor or by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable:

1. **Workers' Compensation and New York State Disability Insurance**
Statutory Workers Compensation (C-105.2 or U-26.3) and New York State Disability Insurance (DB-120.1) for all employees. Proof of coverage must be on the approved specific form as required by the New York State Workers' Compensation Board. ACORD certificates are not acceptable. A person seeking an exemption must file a CE-200 Form with the state.

Extensions	Voluntary compensation
	All states coverage employers
	Employer's liability - unlimited

2. **Commercial General Liability Insurance**
$1,000,000 per Occurrence
$2,000,000 General Aggregate on per project basis
$2,000,000 Products and Completed Operations
$1,000,000 Personal & Advertising Injury
$100,000 Fire Damage (any one fire)
$10,000.00 Medical Expenses (any one person)

3. **Owners Contractors Protective (OCP) Insurance**
$2,000,000 per occurrence, $4,000,000 aggregate with the Owner as the Named Insured and there will be no additional insureds on OCP policies.

4. **Automobile Liability**
$1,000,000.00 combined single limit per accident for all vehicles (owned, hired, borrowed or non-owned)

5. **Umbrella/Excess Insurance**
Coverage in all instances shall be on a follow-form basis or provide broader coverage than the general liability insurance and the automobile liability insurance. The insurance coverage shall apply on a per project basis.

Amount of Prime Contract	**Amount of Umbrella/Excess Insurance**
less than or equal to $5,000,000	$5,000,000
$5,000,0001 to $6,000,000	$6,000,000
$6,000,0001 to $7,000,000	$7,000,000
$7,000,0001 to $8,000,000	$8,000,000

Amount of Prime Contract	Amount of Umbrella/Excess Insurance
$8,000,0001 to $9,000,000	$9,000,000
Greater than or equal to $9,000,001	$10,000,000

6. **Testing Company Errors and Omission Insurance**
$1,000,000 per occurrence/$2,000,000 aggregate for the testing and other professional acts of the Contractor performed under the contract with the Owner. If written on a "claims-made" basis, the retroactive date must pre-date the inception of the contract or agreement. Coverage shall remain in effect for two years following the completion of the work. The testing company shall also provide proof of Workers' Compensation and NY State Disability Benefits Insurance, Commercial General Liability and Excess Liability with limits of $2,000,000 each occurrence and in the aggregate on a per project basis.

7. **Additional Insurance when the project requires the removal of asbestos, lead and/or other hazardous materials**

Asbestos/Lead Abatement/Pollution Liability Insurance
$2,000,000 per occurrence/$2,000,000 aggregate on a per project basis, including products and completed operations. Such insurance shall include coverage for the Contractor's operations including, but not limited to, removal, replacement enclosure, encapsulation and/or disposal of asbestos or any other hazardous material, along with any related pollution events, including coverage for third-party liability claims for bodily injury, property damage and clean-up costs. If a retroactive date is used, it shall pre-date the inception of the Contract. If the Contractor is using motor vehicles for transporting hazardous materials, the Contractor shall obtain and maintain pollution liability broadened coverage (ISO endorsement CA 9948 or CA 0112) as well as proof of MCS 90. Coverage shall fulfill all requirements of this Article 10 and shall extend for a period of three (3) years following acceptance by the Owner of the Certificate of Completion.

B. The coverages required pursuant to paragraph A of this Article 10 shall be maintained without interruption from the date of commencement of the Work until the date of final payment and termination of any coverage required to be maintained after final payment.

C. The insurance required to be procured by the Contractor pursuant to paragraph A of this Article 10 shall be purchased from and maintained by insurance carriers licensed to do business and admitted to issue the type of insurance provided in the State of New York, with an A.M. Best rating of "A-" or better.

D. The Contractor must submit the Certificate of Insurance to the Architect or Construction Manager for the Owner's approval prior to the commencement of any work. The failure of the Owner to object to the contents of a certificate of insurance or the absence of same shall not be deemed a waiver of any rights held by the Owner.

E. All insurance coverage to be provided by the Contractor pursuant to paragraph A of this Article 10 shall include a cancellation notice to the Owner of at least thirty days.

F. The Contractor agrees to effectuate the naming of the Owner, the Construction Manager and the Architect as additional insureds on the polices providing the insurance coverage described in paragraph A of this Article 10, except for Workers' Compensation and New York State Disability Insurance. Additionally, the insurance coverage to be provided by the Contractor pursuant to paragraph A of this Article 10 shall state that the Contractor's coverage shall be the primary and non-contributory coverage for the Owner and the Owner's Board of Education, employees and volunteers including a waiver of subrogation in favor of the Owner for all coverages including Workers' Compensation.

G. Additional insured status for General Liability coverage shall be provided by standard or other endorsements that extend coverage to the Owner for on-going operations (CG 20 38 or equivalent) and products and completed operations (CG 20 37 or equivalent). A completed copy of the additional insured endorsements must be attached to the Certificate(s) of Insurance that include General Liability, Auto Liability and Umbrella/Excess coverages together with a copy of the declaration page of the General Liability, Auto Liability and Umbrella/Excess policies with a list of endorsements and forms.

H. Each Certificate of Insurance must describe the services provided by the Contractor (e.g., roofing, carpentry, plumbing) that are covered by the liability policies.

I. At the Owner's request, the Contractor shall provide a copy of the policy endorsements and forms for the policies listed in paragraph A of this Article 10.

J. There will be no coverage restrictions and/or exclusions involving the New York State Labor Law or gravity related injuries. No policies containing escape clauses or exclusions contrary to the Owner's interest will be accepted.

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

L. In the event that any of the insurance coverage to be provided by the Contractor to the Owner contains a deductible or self-insured retention, or the insurance provided by the Owner contains a deductible, the Contractor shall indemnify and hold the Owner, the Architect and the Construction Manager harmless from the payment of such deductible or self-insured retention, which deductible and self-insured retention shall in all circumstances remain the sole obligation and expense of the Contractor.

M. The Contractor acknowledges that its failure to obtain or keep current the insurance coverage required by paragraph A of this Article 10 shall constitute a material breach of contract and subjects the Contractor to liability for damages, including but not limited to

direct, indirect, consequential, special and such other damages the Owner sustains as a result of such breach. In addition, the Contractor shall be responsible for the indemnification to the Owner, Architect and Construction Manager, of any and all costs associated with such lapse in coverage, including but not limited to reasonable attorney's fees.

N. The Contractor shall require all subcontractors to obtain and maintain the same types of insurance with the same limits of coverage and same additional insureds as set forth in paragraph A of this Article 10 and the subcontractors policies must comply with all the requirements set forth in this Article 10. Contractor shall confirm each subcontractors compliance with the insurance requirements of this Article 10 and collect proof of each subcontractor's insurance prior to the start of any work by the subcontractor. In the event a subcontractor fails to obtain the required insurance and a claim is made or suffered, the Contractor shall indemnify, defend, and hold harmless the Owner, Architect, Engineers, Construction Manager, Consultants, and Sub-consultants and their agents or employees from any and all claims for which the required insurance would have provided coverage. This indemnity obligation is in addition to any other indemnity obligation provided in the Contract Documents.

O. The Contractor assumes responsibility for all injury or destruction of the Contractor's materials, tools, machinery, equipment, appliances, shoring, scaffolding, false and form work, and personal property of Contractor's employees from whatever cause arises. Any policy of insurance secured covering such items that the Contractor or Subcontractors leased or hired and any policy of insurance covering the Contractor or Subcontractors against physical loss or damage to such property shall include an endorsement waiving the right of subrogation against the Owner for any loss or damage to such property.

P. The Owner in good faith may adjust and settle a loss with the Contractor's insurance carrier.

Q. Before commencement of its work, the Contractor shall obtain and pay for such insurance as may be required to comply with the indemnification and hold harmless provisions outlined under Article 12 of these General Conditions of the Contract for Construction.

R. Review and acknowledgment of the Certificate of Insurance by the Owner, Construction Manager or the Architect shall not relieve or decrease the liability of the Contractor hereunder.

S. If the terms of policies expire, or the lives of the insurance companies terminate, before the Contract is completed or during the period of completed operations coverage, and the Contractor fails to maintain continuance of such insurance, the Owner is entitled to provide protection for itself, to pay premiums, and to charge the cost to the Contractor.

ARTICLE 11
REQUIRED BONDS FOR THE PROJECT

A. The Contractor shall furnish a Performance Bond and Labor and Material Payment Bond meeting all statutory requirements of the State of New York.

B. All Surety companies are subject to the approval of the Owner and may be rejected by the Owner without cause.

C. Except as otherwise required by statute, the form and substance of such bonds shall be satisfactory to the Owner in the Owner's sole judgment.

D. Bonds shall be executed by a responsible surety licensed to do business in New York with an A.M. Best Rating of "A-" or better as to Policy Holder Ratings, and "VII" or better as to "Financial Size Category." Such bonds shall remain in effect for a period not less than two (2) years following final completion of the work by the Contractor.

E. Bonds shall further be executed by a surety that is currently listed on the U.S. Treasury Department Circular 570 entitled "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies," as amended.

F. The Performance Bond and the Labor and Material Payment Bond shall each be in an amount equal to 100% of the Contract Sum. The value of each bond shall be adjusted during the Project construction period to reflect changes in the Contract Sum.

G. Every Bond must display the Surety's Bond Number.

H. Each bond must be accompanied by an original Power of Attorney, giving the names of Attorneys-in-fact, and the extent of their bonding capacity.

I. A rider including the following provisions shall be attached to each Bond:

1. Surety hereby agrees that it consents to and waives notice of any addition, alteration, omission, change, or other modification of the Contract Documents. Such addition, alteration, change, extension of time, or other modification of the Contract Documents, or a forbearance on the part of either the Owner or the Contractor to the other, shall not release the Surety of its obligations hereunder and notice to the Surety of such matters is hereby waived.

2. Surety further agrees that in event of any default by the Owner in the performance of the Owner's obligations to the Contractor under the Contract, the Contractor or Surety shall cause written notice of such default (specifying

said default in detail) to be given to the Owner, and the Owner shall have thirty (30) days from time after receipt of such notice within which to cure such default, or such additional reasonable period of time as may be required if the nature of such default is such that it cannot be cured within thirty (30) days. Such Notice of Default shall be sent by certified or registered U.S. Mail, return receipt requested, first class postage prepaid, to Lender and the Owner.

J. The Contractor shall deliver the required bonds to the Owner prior to beginning construction activity at the site, but no later than 10 days of issue date of Notice of Award of Contract. Said bonds shall be in the form set forth in the Project Manual. No work shall be performed by the Contractor until such bonds have been reviewed and approved.

K. The Owner may, in the Owner's sole discretion and without prior notice to the Contractor, inform surety of the progress of the Contractor's work and obtain consents as necessary to protect the Owner's rights, interest, privileges and benefits under and pursuant to any bond issued in connection with the Contractor's work.

L. If the surety on any Bond furnished by Contractor is declared a bankrupt or becomes insolvent or its right to do business is terminated in any state where any part of the Project is located or it ceases to meet the requirements of this Article, the Contractor shall within ten (10) days thereafter substitute another Performance and Payment Bond and surety, both of which must be acceptable to the Owner.

ARTICLE 12
INDEMNIFICATION

A. The Contractor and its subcontractors shall indemnify and hold harmless the Owner, Architect, and Construction Manager, and all their employees, agents or servants or any third parties from and against any and all claims, damages, losses, suits, obligations, fines, penalties, costs, charges and expenses, including but not limited to attorneys' fees, which may be imposed upon or incurred by or asserted against any of them by reason of any act or omission of such Contractor or any of its subcontractors or any person or firm directly or indirectly employed by such Contractor, for the act(s) and/or omission(s) of any Contractor or Subcontractor in connection with the work of the Project.

B. To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, Architect, Architect's consultants, Construction Manager and agents and employees of any of them from and against claims, damages, losses and expenses including but not limited to attorneys' fees, arising out of or resulting from performance of its work, provided that such claim, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction, of tangible property including loss of use resulting therefrom, but only to the extent caused in whole or in part by negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed

by them or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity which would otherwise exist as to a party or person described in this Paragraph

B. The Contractor's indemnity obligations under this Paragraph B shall, but not by way of limitation, specifically include all claims and judgments which may be made against the Owner, the Architect, the Architect's consultants and agents and employees of any of them under any applicable statute, rule or regulation including the New York Statute, Occupational Safety and Hazardous Act, and the Federal Occupational Safety and Hazardous Act. In claims against any person or entity indemnified under this Paragraph B by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, the indemnification obligation under this Paragraph B shall not be limited by a limitation on amount or type of damages, compensation or benefits payable by or for the Contractor or a Subcontractor under workers' or workmen's compensation acts, disability benefit acts or other employee benefit acts.

C. The Contractor shall be liable for and shall indemnify and hold harmless (1) the Owner, its consultants, employees, officers and agents, (2) the Architect and its consultants, employees, officers and agents, and (3) the Construction Manager, its consultants, employees, officers and agents, against any fines, penalties, judgments, or damages, including reasonable attorney's fees, imposed on or incurred by the parties indemnified hereunder which are incurred as a result of the Contractor's failure to give the notices of these General Conditions of the Contract for Construction.

D. The Contractor shall indemnify and hold harmless (1) the Owner, its consultants, employees, officers and agents, (2) the Architect and its consultants, employees, officers and agents, and (3) the Construction Manager, its consultants, employees, officers and agents, against any actions, lawsuits or proceedings or claims of liens brought against each or any of them as a result of liens filed against the Contractor's project funds, including all the cost and expense of said liens, and including but not limited to attorneys' fees incurred by each or any of them.

E. The Contractor shall indemnify and hold harmless the Owner, the Architect and the Construction Manager of and from any and all liability for violation of any laws and regulations applicable to the Contractor's work and shall defend any claims or actions which may be brought against the Owner as the result thereof. In the event that the Contractor shall fail to refuse to defend any such action, the Contractor shall be liable to the Owner for all costs of the Owner in defending such claim or action and all costs of the Owner, including attorney's fees, in recovering such defense costs from the Contractor.

F. The Contractor shall indemnify and hold harmless the Owner and the Architect of and from any and all liability for claims made by third parties, including subcontractors, in connection with this Agreement and shall defend any claims or actions which may be

brought against the Owner as the result thereof. In the event that the Contractor shall fail to refuse to defend any such action, the Contractor shall be liable to the Owner for all costs of the Owner in defending such claim or action and all costs of the Owner, including attorney's fees, in recovering such defense costs from the Contractor.

ARTICLE 13
TIME FOR COMPLETION OF WORK

A. The date of commencement of the Contractor's work shall be as indicated in the agreement between the Contractor and the Owner. The date shall not be postponed or extended by the failure to act of the Contractor or of persons or entities for whom the Contractor is responsible to act. Time limits stated in the agreement between the Owner and the Contractor are of the essence of the Contract. By executing the Agreement, the Contractor confirms that the Contract Time is a reasonable period for performing the Work.

B. The Contractor shall not commence work on the site until two certified copies of all insurance policies and bonds required by Article 10 and Article 11 of these General Conditions of the Contract for Construction are provided to the Owner and accepted by the Owner. The date of commencement and/or completion of the Contractor's work shall not be changed by the effective date of such insurance. The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, prematurely commence operations on the site or elsewhere prior to the acceptance of the insurance and bonds required by Article 10 and Article 11 of these General Conditions.

C. The Contractor shall proceed expeditiously with adequate forces and shall achieve substantial completion of its contract in accordance with the schedule set forth in its agreement. The Contractor shall cooperate with the Owner, Architect, Construction Manager, and other Contractors on the Project, making every reasonable effort to reduce the contract time.

D. 1. In the event the Owner determines that the performance of the Contractor's work, as of a milestone date, has not progressed or reached the level of completion required by its contract, the Owner shall have the right to order the Contractor to take corrective measures necessary to expedite the progress of construction, including, without limitation, (1) working additional shifts or overtime, (2) supplying additional manpower, equipment, and facilities and (3) other similar measures (hereinafter referred to collectively as "Extraordinary Measures"). Such Extraordinary Measures shall continue until the Contractor progresses its work in compliance with the stage of completion required by its agreement with the Owner. The Owner's right to require Extraordinary Measures is solely for the purpose of ensuring the Contractor's compliance with the construction schedule.

2. The Contractor shall not be entitled to an adjustment in its contract sum in connection with Extraordinary Measures ordered by the Owner under or pursuant to this Paragraph D.

3. The Owner may exercise the rights furnished the Owner under or pursuant to this Paragraph D as frequently as the Owner deems necessary to ensure that the Contractor's performance of its work will comply with any Milestone Date or completion date set forth in the Contractor's agreement with it.

4. The Owner reserves the right to withhold payment from the Contractor until such time as the Contractor submits a daily schedule showing work to be again on schedule with the Construction Schedule and/or until its work is being installed according to the project construction schedule, without additional cost to the Owner.

E. The Contractor shall achieve substantial completion of its work in accordance with the schedule for the work set forth in the project manual included as part of its agreement with the Owner. Milestone Dates are dates critical to the Owner's operations that establish when a part of the work is to commence or be complete. All Milestone Dates are of the essence and shall have the same meaning as Substantial Completion for the purpose of Liquidated Damages in this Article 13.

F. Substantial completion shall be achieved by the Contractor when the Contractor has completed ninety eight (98%) of its work. Work remaining to be completed after substantial completion shall be limited to items which can ordinarily be completed within the period between the payment at the time of substantial completion and final payment.

G. 1. This project is to be physically completed in accordance with the time limits set forth in the agreement between the Owner and Contractor and as further set forth in the project manual and/or bidding documents. Liquidated damages will be assessed in the amount of $1,000.00 for each and every calendar day after such time allowed for completion.

2. Contractor realizes that time is of the essence on this Contract and the completion date and milestone date for each work item in its agreement, a Milestone Date reflected on the project schedule, or the date of substantial completion of the Contractor's work shall be no later than the date indicated therein. In the event the Contractor fails to complete any work or substantially complete the work under this contract by said schedule date, the sum per calendar day for each date not met, as delineated above, will be subtracted from the payment due the Contractor (or, if the amount due Contractor as payment is insufficient, any deficiency shall be paid by the Contractor to the Owner), except in cases where the Contractor has applied for and been granted an extension of time in accordance with the provisions of this Article 13.

3. The said sum per calendar day shall constitute the Liquidated Damages incurred by the Owner for each day of delay beyond the agreed upon dates of Substantial Completion. Such Liquidated Damages shall be in addition to any other damages (other than by reason of delay) Owner may incur as a result of Contractor's breach of Contract. In

the event that substantial completion of its work is not achieved in accordance with the project schedule, inspections will be performed once each week unless the Owner or the Architect determines, at their sole discretion, that additional inspections are not needed. All costs incurred by the Owner, Owner's Representative and the cost of additional inspections, at the rate of One Thousand Dollars ($1,000) per inspection, will be subtracted from payment due the Contractor. If the amount due the Contractor for payment is insufficient, any deficiency shall be paid by the Contractor to the Owner.

H. 1. Within five (5) calendar days from the occurrence of same, the Contractor must apply in writing to the Owner, its Architect or Construction Manager for an extension of time to complete its work where it has been delayed as a result of: unforeseeable causes beyond the control and without the fault or negligence of the contractor, including acts of God, acts of the public enemy, acts of the federal or state government in either their sovereign or contractual capacities, fires, floods, epidemics, quarantine restrictions, priority or allocation orders duly issued by the federal government; freight embargoes; changes in the work to be performed by the Contractor. The Contractor may not apply for an extension of time for delays in acquisitions of materials other than by reason of freight embargoes. All other delays of the project, including but not limited to, Architect review and/or approval of shop drawings and/or submittals, requests for information, clarifications, samples, and change orders; Owner schedule; Architect certification of payment; payment by Owner of Contractor's Application for Payment; coordination amongst Contractors; unavailability of materials and/or equipment; surveying/testing; closeout, etc. are deemed to be foreseeable and, therefore shall not form the basis for a claim for an extension of time by the Contractor.

2. All claims for additional time shall be supported by documentation which demonstrates to the Architect and Construction Manager's satisfaction that the Critical path of the Work has been significantly altered by the delays to the activities in question, and that the schedule cannot be maintained by re-ordering other activities within the project at no cost. Upon receipt of the Contractor's request for an extension of time, the Owner will ascertain the facts and extent of the delay, and may, in its sole discretion, extend the time for completion of the Contractor's work when in its judgment such an extension is justified. The Owner's determination will be final and binding in any litigation commenced by the Contractor against the Owner which arises out of the Owner's denial of an extension of time to the Contractor. Any approval of an extension of the Contractor's time to complete its work shall be memorialized by written change order, signed by the Owner, Contractor, Architect and Construction Manager. Where the Owner determines that the Contractor will be granted an extension of time, such extension shall be computed in accordance with the following:

> For each day of delay in the completion of its work, the Contractor shall be allowed one day of additional time to complete its contract. The Contractor shall not be entitled to receive a separate extension of time for each one of several

causes of delay operating concurrently; only the actual period of delay as determined by the Owner or its Architect may be allowed.

3. Notwithstanding anything to the contrary in the Contract Documents, an extension in the contract time, to the extent permitted under subparagraph H of this Article 13, shall be the sole remedy of the Contractor for any (1) delay in the commencement, prosecution, or completion of the Work; (2) hindrance or obstruction in the performance of the Work; (3) loss of productivity or acceleration; or (4) other similar claims (collective referred to herein as "delay(s)"), unless a delay is caused by the Owner's active interference with the Contractor's performance of the Work, and only to the extent such acts continue after the Contractor furnishes the Owner with three (3) days' written notice of such interference. In no event shall the Contractor be entitled to any compensation or recovery of any damages in connection with any Delay, including, but not limited to, consequential damages, lost opportunity costs, impact damages, or other similar remuneration. The Owner's exercise of any of its rights or remedies under the Contract Documents (including, but not limited to, ordering changes in the Work, or directing suspension, rescheduling or correction of the Work), regardless of the extent or frequency of the Owner's exercise of such rights or remedies, shall not be construed as active interference with the Contractor's performance of the Work.

ARTICLE 14
DEFICIENT AND INCOMPLETE WORK

A. The Architect will have the authority to reject work performed by the Contractor which does not conform to the requirements of the drawings and/or specifications.

B. The Architect shall have the authority to require additional inspection or testing of the Contractor's work whether or not such work is fabricated, installed or completed. However, neither this authority of the Architect nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect to the Contractor, Subcontractors, material and equipment suppliers, their agents or employees, or other persons performing portions of the work to have performed additional inspection or testing of the work.

C. 1. If a portion of the Contractor's work is covered contrary to the Architect's request or to requirements specifically expressed in the drawings and/or specifications, upon request by the Architect or the Construction Manager, the Contractor shall uncover such work for the Architect's or any governmental authority's observation and be replaced at the Contractor's sole expense without change in the Contract Time or Contract Sum.

2. If a portion of the Contractor's work has been covered which the Architect or any governmental authority has not specifically requested to observe prior to its being covered, the Architect or any governmental authority may request to see such work and it shall be

uncovered by the Contractor. If such work is in accordance with the drawings and/or specifications, costs of uncovering and replacement shall, by appropriate Change Order, be charged to the Owner. If such Work is not in accordance with the Contract Documents, the Contractor, at its sole cost and expense, shall uncover and replace such work.

D. The Contractor shall promptly correct work rejected by the Architect or failing to conform to the requirements of its contract with the Owner, whether observed before or after Substantial Completion and whether or not fabricated, installed or completed. The Contractor shall bear the all costs of correcting such rejected work, including but not limited to the cost of said additional testing and/or inspection, the cost of the Architect's services incurred in conjunction with such additional testing, and any cost, loss or damages to the Owner resulting from such actions. If prior to the date of Substantial Completion, the Contractor, a Sub-contractor or anyone for whom either is responsible uses or damages any portion of the Work or premises, including, without limitation, mechanical, electrical, plumbing and other building systems, machinery, equipment or other mechanical device, the Contractor shall cause such item to be restored to "like new" condition at no expense to the Owner.

E. If the Contractor (1) fails to correct work which is not in accordance with the requirements of its agreement with the Owner, or (2) fails to carry out its work in accordance with the requirements of its agreement with the Owner, or (3) fails or refuses to provide a sufficient amount of properly supervised and coordinated labor, materials, or equipment so as to be able to complete the work within the contract time, or (4) fails to remove and discharge (within ten (10) days) any lien filed upon Owner's property by anyone claiming by, through, or under the Contractor, or (5) disregards the instructions of the Architect, Owner or Construction Manager, the Construction Manager, on behalf of the Owner may order the Contractor to stop its work, or any portion thereof, until the cause for such order has been eliminated; however, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity. This right shall be in addition to, and not in restriction of, other rights the Owner may have pursuant to these General Conditions or at law.

F. 1. If the Contractor defaults or neglects to carry out its work in accordance with its agreement with the Owner and fails within a three (3) day period after receipt of written notice from the Construction Manager to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to other remedies the Owner may have, correct such deficiencies. In such case, an appropriate Change Order shall be issued deducting from payments then or thereafter due the Contractor the cost of correcting such deficiencies, including compensation for the Architect, the Construction Manager and the Owner and such other consultants whose participation is deemed necessary by the Architect, for additional services and expenses made necessary by such default, neglect or failure. Such action by the Construction Manager, including the amounts to be charged to the Contractor as a result of such action

are subject to the prior approval of the Architect. If payments then or thereafter due the Contractor are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner.

2. Where the Contractor's default and/or neglect to carry out its work in accordance with its agreement with the Owner threatens the health, safety and/or welfare of the occupants of the school district's facilities and/or threatens the structural integrity and/or preservation of the school district's facilities, the Owner may proceed to carry out the Contractor's work upon twenty-four (24) hours notice of its intention to do so to the Contractor.

G. If the Owner prefers to accept work which is not in accordance with the terms and conditions of the agreement between the Owner and the Contractor, the Owner may, in its discretion, accept such work and reduce the Contractor's contract sum accordingly.

ARTICLE 15
FINAL COMPLETION AND CLOSEOUT OF THE PROJECT

A. 1. When advised by the Construction Manager that the Contractor's work is near substantial completion, the Architect shall visit the site to determine whether the Contractor's work is substantially complete. If the Architect's observations of the Contractor's work discloses any item which has not been performed in accordance with the requirements of the drawings and/or specifications and/or which has not been completed to the point indicated in Article 13 paragraph F of these General Conditions, the Contractor shall complete or correct such items upon receipt of notification from the Architect that a deficiency exists. The Architect shall not issue a certificate of substantial completion for the work of the Contractor until the work has been completed in accordance with Article 13(F). Upon completion of the work outlined by the Architect to it in accordance with this paragraph A, the Contractor shall advise the Architect of the need for an inspection of the work. If the Architect is required to inspect the Contractor's work more than twice, the Contractor shall be liable to the Owner for the services performed by the Architect as a result of additional inspections.

2. Upon determining that the Contractor's work has progressed to the point of Substantial Completion, the Architect shall prepare a punch list of the Contractor's work which shall include only minor items of work remaining to be performed by the Contractor to bring its work into compliance with the requirements of the drawings and/or specifications. The Contractor shall proceed promptly to complete and correct items on the punch list issued by the Architect and shall complete said items within thirty (30) days of its receipt of the punch list from the Architect. At the time of substantial completion, the Owner shall retain 200 percent of the value of the punch list items from the Contractor's remaining contract sum. The value of said remaining work shall be determined by the Architect. Upon completion of the work reflected in the final punch list, the Owner shall release the monies withheld pursuant to this paragraph to the Contractor.

3. The Architect's failure to include an item of deficiency on the punch list issued to the Contractor shall not relieve the contractor of its responsibility to perform its work in accordance with the drawings and/or specifications.

B. 1. If within two (2) years after the date of Substantial Completion of the Contractor's work or designated portion thereof, or after the date for commencement of warranties established pursuant to these General Conditions, or by terms of in applicable special warranty required by the agreement between the Owner and the Contractor, any of the Work is found to be not in accordance with the requirements of said agreement, the Contractor shall correct it promptly after receipt of written notice from the Owner to do so unless the Owner has previously given the Contractor a written acceptance of such condition. This period of two (2) years shall be extended with respect to portions of the Contractor's work first performed after Substantial Completion by the period of time between Substantial Completion and the actual performance of such work. The obligation set forth hereunder shall survive acceptance by the Owner of the Contractor's and/or termination of the Contractor's agreement with the Owner. The Owner shall give such notice within a reasonable period of time after discovery of the condition.

2. The Contractor shall, within a reasonable time after receipt of written notice thereof, but in no event no later than seventy-two (72) hours after receipt of such notice, commence to correct, repair, and make good any defects in its work.

3. The obligations of the Contractor pursuant to this paragraph shall cover any repairs to or replacement of work affected by the defective work.

4. In the case of any work performed in correcting defects pursuant to this paragraph, the guarantee periods specified herein shall begin anew from the date of acceptance by the Owner of such work.

C. Upon receipt of written notice from the Construction Manager that the Contractor's work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Architect will promptly make such inspection. When the Architect finds the Contractor's work acceptable pursuant to the terms and conditions of its agreement with the Owner and the Contract fully performed and upon receipt of the closeout documentation required by the Contract Documents and elsewhere in the agreement between the Owner and the Contractor, the Architect will certify to the Owner that the Contractor is entitled to final payment on the project.

D. 1. Prior to receipt of final payment from the Owner, the Contractor shall provide to the Architect the close out documentation required by the Contract Documents.

2. The Contractor shall schedule a close out meeting with the Architect and the Construction Manager for the purpose of delivering the close out documents required

pursuant to the Contract Documents and elsewhere in the agreement between the Owner and the Contractor.

E. If the Contractor's work is not accepted by the Owner after final inspection and additional time is required to complete items identified during the final inspection, the date starting the warranty periods described in the Contract Documents shall be set by the Architect at his discretion.

F. If the Architect is required to perform more than one final inspection because the Contractor's work fails to comply with the requirements of the contract, the amount of compensation paid to the Architect by the Owner for additional services shall be deducted from the final payment to the Contractor.

G. Acceptance of final payment by the Contractor, a Subcontractor or material supplier shall constitute a waiver of claims by that payee except those claims previously made in writing in accordance with the terms of Article 18 hereof and identified by that payee as unsettled at the time of final Application for Payment.

H. Contractor shall submit all documentation identified in this section within ninety (90) days from the date of Substantial Completion. If the documentation has not been submitted, the Owner will obtain same through whatever means necessary. The Contractor shall solely be responsible for all expenses incurred by the Owner in securing such documentation.

ARTICLE 16
RELEVANT STATUTORY PROVISIONS

A. The Contractor shall at all times observe and comply with all Federal and State Laws and all Laws, Ordinances and Regulations of the Owner, in any manner affecting the work and all such orders decreed as exist at present and those which may be enacted later, by bodies or tribunals having jurisdiction or authority over the work, and the Contractor shall indemnify and save harmless the Owner and all his officers, agents, or servants against any claim or liability arising from, or based on, a violation of any such law, ordinances, regulation, order or decree, whether by himself or by his employee or agents.

B. The Contractor and each of its subcontractors shall comply with Prevailing Wage Rates as issued by the State of New York Department of Labor for the location and duration of this Project and shall comply with all requirements governing its payments to its employees as set forth in Labor Law, section 220 et seq of the New York State Labor Law, as amended.

C. The Contractor and each of its subcontractors shall post a notice at the beginning of the performance of every public work contract on each job site that includes the telephone

number and addresses for the Department of Labor and a statement informing laborers, workers or mechanics of their right to contact the Department of Labor if he/she is not receiving the proper prevailing rate of wages and/or supplements for his/her particular job classification.

D. The Contractor specifically agrees, as required by Labor Law, Sections 220 and 220-d, as amended, that:

1. No laborer, workman or mechanic in the employ of the Contractor, subcontractor or other person doing or contracting to do the whole or any part of the work contemplated by the 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.

2. The wages paid for a legal day's work shall not be less than the prevailing rate of wages as defined by law.

3. The minimum hourly rate of wages to be paid shall not be less than that stated in the Project Manual, and any re-determination of the prevailing rate of wages after the Contract is approved shall be deemed to be incorporated herein by reference as of the effective date of re-determination and shall form a part of this Contract. The Labor Law provides that the Contract may be forfeited and no sum paid for any work done thereunder on a second conviction for willfully paying less than:

a. The stipulated wage scale as provided in Labor Law, Section 220, Sub division 3, as amended; or

b. The stipulated minimum hourly wage scale as provided in Labor Law, Section 220-d, as amended.

E. The Contractor acknowledges that its work is governed by the provisions of Section 101 of the General Municipal Law of the State of New York.

F. The Contractor specifically agrees, as required by the provisions of the Labor Law of New York, Section 220-E, as amended that:

1. In the hiring of employees for the performance of this contract or any sub-contractor hereunder, no contractor, sub-contractor, nor any person acting on behalf of such contractor or sub-contractor 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.

2. No contractor, sub-contractor, 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, color, creed, sex or national origin.

3. There may be deducted from the amount payable to the Contractor a penalty of fifty 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.

4. This Contract may be canceled or terminated by the Owner and all monies 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.

The aforesaid provisions of this section covering every Contract for or on behalf of the Owner, the State or a municipality 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.

G. The successful Contractor shall conform to the guidelines spelled out in the County's Affirmative Action Program, if any.

H. The Contractor shall comply with all of the provisions of the Immigration Reform and Control Act of 1986 and regulations promulgated pursuant thereto and shall require its subcontractors to comply with same. The Contractor shall and does hereby agree to fully indemnify, protect, defend, and hold harmless the Owner, Owner's agents and employees from and against any penalties, fees, costs, liabilities, suits, claims, or expenses of any kind or nature, including reasonable attorney's fees, arising out of or resulting from any violation or alleged violation of the provisions of said laws in connection with the work performed hereunder.

I. This Contract shall be void if the Contractor fails to install, maintain, and effectively operate appliances and methods for the elimination of harmful dust when a harmful dust shall have been identified in accordance with Section 222-a of the Labor Law of the State of New York.

J. The Contractor shall insure that absolutely no asbestos containing material is used in conjunction with the performance of its work. The Contractor bears the sole responsibility to provide assurances that no asbestos containing material is built into the construction, or that any equipment used in the construction contains any asbestos containing material. If asbestos containing material is found, at any time during or after the construction is completed, it shall be the responsibility of the Contractor who installed said material to remove it and replace it with new non-asbestos containing material, as per federal, state and local mandates.

K. Large and small asbestos abatement projects as defined by 12 N.Y.C.R.R. 56 shall not be performed while the building is occupied. As referenced in this section, the term "building" shall mean a wing or major section of a building that can be completely isolated from the rest of the building with sealed non-combustible construction. The isolated portion of the building must contain exits that do not pass through the occupied portion, and ventilation systems must be physically separated and sealed at the isolation barrier. Exterior work such as roofing, flashing, siding or soffit work may be performed on occupied buildings provided proper variances are in place as required, and complete isolation of ventilation systems and windows is provided. Work must be scheduled so that classes are not disrupted by noise or visual distraction.

L Surfaces that will be disturbed by reconstruction must have a determination made as to the presence of lead. Projects which disturb surfaces that contain lead shall have in the specifications a plan prepared by a certified Lead Risk Assessor or Supervisor which details provisions for occupant protection, worksite preparation, work methods, cleaning and clearance testing which are in general accordance with the HUD Guidelines.

M. No smoking is allowed anywhere on school property per New York State and County law. Violators are subject to a $1,000 fine and/or banishment from the property.

N. Applicable codes and standards for material furnished and work installed shall include all state laws, local ordinances, requirements of governmental agencies having jurisdiction, and applicable requirements of following codes and standards, including but not limited to:

1. New York State Uniform Fire Prevention and Building Code, and amendments thereto.

2. New York State Energy Conservation Construction Code.

3. State Education Department Manual of Planning Standards.

4. New York State Department of Transportation, Office of Engineering, Standard Specification, Construction and Materials, latest edition.

5. Life Safety Code - NFPA.

O. Wherever in the specifications reference is made to ANSI or ASTM Standards, Federal Specifications, Consumer Product Standards, or similar recognized standards, the latest edition of the respective publishing agency in effect at the date of "Bid Issuance" shall be accepted as establishing the technical requirements for which compliance is required.

P. The Owner shall be entitled to request of Contractor or its successor in interest adequate assurance of future performance in accordance with the terms and conditions of its agreement in the event (1) an order for relief is entered on behalf of the Contractor pursuant to Title 11 of the United States Code, (2) any other similar order is entered under any other debtor relief laws, (3) the Contractor makes a general assignment for the benefit of its creditors, (4) a receiver is appointed for the benefit of its creditors, or (5) a receiver is appointed on account of its insolvency. Failure to comply with such request within ten (10) days of delivery of the request shall entitle the Owner to terminate the Contract in accordance with Article 17 hereof. In all events, pending receipt of adequate assurance of performance and actual performance in accordance therewith, the Owner shall be entitled to proceed with the Contractor's work with its own forces or with other contractors on a time and material or other appropriate basis, the cost of which will be back charged against the Contractor.

Q. The Contractor shall maintain policies of employment as follows:

1. The Contractor and the Contractor's Subcontractors shall not discriminate against any employee or applicant for employment because of race, religion, color, sex or national origin. The Contractor shall take affirmative action to insure that applicants are employed, and that employees are treated during employment without regard to their race, religion, color, sex or national origin. Such action shall include, but not be limited to, the following: employment, upgrading, demotion or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices setting forth the policies of non-discrimination.

2. The Contractor and the Contractor's Subcontractors shall, in all solicitations or advertisements for employees placed by them or on their behalf, state that all qualified applicants will receive consideration for employment without regard to race, religion, color, sex or national origin.

ARTICLE 17
TERMINATION OR SUSPENSION

A. 1. The Owner may terminate the Contractor's agreement in the event the Contractor:

a. refuses or fails to supply sufficient skilled workers or suitable materials or equipment to complete the Work in a diligent, efficient, timely, workmanlike, skillful, and careful manner;

b. refuses or fails to correct deficient work performed by it;

c. fails to make prompt payments to subcontractors for labor, materials, and/or equipment in accordance with the respective agreements between the Contractor and the Subcontractors;

d. disregards laws, ordinances, rules, regulations, or orders of a public authority having jurisdiction;

e. disregards the instructions of the Architect, Construction Manager or the Owner (when such instructions are based on the requirements of the Contract Documents);

f. is adjudged a bankrupt or insolvent, or makes a general assignment for the benefit of Contractor's creditors, or a trustee or receiver is appointed for Contractor or for any of its property, or files a petition to take advantage of any debtor's act or to reorganize under bankruptcy or similar laws; or

g. breaches any warranty made by the Contractor under or pursuant to the Contract Documents.

h. fails to furnish the Owner with assurances satisfactory to the Owner evidencing the Contractor's ability to complete the Work in compliance with all the requirements of the Contract Documents; or

i. fails after commencement of the Work to proceed continuously with the construction and completion of the Work for more than ten (10) days, except as permitted under the Contract Documents.

j. fails to keep the Project free from strikes, work stoppages, slowdowns, lockouts or other disruptive activity;

k. or otherwise does not fully comply with the Contract Documents.

2. When any of the above reasons exists, may without prejudice to any other rights or remedies of the Owner, terminate employment of the Contractor upon three (3) days written notice and may, subject to any prior rights of the surety:

a. take possession of the site and of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;

b. take possession of materials stored off site by the Contractor;

c. take assignments of the Contractor's subcontractors in accordance with these General Conditions;

d. finish the Work by whatever reasonable method the Owner may deem expedient.

3. When the Owner terminates the Contract for one of the reasons stated in Subparagraph 1 hereof, the Contractor shall not be entitled to receive further payment until the completion of the Contractor's work. If the Owner's costs to complete the Contractor's work, including the expenses incurred by the Owner in connection with the services of the Architect, the Construction Manager and/or other consultants, exceed the contract balance remaining on the Contractor's contract, the Contractor shall be liable to the Owner for such excess costs. This provision shall survive termination of the Contractor's agreement with the Owner.

4. In the event a court or other tribunal issues a final determination that Owner's termination for cause was arbitrary, capricious or otherwise without cause and/or reverses Owner's termination for cause, such termination shall, without further action on the part of Owner, be converted to a termination for convenience, as set forth in (B), below.

B. 1. In addition to the Owner's right to carry out the work of the Contractor pursuant to its agreement with the Contractor, the Owner may at any time, at will and without cause, terminate any part of the Contractor's work or all of the Contractor's remaining work for any reason whatsoever by giving three (3) days' written notice to Contractor, specifying the portion of the Contractor's work to be terminated and the effective date of termination.

2. Upon receipt of a notice of termination for convenience, the Contractor shall immediately, in accordance with instructions from the Owner, proceed with performance of the following duties regardless of delay in determining or adjusting amounts due under this Paragraph:

a. cease operation as specified in the notice;

b. place no further orders and enter into no further subcontracts for materials, labor, services or facilities except as necessary to complete continued portions of the Contract;

c. terminate all subcontracts and orders to the extent they relate to the Work terminated;

d. proceed to complete the performance of the remaining work on its contract which has not been so terminated; and

e. take actions that may be necessary, or that the Owner may direct, for

the protection and preservation of the terminated Work.

3. The Contractor shall continue to prosecute that portion of its work which has not been terminated by the Owner pursuant to this paragraph. If the Contractor's work is so terminated, the Owner shall not be liable to the Contractor by reason of such termination except that the Contractor shall be entitled to payment for the work it has properly executed in accordance with its agreement and prior to the effective date of termination (the basis for such payment shall be as provided in the Contract) and for costs directly related to work thereafter performed by Contractor in terminating such Work, provided such work is authorized in advance by the Architect and the Owner. No payment shall be made by Owner, however, to the extent that such work is, was, or could have been terminated under the Contractor's agreement with the Owner.

4. In case of a termination pursuant to this paragraph B, the Owner will issue a Construction Change Directive or authorize a Change Order, making any required adjustment to the Date of Substantial Completion and/or the sum of contract monies remaining to be paid to the Contractor. The Owner shall be credited for (1) payments previously made to the Contractor for the terminated portion of the Work, (2) claims which the Owner has against the Contractor under the Contract and (3) the value of the materials, supplies, equipment or other items that are to be disposed of by the Contractor that are part of the Contract Sum; multiplied by 15% representing the Contractor's overhead and profit.

5. For the remaining portions of the Contractor's work which have not been terminated pursuant to this paragraph B, the terms and conditions of the Contractor's agreement with the Owner shall remain in full force and effect.

6. Upon termination of the Contractor's work or a portion of the Contractor's work pursuant to this paragraph B, the Contractor shall recover as its sole remedy, payment for work which it has properly performed in connection with the terminated portion of the Work prior to the effective date of termination and for items properly and timely fabricated off the Project site, delivered and stored in accordance with the Owner's instructions. The Contractor hereby waives and forfeits all other claims for payment and damages, including, without limitation, overhead and profit related to work terminated by the Owner pursuant to this paragraph B.

C. 1. In addition to Owner's right to suspend, delay, or interrupt Contractor from proceeding with any portion of its work pursuant to the terms and conditions of its agreement with the Owner, the Owner may at any time, at will and without cause suspend, delay, or interrupt any part of the Contractor's work or all work for any reason whatsoever for such period of time as the Owner may determine by giving three (3) days' prior written notice to Contractor, specifying that portion of the Contractor's work which is to be suspended, delayed, or interrupted, and the effective date of such suspension, delay, or interruption, as the case may be.

2. The Contractor shall continue to prosecute that portion of its work which has not been suspended, delayed, or interrupted, and shall properly protect and secure the portion of its work so suspended, delayed or interrupted.

3. The Owner shall incur no liability to Contractor by reason of such suspension, delay, or interruption except that Contractor may request an extension of its time to complete its work in accordance with Article 13 hereof.

D. The Contractor agrees and acknowledges that payments for the work have been obtained through obligations or bonds which have been sold after public referendum. In the event the work is suspended or canceled as a result of the order of any court, agency, department entity or individual having jurisdiction, or in the event the work is suspended or canceled due to the fact that a court, agency, department, entity or individual having jurisdiction has issued an order, the result of which is that the aforesaid obligations or bonds are no longer available for payment for the work, the Contractor expressly agrees that it shall be solely entitled to payment for work accomplished until a notice of suspension or cancellation is served upon it. The Contractor expressly waives any and all rights to institute an action, claim, cause of action or similar for any damages it may suffer as a result of the suspension or cancellation of the Work and/or its contract pursuant to this section.

ARTICLE 18
CLAIMS AND DISPUTES

A. Definition. A "Claim" is a demand or assertion by one of the parties seeking, as a matter of right, adjustment or interpretation of Contract terms, payment of money, extension of time or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract.

B. Time Limits on Claims. Claims by the Contractor must be made within thirty (30) days after occurrence of the event giving rise to such Claim, or within thirty (30) days after the claimant first recognizes the condition giving rise to the Claim, whichever is earlier. Claims must be made by written notice. An additional Claim made after the initial Claim has been decided by the Owner will not be considered unless submitted in a timely manner. Failure of the Contractor to give timely notice of claim shall constitute waiver of the claim. Claims must be made by written notice to the Construction Manager, Architect and Owner. The responsibility to substantiate Claims shall rest with the Contractor.

C. Pending final resolution of a Claim, unless otherwise agreed in writing, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents.

D. Claims for Concealed or Unknown Conditions. If conditions are encountered at the site which are (1) subsurface or otherwise concealed physical conditions which differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature, which differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, then notice by the Contractor shall be given to the Owner and Architect promptly before conditions are disturbed and in no event later than five (5) days after first observance of the conditions; and, (3) in the case of a condition at the site which involves a hazardous or toxic substance, as those terms are defined by OSHA or AHERA, notice to the Owner, the Construction Manager and the Architect shall be given immediately upon discovery of such hazardous or toxic substance. The Architect, and/or Construction Manager will promptly investigate such conditions and, if they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend an equitable adjustment in the Contract Sum or Contract Time, or both. If the Architect determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall so notify the Contractor in writing, stating the reasons.

E. Claims for Additional Cost. If the Contractor wishes to make Claim for an increase in the Contract Sum as a result of a Change in the Work pursuant to Article 8 of these General Conditions, written notice as provided in this Article 18 shall be given before proceeding to execute the Work.

F. Claims for Additional Time. If the Contractor wishes to make Claim for an increase in the Contract Time, the Contractor shall comply with the requirements set forth in Article 13.

G. Nothing contained in the Contract Documents shall relieve a Contractor from compliance with any statutory requirement, including, but not limited to those contained in Education Law Section 3813.

ARTICLE 19
MISCELLANEOUS PROVISIONS

A. The agreement between the Owner and the Contractor shall be governed by the law of the place where the project is located; venue to be in the County in which the project is located.

B. Historical lack of enforcement of any law, local or otherwise, shall not constitute a waiver of Contractor's responsibility for compliance with such law in a manner consistent with its agreement with the Owner unless and until the Contractor has received written consent for the waiver of such compliance from the Owner and the Agency responsible for the enforcement of such law.

C. All notices to be given hereunder shall be in writing and may be given, served, or made (1) by depositing the same for first class mail delivery in the United Stated mail addressed to the authorized representative of the party to be notified; (2) by depositing the same in the United Stated mail addressed to the authorized representative of the party to be notified, postpaid and registered or certified with return receipt requested; (3) by depositing the same for overnight delivery (prepaid by or billed to the party giving notice) with the United States Postal Service or other nationally recognized overnight delivery service addressed to the authorized representative of the party to be notified; or (4) by delivering the same in person to the said authorized representative of such party. Notice deposited in the mail by certified mail or overnight delivery in accordance with the provisions hereof shall be effective from and after the fourth (4th) day next following the date postmarked on the envelope containing such notice, or when actually received, whichever is earlier. All notices to be given to the parties hereto shall be sent to or made at the addresses set forth hereinbelow. By giving the other parties at least seven (7) days' written notice thereof, the parties hereto shall have the right to change their respective addresses and specify as their respective addresses for the purposes hereof any other address in the United States of America.

D. Except as expressly provided in the agreement between the Owner and the Contractor, duties and obligations imposed by such agreement and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights and remedies otherwise imposed or available by law, or in equity or by other agreement, and such rights and remedies shall survive acceptance of the Contractor's work and/or any other termination of the Contractor's agreement with the Owner.

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

F. The headings denoting the separately numbered Articles of these General Conditions are specifically set forth for reference purposes only and are not in any way to be deemed explanatory of or limiting of the contents of any paragraph or subparagraph. Furthermore, said headings are not to be deemed part of this Agreement for purposes of interpretation, litigation or as defining or limiting the rights or obligations of the parties.

G. In case any provision of this Agreement should be held to be contrary to, or invalid, under the law of any country, state or other jurisdiction, such illegality or invalidity, shall not affect in any way, any other provisions hereof, all of which shall continue, nevertheless, in full force and effect in any country, state or jurisdiction in which such provision is legal and valid.

H. The rights stated in these General Conditions and the documents which form the agreement between the Owner and the Contractor are cumulative and not in limitation of any rights of the Owner at law or in equity.

I. The Owner shall not be responsible for damages or for loss of anticipated profits on work not performed on account of any termination of the Contractor by the Owner or by virtue of the Owner's exercise of its right to take over the Contractor's work pursuant to its agreement with the Contractor.

J. The Owner shall not be liable to the Contractor for punitive damages on account of any its termination of the Contractor or any other alleged breach of the agreement between it and the Contractor and the Contractor hereby expressly waives its right to claim such damages against the Owner.

K. The Contractor hereby expressly waives any rights it may have in law or in equity to lost bonding capacity as a result of any of the actions of the Owner, the Architect or the Construction Manager taken in connection with the Contractor's work on the Project.

L. Upon determination by legal means (e.g. court action, etc.) that termination of Contractor pursuant to Article 17.A.1 was wrongful, such termination will be deemed converted to a termination for convenience pursuant to Article 17.B.1 and Contractor's remedy for such termination shall be limited to the recovery of the payments permitted for termination for convenience as set forth in Article 17.B.1.

M. As between the Owner and Contractor:

1. Before Substantial Completion. As to acts or failures to act occurring prior to the relevant date of Substantial Completion, any applicable statute of limitations shall commence to run and any alleged cause of action shall be deemed to have accrued in any and all events not later than such date of Substantial Completion;

2. Between Substantial Completion and Final Certificate for Payment. As to acts or failures to act occurring subsequent to the relevant date of Substantial Completion and prior to issuance of the final Certificate for Payment, any applicable statute of limitations shall commence to run and any alleged cause of action shall be deemed to have accrued in any and all events not later than the date of issuance of the final Certificate for Payment; and

3. After Final Certificate for Payment. As to acts or failures to act occurring after the relevant date of issuance of the final Certificate for Payment, any applicable statute of limitations shall commence to run and any alleged cause of action shall be deemed to have accrued in any and all events not later than the date of any act or failure to act by the Contractor pursuant to warranties provided in accordance with its agreement with the Owner, the date of any correction of work performed by the Contractor or failure to correct its work, or the date of actual commission of any other act or failure to perform any duty or obligation by the Contractor or Owner, whichever occurs last.

N. 1. The Owner may occupy or use any completed or partially completed portion of the Contractor's work at any stage when such occupancy is authorized by public authorities having jurisdiction over the project.

2. Partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of the Contractor's work, nor does it waive the Owner's right to liquidated damages. Further such occupancy alone shall not determine when substantial completion and performance has been reached

3. Immediately prior to such partial occupancy or use, the Owner, Contractor and Architect shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Contractor's work, and in order to prepare a complete punchlist of omissions of materials, faulty workmanship, or any items to be repaired, torn out or replaced.

O. The Contractor agrees not to assign, transfer, convey or sublet or otherwise dispose of this Contract or his right, title and interest therein or his power to execute such Contract, to any other person, firm or corporation without the previous consent in writing of the Owner.

P. The Owner is a tax exempt organization and will take title to materials used in the Project in order to permit tax exemption.

Q. The Owner will furnish a certificate with the Owner's Tax Exemption Number to the Contractor for use in purchasing tangible personal property required for the Project.

R. This exemption shall not apply to machinery, equipment, tools, and other items purchased, leased, rented, or otherwise acquired for the Contractor's use even though the machinery, equipment, tools or other items are used either in part or entirely on the Work. This exemption shall apply only to materials fully incorporated into the Work of the Contract as accepted and approved by the Architect.

S. The Contractor shall, upon request by the Owner, furnish a bill of sale or other instrument indicating the quantities and types of materials purchased directly by the Contractor or subcontractor for incorporation into the Work. Upon delivery of the materials to the site, the Contractor shall mark or otherwise identify the materials to be incorporated into the Work. This exemption shall apply only to materials so identified and accepted.

END OF GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION

NYSED 155.5 REGULATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section specifies requirements of 8NYCRR155.5, Uniform Safety Standards for School Construction and Maintenance Projects, that are required in construction documents. The Contractor shall comply with these requirements in addition to any and all similar requirements in the Contract Documents.

1.3 REQUIREMENTS

A. The occupied portion of any school building shall always comply with the minimum requirements necessary to maintain a certificate of occupancy. In addition, the following shall be strictly enforced and cooperated with:

1. No smoking is allowed on public school property, including construction areas.
2. During construction daily inspections of district occupied areas shall be conducted by school district personnel to assure that construction materials, equipment or debris do not block fore exits or emergency egress windows.
3. Proper operation of fire extinguishers, fire alarm, and smoke/fire detection systems shall be maintained throughout the project.

B. Verify that all school areas to be disturbed during renovation or demolition have been or will be tested for lead and for asbestos. For any project work that disturbs surfaces that contain lead or asbestos, follow the plans and specifications prepared by a certified Lead Risk Assessor or Supervisor which details provisions for occupant protection, worksite preparation, work methods, cleaning, and clearance testing; which are in general accordance with HUD Guidelines.

1. All asbestos abatement projects shall comply will all applicable federal and State laws including but not limited to the New York

State Department of Labor industrial code rule 56(12NYCRR56), and the federal Asbestos Hazard Emergency Response Act (AHERA), 40 CFR Part 763 (Code of Federal Regulations, 1998 Edition); available at the Office of Facilities Planning, Education Building Annex, Room 1060, State Education Department, Albany, NY 12234.

2. Any construction or maintenance operations which will disturb lead-based paint will require abatement of those areas pursuant to protocols detailed in the "Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing", June 1995; U.S. Department of Housing and Urban Development (HUD), Washington, D.C. 20410; available at the Office of Facilities Planning, Education Building Annex, Room 1060, State Education Department, Albany, NY 12234.

C. General Safety and Security Standards for Construction Projects:

1. All construction materials shall be stored in a safe and secure manner.
2. Fences around construction supplies or debris shall be maintained.
3. Gates shall always be locked unless a worker is in attendance to prevent unauthorized entry.
4. During exterior renovation work, overhead protection shall be provided for any sidewalks or areas immediately beneath the work site or such areas shall be fenced off and provided with warnings signs to prevent entry.
5. Workers shall be required to wear photo-identification badges at all times for identification and security purposes while working at occupied sites.

D. Separation of construction areas from occupied spaces. Construction areas which are under the control of a contractor and therefore not occupied by district staff or students, shall be separated from occupied areas. Provisions shall be made to prevent the passage of dust and contaminants into occupied parts of the building. Periodic inspection and repairs of the containment barriers must be made to prevent exposure to dust or contaminants. Gypsum board must be used in exit ways or other areas that require fire rated separation. Heavy duty plastic sheeting may be used only for a vapor, fine dust or air infiltration barrier, and shall not be used to separate occupied spaces from construction areas.

1. A specific stairwell and/or elevator may be assigned for construction worker use during the work hours. In general,

workers may not us the corridors, stairs or elevators designated for students or school staff.

2. Large amounts of debris must be removed by using enclosed chutes or a similar sealed system. There shall be no movement of debris through halls of occupied spaces of the building. No material shall be dropped or thrown outside the walls of the building.
3. All occupied parts of the buildings affected by renovation activity shall be cleaned at the close of each workday. School buildings occupied during a construction project shall maintain required health, safety and educational capabilities at all times that classes are in session.

E. The Architect will prepare phasing plans indicating exiting, required by the applicable building code, which shall be maintained during construction.

1. The Contractor shall submit plans, to be approved by the Architect, indicating temporary construction required to isolate construction equipment, materials, people, dust, fumes, odors, and noise during the construction period and meeting the requirements of the phasing plans.
2. Temporary construction details shall meet code-required fire ratings for separation and corridor enclosure.
3. At a minimum, required exits, temporary stairs, ramps, exit signs, and door hardware shall be provided at all times.

F. Prepare a plan detailing how adequate ventilation will be maintained during construction.

1. The plan shall indicate ductwork which must be rerouted, disconnected, or capped in order to prevent contaminants from the construction area from entering the occupied areas of the building.
2. The plan shall also indicate how required ventilation to occupied spaces affected by construction will be maintained during the project.

G. Construction and maintenance operations shall not produce noise in excess of 60 dba in occupied spaces or shall be scheduled for times when the building or affected building spaces are not occupied or acoustical abatement measures shall be taken.

H. The contractor shall be responsible for the control of chemical fumes, gases, and other contaminates produced by welding, gasoline or diesel engines, roofing, paving, painting, etc. to ensure they do not enter occupied portions of the building or air intakes.

I. The contractor shall be responsible to ensure that activities and materials which result in "off-gassing" of volatile organic compounds such as glues, paints, furniture, carpeting, wall covering, drapery, etc. are scheduled, cured or ventilated in accordance with manufacturers recommendations before a space can be occupied.

J. Large and small asbestos abatement projects as defined by 12NYCRR56 shall not be performed while the building is occupied. The term "building", as used in this paragraph, means a wing or major section of a building that can be completely isolated from the rest of the building with sealed non-combustible construction. The isolated portion of the building must contain exits that do not pass through the occupied portion, and ventilation systems must be physically separated and sealed at the isolation barrier.

K. Exterior work such as roofing, flashing, siding, or soffit work may be performed on occupied buildings provided proper variances are in place as required, and complete isolation of ventilation systems and at windows is provided. Care must be taken to schedule work so that classes are not disrupted by noise or visual distraction.

IN ACCORDANCE WITH ARTICLE 8, SECTION 220 (3-a) OF THE NEW YORK STATE LABOR LAW, THE FOLLOWING LINK REPRESENTS THE MOST CURRENT PREVAILING WAGE RATE SCHEDULES AT THE TIME OF BIDDING, ISSUED BY THE NEW YORK STATE DEPARTMENT OF LABOR SPECIFICALLY REQUESTED FOR THIS PROJECT:

PRC# 2023003515

https://apps.labor.ny.gov/wpp/publicViewProject.do?method=showIt&id=1547277

CONTRACTOR IS TO OBTAIN THE PREVAILING WAGE RATES GENERATED FOR THIS PROJECT AT THE NEW YORK STATE DEPARTMENT OF LABOR WEBSITE.

- ASSEMBLY BILL NUMBER 1839
- NOTICES REGARDING WAGE RATE UPDATES
- WAGE RATE SCHEDULE
- LIST OF EMPLOYERS INELIGIBLE TO BID ON OR BE AWARDED PUBLIC WORK

WHITE PLAINS CITY SCHOOL DISTRICT
Board of Education
5 Homeside Lane
White Plains, NY 10605

U.S. Department of Labor
Wage and Hour Division

PAYROLL

(For Contractor's Optional Use; See Instructions at www.dol.gov/whd/forms/wh347instr.htm)

Persons are not required to respond to the collection of information unless it displays a currently valid OMB control number.

U.S. Wage and Hour Division

Rev. Dec. 2008

OMB No.: 1235-0008
Expires: 02/28/2018

NAME OF CONTRACTOR ☐ OR SUBCONTRACTOR ☐	ADDRESS	
PAYROLL NO.	FOR WEEK ENDING	PROJECT AND LOCATION / PROJECT OR CONTRACT NO.

(1) NAME AND INDIVIDUAL IDENTIFYING NUMBER (e.g., LAST FOUR DIGITS OF SOCIAL SECURITY NUMBER) OF WORKER	(2) NO. OF WITHHOLDING EXEMPTIONS	(3) WORK CLASSIFICATION	OT. OR ST.	(4) DAY AND DATE — HOURS WORKED EACH DAY	(5) TOTAL HOURS	(6) RATE OF PAY	(7) GROSS AMOUNT EARNED	(8) DEDUCTIONS: FICA	WITH-HOLDING TAX			OTHER	TOTAL DEDUCTIONS	(9) NET WAGES PAID FOR WEEK
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While completion of Form WH-347 is optional, it is mandatory for covered contractors and subcontractors performing work on Federally financed or assisted construction contracts to respond to the information collection contained in 29 C.F.R. §§ 3.3, 5.5(a). The Copeland Act (40 U.S.C. § 3145) contractors and subcontractors performing work on Federally financed or assisted construction contracts to "furnish weekly a statement with respect to the wages paid each employee during the preceding week." U.S. Department of Labor (DOL) regulations at 29 C.F.R. § 5.5(a)(3)(ii) require contractors to submit weekly a copy of all payrolls to the Federal agency contracting for or financing the construction project, accompanied by a signed "Statement of Compliance" indicating that the payrolls are correct and complete and that each laborer or mechanic has been paid not less than the proper Davis-Bacon prevailing wage rate for the work performed. DOL and federal contracting agencies receiving this information review the information to determine that employees have received legally required wages and fringe benefits.

Public Burden Statement

We estimate that is will take an average of 55 minutes to complete this collection, including time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. If you have any comments regarding these estimates or any other aspect of this collection, including suggestions for reducing this burden, send them to the Administrator, Wage and Hour Division, U.S. Department of Labor, Room S3502, 200 Constitution Avenue, N.W. Washington, D.C. 20210

(over)

Date _____

I, _____ _____
(Name of Signatory Party) (Title)

do hereby state:

(1) That I pay or supervise the payment of the persons employed by

_____ on the
(Contractor or Subcontractor)

_____; that during the payroll period commencing on the
(Building or Work)

_____ day of _____, _____, and ending the _____ day of _____, _____,

all persons employed on said project have been paid the full weekly wages earned, that no rebates have been or will be made either directly or indirectly to or on behalf of said

_____ from the full
(Contractor or Subcontractor)

weekly wages earned by any person and that no deductions have been made either directly or indirectly from the full wages earned by any person, other than permissible deductions as defined in Regulations, Part 3 (29 C.F.R. Subtitle A), issued by the Secretary of Labor under the Copeland Act, as amended (48 Stat. 948, 63 Stat. 108, 72 Stat. 967; 76 Stat. 357; 40 U.S.C. § 3145), and described below:

_____

_____

_____

_____

(2) That any payrolls otherwise under this contract required to be submitted for the above period are correct and complete; that the wage rates for laborers or mechanics contained therein are not less than the applicable wage rates contained in any wage determination incorporated into the contract; that the classifications set forth therein for each laborer or mechanic conform with the work he performed.

(3) That any apprentices employed in the above period are duly registered in a bona fide apprenticeship program registered with a State apprenticeship agency recognized by the Bureau of Apprenticeship and Training, United States Department of Labor, or if no such recognized agency exists in a State, are registered with the Bureau of Apprenticeship and Training, United States Department of Labor.

(4) That:

(a) WHERE FRINGE BENEFITS ARE PAID TO APPROVED PLANS, FUNDS, OR PROGRAMS

☐ – in addition to the basic hourly wage rates paid to each laborer or mechanic listed in the above referenced payroll, payments of fringe benefits as listed in the contract have been or will be made to appropriate programs for the benefit of such employees, except as noted in section 4(c) below.

(b) WHERE FRINGE BENEFITS ARE PAID IN CASH

☐ – Each laborer or mechanic listed in the above referenced payroll has been paid, as indicated on the payroll, an amount not less than the sum of the applicable basic hourly wage rate plus the amount of the required fringe benefits as listed in the contract, except as noted in section 4(c) below.

(c) EXCEPTIONS

EXCEPTION (CRAFT)	EXPLANATION

REMARKS:

NAME AND TITLE	SIGNATURE

THE WILLFUL FALSIFICATION OF ANY OF THE ABOVE STATEMENTS MAY SUBJECT THE CONTRACTOR OR SUBCONTRACTOR TO CIVIL OR CRIMINAL PROSECUTION. SEE SECTION 1001 OF TITLE 18 AND SECTION 231 OF TITLE 31 OF THE UNITED STATES CODE.

DRAFT

AIA® Document A310™ - 2010

Bid Bond

CONTRACTOR:
(Name, legal status and address)

« »« »
« »

SURETY:
(Name, legal status and principal place of business)

« »« »
« »

OWNER:
(Name, legal status and address)

« »« »
« »

BOND AMOUNT: $ « »

PROJECT:
(Name, location or address, and Project number, if any)

«PWA»
« »
« »

The Contractor and Surety are bound to the Owner in the amount set forth above, for the payment of which the Contractor and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, as provided herein. The conditions of this Bond are such that if the Owner accepts the bid of the Contractor within the time specified in the bid documents, or within such time period as may be agreed to by the Owner and Contractor, and the Contractor either (1) enters into a contract with the Owner in accordance with the terms of such bid, and gives such bond or bonds as may be specified in the bidding or Contract Documents, with a surety admitted in the jurisdiction of the Project and otherwise acceptable to the Owner, for the faithful performance of such Contract and for the prompt payment of labor and material furnished in the prosecution thereof; or (2) pays to the Owner the difference, not to exceed the amount of this Bond, between the amount specified in said bid and such larger amount for which the Owner may in good faith contract with another party to perform the work covered by said bid, then this obligation shall be null and void, otherwise to remain in full force and effect. The Surety hereby waives any notice of an agreement between the Owner and Contractor to extend the time in which the Owner may accept the bid. Waiver of notice by the Surety shall not apply to any extension exceeding sixty (60) days in the aggregate beyond the time for acceptance of bids specified in the bid documents, and the Owner and Contractor shall obtain the Surety's consent for an extension beyond sixty (60) days.

If this Bond is issued in connection with a subcontractor's bid to a Contractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

When this Bond has been furnished to comply with a statutory or other legal requirement in the location of the Project, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

ADDITIONS AND DELETIONS: The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed.

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

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

ELECTRONIC COPYING of any portion of this AIA® Document to another electronic file is prohibited and constitutes a violation of copyright laws as set forth in the footer of this document.

Signed and sealed this « » day of « » , « »

« »	
(Contractor as Principal)	*(Seal)*
« »	
(Witness)	*(Title)*
« »	
(Surety)	*(Seal)*
« »	
(Witness)	*(Title)*

DRAFT

AIA® Document A312™ – 2010

Performance Bond

CONTRACTOR:
(Name, legal status and address)
« »« »
« »

SURETY:
(Name, legal status and principal place of business)
« »« »
« »

OWNER:
(Name, legal status and address)
« »« »
« »

CONSTRUCTION CONTRACT
Date: « »
Amount: $ « »
Description:
(Name and location)
«PWA»
« »

BOND
Date:
(Not earlier than Construction Contract Date)
« »
Amount: $ « »
Modifications to this Bond: « » None « » See Section 16

CONTRACTOR AS PRINCIPAL		**SURETY**	
Company:	*(Corporate Seal)*	Company:	*(Corporate Seal)*
Signature:		Signature:	
Name and Title:	« »« »	Name and Title:	« »« »

(Any additional signatures appear on the last page of this Performance Bond.)

(FOR INFORMATION ONLY — Name, address and telephone)

AGENT or **BROKER:**
« »
« »
« »

OWNER'S REPRESENTATIVE:
(Architect, Engineer or other party:)
« »
« »
« »
« »
« »
« »

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§ 1 The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Owner for the performance of the Construction Contract, which is incorporated herein by reference.

§ 2 If the Contractor performs the Construction Contract, the Surety and the Contractor shall have no obligation under this Bond, except when applicable to participate in a conference as provided in Section 3.

§ 3 If there is no Owner Default under the Construction Contract, the Surety's obligation under this Bond shall arise after

.1 the Owner first provides notice to the Contractor and the Surety that the Owner is considering declaring a Contractor Default. Such notice shall indicate whether the Owner is requesting a conference among the Owner, Contractor and Surety to discuss the Contractor's performance. If the Owner does not request a conference, the Surety may, within five (5) business days after receipt of the Owner's notice, request such a conference. If the Surety timely requests a conference, the Owner shall attend. Unless the Owner agrees otherwise, any conference requested under this Section 3.1 shall be held within ten (10) business days of the Surety's receipt of the Owner's notice. If the Owner, the Contractor and the Surety agree, the Contractor shall be allowed a reasonable time to perform the Construction Contract, but such an agreement shall not waive the Owner's right, if any, subsequently to declare a Contractor Default;

.2 the Owner declares a Contractor Default, terminates the Construction Contract and notifies the Surety; and

.3 the Owner has agreed to pay the Balance of the Contract Price in accordance with the terms of the Construction Contract to the Surety or to a contractor selected to perform the Construction Contract.

§ 4 Failure on the part of the Owner to comply with the notice requirement in Section 3.1 shall not constitute a failure to comply with a condition precedent to the Surety's obligations, or release the Surety from its obligations, except to the extent the Surety demonstrates actual prejudice.

§ 5 When the Owner has satisfied the conditions of Section 3, the Surety shall promptly and at the Surety's expense take one of the following actions:

§ 5.1 Arrange for the Contractor, with the consent of the Owner, to perform and complete the Construction Contract;

§ 5.2 Undertake to perform and complete the Construction Contract itself, through its agents or independent contractors;

§ 5.3 Obtain bids or negotiated proposals from qualified contractors acceptable to the Owner for a contract for performance and completion of the Construction Contract, arrange for a contract to be prepared for execution by the Owner and a contractor selected with the Owner's concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Construction Contract, and pay to the Owner the amount of damages as described in Section 7 in excess of the Balance of the Contract Price incurred by the Owner as a result of the Contractor Default; or

§ 5.4 Waive its right to perform and complete, arrange for completion, or obtain a new contractor and with reasonable promptness under the circumstances:

.1 After investigation, determine the amount for which it may be liable to the Owner and, as soon as practicable after the amount is determined, make payment to the Owner; or

.2 Deny liability in whole or in part and notify the Owner, citing the reasons for denial.

§ 6 If the Surety does not proceed as provided in Section 5 with reasonable promptness, the Surety shall be deemed to be in default on this Bond seven days after receipt of an additional written notice from the Owner to the Surety demanding that the Surety perform its obligations under this Bond, and the Owner shall be entitled to enforce any remedy available to the Owner. If the Surety proceeds as provided in Section 5.4, and the Owner refuses the payment or the Surety has denied liability, in whole or in part, without further notice the Owner shall be entitled to enforce any remedy available to the Owner.

§ 7 If the Surety elects to act under Section 5.1, 5.2 or 5.3, then the responsibilities of the Surety to the Owner shall not be greater than those of the Contractor under the Construction Contract, and the responsibilities of the Owner to the Surety shall not be greater than those of the Owner under the Construction Contract. Subject to the commitment by the Owner to pay the Balance of the Contract Price, the Surety is obligated, without duplication, for

.1 the responsibilities of the Contractor for correction of defective work and completion of the Construction Contract;

.2 additional legal, design professional and delay costs resulting from the Contractor's Default, and resulting from the actions or failure to act of the Surety under Section 5; and

.3 liquidated damages, or if no liquidated damages are specified in the Construction Contract, actual damages caused by delayed performance or non-performance of the Contractor.

§ 8 If the Surety elects to act under Section 5.1, 5.3 or 5.4, the Surety's liability is limited to the amount of this Bond.

§ 9 The Surety shall not be liable to the Owner or others for obligations of the Contractor that are unrelated to the Construction Contract, and the Balance of the Contract Price shall not be reduced or set off on account of any such unrelated obligations. No right of action shall accrue on this Bond to any person or entity other than the Owner or its heirs, executors, administrators, successors and assigns.

§ 10 The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders and other obligations.

§ 11 Any proceeding, legal or equitable, under this Bond may be instituted in any court of competent jurisdiction in the location in which the work or part of the work is located and shall be instituted within two years after a declaration of Contractor Default or within two years after the Contractor ceased working or within two years after the Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this Paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

§ 12 Notice to the Surety, the Owner or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears.

§ 13 When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

§ 14 Definitions

§ 14.1 Balance of the Contract Price. The total amount payable by the Owner to the Contractor under the Construction Contract after all proper adjustments have been made, including allowance to the Contractor of any amounts received or to be received by the Owner in settlement of insurance or other claims for damages to which the Contractor is entitled, reduced by all valid and proper payments made to or on behalf of the Contractor under the Construction Contract.

§ 14.2 Construction Contract. The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and changes made to the agreement and the Contract Documents.

§ 14.3 Contractor Default. Failure of the Contractor, which has not been remedied or waived, to perform or otherwise to comply with a material term of the Construction Contract.

§ 14.4 Owner Default. Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

§ 14.5 Contract Documents. All the documents that comprise the agreement between the Owner and Contractor.

§ 15 If this Bond is issued for an agreement between a Contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

§ 16 Modifications to this bond are as follows:

« »

(Space is provided below for additional signatures of added parties, other than those appearing on the cover page.)

CONTRACTOR AS PRINCIPAL		**SURETY**	
Company:	*(Corporate Seal)*	Company:	*(Corporate Seal)*
Signature:		Signature:	
Name and Title:	« »« »	Name and Title:	« »« »
Address:	« »	Address:	« »

DRAFT

AIA® Document A312™ - 2010

Payment Bond

CONTRACTOR:
(Name, legal status and address)

« »« »
« »

SURETY:
(Name, legal status and principal place of business)

« »« »
« »

OWNER:
(Name, legal status and address)

« »« »
« »

CONSTRUCTION CONTRACT
Date: « »
Amount: $ « »
Description:
(Name and location)
«PWA»
« »

BOND
Date:
(Not earlier than Construction Contract Date)
« »
Amount: $ « »
Modifications to this Bond: « » None « » See Section 18

CONTRACTOR AS PRINCIPAL		**SURETY**	
Company:	*(Corporate Seal)*	Company:	*(Corporate Seal)*
Signature:		Signature:	
Name and Title:	« »« »	Name and Title:	« »« »

(Any additional signatures appear on the last page of this Payment Bond.)

(FOR INFORMATION ONLY — Name, address and telephone)

AGENT or **BROKER:**

« »
« »
« »

OWNER'S REPRESENTATIVE:
(Architect, Engineer or other party:)

« »
« »
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« »
« »
« »

ADDITIONS AND DELETIONS: The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed.

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

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

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§ 1 The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Owner to pay for labor, materials and equipment furnished for use in the performance of the Construction Contract, which is incorporated herein by reference, subject to the following terms.

§ 2 If the Contractor promptly makes payment of all sums due to Claimants, and defends, indemnifies and holds harmless the Owner from claims, demands, liens or suits by any person or entity seeking payment for labor, materials or equipment furnished for use in the performance of the Construction Contract, then the Surety and the Contractor shall have no obligation under this Bond.

§ 3 If there is no Owner Default under the Construction Contract, the Surety's obligation to the Owner under this Bond shall arise after the Owner has promptly notified the Contractor and the Surety (at the address described in Section 13) of claims, demands, liens or suits against the Owner or the Owner's property by any person or entity seeking payment for labor, materials or equipment furnished for use in the performance of the Construction Contract and tendered defense of such claims, demands, liens or suits to the Contractor and the Surety.

§ 4 When the Owner has satisfied the conditions in Section 3, the Surety shall promptly and at the Surety's expense defend, indemnify and hold harmless the Owner against a duly tendered claim, demand, lien or suit.

§ 5 The Surety's obligations to a Claimant under this Bond shall arise after the following:

§ 5.1 Claimants, who do not have a direct contract with the Contractor,

- **.1** have furnished a written notice of non-payment to the Contractor, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were, or equipment was, furnished or supplied or for whom the labor was done or performed, within ninety (90) days after having last performed labor or last furnished materials or equipment included in the Claim; and
- **.2** have sent a Claim to the Surety (at the address described in Section 13).

§ 5.2 Claimants, who are employed by or have a direct contract with the Contractor, have sent a Claim to the Surety (at the address described in Section 13).

§ 6 If a notice of non-payment required by Section 5.1.1 is given by the Owner to the Contractor, that is sufficient to satisfy a Claimant's obligation to furnish a written notice of non-payment under Section 5.1.1.

§ 7 When a Claimant has satisfied the conditions of Sections 5.1 or 5.2, whichever is applicable, the Surety shall promptly and at the Surety's expense take the following actions:

§ 7.1 Send an answer to the Claimant, with a copy to the Owner, within sixty (60) days after receipt of the Claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed; and

§ 7.2 Pay or arrange for payment of any undisputed amounts.

§ 7.3 The Surety's failure to discharge its obligations under Section 7.1 or Section 7.2 shall not be deemed to constitute a waiver of defenses the Surety or Contractor may have or acquire as to a Claim, except as to undisputed amounts for which the Surety and Claimant have reached agreement. If, however, the Surety fails to discharge its obligations under Section 7.1 or Section 7.2, the Surety shall indemnify the Claimant for the reasonable attorney's fees the Claimant incurs thereafter to recover any sums found to be due and owing to the Claimant.

§ 8 The Surety's total obligation shall not exceed the amount of this Bond, plus the amount of reasonable attorney's fees provided under Section 7.3, and the amount of this Bond shall be credited for any payments made in good faith by the Surety.

§ 9 Amounts owed by the Owner to the Contractor under the Construction Contract shall be used for the performance of the Construction Contract and to satisfy claims, if any, under any construction performance bond. By the Contractor furnishing and the Owner accepting this Bond, they agree that all funds earned by the Contractor in the performance of the Construction Contract are dedicated to satisfy obligations of the Contractor and Surety under this Bond, subject to the Owner's priority to use the funds for the completion of the work.

§ 10 The Surety shall not be liable to the Owner, Claimants or others for obligations of the Contractor that are unrelated to the Construction Contract. The Owner shall not be liable for the payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligation to make payments to, or give notice on behalf of, Claimants or otherwise have any obligations to Claimants under this Bond.

§ 11 The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders and other obligations.

§ 12 No suit or action shall be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the state in which the project that is the subject of the Construction Contract is located or after the expiration of one year from the date (1) on which the Claimant sent a Claim to the Surety pursuant to Section 5.1.2 or 5.2, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs. If the provisions of this Paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

§ 13 Notice and Claims to the Surety, the Owner or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears. Actual receipt of notice or Claims, however accomplished, shall be sufficient compliance as of the date received.

§ 14 When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

§ 15 Upon request by any person or entity appearing to be a potential beneficiary of this Bond, the Contractor and Owner shall promptly furnish a copy of this Bond or shall permit a copy to be made.

§ 16 Definitions

§ 16.1 Claim. A written statement by the Claimant including at a minimum:

- .1 the name of the Claimant;
- .2 the name of the person for whom the labor was done, or materials or equipment furnished;
- .3 a copy of the agreement or purchase order pursuant to which labor, materials or equipment was furnished for use in the performance of the Construction Contract;
- .4 a brief description of the labor, materials or equipment furnished;
- .5 the date on which the Claimant last performed labor or last furnished materials or equipment for use in the performance of the Construction Contract;
- .6 the total amount earned by the Claimant for labor, materials or equipment furnished as of the date of the Claim;
- .7 the total amount of previous payments received by the Claimant; and
- .8 the total amount due and unpaid to the Claimant for labor, materials or equipment furnished as of the date of the Claim.

§ 16.2 Claimant. An individual or entity having a direct contract with the Contractor or with a subcontractor of the Contractor to furnish labor, materials or equipment for use in the performance of the Construction Contract. The term Claimant also includes any individual or entity that has rightfully asserted a claim under an applicable mechanic's lien or similar statute against the real property upon which the Project is located. The intent of this Bond shall be to include without limitation in the terms "labor, materials or equipment" that part of water, gas, power, light, heat, oil, gasoline, telephone service or rental equipment used in the Construction Contract, architectural and engineering services required for performance of the work of the Contractor and the Contractor's subcontractors, and all other items for which a mechanic's lien may be asserted in the jurisdiction where the labor, materials or equipment were furnished.

§ 16.3 Construction Contract. The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and all changes made to the agreement and the Contract Documents.

§ 16.4 Owner Default. Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

§ 16.5 Contract Documents. All the documents that comprise the agreement between the Owner and Contractor.

§ 17 If this Bond is issued for an agreement between a Contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

§ 18 Modifications to this bond are as follows:

« »

(Space is provided below for additional signatures of added parties, other than those appearing on the cover page.)

CONTRACTOR AS PRINCIPAL		**SURETY**	
Company:	*(Corporate Seal)*	Company:	*(Corporate Seal)*
Signature:		Signature:	
Name and Title:	« »« »	Name and Title:	« »« »
Address:	« »	Address:	« »

AIA® Document G702™ - 1992

Application and Certificate for Payment

TO OWNER:

PROJECT: PWA

APPLICATION NO: 001

Distribution to:
OWNER:
ARCHITECT:
CONTRACTOR:
FIELD:
:

PERIOD TO:

CONTRACT FOR: General Construction

CONTRACT DATE:

PROJECT NOS: / /

FROM CONTRACTOR:

VIA ARCHITECT:

CONTRACTOR'S APPLICATION FOR PAYMENT

Application is made for payment, as shown below, in connection with the Contract.
Continuation Sheet, AIA Document G703, is attached.

1. ORIGINAL CONTRACT SUM	$0.00
2. NET CHANGE BY CHANGE ORDERS	$0.00
3. CONTRACT SUM TO DATE (Line 1 ± 2)	$0.00
4. TOTAL COMPLETED & STORED TO DATE (Column G on G703)	$0.00
5. RETAINAGE:	
a. 0 % of Completed Work (Column D + E on G703: $0.00)=	$0.00
b. 0 % of Stored Material (Column F on G703: $0.00)=	$0.00
Total Retainage (Lines 5a + 5b or Total in Column I of G703)	$0.00
6. TOTAL EARNED LESS RETAINAGE (Line 4 Less Line 5 Total)	$0.00
7. LESS PREVIOUS CERTIFICATES FOR PAYMENT (Line 6 from prior Certificate)	$0.00
8. CURRENT PAYMENT DUE	$0.00
9. BALANCE TO FINISH, INCLUDING RETAINAGE (Line 3 less Line 6)	$0.00

CHANGE ORDER SUMMARY	ADDITIONS	DEDUCTIONS
Total changes approved in previous months by Owner	$0.00	$0.00
Total approved this Month	$0.00	$0.00
TOTALS	$0.00	$0.00
NET CHANGES by Change Order		$0.00

The undersigned Contractor certifies that to the best of the Contractor's knowledge, information and belief the Work covered by this Application for Payment has been completed in accordance with the Contract Documents, that all amounts have been paid by the Contractor for Work for which previous Certificates for Payment were issued and payments received from the Owner, and that current payment shown herein is now due.

CONTRACTOR:

By: _____ Date: _____

State of:
County of:
Subscribed and sworn to before me this day of
Notary Public:
My Commission expires:

ARCHITECT'S CERTIFICATE FOR PAYMENT

In accordance with the Contract Documents, based on on-site observations and the data comprising this application, the Architect certifies to the Owner that to the best of the Architect's 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 $0.00

(Attach explanation if amount certified differs from the amount applied. Initial all figures on this Application and on the Continuation Sheet that are changed to conform with the amount certified.)

ARCHITECT:

By: _____ Date: _____

This Certificate is not negotiable. The AMOUNT CERTIFIED is payable only to the Contractor named herein. Issuance, payment and acceptance of payment are without prejudice to any rights of the Owner or Contractor under this Contract.

DRAFT **AIA® Document G703™ – 1992**

Continuation Sheet

AIA Document, G702™–1992, Application and Certification for Payment, or G736™–2009, Project Application and Project Certificate for Payment, Construction Manager as Adviser Edition, containing Contractor's signed certification is attached.
In tabulations below, amounts are in US dollars.
Use Column I on Contracts where variable retainage for line items may apply.

APPLICATION NO: 001
APPLICATION DATE:
PERIOD TO:
ARCHITECT'S PROJECT NO:

A	B	C	D	E	F	G		H	I
			WORK COMPLETED						
ITEM NO.	DESCRIPTION OF WORK	SCHEDULED VALUE	FROM PREVIOUS APPLICATION (D + E)	THIS PERIOD	MATERIALS PRESENTLY STORED (NOT IN D OR E)	TOTAL COMPLETED AND STORED TO DATE (D + E + F)	% (G ÷ C)	BALANCE TO FINISH (C - G)	RETAINAGE (IF VARIABLE RATE)
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
	GRAND TOTAL	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00%**	**0.00**	**0.00**

User Notes:

DRAFT

AIA® Document G704™ – 2000

Certificate of Substantial Completion

PROJECT:
(Name and address)
PWA

PROJECT NUMBER: /
CONTRACT FOR: General Construction
CONTRACT DATE:

OWNER: ☐
ARCHITECT: ☐
CONTRACTOR: ☐
FIELD: ☐
OTHER: ☐

TO OWNER:
(Name and address)

TO CONTRACTOR:
(Name and address)

PROJECT OR PORTION OF THE PROJECT DESIGNATED FOR PARTIAL OCCUPANCY OR USE SHALL INCLUDE:

The Work performed under this Contract has been reviewed and found, to the Architect's best knowledge, information and belief, to be substantially complete. Substantial Completion is the stage in the progress of the Work when the Work or designated portion is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use. The date of Substantial Completion of the Project or portion designated above is the date of issuance established by this Certificate, which is also the date of commencement of applicable warranties required by the Contract Documents, except as stated below:

Warranty **Date of Commencement**

ARCHITECT	BY	DATE OF ISSUANCE

A list of items to be completed or corrected is attached hereto. The failure to include any items on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents. Unless otherwise agreed to in writing, the date of commencement of warranties for items on the attached list will be the date of issuance of the final Certificate of Payment or the date of final payment.

Cost estimate of Work that is incomplete or defective: $0.00

The Contractor will complete or correct the Work on the list of items attached hereto within Zero (0) days from the above date of Substantial Completion.

CONTRACTOR	BY	DATE

The Owner accepts the Work or designated portion as substantially complete and will assume full possession at (time) on (date).

OWNER	BY	DATE

The responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance shall be as follows:
(Note: Owner's and Contractor's legal and insurance counsel should determine and review insurance requirements and coverage.)

DRAFT

AIA® Document G706™ – 1994

Contractor's Affidavit of Payment of Debts and Claims

PROJECT: *(Name and address)*
PWA

TO OWNER: *(Name and address)*

ARCHITECT'S PROJECT NUMBER:

CONTRACT FOR: General Construction
CONTRACT DATED:

OWNER: ☐
ARCHITECT: ☐
CONTRACTOR: ☐
SURETY: ☐
OTHER: ☐

STATE OF:
COUNTY OF:

The undersigned hereby certifies that, except as listed below, payment has been made in full and all obligations have otherwise been satisfied for all materials and equipment furnished, for all work, labor, and services performed, and for all known indebtedness and claims against the Contractor for damages arising in any manner in connection with the performance of the Contract referenced above for which the Owner or Owner's property might in any way be held responsible or encumbered.

EXCEPTIONS:

SUPPORTING DOCUMENTS ATTACHED HERETO:

1. Consent of Surety to Final Payment. Whenever Surety is involved, Consent of Surety is required. AIA Document G707, Consent of Surety, may be used for this purpose

Indicate Attachment ☐ Yes ☒ No

The following supporting documents should be attached hereto if required by the Owner:

1. Contractor's Release or Waiver of Liens, conditional upon receipt of final payment.

2. Separate Releases or Waivers of Liens from Subcontractors and material and equipment suppliers, to the extent required by the Owner, accompanied by a list thereof.

3. Contractor's Affidavit of Release of Liens (AIA Document G706A).

CONTRACTOR: *(Name and address)*

BY: _____
(Signature of authorized representative)

_____
(Printed name and title)

Subscribed and sworn to before me on this date:

Notary Public:
My Commission Expires:

(1684171873)

DRAFT

AIA® Document G706A™ - 1994

Contractor's Affidavit of Release of Liens

PROJECT: *(Name and address)*

PWA

TO OWNER: *(Name and address)*

ARCHITECT'S PROJECT NUMBER:

CONTRACT FOR: General Construction

CONTRACT DATED:

OWNER: ☐
ARCHITECT: ☐
CONTRACTOR: ☐
SURETY: ☐
OTHER: ☐

STATE OF:
COUNTY OF:

The undersigned hereby certifies that to the best of the undersigned's knowledge, information and belief, except as listed below, the Releases or Waivers of Lien attached hereto include the Contractor, all Subcontractors, all suppliers of materials and equipment, and all performers of Work, labor or services who have or may have liens or encumbrances or the right to assert liens or encumbrances against any property of the Owner arising in any manner out of the performance of the Contract referenced above.

EXCEPTIONS:

SUPPORTING DOCUMENTS ATTACHED HERETO:

1. Contractor's Release or Waiver of Liens, conditional upon receipt of final payment.

2. Separate Releases or Waivers of Liens from Subcontractors and material and equipment suppliers, to the extent required by the Owner, accompanied by a list thereof.

CONTRACTOR: *(Name and address)*

BY:

(Signature of authorized representative)

(Printed name and title)

Subscribed and sworn to before me on this date:

Notary Public:
My Commission Expires:

(1130915160)

DRAFT

AIA® Document G707™ – 1994

Consent Of Surety to Final Payment

PROJECT: *(Name and address)* PWA	**ARCHITECT'S PROJECT NUMBER:**	OWNER: ☐ ARCHITECT: ☐
	CONTRACT FOR: General Construction	CONTRACTOR: ☐
TO OWNER: *(Name and address)*	**CONTRACT DATED:**	SURETY: ☐ OTHER: ☐

In accordance with the provisions of the Contract between the Owner and the Contractor as indicated above the
(Insert name and address of Surety)

, SURETY,

on bond of
(Insert name and address of Contractor)

, CONTRACTOR,

hereby approves of the final payment to the Contractor, and agrees that final payment to the Contractor shall not relieve the Surety of any of its obligations to
(Insert name and address of Owner)

, OWNER,

as set forth in said Surety's bond.

IN WITNESS WHEREOF, the Surety has hereunto set its hand on this date:
(Insert in writing the month followed by the numeric date and year.)

_____
(Surety)

_____
(Signature of authorized representative)

Attest:
(Seal):

_____
(Printed name and title)

PART 1 - GENERAL

1.01 BRIEF PURPOSE OF PROJECT / GENERAL

A. The purpose of the project is to remove existing unit ventilators and replace with new unit ventilators with air conditioning. Upgrades to electric for new unit ventilators. Modifications to existing casework.

B. This Section provides an abbreviated summary of the work for the Construction Contracts associated with the Owner's program to construct the project.

C. In the event that any of the provisions in the technical specifications conflicts with the general conditions, the provision more favorable to the owner, as determined by the owner in its sole discretion, shall govern.

1.02 NOMENCLATURE

A. Where the terms "Engineer/Architect", "Architect/Engineer", "Engineer", or "Architect" are used throughout these Contract Documents, they shall mean the firm of H2M architects + engineers as may be abbreviated by H2M or H2M Group.

B. The Electrical Construction Contractor may be referred to as the "Electrical Contractor", "Prime Electrical Contractor", "Contract E Contractor" or similar wording. The lack of word capitalization shall be incidental. This Construction Contract shall be known as Contract E.

C. The Heating, Ventilating & Air Conditioning Construction Contractor may be referred to as the "HVAC Contractor", "Prime HVAC Contractor", "Contract H Contractor" or similar wording. The lack of word capitalization shall be incidental. This Construction Contract shall be known as Contract H.

D. Where the terms "Owner" or "Owner's Construction Representative" are used, they will be defined as a person selected by the Owner, or the actual Owner, WHITE PLAINS CITY SCHOOL DISTRICT.

1.03 ABBREVIATED SUMMARY OF CONTRACT E WORK

A. Furnish all labor, equipment, materials, tools, means, methods, and incidentals necessary to complete the Work as required by the Contract Documents for this Construction Contract. Each Contractor shall coordinate, through the Owner/Architect, the work of their contract with the work by others.

B. This following abbreviated summary is provided in order to briefly describe the work covered by the Contract Documents for this Construction Contract. It is not all inclusive of the work under the Contract.

C. The work includes, but is not limited to, the following:
   1. Provide, install, maintain, and repair, if necessary, temporary power and light throughout the site and to the Owner/Architect’s field office. Temporary power shall be provided at location(s) selected by the Architect based on input by the General Contractor.
   2. Arrange for and install primary electric service.
   3. Main secondary feeders, power distribution, and instrumentation control wiring. Provide, mount, and install electrical conduit, wire, fittings, boxes, panels, and electrical accessories.

4. All clearing, excavation, filling, and backfilling associated with the installation of underground conduit, duct bank, or wiring.
5. Emergency generators including the construction of its concrete slab.
6. Motor control centers, local control stations, transfer switches, power distribution panels, breakers, lights, and switches.
7. Furnish, install and power primary flow elements, transmitters, flow recorders and install interconnecting wiring where said devices are to be provided as work of Contract E. Install and power primary flow elements, transmitters, flow recorders and install interconnecting wiring where said devices are to be provided as work of other contracts.
8. Setting of electrical sleeves and/or embedded conduit in all concrete construction. All conduit for new construction shall be embedded in concrete slabs, decks, or walls.
9. Electrical connections (final termination) to all equipment, control panels, ventilating equipment and electrical devices.
10. Startup participation for the various equipment and systems of the project and provide complete service to troubleshoot and assist manufacturer service representatives in obtaining a completely functional installation.
11. Removal of existing components as noted.
12. Final electrical terminations to all control panels, pumping equipment, blowers, HVAC equipment, etc.
13. Wiring connections to all electrical equipment (including equipment furnished by others).
14. Testing, programming and adjusting of all electrical systems.
15. Startup participation for the various equipment and systems of the project. Provide complete service to troubleshoot and assist manufacturer service representatives in obtaining a completely functional installation. Provide systems and equipment training for Owner personnel.
16. Project closeout submittals.

D. All other work shown and specified in the Contract Documents for Contract E.

1.04 ABBREVIATED SUMMARY OF CONTRACT H WORK

A. Furnish all labor, equipment, materials, tools, means, methods, and incidentals necessary to complete the Work as required by the Contract Documents for this Construction Contract. Each contractor shall coordinate, through the Owner/Architect, the work of their contract with the work by others.

B. This following abbreviated summary is provided in order to briefly describe the work covered by the Contract Documents for this Construction Contract. It is not all inclusive of the work under the Contract.

C. The work includes, but is not limited to, the following:
1. Startup participation for the various equipment and systems of the project and provide complete service to troubleshoot and assist manufacturer service representatives in obtaining a completely functional installation.
2. New electric unit heaters.
3. Furnish louvers and coordinate location for Contract G to install.
4. Testing and balancing of systems.
5. Project closeout submittals.

D. All other work shown and specified in the Contract Documents for Contract H.

1.05 PARTIAL LISTING OF SPECIFIC CONTRACT REQUIREMENTS

A. The Contract Documents detail the work included in the Contract. Related requirements and conditions covered by the Contract Documents include, but are not limited to, the following:
   1. The contractor shall adhere to all New York State Education Department requirements, including but not limited to NYCRR, Title 8, Chapter 2, Part 155.5 - Uniform Safety Standards for School Construction and Maintenance
   2. Guidelines and requirements of the local Health Department.
   3. Local gas utility requirements for new services, connections, alterations and related work.
   4. The contractor shall adhere to all New York State Education Department requirements, including but not limited to NYCRR, Title 8, Chapter 2, Part 155.5 - Uniform Safety Standards for School Construction and Maintenance.

1.06 PARTIAL LISTING OF OVERALL CONTRACT REQUIREMENTS

A. The Contract Documents detail the work included in the Contract. Related requirements and conditions covered by the Contract Documents include, but is not limited to, the following:
   1. Debris removal and daily and final cleaning up.
   2. Coordination with the Owner and other contractors who have been awarded work by the Owner.
   3. Coordination with utility companies necessary to schedule connection of services, and management of the installation.
   4. Site utilization and management so as not to disrupt the Owner’s ability to operate the existing facilities in a safe and efficient manner.
   5. Maintain the Owner’s ability to operate the facility at all times during the construction period.
   6. Facilities to be used during the contract period that are to be used by the Owner or his representatives and others involved with constructing the project.
   7. Product and equipment storage and handling requirements.
   8. Starting and adjusting of the equipment and systems required under the project.
   9. Site safety in accordance with all applicable federal, state, and local regulations.
   10. Project submittals, testing services, work plans, schedules, shop drawings, closeout procedures and documents, manuals, as-built drawings, final commissioning, of the work shall be provided as required by the Contract.

B. Each Contractor shall coordinate the work between the various construction contracts, through the Owner/Architect, as required to complete the contract requirements in accordance with the requirements contained in Section 013100.

1.07 OWNER SUPPLIED PRODUCTS AND UTILITIES

A. The Owner will not be supplying equipment, labor, or tools for the project.

1.08 EXISTING CONDITIONS

A. The Drawings show certain information that has been obtained by the Owner regarding various conditions that exist at the location of the project both below and at grade.

B. The Owner and the Architect expressly disclaims all responsibility for the accuracy or completeness of the information given on the Drawings with regard to existing facilities.

C. In the case where the Contractor discovers an obstruction not indicated on the Drawings or not described via specification reference, then the Contractor shall immediately notify the Architect of the obstructions' existence.

D. The Architect will determine if the obstruction is to be relocated or removed.

E. Compensation for this extra work will be paid for in accordance with the provisions in the Contract for "Extra Work".

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION 011100

H2M

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Site access and control of areas outside of site.

B. Contractor use of the premises.

C. Contractor storage, parking and deliveries.

D. Work hours, employee conduct and miscellaneous employee requirements.

1.02 SITE ACCESS AND CONTROL

A. Contractors shall use the designated entrance to the site as shown on the drawings. If no site entrance is designated, Contractors shall use an entrance designated by the Owner's Construction Representative.
   1. The Owner may permit, solely at the Owner's discretion, the temporary use of another entrance for site access.
   2. The Owner will only review requests made by the Contractor for an exception to the designated site entrance if made in writing at least 72 hours in advance of each of the times desired for use.

B. All contractors to maintain the entrance area clear of materials, vehicles and any other obstacle or debris. Failure to do so will result in a minimum back charge of $750 per occurrence.

C. The area around the site is a residential neighborhood. The Owner intends to be a good neighbor. Contractors shall not close any road for any period in time. The Contractors shall take whatever measures are necessary to not cause any inconvenience to the area's residents

D. All Contractors are responsible to employ methods to prevent construction materials and/or debris from leaving the site. All Contractors are responsible to routinely monitor the areas surrounding the site during the day as well as at the end of the work-day and to immediately clean up any area to its previous condition.

E. The Contractors shall employ methods to prevent the transmission of dirt from vehicles driving on exposed areas of the site from reaching the surrounding roadways. The Contractors will be responsible to immediately clean the roadway, should the measures being taken by the Contractors not satisfactorily control the transmission of any dirt to the roadway.

F. Any damages to areas outside the site, spills of soil, liquid, or any other material shall immediately be repaired, cleaned and restored to its previous condition.

G. The Contractors shall comply with all state and local requirements for allowable weight limits of vehicles on all roads.

H. The Owner reserves the right to back charge the Contractors for all costs associated with maintaining the grounds as well as maintaining areas outside the site, which may be disturbed by the Contractors should the Contractors fail to maintain or repair the aforementioned in a condition acceptable to the Owner.

I. The Contractor is responsible for cleaning up the work area. Failure to maintain a clean work site daily, will result in others performing the work and the Contractor being back charged for the cleaning cost plus construction administration fees.

J. Do not discard or dispose of any waste on-site.

K. The Contractor shall be responsible for managing dust.

1.03 CONTRACTOR USE OF THE PREMISES

A. Premises, for the purpose of this Contract, shall mean the site, buildings and other structures located within the property line or in any temporary or permanent construction easements identified on the plans.

B. The Contractors shall use and manage the premises and the associated construction activities as follows:
   1. To not hinder the Owner's ability to operate their facilities.
   2. To allow other Prime Contractors to install their work and complete their contractual obligations in the time period specified.
   3. To allow for stockpiling of construction material and debris without any significant hardship, as defined by the Owner's Construction Representative, on the Owner or other contractors.
   4. To allow for the stockpiling of excavated soil and imported fill, when called for, without any significant hardship, as defined by the Owner's Construction Representative, on the Owner or other contractors.
   5. To allow utility companies to install their work.
   6. To allow for the delivery of equipment and materials by independent trucking companies by leaving enough space for backing in and out of areas.
   7. To allow for the safe, unimpeded travel way of the Owners vehicles, Owner's Construction Representative's vehicles, Architect's vehicles, construction vehicles and heavy construction equipment about the entire site.

C. Contractors shall maintain the premises in a safe condition throughout the construction period. Compliance with OSHA regulations and site safety shall be the responsibility of the Contractor as it relates to work of the Contract. The posting of all applicable OSHA safety signs shall be the responsibility of the Contractors.

D. Contractors shall be responsible for protecting Owner's property. All existing buildings, structures, shrubs, trees, lawn fixtures, sculptures and misc. equipment shall be protected at all times. Any removals or relocation of said objects, if allowed shall be as directed by Owner's Construction Representative.

E. Contractors shall protect all of the physical structures, property and improvements upon the site from damage by their Work and shall immediately repair or replace damage caused by construction operations, employees or equipment employed by the Contractor. All labor, materials and equipment and outside contractors that are employed by the Owner to repair damage caused by the Contractor shall be billed to the Contractor directly or withheld from money due the Contractor for work already completed.

F. Immediately remove excess excavated material or relocate to areas on the site requiring placement of fill. Do not stockpile excess material on the site.

G. The construction site space is limited and it shall be the General Contractor's responsibility to manage the site during the entire construction period with input from all concerned parties as to meeting their needs. Equal consideration of the needs of others with that of the Contractor's shall be provided as judged by the Owner.

H. Due to the limited site area available for construction, staging areas shall be relocated several times during the various stages of construction. Additional compensation for relocating staging areas, equipment and material storage, and trailers are not to be considered an extra cost to the Contractor as this is an anticipated expense that shall be considered at the time of the bid.

I. Contractors are responsible for cleaning up their own materials and debris. Failure to maintain a clean work site daily, will result in other performing the work and Contractors being back charged for the cleaning cost plus construction administration fees.

J. Use of the existing building facilities during construction is prohibited including but not limited to: toilet rooms, telephone and water fountains. Contractors shall be fined ($250) per occurrence if their employee (or subcontractor's employee) is observed disregarding these rules.

K. Should it become necessary to access the existing building during construction hours for measurements or other non-disruptive work, the contractor shall be escorted by an Owner's Construction Representative.

L. Do not discard or dispose of any waste on-site.

M. Open fires will not be permitted on the site.

N. The Sitework Contractor shall employ erosion control measures to protect wetlands located adjacent to the work where shown on the Drawings and as required by regulatory agencies.

O. Install erosion control measures as indicated in the Contract. The Contractor shall confine stormwater runoff to the site.

1.04 CONTRACTOR STORAGE, PARKING AND DELIVERIES

A. Contractors must provide exterior storage containers when required. Final location of storage container shall be determined by the Owner.

B. Do not unreasonably encumber the premises with materials and equipment. Do not store material in existing buildings. Store all equipment and materials to allow the Owner's employees to operate and conduct their business safely.

C. Confine premise storage areas to locations designated by the Owner. Immediately repair or replace damaged facilities to the satisfaction of the Owner and to a condition that existed before the damage occurred as determined by preconstruction photographs, or if photographs are unavailable, to that deemed by the Owner.

D. No materials storage will be permitted within the buildings at any time during construction.

E. Storage of chemicals and paint materials shall be outside the existing or new structures and shall follow manufacturer's storage/handling guidelines.

F. Compressed gas containers shall be properly stored and secured per OSHA, to the satisfaction of the Owner. Failure to do so will result in a $250 back charge, per occurrence.

G. Contractors shall provide minimum of 48 hours advance written notice to the Owner's Construction Representative for deliveries of materials, site visits by inspectors, manufacturer's representatives or any other occasion that impacts the use of the site. Contractors shall be responsible for any costs that are incurred by the owner, for failure to meet previously agreed upon appointments or work schedules.

H. Deliveries sent to the Owner will not be signed for or unloaded by the Owner. They will be directed to the construction site and if no employee is on site, the delivery will be rejected, at the contractor's expense.

I. Night deliveries of equipment (past the designated quitting time) will not be permitted. Do not schedule trucking companies to deliver equipment or wait for the job site to open. Delivery trucks shall not obstruct the site entrance, shall not sit within the neighborhood causing an obstruction or perceived nuisance, nor be left idling on or off the site for any period of time.

J. Parking shall be in the designated areas of the site only. All automotive type vehicles are to be locked when parked or unattended to prevent unauthorized use. Do not leave vehicles or equipment unattended with the motor running or the ignition key in place. Any vehicles or trucks in non-designated areas may be towed at contractor's expense.

1.05 WORK HOURS, EMPLOYEE CONDUCT AND MISCELLANEOUS EMPLOYEE REQUIREMENTS

A. The Contractors will be permitted to schedule working days and hours as specified in the General Terms and Conditions, if no times are specified therein then the work hours shall be Monday - Friday 8:00 am - 4:00 pm.

B. Employees are to act in a professional manner. Any employee using inappropriate language or who is disruptive to the work environment will be banned from the site.

C. Proper work attire is required. Shirts are to be worn at all times and no short pants are permitted.

D. Comply with the Owner's Identification and Personal Protection Policies. A copy of the current policy will be distributed at the initial job meeting.

E. Employees shall not converse with local residents or Owner's employees.

F. Any employee found under the influence of any drug or alcohol will be banned from the site.

G. The following items are not allowed on the Site or the Owner's premises. Any person observed to bear any of the following items will be immediately removed from the site.
   1. Firearms, ammunition, weapons, and dangerous instruments (other than tools required for the work).
   2. Alcoholic beverages or illegal controlled substances.
   3. Cameras (except with written permission from the Owner).

H. Smoking is not permitted withing the building except for outdoors at least 100 feet from any window, louver, or door. Comply with the Owner's policies relating to smoking at the Site.

I. The Contractors shall schedule working days and hours as specified. The contractor shall pay all excess costs for working beyond the times specified. This includes the cost of the owner's employees to keep the building/site open and/or the cost of the additional services for the construction manager.

1.06 UNIFORM SAFETY STANDARDS

A. Section 155.5 Uniform Safety Standards for School Construction and Maintenance Projects
Disclaimer: These Rules of the Regents and Regulations of the Commissioner of Education ("regulations") are unofficial, and are presented for general informational purposes as a public service. Although reasonable efforts have been made to ensure that these regulations are current, complete and accurate, the State Education Department does not warrant or represent that they are current, complete and accurate. These regulations are subject to change on a regular basis. Readers are advised to consult Title 8 of the Official Compilation of Codes, Rules and Regulations of the State of New York (8 NYCRR), published by the Department of State, and the State Register <http://www.dos.state.ny.us/info/register.htm> for the official exposition of the text of these regulations, as well as for amendments and any subsequent changes or revisions thereto.

1. Monitoring of construction and maintenance activities.
   a. The occupied portion of any school building shall always comply with the minimum requirements necessary to maintain a certificate of occupancy and shall be monitored during construction or maintenance activities for safety violations by school district personnel. It is the responsibility of the board of education or board of cooperative educational services to assure that these standards are continuously maintained when the building or any portion thereof is occupied.
   b. Investigation and disposition of complaints relating to health and safety received as a result of construction and maintenance activities.
      1) Boards of education and boards of cooperative educational services shall follow procedures established under section 155.4(d)(7) of this Part.
   c. Pre-construction testing and planning for construction projects.
      1) Boards of education and boards of cooperative educational services shall assure that proper planning is made for safety of building occupants during construction. For all construction projects for which bids are issued on or after September 30, 1999, such boards shall assure that safety is addressed in the bid specifications and contract documents before contract documents are advertised for bid. All school areas to be disturbed during renovation or demolition shall be tested for lead and asbestos. Appropriate procedures to protect the health of building occupants shall be included in the final construction documents for bidding.
      2) Boards of education and boards of cooperative educational services shall establish procedures for involvement of the health and safety committee to monitor safety during school construction projects. The health and safety committees in school districts other than in cities with one million inhabitants or more shall be expanded during construction projects to include the project architect, construction manager, and the contractors. Such committee shall meet periodically to review issues and address complaints related to health and safety resulting from the construction project. In the case of a city school district in a city of one million inhabitants or more, the board of education shall submit procedures for protecting health and safety during construction to the commissioner for approval. Such procedures shall outline methods for compliance with this section.

3) The district emergency management plan shall be updated to reflect any changes necessary to accommodate the construction process, including an updated emergency exit plan indicating temporary exits required due to construction. Provisions shall be made for the emergency evacuation and relocation or release of students and staff in the event of a construction incident.
4) Fire drills shall be held to familiarize students and staff with temporary exits and revised emergency procedures whenever such temporary exits and revised emergency procedures are required.

d. Pre-construction notification of construction projects.
1) The board of education or board of cooperative educational services shall establish procedures for notification of parents, staff and the community in advance of a construction project of $10,000 or more to be conducted in a school building while the building is occupied. Such procedures shall provide notice at least two months prior to the date on which construction is scheduled to begin, provided that in the case of emergency construction projects, such notice shall be provided as far in advance of the start of construction as is practicable. Such notice shall include information on the district's obligations under this section to provide a safe school environment during construction projects. Such notice requirement may be met by publication in district newsletters, direct mailings, or holding a public hearing on the project to inform parents, students, school personnel and community members.

e. General safety and security standards for construction projects.
1) All construction materials shall be stored in a safe and secure manner.
2) Fences around construction supplies or debris shall be maintained.
3) Gates shall always be locked unless a worker is in attendance to prevent unauthorized entry.
4) During exterior renovation work, overhead protection shall be provided for any sidewalks or areas immediately beneath the work site or such areas shall be fenced off and provided with warning signs to prevent entry.
5) Workers shall be required to wear photo identification badges at all times for identification and security purposes while working at occupied sites.

f. Separation of construction areas from occupied spaces.
1) Construction areas which are under the control of a contractor and therefore not occupied by district staff or students shall be separated from occupied areas. Provisions shall be made to prevent the passage of dust and contaminants into occupied parts of the building. Periodic inspection and repairs of the containment barriers must be made to prevent exposure to dust or contaminants. Gypsum board must be used in exit ways or other areas that require fire rated separation. Heavy duty plastic sheeting may be used only for a vapor, fine dust or air infiltration barrier, and shall not be used to separate occupied spaces from construction areas.
2) A specific stairwell and/or elevator should be assigned for construction worker use during work hours. In general, workers may not use corridors, stairs or elevators designated for students or school staff.
3) Large amounts of debris must be removed by using enclosed chutes or a similar sealed system. There shall be no movement of debris through halls of occupied spaces of the building. No material shall be dropped or thrown outside the walls of the building.
4) All occupied parts of the building affected by renovation activity shall be cleaned at the close of each workday. School buildings occupied during a construction project shall maintain required health, safety and educational capabilities at all times that classes are in session.

g. Maintaining exiting and ventilation during school construction projects.
   1) The following information shall be included in all plans and specifications for school building projects:
      (a) A plan detailing how exiting required by the applicable building code will be maintained during construction. The plan shall indicate temporary construction required to isolate construction equipment, materials, people, dust, fumes, odors, and noise during the construction period. Temporary construction details shall meet code-required fire ratings for separation and corridor enclosure. At a minimum, required exits, temporary stairs, ramps, exit signs, and door hardware shall be provided at all times.
      (b) A plan detailing how adequate ventilation will be maintained during construction. The plan shall indicate ductwork which must be rerouted, disconnected, or capped in order to prevent contaminants from the construction area from entering the occupied areas of the building. The plan shall also indicate how required ventilation to occupied spaces affected by construction will be maintained during the project.

h. Fire and hazard prevention.
   1) Areas of buildings under construction that are to remain occupied shall maintain a certificate of occupancy. In addition, the following shall be strictly enforced:
      (a) No smoking is allowed on public school property, including construction areas.
      (b) During construction daily inspections of district occupied areas shall be conducted by school district personnel to assure that construction materials, equipment or debris not block fire exits or emergency egress windows.
      (c) Proper operation of fire extinguishers, fire alarm, and smoke/fire detection systems shall be maintained throughout the project.

i. Noise abatement during construction and maintenance activities.
   1) Construction and maintenance operations shall not produce noise in excess of 60 dba in occupied spaces or shall be scheduled for times when the building or affected building spaces are not occupied or acoustical abatement measures shall be taken. Noise level measurements (dba) shall be taken with a type 2 sound level meter in the occupied space in a location closest to the source of the noise. Complaints regarding excessive noise shall be addressed through the health and safety committee. The district should anticipate those times when construction noise is unacceptable and incorporate “no work” periods into the bid specifications.

j. Control of chemical fumes, gases, and other contaminants during construction and maintenance projects.
   1) The bid specifications and construction contracts for each construction project shall indicate how and where welding, gasoline engine, roofing, paving, painting or other fumes will be exhausted. Care must be taken to assure fresh air intakes do not draw in such fumes.
   2) The bid specifications shall require schedules of work on construction and maintenance projects which include time for off-gassing of volatile organic compounds introduced during construction before occupancy is allowed. Specific attention is warranted for activities including glues, paint, furniture, carpeting, wall coverings, and drapery. Manufacturers shall be contacted to obtain information regarding appropriate temperatures and times needed to cure or ventilate the product during use and before safe occupancy of a space can be assured. Building materials or furnishings which off-gas chemical fumes, gases, or other contaminants shall be aired out in a well ventilated heated warehouse before it is brought to the project for installation or the manufacturer's recommended off-gassing periods must be scheduled between installation and

use of the space. If the work will generate toxic gases that cannot be contained in an isolated area, the work must be done when school classes and programs are not in session. The building must be properly ventilated and the material must be given proper time to cure or off-gas before re-occupancy.

3) Manufacturer's material safety data sheets (MSDS) shall be maintained at the site for all products used in the project. MSDS must be provided to anyone who requests them. MSDS indicate chemicals used in the product, product toxicity, typical side effects of exposure to the product and safe procedures for use of the product.

k. Asbestos abatement protocols.
   1) All asbestos abatement projects shall comply with all applicable Federal and State laws including but not limited to the New York State Department of Labor industrial code rule 56 (12 NYCRR 56), and the Federal Asbestos Hazard Emergency Response Act (AHERA), 40 CFR part 763 (Code of Federal Regulations, 1998 Edition, Superintendent of Public Documents, U.S. Government Printing Office, Washington, DC 20402; 1998; available at the Office of Facilities Planning, Education Building Annex, Room 1060, State Education Department, Albany, NY 12234). Large and small asbestos projects as defined by 12 NYCRR 56 shall not be performed while the building is occupied. Minor asbestos projects defined by 12 NYCRR 56 as an asbestos project involving the removal, disturbance, repair, encapsulation, enclosure or handling of 10 square feet or less of asbestos or asbestos material, or 25 linear feet or less of asbestos or asbestos material may be performed in unoccupied areas of an occupied building in accordance with the above referenced regulations.

l. Lead paint.
   1) Any construction or maintenance operations which will disturb lead based paint will require abatement of those areas pursuant to protocols detailed in the “Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing” (June 1995; U.S. Department of Housing and Urban Development, Washington, D.C. 20410; available at the Office of Facilities Planning, Education Building Annex, Room 1060, State Education Department, Albany, NY 12234). All areas scheduled for construction as well as areas of flaking and peeling paint shall be tested for the presence of lead and abated or encapsulated in accordance with the above noted guidelines.

m. Radon.
   1) Districts shall take responsibility to be aware of the geological potential for high levels of radon and to test and mitigate as appropriate. This information is available from the New York State Department of Health Radon Measurement Database.

n. Post construction inspection.
   1) The school district or board of cooperative educational services shall provide the opportunity for a walk-through inspection by the health and safety committee members to confirm that the area is ready to be reopened for use.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION 011400

H2M

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. SED Commissioner's Uniform Safety Standards - Section155.5

B. Contractor use of the premises.

1.02 SITE ACCESS AND CONTROL

A. The Contractor shall use the designated entrance to the site as shown on the drawings. If no site entrance is designated, the Contractor shall use an entrance designated by the Owner's Construction Representative.
   1. The Owner may permit, solely at the Owner's discretion, the temporary use of another entrance for site access.
   2. The Owner will only review requests made by the Contractor for an exception to the designated site entrance if made in writing at least 72 hours in advance of each of the times desired for use.

B. The Contractor is to maintain the entrance area clear of materials, vehicles and any other obstacle or debris. Failure to do so will result in a minimum back charge of $750 per occurrence.

C. The area around the site is a residential neighborhood. The Owner intends to be a good neighbor. The Contractor shall not close any road for any period in time. The Contractor shall take whatever measures are necessary to not cause any inconvenience to the area's residents.

D. The Contractor is responsible to employ methods to prevent construction materials and/or debris from leaving the site. The Contractor is responsible to routinely monitor the areas surrounding the site during the day as well as at the end of the work-day and to immediately clean up any area to its previous condition.

E. The Contractor shall employ methods to prevent the transmission of dirt from vehicles driving on exposed areas of the site from reaching the surrounding roadways. The Contractor will be responsible to immediately clean the roadway, should the measures being taken by the Contractor not satisfactorily control the transmission of any dirt to the roadway.

F. Any damages to areas outside the site, spills of soil, liquid, or any other material shall immediately be repaired, cleaned and restored to its previous condition.

G. The Contractor shall comply with all state and local requirements for allowable weight limits of vehicles on all roads.

H. The Owner reserves the right to back charge the Contractor for all costs associated with maintaining the grounds as well as maintaining areas outside the site, which may be disturbed by the Contractor should the Contractor fail to maintain or repair the aforementioned in a condition acceptable to the Owner.

1.03 CONTRACTOR USE OF THE PREMISES

A. Premises, for the purpose of this Contract, shall mean the site, buildings and other structures located within the property line or in any temporary or permanent construction easements identified on the plans.

B. The Contractor shall use and manage the premises and the associated construction activities as follows:
   1. To not hinder the Owner's ability to operate their facilities.
   2. To allow other Prime Contractors to install their work and complete their contractual obligations in the time period specified.
   3. To allow for stockpiling of construction material and debris without any significant hardship, as defined by the Owner's Construction Representative, on the Owner or other contractors.
   4. To allow for the stockpiling of excavated soil and imported fill, when called for, without any significant hardship, as defined by the Owner's Construction Representative, on the Owner or other contractors.
   5. To allow utility companies to install their work.
   6. To allow for the delivery of equipment and materials by independent trucking companies by leaving enough space for backing in and out of areas.
   7. To allow for the safe, unimpeded travel way of the Owners vehicles, Owner's Construction Representative's vehicles, Architect's vehicles, construction vehicles and heavy construction equipment about the entire site.

C. Contractor shall maintain the premises in a safe condition throughout the construction period. Compliance with OSHA regulations and site safety shall be the responsibility of the Contractor as it relates to work of the Contract. The posting of all applicable OSHA safety signs shall be the responsibility of the Contractor.

D. The Contractor shall be responsible for protecting Owner's property. All existing buildings, structures, shrubs, trees, lawn fixtures, sculptures and misc. equipment shall be protected at all times. Any removals or relocation of said objects, if allowed shall be as directed by Owner's Construction Representative.

E. The Contractor shall protect all of the physical structures, property and improvements upon the site from damage by their Work and shall immediately repair or replace damage caused by construction operations, employees or equipment employed by the Contractor. All labor, materials and equipment and outside contractors that are employed by the Owner to repair damage caused by the Contractor shall be billed to the Contractor directly or withheld from money due the Contractor for work already completed.

F. Immediately remove excess excavated material or relocate to areas on the site requiring placement of fill. Do not stockpile excess material on the site.

G. The construction site space is limited and it shall be the General Contractor's responsibility to manage the site during the entire construction period with input from all concerned parties as to meeting their needs. Equal consideration of the needs of others with that of the Contractor's shall be provided as judged by the Owner.

H. Due to the limited site area available for construction, staging areas shall be relocated several times during the various stages of construction. Additional compensation for relocating staging areas, equipment and material storage, and trailers are not to be considered an extra cost to the Contractor as this is an anticipated expense that shall be considered at the time of the bid.

I. The Contractor is responsible for cleaning up their own materials and debris. Failure to maintain a clean work site daily, will result in other performing the work and The Contractor being back charged for the cleaning cost plus construction administration fees.

J. Use of the existing building facilities during construction is prohibited including but not limited to: toilet rooms, telephone and water fountains. The Contractor shall be fined ($250) per occurrence if their employee (or subcontractor's employee) is observed disregarding these rules.

K. Should it become necessary to access the existing building during construction hours for measurements or other non-disruptive work, the contractor shall be escorted by an Owner's Construction Representative.

L. Do not discard or dispose of any waste on-site.

M. Open fires will not be permitted on the site.

N. The Sitework Contractor shall employ erosion control measures to protect wetlands located adjacent to the work where shown on the Drawings and as required by regulatory agencies.

O. Install erosion control measures as indicated in the Contract. The Contractor shall confine stormwater runoff to the site.

1.04 CONTRACTOR STORAGE, PARKING AND DELIVERIES

A. Contractor must provide exterior storage containers when required. Final location of storage container shall be determined by the Owner.

B. Do not unreasonably encumber the premises with materials and equipment. Do not store material in existing buildings. Store all equipment and materials to allow the Owner's employees to operate and conduct their business safely.

C. Confine premise storage areas to locations designated by the Owner. Immediately repair or replace damaged facilities to the satisfaction of the Owner and to a condition that existed before the damage occurred as determined by preconstruction photographs, or if photographs are unavailable, to that deemed by the Owner.

D. No materials storage will be permitted within the buildings at any time during construction.

E. Storage of chemicals and paint materials shall be outside the existing or new structures and shall follow manufacturer's storage/handling guidelines.

F. Compressed gas containers shall be properly stored and secured per OSHA, to the satisfaction of the Owner. Failure to do so will result in a $250 back charge, per occurrence.

G. Contractor shall provide minimum of 48 hours advance written notice to the Owner's Construction Representative for deliveries of materials, site visits by inspectors, manufacturer's representatives or any other occasion that impacts the use of the site. Contractor shall be responsible for any costs that are incurred by the owner, for failure to meet previously agreed upon appointments or work schedules.

H. Deliveries sent to the Owner will not be signed for or unloaded by the Owner. They will be directed to the construction site and if no employee is on site, the delivery will be rejected, at the contractor's expense.

I. Night deliveries of equipment (past the designated quitting time) will not be permitted. Do not schedule trucking companies to deliver equipment or wait for the job site to open. Delivery trucks shall not obstruct the site entrance, shall not sit within the neighborhood causing an obstruction or perceived nuisance, nor be left idling on or off the site for any period of time.

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C. Proper work attire is required. Shirts are to be worn at all times and no short pants are permitted.

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E. Employees shall not converse with local residents or Owner's employees.

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regulations are subject to change on a regular basis. Readers are advised to consult Title 8 of the Official Compilation of Codes, Rules and Regulations of the State of New York (8 NYCRR), published by the Department of State, and the State Register <http://www.dos.state.ny.us/info/register.htm> for the official exposition of the text of these regulations, as well as for amendments and any subsequent changes or revisions thereto.

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      1) Boards of education and boards of cooperative educational services shall follow procedures established under section 155.4(d)(7) of this Part.
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      3) The district emergency management plan shall be updated to reflect any changes necessary to accommodate the construction process, including an updated emergency exit plan indicating temporary exits required due to construction. Provisions shall be made for the emergency evacuation and relocation or release of students and staff in the event of a construction incident.
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shall also indicate how required ventilation to occupied spaces affected by construction will be maintained during the project.

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   1) Areas of buildings under construction that are to remain occupied shall maintain a certificate of occupancy. In addition, the following shall be strictly enforced:
      (a) No smoking is allowed on public school property, including construction areas.
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      (c) Proper operation of fire extinguishers, fire alarm, and smoke/fire detection systems shall be maintained throughout the project.

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   1) Construction and maintenance operations shall not produce noise in excess of 60 dba in occupied spaces or shall be scheduled for times when the building or affected building spaces are not occupied or acoustical abatement measures shall be taken. Noise level measurements (dba) shall be taken with a type 2 sound level meter in the occupied space in a location closest to the source of the noise. Complaints regarding excessive noise shall be addressed through the health and safety committee. The district should anticipate those times when construction noise is unacceptable and incorporate “no work” periods into the bid specifications.

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   2) The bid specifications shall require schedules of work on construction and maintenance projects which include time for off-gassing of volatile organic compounds introduced during construction before occupancy is allowed. Specific attention is warranted for activities including glues, paint, furniture, carpeting, wall coverings, and drapery. Manufacturers shall be contacted to obtain information regarding appropriate temperatures and times needed to cure or ventilate the product during use and before safe occupancy of a space can be assured. Building materials or furnishings which off-gas chemical fumes, gases, or other contaminants shall be aired out in a well ventilated heated warehouse before it is brought to the project for installation or the manufacturer's recommended off-gassing periods must be scheduled between installation and use of the space. If the work will generate toxic gases that cannot be contained in an isolated area, the work must be done when school classes and programs are not in session. The building must be properly ventilated and the material must be given proper time to cure or off-gas before re-occupancy.
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   1) All asbestos abatement projects shall comply with all applicable Federal and State laws including but not limited to the New York State Department of Labor industrial code rule 56 (12 NYCRR 56), and the Federal Asbestos Hazard Emergency Response Act (AHERA), 40 CFR part 763 (Code of Federal

Regulations, 1998 Edition, Superintendent of Public Documents, U.S. Government Printing Office, Washington, DC 20402; 1998; available at the Office of Facilities Planning, Education Building Annex, Room 1060, State Education Department, Albany, NY 12234). Large and small asbestos projects as defined by 12 NYCRR 56 shall not be performed while the building is occupied. Minor asbestos projects defined by 12 NYCRR 56 as an asbestos project involving the removal, disturbance, repair, encapsulation, enclosure or handling of 10 square feet or less of asbestos or asbestos material, or 25 linear feet or less of asbestos or asbestos material may be performed in unoccupied areas of an occupied building in accordance with the above referenced regulations.

l. Lead paint.
   1) Any construction or maintenance operations which will disturb lead based paint will require abatement of those areas pursuant to protocols detailed in the “Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing” (June 1995; U.S. Department of Housing and Urban Development, Washington, D.C. 20410; available at the Office of Facilities Planning, Education Building Annex, Room 1060, State Education Department, Albany, NY 12234). All areas scheduled for construction as well as areas of flaking and peeling paint shall be tested for the presence of lead and abated or encapsulated in accordance with the above noted guidelines.

m. Radon.
   1) Districts shall take responsibility to be aware of the geological potential for high levels of radon and to test and mitigate as appropriate. This information is available from the New York State Department of Health Radon Measurement Database.

n. Post construction inspection.
   1) The school district or board of cooperative educational services shall provide the opportunity for a walk-through inspection by the health and safety committee members to confirm that the area is ready to be reopened for use.

1.07 CONTRACT REQUIREMENTS RELATED TO MAINTAINING OWNER'S CURRENT OPERATIONS AND EXCESS INSPECTION REQUIRED

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION 011400.11

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Site Utilization Plan requirements

1.02 SITE UTILIZATION PLAN REQUIREMENTS

A. Each Contractor shall prepare a Site Utilization Plan (SUP) showing staging areas, parking areas, stockpile areas, debris container areas, unloading areas, and trailer areas for review by the Architect and Owner's Construction Representative. The length and number of meetings necessary to develop and adopt a SUP shall be as required.

B. Meetings will be held at the site with all concerned parties to assist the Contractor in developing the criteria for the plan. During these meetings, all parties will present their needs and requirements for site utilization. Representatives from the local municipality or utility companies may be attending. The requirements of the local municipality and utility companies shall be incorporated into the SUP.

C. Each Contractor shall then prepare a draft site plan that attempts to incorporate the needs of all concerned parties. Another meeting will then be held at the site to review and present the plan. The plan shall then be revised at that meeting and adopted for use if it is acceptable to all relevant parties. If all parties cannot agree on an acceptable plan, then the Owner's Construction Representative will establish the Site Utilization Plan without any claims from any contractor.

D. Each Contractor, by submitting a bid, understands the importance of a workable Site Utilization Plan and also understands that the Owner's Construction Representative may be required to select a plan for the contractor to adopt that is not ideal to the planned construction activities anticipated before the bid was submitted. There shall be no claims for damages associated with site utilization.

E. If the General Contractor fails to prepare the Site Utilization Plan as stipulated above, then the Owner reserves the right to back charge the Contractor for the costs associated with having a Site Utilization Plan developed.

F. If a Prime Contractor fails to participate or attend the meetings scheduled to develop the Site Utilization Plan then the Prime Contractor will forfeit any right to comment on the plan that is developed.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION 011419

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Allowance pricing for the following items:
   1. General Contingency Account.

B. This Section covers the requirements for use of the cash allowances listed above contained in the proposal (Bid Forms, Price Schedule) and included in the Contract Price bid by the Contractor and defines and stipulates the charges that will be paid for out of the stipulated allowances.

C. The Contractor shall include the cash allowances stipulated in this Section in the amount bid (Base Bid).

D. Eligible costs described in this Section, and Sections referenced herein, will be the only costs paid for out of the stipulated allowances.

E. All other costs associated with the project as specified and/or shown, including but not limited to the delivery, installation and all Contractor overhead and/or collateral expenses are to be distributed among the other portions of the work and shall be included in the lump sum base bid.

1.02 SUBMITTALS

A. Make all submissions under the provisions of Section 013300.

B. For each type of product/material specified to be furnished under allowance pricing provide documentation of the unit pricing on manufacturer's letterhead certifying pricing of the product/material.

C. Submit additional backup information to substantiate the invoiced amount(s) as the Architect may require for review and approval, prior to order or payment of item.

D. Provide written breakdowns for extra work as the Owner may require.

1.03 CHANGES TO STIPULATED (CASH) ALLOWANCE

A. If the actual cost of services differs from the cash allowance, then the Contract Price will be adjusted accordingly.

1.04 PAYMENTS TO BE MADE OUT OF GENERAL CONTINGENCY ACCOUNT

A. Include the cash allowance as shown in the proposal, in the amount bid for use upon the Owner's instructions.

B. The Owner will draw funds from the contingency account only upon prior written approval by the Owner's Construction Field Representative and Architect.

C. Funds remaining at project closeout shall be credited to the Owner.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION 012100

PART 1 - GENERAL

1.01 DESCRIPTION

A. This Section specifies the requirements for measurements and records made for payment purposes and describes the item(s) under which payment(s) will be made for the Work performed under this Contract.

B. All work shown or specified in the Contract Documents shall be performed.

C. Items not specified to be measured or paid for (for which no specific pay item exists in the Price Schedule) shall be included in an appropriate unit price item or in a lump-sum item.

D. Comply with the requirements pertaining to the restoration of all surfaces, which may or may not be paid for under a separate unit price item, and which shall be restored to a condition equal to or better than that existed prior to work starting under this contract.

1.02 MEASUREMENT REQUIREMENTS

A. All required measurements shall be made by the Contractor with the Architect.

B. Any measurements not witnessed by Architect and which cannot be verified or substantiated by Architect will not be approved and payment under the item(s) requiring such measurements will not be made.

C. Coordinate measurements monthly, for the preparation of periodic pay estimates.

D. Where payments will be made for removing rock and existing materials, notify Architect so that he may witness the measurements.
   1. All materials removed without conforming to the above procedures, which Architect cannot verify or substantiate, will not be paid for.
   2. Maintain complete, neat, clean, and legible field notes for all measured items.
   3. Notes shall contain spaces for Contractor’s and Architect’s signatures plus additional space for comments.
   4. An original and a carbon copy shall be made for all notes and one copy shall be turned over to Architect daily.
   5. The Architect’s signature shall not be constituted as an acceptance of the work, or the measurements made, but shall mean that he was present when the measurements were made.

1.03 SUBMITTALS

A. Field notes of all measurements for payment purposes delivered to Architect daily.

B. Copies of all invoices required for payments out of cash allowance(s).

C. Monthly Applications for Payment.

D. Record Drawings showing the locations and quantities of all items measured for payment purposes.

1.04 SCHEDULING

A. Notify Architect, as far in advance as possible, of the recording of measurements so that a representative of the Architect may observe existing conditions, work being performed, and measurements being made.

B. Allow for and afford Architect ample time, space, and equipment to observe measurements and to verify measurements and elevations.

PART 2 - PRODUCTS

2.01 GENERAL

A. Provide all labor, materials, facilities, levels, measuring devices and all other equipment and items necessary to properly and accurately perform all measurements for payment purposes.

B. Payment for certain items not specifically listed in the bid forms but otherwise required by the technical specifications shall be deemed included as part of the General Conditions and the individual unit price and lump sum bid items provided for in the proposal.

PART 3 - EXECUTION

3.01 GENERAL

A. Perform all measuring required under this Section.

B. Record all measurements and calculated quantities on the Record Drawings.

C. No measurement shall be made for work performed within the limits of Lump Sum Items.

ITEM NO.	ITEM DESCRIPTION
1	

END OF SECTION 012200

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Submission procedures.

B. Documentation of changes to Contract Sum/Price and Contract Time.

1.02 RELATED SECTIONS

A. Proposal Form.

B. Other sections referencing this section.

C. All contractual requirements outlined in the documents.

1.03 SUBMISSION REQUIREMENTS

A. Submit Alternates on Proposal Forms identifying the effect on adjacent or related components.

B. Alternates will be reviewed and accepted or rejected at the Owner's option.

C. Coordinate related work and modify surrounding work to integrate the Work of each Alternate.

1.04 SELECTION AND AWARD OF ALTERNATES

A. Indicate variation of Bid Price for Alternates listed on the PROPOSAL FORM. This form requests a "difference" in Bid Price by adding to or deducting from the base Bid Price.

B. Alternates quoted on PROPOSAL FORM will be reviewed and accepted or rejected at Owner’s option.

C. Accepted alternates will be identified in Owner-Contractor Agreement.

D. Bids will be evaluated on the base bid price, plus any combination of alternate items.

1.05 WORK FOR ALTERNATES

A. Work for alternate items selected shall include all related materials, labor, equipment and operations necessary to conduct and complete the alternate work and all other affected work or adjacent areas.

B. There shall be no change in time or completion date for the selected alternates, unless specified herein or approved in writing by the Architect and Owner.

C. Alternates and associated work shall meet all standards and specifications delineated in the Contract Documents.

D. Contractor shall coordinate pertinent related Work and modify surrounding Work as required to complete the project under each alternate selected by the Owner.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.01 PROCEDURES

A. Work for each alternate, related items and collateral work shall be completed in their entirety.

B. If alternate items are not selected, work for the base bid and collateral work shall be completed in their entirety.

END OF SECTION 012300

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. **This Section includes the requirements for substitution of specified products during construction.**

B. *The* Architect *will consider requests for substitutions only within* ***two (2)*** *business days following the Bid Opening.*

C. Products named by the Bidder, at the time of bid, shall be furnished and installed and substitutions will not be considered by the Owner/Architect for those products.

1.02 CONTRACTOR'S OPTIONS

A. For products specified only by reference standard, select any product meeting that standard.

B. For products specified by naming several products or manufacturers, select any one of the products or manufacturers named which complies with the Specifications.

C. Where products are not named, then submit products that meet the specifications.

PART 2 - PRODUCTS

2.01 SUBSTITUTIONS

A. Name - The Drawings and Specifications list acceptable manufacturers, commercial names, trademarks, brands and other product, material and equipment designations. Such names are provided to establish the required type, quality and other salient requirements of procurement.

B. Equals - An item equal to that named or described on the Drawings or in the Specifications may be provided by Contractor if accepted in writing by the Architect.

C. A request for product substitution constitutes a representation that the Contractor:
   1. Has investigated proposed Product and determined that it meets or exceeds the quality level of the specified Product.
   2. Shall provide the same warranty for the Substitution as for the specified Product.
   3. Shall coordinate installation and make changes to other Work that may be required for the Work to be complete with no additional cost to Owner, including extra charges by other Prime Contractors, material suppliers, and vendors.
   4. Waives claims for additional costs or time extension that may subsequently become apparent.
   5. May be responsible to reimburse the Owner for review or redesign services associated with re-approval by authorities, if required.
   6. May be responsible to reimburse the Owner for all additional A/E services needed by the Architect for extra services associated with the review of the Contractor's substituted item since it could not have been originally included in the Architect's professional engineering services agreement. Reimbursement shall be based on the man-hours expended, at current billing rates. A copy of the billing rates will be provided to the contractor for approval prior to services being provided.

D. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.

E. Substitution Submittal Procedure:
   1. The Contractor shall submit three (3) copies of the REQUEST FOR SUBSTITUTION FORM for consideration including all required information.
   2. The Contractor shall use the form included within this Section.
   3. All forms shall be type written.
   4. Submit shop drawings, product data, and certified test results attesting to the proposed product equivalence.

F. The burden to prove product equivalence rests on the Contractor.

G. The Architect will notify Contractor in writing of decision to accept or reject request and at that time the Contractor can make a formal submittal in accordance with the requirements contained in Section 013300.

H. Substitutions may be considered when a product becomes unavailable through no fault of the Contractor or the Architect.

PART 3 - EXECUTION

NOT USED

This space left intentionally blank.

REQUEST FOR SUBSTITUTION FORM

Project: AC & VENTILATION AT MAMARONECK ELEMENTARY SCHOOL

Substitution Request Number:_____

Contractor:_____

Address:_____

To:_____

Date:_____

H2M Project Number: WPSD2205

Owner: WHITE PLAINS CITY SCHOOL DISTRICT

Contract Name:_____

Contract No.:_____

Specification Title:_____

Section:_____ Page:_____ Article/Paragraph:_____

Drawing No(s).:_____

Proposed Substitution:_____

Manufacturer:_____

Address:_____

Trade Name:_____

Phone #: (____)_____

Installer:_____

Address:_____

Phone #: (____)_____

History: ___New product ___2-5 years old ___5-10 years old ___More than 10 years old

Differences between proposed substitution and specified product:

___Point-by-point comparative data attached

Reason for not providing specified item (Attach separate sheet if necessary):

Typical Similar Installation:

Project:_____

Engineer / Architect:_____

Address:_____

Owner:_____

Date Installed:_____

Submit complete installation list on separate sheets.

Proposed substitution affects other parts of Work: ___No ___Yes

Explain:_____

Gross Savings to Owner for accepting substitution: $_____

Proposed substitution changes Contract Time: ___No ___Yes

Add / deduct (circle):_____ days

Supporting data attached for evaluation of the proposed substitution:

___Product Data ___Photos ___Drawings ___Tests ___Reports ___Samples

___Other (explain):_____

Attached data includes description, specifications, drawings, photographs, performance and test data adequate for evaluation of request; applicable portions of data are clearly identified.

Attached data also includes a description of changes to Contract Documents that proposed substitution will require for its proper installation.

The undersigned certifies that the following paragraphs, unless modified by attachments, are correct:

1. Proposed Substitution has been fully checked and coordinated with Contract Documents.
2. Proposed Substitution does not affect dimensions shown on Drawings.
3. Proposed Substitution does not require revisions to any other Prime Contractor's work.
4. The undersigned will pay for changes to building design, including Architectural and Engineering design, detailing, and construction costs caused by requested Substitution.
5. Proposed Substitution will have no adverse affect on other trades, construction schedule, or specified warranty requirements.
6. Maintenance and service parts will be locally available for proposed substitution.
7. The undersigned further states that the function, appearance, and quality of proposed Substitution are equivalent or superior to specified item.

This request for product substitution also constitutes a representation that I, as the Contractor:

1. Has investigated proposed Product and determined that it meets or exceeds the quality of the specified Product.
2. Shall provide the same warranty for the Substitution as for the specified Product.
3. Shall coordinate installation and make changes to other Work that may be required for the Work to be complete with no additional cost to Owner, including extra charges by other Prime Contractors, material suppliers, and vendors.
4. Waives claims for additional costs or time extension that may subsequently become apparent.
5. Shall reimburse the Owner and the Architect for review or redesign services associated with re-approval by authorities.
6. Shall reimburse the Owner for all additional engineering services claimed by the Architect for extra services associated with the review of the Contractor's substituted item since it could not have been originally included in the Architect's professional engineering services agreement. Reimbursement shall be based on the man-hours expended, at current billing rates.

Contractor's Authorized Representative (Typewritten):_____

Authorized Signature:_____

Date:_____

END OF SECTION 012500

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work under this Section specifies the procedures used to process partial payments and the Final Payment Request.

1.02 SUMMARY

A. This Section specifies administrative and procedural requirements governing each prime contractor's Applications for Payment.
   1. Coordinate the Schedule of Values and Applications for Payment with the Contractor's Construction Schedule, Submittal Schedule, and List of Subcontracts.

B. Related Sections: The following Sections contain requirements that relate to this Section.
   1. Schedules: The Contractor's Construction Schedule and Submittal Schedule are specified in Division 01 - Section 013300 - SUBMITTALS.

1.03 TIME FOR COMPLETION

A. Inasmuch as the provisions of the Contract relating to the time for performance and completion of the Work are for the purposes of enabling the Owner to proceed with the construction of a public improvement in accordance with a predetermined program, and inasmuch as failure to complete the Work within the period herein specified may result in damage or loss to the Owner, time is of the essence of the Contract.

B. Time for completion of the Work shall be in accordance with that stipulated in the Contract Documents.

C. The date for completion will be calculated from the date shown on the Notice to Proceed. The Contractor shall execute the Work with diligence from day to day, and complete it within the time fixed.

D. For the purpose of defining the date of substantial completion, the Project will be considered complete when all Work covered by the Contract has been performed and all installations and equipment have been tested and are ready for permanent use. Contractor shall provide a copy of the final Certificate of Occupancy from the AHJ prior to issuance of the final payment. Removal of the Contractor's plant and equipment and other minor adjustments which do not prevent use of the Project will not be a factor in establishing the date of substantial completion.

E. Notwithstanding the foregoing, the Architect will establish the date of substantial completion when the project is accepted and ready for operation, and no large or major items of work are as yet outstanding. At such time, the Architect will issue a punch list, itemizing the items of work remaining. The punch list will include "minor" items only, as defined solely by the Architect. Any prior punch lists, which include "major" or significant items, as defined by the Architect, shall not be a criterion in establishing the date of substantial completion.

1.04 PARTIAL COMPENSATION

A. At the Owner's discretion, the Contractor may receive compensation for materials and products delivered to the site yet not installed providing:
   1. A canceled check or paid bill from the supplier is submitted to the Architect indicating that the Contractor has paid the supplier for the material or equipment.

2. The material or piece of equipment is properly stored and protected from the elements and/or vandalism in accordance with the manufacturer's written requirements for long term storage.
3. A certificate of insurance is provided for the material or piece of equipment in the event of a fire, vandalism, theft, etc.
4. A bill of material is delivered to the Architect at the time of delivery itemizing the subject material or equipment. Payment will be made for on-site material and/or equipment in the amount of 80% of the gross amount of the paid invoice. This payment will be subject to the normal retainage of the partial estimate.
5. The Architect has agreed to the pre-purchasing of the materials.

B. The Contractor may not receive compensation for materials and products stored in the Contractor's yard or shop unless permitted by the Owner.

1.05 SCHEDULE OF VALUES

A. Coordination: Contractor shall coordinate preparation of its Schedule of Values for the Work with preparation of the Contractors' Construction Schedule.
   1. Correlate line items in the Schedule of Values with other required administrative schedules and forms, including:
      a. Contractor's Construction Schedule.
      b. Application for Payment forms, including Continuation Sheets.
      c. List of subcontractors.
      d. Schedule of allowances.
      e. Schedule of alternates.
      f. Schedule of submittals.
   2. Submit the Schedule of Values (SOV) to the Owner's Construction Representative within 10 days of receipt of Letter of Intent but no later than 10 days before the date scheduled for submittal of the initial Applications for Payment. (SOV received after the 15 day of the month, will not be accepted for review until the following month to allow for computer system input time required by the Owner's Construction Representative and the Owner.

B. Format and Content: Use the Project Manual table of contents as a guide to establish the format for the Schedule of Values. Provide at least one item for each Specification Section.
   1. Identification: Include the following Project Identification on the Schedule of Values:
      a. Project name and location. (Each school and additions / renovations will require separate breakdown sections and front end with subtotals.
      b. Name of the Architect.
      c. Architect's Project Number.
      d. Contractor's name and address.
      e. Date of Submittal.
   2. Arrange the Schedule of Values in tabular form with separate columns to indicate the following for each item listed:
      a. Related Specification Section or Division.
      b. Description of Work.
      c. Name of subcontractor.
      d. Name of manufacturer or fabricator.
      e. Name of supplier.
      f. Change Orders (numbers) that affect value.
      g. Dollar value.
         1) Percentage of Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.

3. Provide a breakdown of the Contract Sum in sufficient detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Break principal subcontract amounts down into several line items where requested by Owner's Construction Representative. Multiple line items will be provided for amounts in excess of five percent of the contract sum, broken out into sub components equating not greater than five percent each. Separate all line items by material & labor.
    a. Breakdown shall be separated between additions and renovations with subtotals for each.
4. In addition to the breakdown of specification sections , separate line items will be required for the following front-end line items:
    a. Bonds & OCP insurances shall have separate line items. (substantiation letters shall be required from bonding & insurance company for any amounts higher than industry standard). Only OCP insurance shall be allowed for the insurance line item. All other insurance costs must be distributed by contractor throughout the various sections.
    b. Supervision: include a minimum of one percent of contract value.
    c. Project Administration: include a minimum of one percent of contract value.
    d. Project meetings (appropriate value for weekly attendance for entire duration of project - see Section 013119 Project Meetings).
    e. Punchlist - include a minimum of two (2) percent of contract sum.
    f. Closeout: separate lines for demobilization, Operation & Maintenance manuals, closeout paperwork and Demonstration & Training. All totaling a minimum two (2) percent of the Contract value.
    g. Continuous Clean-up and Final Clean-up values each at a minimum of one half percent (0.5 % of the Contract value).
    h. The General Construction Contractor shall add a line item for broom sweep/ damp mopping at an agreed to value.
5. Round amounts to nearest whole dollar; the total shall equal the Contract Value.
6. Provide a separate line item in the Schedule of Values (SOV) for each part of the Work where Applications for Payment may include materials or equipment, purchased or fabricated and stored, but not yet installed.
    a. Differentiate between items stored on-site and items stored off-site. Include requirements for insurance and bonded warehousing.
7. Provide separate line items on the Schedule of Values for initial cost of the materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
8. Unit-Cost Allowances: Show the line-item value of unit-cost allowances, as a product of the unit cost, multiplied by the measured quantity. Estimate quantities from the best indication in the Contract Documents.
9. Margins of Cost: Show line items for indirect costs and margins on actual costs only when such items are listed individually in Applications for Payment. Each item in the Schedule of Values and Applications for Payment shall be complete. Include the total cost and proportionate share of general overhead and profit margin for each item.
    a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the Schedule of Values or distributed as general overhead expenses, at the discretion of the Contractor.
10. Schedule Updating: Update and resubmit the Schedule of Values prior to the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Value.

1.06 APPLICATIONS FOR PAYMENT

A. Each Application for Payment shall be consistent with previous applications and payments as certified by the Architect and paid for by the Owner.
   1. The initial Application for Payment, the Application for Payment at time of Substantial Completion, and the final Application for Payment involve additional requirements.

B. Payment-Application Times: Each progress-payment date is indicated in the Agreement. The period of construction Work covered by each Application for Payment is the period indicated in the Agreement.

C. Payment-Application Times: The date for each progress payment is the 21st day of each month (or as designated by the Owner). The period covered by each Application for Payment is the previous month.

D. Payment-Application Forms: Use AIA Document G732/CMa (include line for Owner's Construction Representative signature) and Continuation Sheets G703 as the form for Applications for Payment.
   1. Separate Continuation Sheets shall be provided for work which takes place on each building, which will detail that portion of the contract which is attributable to the specific building. The appropriate S.E.D. project number(s) shall be shown on the top of each continuation form.

E. Application Preparation: Complete every entry on the form. Include notarization and execution by a person authorized to sign legal documents on behalf of the Contractor. The Owner's Construction Representative will return incomplete applications without action.
   1. Entries shall match data on the Schedule of Values and the Contractor's Construction Schedule. Use updated schedules if revisions were made.
   2. Include amounts of Change Orders and Allowances issued prior to the last day of the construction period covered by the application. (No Change order or Allowance requisitions can be made or listed on the requisition, unless the formal Change Order and Allowance paperwork has been fully executed by Contractor, Owner's Construction Representative, Architect and Owner).
   3. Provide copies of payrolls which are signed and notarized documenting compliance with prevailing wage laws. Payrolls for contractors are required from the of the previous month to the 24th day of the current month. Payrolls for subcontractors are required from the 15th day of the previous month to the 14th day of the current month.
   4. Provide copies of Lien Waivers for the previous payment (or anticipated payment). Include certificate of monthly payment for subcontractors for the previous month.
   5. Provide OSHA 10 certificates for all workers on site.
   6. Payment for stored materials (whether on-site but not installed, or offsite in a secured warehouse) will require a Bill of Lading showing the exact value accompanied by photographs of the actual materials. In no case shall more that 80% be approved for uninstalled stored materials. An Insurance certificate must be provided, specific to the materials stored with the appropriate dollar value (for on-site or offsite materials).

F. Transmittal: Submit five (5) signed and notarized original copies of each Application for Payment to the Owner's Construction Representative by a method ensuring receipt within 24 hours. Each copy shall be complete and securely attached and shall include all waivers of lien, certified payrolls and similar attachments.

1. Transmit each copy with a transmittal form listing attachments and recording appropriate information related to the application, in a manner acceptable to the Architect and Owner's Construction Representative.

G. Waivers of Mechanics Lien: With each Application for Payment, submit waivers of mechanics liens from subcontractors, sub-subcontractors and suppliers for the construction period covered by the previous application.
   1. Submit partial waivers on each item for the amount requested, prior to deduction for retainage, on each item.
   2. When an application shows completion of an item, submit final or full waivers.
   3. The Owner reserves the right to designate which entities involved in the Work must submit waivers.
      a. Submit final Applications for Payment with or preceded by final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
   4. Waiver Forms: Submit waivers of lien on forms, and executed in a manner, acceptable to the Owner.

H. Initial Application for Payment: Administrative actions and submittals, that must precede or coincide with submittal of the first Application for Payment include the items listed below. The initial payment application will not be processed until all of these actions and submittals have been received by the Owner's Construction Representative. When preliminary submissions are received with the initial application (item 4 and item 7 listed below), the final submission for these items must be received and approved by the Owner's Construction Representative prior to submission of the second application for payment.
   1. List of subcontractors.
   2. List of principal suppliers and fabricators.
   3. Schedule of Values.
   4. Contractor's Construction Schedule (preliminary if not final).
   5. Schedule of principal products.
   6. Schedule of unit prices.
   7. Submittal Schedule (preliminary if not final).
   8. List of Contractor’s staff assignments.
   9. List of Contractor’s principal consultants.
   10. Copies of building permits.
   11. Copies of authorizations and licenses from governing authorities for performance of the Work.
   12. Initial progress report.
   13. Report of preconstruction meeting.
   14. Certificates of insurance and insurance policies.
   15. Performance and payment bonds.
   16. Data needed to acquire the Owner's insurance.
   17. Initial settlement survey and damage report, if required.

I. Application for Payment at Substantial Completion: Following issuance of the Certificate of Substantial Completion, submit an Application for Payment.

1.07 ACCEPTANCE OF FINAL PAYMENT REQUEST

A. The Contractor shall be conclusively deemed to have accepted the Final Payment Request as a correct statement of the total liability of the Owner and of the compensation paid and to be paid to the Contractor by the Owner unless within seven (7) days after delivery of his copy of the

Final Payment Request to him, the Contractor shall return such copy to the Owner together with a statement of his objections to such request and of any claim for damages or compensation in excess of the amounts shown on the Request. The acceptance by the Contractor of the Final Payment Request approved by the Owner shall constitute a release and shall discharge the Owner from all further claims by the Contractor arising out of or relating to the Contract, including but not limited to, a release from all impact costs.

1.08 SCOPE OF PAYMENTS

A. The Contractor shall receive and accept the compensation as herein provided, in full payment for furnishing all materials, labor, tools, and equipment and for performing all work contemplated and embraced under the Contract, also for all loss or damage arising out of the nature of the Work or from the action of the elements, or from any unforeseen difficulties or obstructions which may arise or be encountered during the prosecution of the Work, and for all risks of every description connected with the prosecution of the Work, until its final acceptance by the Owner, also for all expenses incurred by, or in consequence of, the suspension or discontinuance of the said prosecution of the Work as herein specified, and for all actual or alleged infringements of patent, trademark, or copyright, and for completing the Work and the whole hereof, in an acceptable manner, according to the Plans, Specifications, and other Contract Documents. The payment of any partial or final estimate shall in no way or in no degree prejudice or affect the obligation of the Contractor, at his own cost and expense, to renew or replace all defects and imperfections, or damages. The Architect shall be the judge, and the said Contractor shall be liable to the Owner for failure so to do.

PART 2 - PRODUCTS

NOT USED.

PART 3 - EXECUTION

NOT USED.

END OF SECTION 012900

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Schedule of Values

1.02 SCHEDULE OF VALUES

A. Submit for approval prior to the start of the work a Schedule of Values that indicates a breakdown of the labor, materials and equipment and other costs used in the preparation of the bid. This schedule shall be in sufficient detail to indicate separate figures for such items as excavation, concrete, equipment and all other items making up the lump sum price. The cost breakdown shall be separately itemized for each lump sum bid item in the project.

B. Where the cost breakdown includes items for bond payment, insurance payment, job set-up, or job mobilization, these items will be paid based on paid invoices and copies of cancelled checks.

C. Submit a Schedule of Values to the Architect for review and approval within fifteen (15) calendar days from the date shown on the Notice to Proceed.

1.03 FORM OF SUBMITTAL

A. Submit typewritten Contract Cost Breakdown on AIA Form G703 - Application and Certificate for Payment Continuation Sheet or EJCDC 1910-8-E. The Architect reserves the right to revise the form or provide a form prepared by the Architect.

B. Use the Table of Contents of the Contract Specifications as a basis for format for listing costs of work for Sections under Divisions 01-48 as sections apply to work. Not all Sections need be assigned a breakout price as determined by the Architect.

C. Identify each line item with number and title as listed in Table of Contents.

D. Provide dollar values for each line item for labor, overhead, profit, material, and equipment components for each category of work if requested by the Architect.

E. List quantities of materials specified under unit price allowances.

F. The Schedule of Values, after approval by the Architect, shall be the basis for the Contractor's Application for Payment.

G. The first Application for Payment will not be reviewed prior to an approved breakdown.

1.04 PREPARATION OF SCHEDULE OF VALUES

A. In addition to the above, provide a separate line item cost for each of the following items which shall be supported by proof where requested by Architect:
   1. Performance and payment bonds.
   2. Insurance.
   3. Mobilization and Demobilization (Amounts shall be equal in value).
   4. Temporary facilities and measures as specified in Section 015000.
   5. Project Coordination Meetings as specified in Section 013100.

6. Preparation of the Project Construction Schedule, and updates, as specified in Section 013300.
7. Preparation of Weekly Schedules as specified in Section 013100
8. Rubbish removal and daily cleaning up. (Provide a total dollar amount and a daily rate for each calendar day during the contract period.)
9. All Cash Allowance items as contained in Section 012100.
10. On-site, full time superintendent starting on the date of the Notice To Proceed and ending on the date that all punch list items are completed, which for the purposes of the Schedule of Values, shall be the contract completion date.
11. Final cleaning.

B. Show total costs including overhead and profit.

C. Provide additional details and data to substantiate the cost breakdown as requested by the Architect.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION 012973

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Work of this Section includes:
   1. Requests for Interpretation or for information
   2. Coordination between contractors, if applicable
   3. Administration of subcontracts
   4. Coordination of work with utility companies and the Owner/Architect
   5. Communication and coordination requirements
   6. Qualifications of Contractor's job site superintendent

B. Site staffing requirements for the Contractor's superintendent are also specified herein, the costs for which shall be included in the Contract price.

1.02 REQUEST FOR INTERPRETATION OR INFORMATION

A. The Contractor shall use the Request for Interpretation/Information Form included within this Section when the Contractor feels that additional information is needed to perform the work of the Contract.

B. The Architect will respond to requests utilizing the form provided herein.

C. The Architect's verbal response(s) to the Contractor's formal requests, if provided, shall not constitute an official response and if acted upon by the Contractor are done so at the Contractor's own risk and liability and shall not be subject to claims for additional compensation.

D. A signed facsimile of the form will be accepted. The original of the form must be signed and provided to the project manager.

E. The Architect will respond in writing to the request as soon as possible.

1.03 DAILY CONSTRUCTION REPORTS

A. Prepare a daily construction report recording the following information concerning events at the site, and submit one copy to the Owner's Construction Representative by 10:00 a.m. the following day. Any contractor not submitting required reports will not receive approval of the subsequent application for payment until such time that all required information is submitted:
   1. List of subcontractors at the site.
   2. Count and names of personnel at the site.
   3. High and low temperatures, general weather conditions.
   4. Accidents and unusual events.
   5. Meetings and significant decisions.
   6. Stoppages, delays, shortages, and losses.
   7. Meter readings and similar recordings.
   8. Emergency procedures.
   9. Orders and requests of governing authorities.
   10. Change Orders received, implemented.
   11. Services connected, disconnected.
   12. Equipment or system tests and startups.
   13. Partial Completions, occupancies.
   14. Substantial Completions authorized.

1.04 COORDINATION BETWEEN CONTRACTORS

A. During the progress of the Work, other Contractors may be engaged in performing other work or may be awarded other contracts for other work on this Project. Each Contractor shall coordinate all the work to be done with the work of each Contractor(s) through the Owner.

B. Each Contractor shall fully cooperate with each other Contractor(s) and carefully fit its own work to that provided under other contracts as shown or specified in the Contract Documents and as may be coordinated by the Owner and as may be coordinated by the Owner/Architect

C. Each Contractor shall not commit or permit any act that will interfere with the timely performance of work by any other Contractor.

D. The Contractor shall conduct his/her own operations, and to cooperate with such other parties, so as to cause as little interference as possible with the work by others.

E. The Contractor agrees to make no claim against the Owner/Architect for additional payment due to delays or other conditions created by the operation of others.

F. If there is a difference of opinion as to the respective project rights of each Contractor doing the work, within the limits of or adjacent to the Project, the Owner/Architect shall decide as to the respective rights of the various parties involved in order to secure completion of the work in a satisfactory manner. The Owner/Architect's decision shall be final and binding on each Contractor.

G. If any portion of the work of the Contractor, or any of his/her subcontractors, depends upon the proper execution of the work by others, the Contractor shall promptly give written notice to the Architect of all purported defects in the installed work as renders it unsuitable for proper execution and completion of his own work. The Contractor shall further notify the Architect of all supposed delays, in the performance of his/her work, as will affect the timely performance of his own work or the project.

H. The Contractor's lack of notice shall constitute an acceptance by him/her that the work of others is fit and proper for the reception of the Contractor's own work, except as to defects developing in the work that could not have been reasonably foreseen.

I. The Contractor's lack of notice shall also constitute an acceptance by him/her and an acknowledgement of the timely performance of work by other Contractors or the Owner and that no claims for additional compensation may result.

J. If the Owner/Architect determines that the Contractor is failing to coordinate his own work with the work of others, then the Owner shall have the right to enforce the provisions of the Contract as related to non-performance.

K. The Owner/Architect shall not be liable for any damages suffered by this Contractor by reason of any other Contractor's failure to comply with the directions so issued by the Owner/Architect, or by reason of another Contractor's default in performance; it being understood that the Owner does not guarantee the continued efficiency or work production of any Contractor and by execution of the Contract, the Contractor fully understood the potential coordination problems associated with projects involving multiple prime construction contracts.

L. The Contractor's attention is specifically directed to the fact that he may not have exclusive occupancy of the work area within the limits of the Contract. Each Contractor shall afford the Owner, other Contractors, and utilities reasonable opportunity for the storage of their materials and equipment, and the execution of their work, and shall connect and coordinate his work with theirs as required by the Contract Documents.

1.05 SUBCONTRACTOR ADMINISTRATION AND COORDINATION

A. Terms and conditions of the Contract shall be binding upon each subcontractor.

B. Furnish each subcontractor and major equipment vendor at least one (1) copy of the Plans and Technical Specifications.

C. Provide at least one (1) copy of each approved shop drawing to each subcontractor whose work may depend upon the contents of the shop drawing submittal. The Owner reserves the right to stop all work, without claims for delay, until such time as appropriate subcontractors are furnished with appropriate shop drawings.

D. Each Contractor shall sequence and schedule the work of subcontractors. Coordinate construction and administration activities of subcontractors. The Architect and Owner will not accept telephone calls, facsimiles or office visits from any subcontractors on the project. Subcontractor and vendor questions and clarifications shall be directed to the Architect by the Contractor.

E. The Contractor's on-site project superintendent shall inspect all the work of all of his/her subcontractors, as it is being constructed. The Contractor's subcontractor shall not be permitted to do any work on the site without the Contractor's job site superintendent also being there to inspect the work as it is being performed.

1.06 UTILITY COORDINATION

A. Comply with the requirements of 16 NYCRR Part 753 - Protection of Underground Facilities. Submit a letter stating the case number.

B. Comply with the utility coordination requirements contained in the General Conditions.

1.07 PUBLIC/PRIVATE UTILITIES

A. Notify all public and private utilities in accordance with Article 20, Section 322-a of the New York State General Business Law for location and markout of existing utilities in the vicinity of the work.

B. Repair all utilities damaged during the Work to the standards and approval of the respective utility at no cost to the Owner.

1.08 SPECIFIC COORDINATION REQUIREMENTS

A. Sequence and schedule work so as not to interfere with the work by others. Coordinate the work of this Contract with the work by others. In case of conflicts due to improper coordination by the Contractor, the Owner/Architect's resolution will be final. No compensation will be awarded for extra work required to resolve conflicts.

B. Coordinate space requirements, supports, and installation of mechanical, electrical and plumbing work which may be indicated diagrammatically on the Drawings. Follow routing shown for pipes, ducts, and conduit as closely as practicable. Place runs parallel with building lines. Utilize spaces efficiently to maximize accessibility for other installations, maintenance, and to facilitate repairs.

C. In finished areas, except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of all fixtures and outlets with finish elements and work by all other trades.

1.09 CONTRACTOR'S JOB SITE SUPERINTENDENT

A. Each Contractor shall employ an on-site superintendent as specified herein below. He/She shall be a full-time employee of the Contractor.

B. Each Contractor shall name the job site superintendent within five (5) days of the Notice To Proceed. A letter to the Architect shall be provided.

C. He/She shall have the authority to sequence and schedule the work, and to staff the project, so as not to interfere with the work by others and to complete the work daily within the time so required.

D. Each Superintendent shall have a minimum of five (5) years of experience as a job site superintendent for projects of equal size and complexity.

E. Each superintendent shall be qualified to perform the duties so required to successfully complete the work in accordance with the Contract Documents.

F. Each superintendent shall speak English. If required by the Architect, provide a resume for the proposed superintendent that shall be typed and shall list the qualifications of the superintendent. Prior to the Contractor assigning a superintendent to the project, he may wish to arrange an interview with the Architect to determine the proposed superintendent's ability to properly coordinate the work through the Owner/Architect. The Contractor shall employ a superintendent acceptable to the Owner.

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REQUEST FOR INTERPRETATION/INFORMATION (RFI)

OWNER'S NAME: WHITE PLAINS CITY SCHOOL DISTRICT

PROJECT NAME & CONTRACT DESIGNATION: AC & VENTILATION AT MAMARONECK ELEMENTARY SCHOOL

CONSTRUCTION CONTRACT NO.: WPSD2205

Product, Item, or System:	
Request Date:	RFI No.:
Specification Section:	Paragraph Ref:
Contract Drawing Reference(s):	
Describe Request:	
Signed:	See Contractor's Attachments for Additional Description for Information
Owner/Architect Response:	
Architect (Printed):	See Architect's Attachments for Additional Information
Architect's Signature & Date	*Response Accepted By Contractor* *Contractor's Signature & Date*
The Work shall be carried out in accordance with these supplemental instructions without change in Contract amount or Contract time for completion. Prior to proceeding with these instructions, indicate your acceptance of these instructions by signing where indicated and returning this form to the Architect.	

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION 013100

H2M

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Work of this Section includes the requirements for progress meetings, including but not limited to, the following:
   1. Preconstruction conferences.
   2. Preinstallation conferences.
   3. Progress meetings.
   4. Coordination meetings.

1.02 PRE-CONSTRUCTION CONFERENCE

A. A preconstruction conference will be scheduled before starting construction, at a time convenient to the Owner, Owner's Construction Representative and the Architect, but no later than 15 days after issuance of the Letter of Intent. The conference will be held at the Project Site or another convenient location.

B. Attendees: Authorized representatives of the Construction Manager, Owner, Architect, and their consultants; the Contractor and its superintendent; major subcontractors; manufacturers; suppliers; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with the Project and be authorized to speak/make decisions, on behalf of the concern they represent, on matters relating to the Work.
   1. Agenda: Discuss items of significance that could affect progress, including the following:
   2. Tentative construction schedule.
   3. Critical work sequencing.
   4. Designation of responsible personnel.
   5. Procedures for processing field decisions and Change Orders.
   6. Procedures for processing Applications for Payment.
   7. Distribution of Contract Documents.
   8. Submittal of Shop Drawings, Product Data, and Samples.
   9. Preparation of record documents.
   10. Use of the premises.
   11. Parking availability.
   12. Office, work, and storage areas
   13. Equipment deliveries and priorities.
   14. Safety procedures.
   15. First aid.
   16. Security.
   17. Housekeeping.
   18. Working hours.

C. Reporting: The Owner's Construction Representative shall set-up the meeting(s), prepare and issue meeting minutes to attendees and interested parties.

D. The Contractor is required to attend the pre-construction conference at a location, date, and time selected by the Owner.

1.03 PREINSTALLATION CONFERENCES

A. Contractor shall conduct a pre-installation conference at the Project Site before each construction activity that requires coordination with other construction activities / trade work.

B. Attendees: The Installer and representatives of the Prime Contractor, 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 the Owner's Construction Representative and Architect of scheduled meeting dates.
   1. Review the progress of other construction activities and preparations for the particular activity under consideration at each pre-installation conference, including requirements for the following:
      a. Contract Documents.
      b. Options.
      c. Related Change Orders.
      d. Purchases.
      e. Deliveries.
      f. Shop Drawings, Product Data, and quality-control samples.
      g. Review of mockups. Possible conflicts.
      h. Compatibility problems.
      i. Time schedules.
      j. Weather limitations.
      k. Manufacturer's recommendations.
      l. Warranty requirements. Compatibility of materials. Acceptability of substrates. Temporary facilities.
      m. Space and access limitations.
      n. Governing regulations. Safety.
      o. Inspecting and testing requirements. Required performance results.
      p. Recording requirements Protection.
   2. Prime Contractor shall record significant discussions, agreements and disagreements of each conference and the approved schedule. Promptly distribute the record of the meeting to everyone concerned, including the Owner and the Architect.
   3. Do not proceed with the installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of Work and reconvene the conference at the earliest possible date.
   4. Reporting: Prime Contractor or Installer shall issue meeting minutes to attendees, Owner's Construction Representative, Owner and Architect and associated field representatives.

1.04 PROGRESS MEETINGS

A. Progress meetings will be held at the Project Site at regular intervals (typically weekly) as determined by the Owner's Construction Representative and Architect.

B. Attendees: In addition to representatives of the Owner, Owner's Construction Representative, and the Architect, each Prime Contractor shall be represented at these meetings. Attendance is mandatory at weekly meetings and contractor will include in their bid a sum of $250.00 per meeting (figure 10 meetings) to have an authorized individual in attendance capable of making decisions and providing direction. This amount will be listed as a separate line item on the contractors Schedule of Values. If the contractor misses a meeting without prior written authorization from the Owner's Construction Representative, they will be issued a deduct change order in the amount of $250.00 per occurrence. Subcontractors, suppliers, or other entities will be invited at the discretion of the Owner, Owner's Construction Representative, and the Architect. All participants at the conference shall be familiar with the Project and authorized to conclude matters relating to the Work.

C. Agenda: Review and correct or approve minutes of the previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to the status of the Project.
   1. Contractor's Construction Schedule: Review progress since the last meeting. Determine where each activity is in relation to the Contractor's Construction Schedule, whether on time or ahead or behind schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to insure that current and subsequent activities will be completed within the Contract Time.
   2. Review the present and future needs of each entity present, including the following:
      a. Interface requirements. Time.
      b. Sequences.
      c. Status of submittals. Deliveries.
      d. Off-site fabrication problems. Access.
      e. Site utilization.
      f. Temporary facilities and services.
      g. Hours of work.
      h. Hazards and risks.
      i. Housekeeping.
      j. Quality and work standards. Change Orders.
      k. Documentation of information for payment requests.

D. Reporting: Approximately 5 days after each meeting, Owner's Construction Representative will prepare and distribute minutes of the meeting to each party present and to parties who should have been present. Include a brief summary, in narrative form, of progress since the previous meeting and report.

E. Progress meetings will be held approximately once every two (2) weeks during the project. The Owner may elect to hold meetings more or less frequently.

F. At least seven (7) calendar days advance notice will be given by the Owner's Construction Representative or the date for the upcoming meeting will be set during the progress meeting.

G. Attendance at progress meetings shall be mandatory. An amount of $1,000 shall be deducted from the Contract Amount for each announced meeting not attended by the Contractor.

H. The owner, a partner, or a corporate officer representing the Contractor shall attend each announced progress meeting. The job site superintendent and office project manager for each Contractor shall also attend.

I. Subcontractors shall attend when requested by the Owner or Owner's Construction Representative at no cost to the Owner.

J. Meetings will be conducted by Owner's Construction Representative at a location selected by the Owner, normally at or adjacent to the project site.

K. The minimum agenda will cover:
   1. Review minutes of previous meetings.
   2. Identify present problems and resolve them.
   3. Plan work progress during next work period.
   4. Review the status of off-site fabrication and delivery schedule.

5. Review shop drawings and submittal schedules.
6. Review change order status.
7. Review status of construction progress schedule.
8. Coordinate access requirements.
9. Other business related to the work.

1.05 COORDINATION MEETINGS

A. Conduct project coordination meetings at regular intervals convenient for all parties involved. Project coordination meetings are in addition to specific meetings held for other purposes, such as regular progress meetings and special pre-installation meetings.

B. Request representation at each meeting by every party currently involved in coordination or planning for the construction activities involved.

C. Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

D. The Owner's Construction Representative Field Manager will conduct daily meetings with the prime contractors and major subcontractors foremen. The purpose of the meetings is to provide the opportunity for each contractor to communicate to the Field Manager any items relating to their respective construction activity for that day (request for shutdown, deliveries, etc.) The meetings will commence from 7:00 o'clock am until 7:30 o'clock am. These meetings are generally informal. The Owner's Construction Representative Field Manager will keep minutes of these meetings when appropriate and will be available upon request.

1.06 SAFETY MEETINGS

A. Each Contractor will be responsible to conduct their own safety meetings on a regular basis (but not less than four times during any thirty day period.)

B. Minutes of the Safety Meeting must be maintained by each contractor on-site and must be made available upon request. Failure to conduct and submit meeting minutes will be grounds to reject the Prime Contractor's progress payment.

1.07 CONDUCTING MEETINGS

A. General - This paragraph covers Owner, Owner's Construction Representative, and Architect meetings with Contractor and/or his subcontractors. Neither the Owner nor the Owner's Construction Representative nor the Architect wish to meet solely with a subcontractor and requests for such meetings will be discouraged. If a meeting is deemed necessary, every effort will be made to have Contractor attend. If, for some reason, circumstances do not allow such, the meeting may be held, minutes of the meeting will be sent to contractor and decisions on any major questions will be reserved until contractor has been consulted. Subcontractors may accompany contractor to meetings provided the contractor notifies the Owner's Construction Representative in advance.

B. Chairman - When Owner's Construction Representative/Owner attend meetings, the Owner's Construction Representative, or his duly authorized representative, will act as chairman. Should Owner-Contractor meetings be necessary, Owner will chair such meetings.

C. Notices - Owner's Construction Representative or Owner will issue notices of meetings to all parties concerned and will note, thereof, who must attend and who may attend if they so desire.

When a Contractor desires a formal meeting, make a request through Owner's Construction Representative. Except when Owner's Construction Representative determines that a prompt meeting is essential, all notices will be issued at least one week in advance of the meeting date.

D. Agenda - All parties shall inform Owner's Construction Representative of items desired to be discussed and Owner's Construction Representative will notify all parties of all items to be considered. This is to allow each party to fully prepare for the meeting. This shall not be construed to mean that other items cannot be brought up at the meetings.

E. Time Limits - It is the intent to hold productive and efficient meetings and to keep them as short as is reasonably possible. The Chairman will be the sole judge as to whether or not further discussion on any matter is warranted and all discussions shall cease when he so orders.

F. Minutes - Minutes of meetings will be kept, written and distributed by the Chairman or his duly authorized representative. Minutes of all meetings will be available upon request to the Chairman.

G. Conduct - It is the intent to conduct all meetings in an orderly manner, to reasonably discuss all items and to hear and observe the rights and opinions of all parties. The Chairman will allow each party to speak, however, he reserves the right to order any individual to leave the meeting at any time for any reason.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION 013119

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. This Section specifies the requirements for preparing construction schedules and for keeping them up to date.

1.02 CONSTRUCTION SCHEDULE - GENERAL

A. The Contractor shall develop a full schedule, in sufficient detail and clarity of for and technique so that the contractor can plan and control his work properly and the Owner's Construction Representative, Owner, and Architect can each readily monitor and follow the progress for all portions of the work. The Contractor shall complete the detailed schedule within 10 days after contract award.

B. In no case shall first application for payment be approved prior to submission of acceptable preliminary schedule, detailed submittal schedule, and schedule of values.

C. Monthly updates, required schedules and graphics shall be submitted to the Owner's Construction Representative/Owner within five working days following the end of the preceding month. Monthly updates, schedules and graphics shall be submitted in five copies.

D. If any of the required submissions are returned to the Contractor for corrections or revisions, they shall be resubmitted within ten (10) calendar days after the return mailing date. Re-submittals shall be in the same quantities as noted above. Review and response by the Owner's Construction Representative/Owner will be given within (10) calendar days after resubmission.

E. The schedule shall comply with the various limits imposed by the scope of work any by any contractually intermediate milestone dates and completion dates included in the contract.

F. The activities identified in the schedule shall be analyzed in detail to determine activity time durations in units of whole working days. All durations listed shall be the result of definitive manpower and resource planning by the Contractor. The contractor will provide specific manpower loading information / crew size to support the duration proposed. (e.g. - 4 man crew can produce 1000 sq. ft. / day, project has 11,000 sq. ft., thus duration is identified as 11 days)

G. The activity data shall include activity codes to facilitate selection, sorting and preparation of summary reports and graphics. Activity codes shall be developed for:
   1. Area: Subdivision of the site into logical modules or blocks and levels.
   2. Responsibility: Contractor or subcontractor responsible for the work.
   3. Specifications: CSI format - 48 Division.
   4. System: Division of the work into building systems for summary purposes.
   5. Milestone: Work associated with completion of interim completion dates or milestones.
   6. Pay Item: Work identified with a pay item listed on the approved Schedule of Values.

H. Coordinate the work and maintain the construction schedule. In the event actual progress begins to lag the schedule, promptly employ additional means and methods of construction to make up the lost time.

I. Keep the construction schedule current and revise and resubmit as often as necessary to accurately reflect the conditions of the work, past progress and anticipated future progress.

J. The construction schedule shall be completed, submitted, and deemed received by the Architect prior to the first payment application.

K. The schedule, when approved by the Owner's Construction Representative, Owner, and Architect, shall establish the dates for starting and completing work for the various portions of the Contract. It shall be the duty of the Contractor to conform to his/her own schedule and to perform the work within the time limits indicated. Failure to adhere to the approved schedule may expose the Contractor to disputes, claims and additional costs incurred by others.

L. Coordinate letting of subcontracts, material purchases, shop drawing submissions, delivery of materials, and sequence of operations, to conform to the schedule.

M. Coordinate the construction schedule with the proposed schedules of the equipment suppliers and subcontractors.

N. The schedule shall show the critical sequence items where new units must come online before existing facilities go offline, if applicable to the project. The schedule shall also show, in detail, the proposed sequence of the work and the estimated date of starting and completing each stage of the work in order to complete the project within the contract time.

O. The schedule shall be plotted out in color and shall be 11-inch by 17-inch. It shall contain as many sheets as are necessary to show all rolled down tasks. Partially printed schedules will not be accepted. Each Contractor shall arrange to have it plotted on a color plotter suitable for the intended application.

P. Prepare the schedule in a manner so that the actual progress of the work can be recorded and compared with the expected progress.

Q. The schedule shall use the following convention:
   1. Tasks for the General Contractor in blue ink.
   2. Task links/task dependency in blue ink.
   3. Work by others in green ink.
   4. Milestone dates (zero duration) by a red diamond.
   5. The end date for each task and subtask at the end of a bar.
   6. The description of all major tasks within the bar. The bar shall be red.
   7. Critical path.

R. The construction schedule shall also show the following:
   1. Critical sequence items where new units must come on-line before existing facilities go off-line, if applicable to the project.
   2. Computer delivery, if so specified elsewhere.
   3. Telephone service and high speed internet cable installation.
   4. Lead time for control panels that are packaged as systems.

1.03 REPORTS

A. For initial submittal and each update the contractor shall prepare the following standard report:
   1. Tabular Schedule Report sorted by Activity code and Early Start.

1.04 GRAPHICS

A. For initial submittal the contractor shall prepare the following graphics:

1. Pure logic diagram (Precedence Format) of all data, not time scaled, grouped by Activity code.
2. Detailed bar chart sorted by Activity Code with Early Start and Early Finish.
3. Summary bar chart summarizing by Activity Code with Early Start and Early Finish.

B. For each update the contractor shall prepare the following graphic:
1. Bar Chart showing work activities with Early Start in the next 40 work-days sorted by Activity Code and Early Start.
2. Summary Bar Chart summarizing by Activity Code showing progress with Early Start and Early Finish.

C. For each Change Order involving adjustment in the contract time for performance, the contractor shall prepare a pure logic diagram showing the changed work with all preceding (predecessors) and succeeding (successors)activities (fragnet schedule).

1.05 SUBMITTALS

A. In no case shall first application for payment be approved prior to submission of acceptable preliminary schedule, detailed submittal schedule, and schedule of values.

B. Monthly updates, required schedules and graphics shall be submitted to the Owner's Construction Representative and Owner within five working days following the end of the preceding month. Monthly updates, schedules and graphics shall be submitted in five copies.

C. If any of the required submissions are returned to the Contractor for corrections or revisions, they shall be resubmitted within ten (10) calendar days after the return mailing date. Resubmittal shall be in the same quantities as noted above. Review and response by the Owner's Construction Representative and Owner will be given within (10) calendar days after resubmission.

1.06 PAYMENT WITHHELD

A. If the Contractor fails to submit the required schedule information as indicated in this section within the time stipulated or provide revision(s) thereof within the requested time, the Owner and Owner's Construction Representative may withhold approval of Progress Payment Estimates until such time as the Contractor submits the required information.

1.07 REVISION OF PROJECT PROGRESS SCHEDULE

A. Each Prime Contractor shall evaluate and provide updated construction schedules monthly in accordance with job requirements. Each update shall be submitted to the Owner and Owner's Construction Representative for information purposes and be provided by the last Friday of every month

B. Each Contractor shall modify its construction schedule to accommodate coordination of the construction contracts by the Owner/Architect without claims for additional compensation or delay.

C. The Owner's Construction Representative will provide an electronic version of the Final Combined Construction Schedule for use in keeping the schedule up to date.

D. From time to time, and at stages deemed appropriate by the Owner's Construction Representative, the Owner may issue updated schedules to reflect the project’s status. The

percent complete for each task may be shown, as determined by the Owner's Construction Representative.

1.08 UPDATES

A. Updates of the Schedule shall be made at the end of each month reflecting actual or reasonably anticipated progress as of the last working day of the month. Monthly updates of the Detailed Schedule will be made each month until all work is substantially complete.

B. The Contractor will meet with the Owner's Construction Representative and Owner at the end of the updated period to review information in draft form before preparation of the required schedules and graphics. The Contractor will present data, prepared in advance, for review and approval of the Owner's Construction Representative and Owner including :
   1. Actual Start Dates.
   2. Actual Completion Dates.
   3. Activity percent complete and/or Remaining Duration.
   4. Revised logic, changes in activity duration's or resource assignments.
   5. Narrative report discussing progress through the update period; changes, delays or other circumstances affecting progress; status of the project with respect to completion schedule; and any efforts by the Contractor to improve progress.

C. The update meeting will establish the values to be submitted for payment and will be directly related to the schedule of values in the application for payment.

D. The Contractor shall prepare a report of the meeting and make all changes, additions or corrections to the data resulting from the review. The contractor shall promptly prepare the monthly submittal following the update meeting.

1.09 CHANGES, DELAYS AND EXTENSIONS OF TIME

A. When changes or delays are experienced, the Contractor shall submit to the Owner's Construction Representative and Owner, a Time Impact Analysis (TIA) illustrating the influence of each change or delay on the currently scheduled Contract completion date. Each Time Impact Analysis shall include a Fragnet (network analysis) demonstrating how the Contractor proposes to incorporate the change or delay into the Detailed Schedule. Additionally, the analysis shall demonstrate the time impact based on the date the change was given to the Contractor, the status of construction at that point in time, and the activity duration of all affected activities. The activity duration used in this Time Impact Analysis shall be those activities included in the latest update of the Detailed Schedule, closest to the time of delay or as adjusted by mutual agreement.

B. Each TIA shall be submitted within ten (10) calendar days after a delay occurs or a notice of change order is given to the Contractor. In cases where the Contractor does not submit a TIA for a specific change or delay with a specified period of time, it shall be mutually agreed that no time extension is required. Final evaluation of each TIA by the Owner's Construction Representative and Owner shall be made within fourteen (14) calendar days after receipt of the TIA unless subsequent meetings and negotiations are necessary. Adjustments in the Contract time for performance shall be made only by written change order approved by the Owner. Upon approval of the Owner, Fragnets illustrating the influence of changes and delays shall be incorporated into the Detailed Schedule by the contractor during the first update after agreement is reached.

C. The time difference between the Early Finish date and the Late Finish Date is defined as "float." The "float" belongs to the Project and may be used by the Contractor or the Owner's Construction Representative and Owner to benefit the Project. Changes or delays that influence activities in the network with "float" and do not extend the Critical Path (the network of activities with zero days "float") shall not be justification for an adjustment in Contract time for performance.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION 013216

END OF SECTION 013223

H2M

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. This Section specifies the requirements for making submissions for the project. Electronic submissions will be required unless expressly noted otherwise.

B. Refer to Section 013216 - Construction Schedule for the requirements concerning the submission of construction schedules and for making updates thereto.

C. This Section includes administrative and procedural requirements for submittals required for performance of the Work, including the following:
   1. Contractor's construction schedule.
   2. Submittal schedule.
   3. Daily construction reports.
   4. Shop Drawings.
   5. Product Data.
   6. Samples.
   7. Quality assurance submittals.

D. Administrative Submittals: Refer to other Division 1 Sections and other Contract Documents for requirements for administrative submittals. Such submittals include, but are not limited to, the following:
   1. Permits.
   2. Applications for Payment.
   3. Performance and payment bonds.
   4. Insurance certificates.
   5. List of subcontractors.

E. Related Sections: The following Sections contain requirements that relate to this Section:
   1. Division 1 Section " Payment Procedures" specifies requirements for submittal of the Schedule of Values.
   2. Division 1 Section " Project Management and Coordination" specifies requirements governing preparation and submittal of required Coordination Drawings.
   3. Division 1 Section "Project Meetings" specifies requirements for submittal and distribution of meeting and conference minutes.
   4. Division 1 Section "Quality Requirements" specifies requirements for submittal of inspection and test reports.
   5. Division 1 Section "Execution and Closeout Requirements " specifies requirements for submittal of Project Record Documents and warranties at project closeout.

1.02 DEFINITIONS

A. Coordination Drawings show the relationship and integration of different construction elements that require careful coordination during fabrication or installation to fit in the space provided or to function as intended.
   1. Preparation of Coordination Drawings is specified in Division 1 Section " Project Management and Coordination" and may include components previously shown in detail on Shop Drawings or Product Data.

B. Field samples are full-size physical examples erected on-site to illustrate finishes, coatings, or finish materials. Field samples are used to establish the standard by which the Work will be judged.

C. Mockups are full-size assemblies for review of construction, coordination, testing, or operation; they are not Samples.

1.03 IDENTIFICATION OF SUBMITTALS

A. Each and every submission shall be provided by the Contractor and shall be accompanied by a SUBMISSION TRANSMITTAL FORM. The Contractor shall use the specimen form made a part of this Section. *Submittals not containing the form will be returned to the Contractor un-reviewed.* The Architect will not review project submissions until such time as the form is competed in its entirety. Identify each submittal and resubmittal using the form.

B. Each individual submittal shall be identified with a 'submission log number' as specified here in this example: 033000.01-1
   1. The Section number for which the submittal applies, followed by a period, shall be indicated, "033000.".
   2. The submittal within the Section shall be indicated by the next grouping "01". For instance and in this example, the concrete design mix may be submission "01", the waterstop catalog cut may be "02", and so on. Submittals shall be sequentially numbered within the Specification Section, i.e. 01, 02, etc.
   3. The number of times the submission was made shall be preceded by a dash and a numerical suffix as follows: "-1". In this example, the concrete design mix is being submitted for the first time. Use the number "1" for the first time it is being submitted.
   4. Subsequent submissions of the concrete design mix shall utilize the original number and a sequential numeric suffix, i.e. "2" for a resubmission, "3" for the second resubmission, and so on. Substitute the new number for the original "1".

C. Where a layout drawing, containing different elements of the project, is being submitted and there is a question as to what the log number might be, then the Contractor shall contact the Architect so that an agreed upon log number can be assigned.

D. It is incumbent on the Contractor to initially assign the submission log number designation to each submission. Submissions not containing a log number, as specified above, will be returned to the Contractor un-reviewed by the Architect.

E. Every submittal shall also be accompanied by a Transmittal Letter (or "Speed Form") addressed to the Architect's Project Manager as hereinafter defined.

1.04 SUBMITTAL SCHEDULE

A. Submittals must be prepared and transmitted as follows, unless otherwise approved by the Owner's Construction Representative:
   1. Within 15 working days after Notice to Proceed:
      a. Skylights.
      b. Tapered Shop Drawings.
      c. Roofing Package (membrane, vapor barrier, adhesive, etc.).
      d. Masonry Samples.
      e. Asbestos Abatement submittals & Plan.

2. If the contractor misses the milestone submittal timeframes listed above, the owner / agents can withhold requisition payments until the required paperwork is received. If there are any open submittals beyond 60 days of contract award, the owner may withhold contractor payments until all required paperwork is received.
3. Upon approval by the Owner's Construction Representative, non-critical submissions may be transmitted after the above time frame.
4. Prepare submittals including information in accordance with Submittal Identification and Procedures specified in this section.

1.05 COORDINATION OF SUBMITTALS

A. Prior to submitting to the Owner's Construction Representative, fully coordinate all interrelated work. As a minimum, do the following:
   1. Determine and verify all field dimensions and conditions by field measuring existing conditions and the installed work of this Contract and work by others.
   2. Coordinate with all trades, subcontractors, vendors, system and equipment suppliers and manufacturers, public agencies, and utility companies and secure all necessary approvals, in writing.

B. Make submittals in groups containing all associated items that in some way depend upon each other.
   1. This also applies to color charts, as one color may not be able to be selected without the selection of other colors so as to form a color-coordinated group.
   2. The Owner's Construction Representative may elect not to review partial or incomplete submissions, whereupon he will notify the Contractor of the additional submissions that are required before a review can be made.

1.06 TIMING OF SUBMITTALS

A. Make submittals far enough in advance of scheduled dates of installation to provide time for reviews, for securing necessary approvals, for possible revisions and re-submittals, and for placing orders and securing delivery. The Architect will review submittals in a manner as expedient as possible, and will generally send a written response to the Contractor within seven (7) calendar days of receipt of submittals.

B. Submissions may be returned reviewed, unreviewed, rejected, returned conditioned upon submission of related items, or for other reasons set forth in the Contract Documents.

C. Make submissions well in advance as the returning, rejecting or disapproval of submissions or other similar circumstances are possible and are deemed "avoidable delays". Costs for these delays or those attributed to Contractor’s tardiness in making submittals shall be borne by the Contractor.

D. ***All*** submittals requiring Owner's Construction Representative’s review (except operations manuals) as required under the technical specifications of these documents shall be submitted within **FORTY FIVE (45)** consecutive calendar days after the date of the Notice to Proceed. An amount of **$250** per calendar day shall be deducted from payment due the Contractor for ***each*** day that an outstanding submittal exists, said amount being the cost associated with the Owner's Construction Representative’s review.

E. Operation and maintenance manuals shall be submitted at least **FORTY FIVE (45)** consecutive calendar days prior to scheduled startup of the unit or system.

F. If material or equipment is installed before it has been deemed to be in general compliance with the Contract Documents, as determined by the Owner's Construction Representative, the Contractor shall be liable for its removal and replacement at no extra charge and without an increase in contract time.

1.07 DESTINATION OF SUBMITTALS

A. Each submission of documents shall be accompanied by a transmittal form containing the name of the project, the contract name, the Architect's project manager, a submittal ID number, and a description of content for the submitted items.

B. A copy of the TRANSMITTAL FORM shall also be provided to the Owner's Construction Representative's inspector at the job site.

C. Electronic submittals shall be transmitted through the Newforma® Project Center website; a Submittal Exchange website or by email; pending instruction by the Architect. H2M Architecs + Engineers is using a project information application called Newforma® Project Center. One of its components is Newforma Info Exchange, a web application that facilitates sending and sharing transmittals, and file sharing.

D. As an external team member on this project the Contractor will be required to access the H2M Architecs + Engineers/Newforma Info Exchange website for information related to the project, including file transfers, RFI, Submittals, Action Items, and project Calendar information. The Contractor will have access to this website using any internet-capable computer running Internet Explorer or Firefox. All data transmitted through the H2M Architecs + Engineers/Newforma Info Exchange website is encrypted and logged. Further instructions will be provided to the Contractor after the contract is awarded.

E. Other submissions, such as material samples or other items as instructed by the Owner's Construction Representative, shall be sent to the Architect's office as follows:
H2M Architecs + Engineers
538 Broad Hollow Road, 4th Floor East, Melville, NY 11747

Attention: H2M Project Manager (Named at Pre-Construction Conference or in the Notice to Proceed)

1.08 CLARITY OF SUBMITTALS

A. All printed materials shall be neat, clean, professionally drafted by hand or by computer, clear, legible, and of such quality that they can be easily reproduced by normal photocopying or wide format copy/print machines.

B. All electronic submittals shall be produced with a minimum resolution of 300 dpi.

C. Binders of information shall be separated into groups, subsystems, or similar equipment/function. Copies not conforming to this paragraph will be returned to the Contractor without the Owner's Construction Representative's review.

1.09 CONTRACTOR'S REPRESENTATION

A. By making a submission, the Contractor represents that he has determined and verified all field measurements and dimensions, field construction criteria, site and building constraints in terms

of limitations in moving equipment into an enclosed space, materials, catalog and model numbers and similar data and that he has checked and coordinated each submission with other work at or adjacent to the project site in accordance with the requirements contained in Section 013100 - PROPOSAL (PA) and the Contract Documents.

B. Every SUBMISSION TRANSMITTAL FORM shall contain the Contractor's approval stamp and date showing that the submittal has been approved by the Contractor. The Owner's Construction Representative will not review submittals that have not yet been reviewed and approved by the Contractor.

1.10 ENGINEER/ARCHITECT'S REVIEW

A. Owner's Construction Representative will review and comment on each submission conforming to the requirements of this Section.
   1. Architect's review will be for conformance with the design concept of the project and will be confined to general arrangement and compliance with the Contract Documents only, and will not be for the purpose of checking dimensions, weights, clearances, fittings, laying lengths, tolerances, interference's, for coordinating the work by others or subcontractors.
   2. The Architect's review of a separate item, or portion of a system, does not represent a review of an assembly or system in which the item functions.

B. The Architect will mark submittals as follows:
   1. NO EXCEPTION TAKEN (**A**) - No corrections, no marks. The content of this submittal has been reviewed by the Architect and been found to be in general compliance with the Contract Documents. No further submission of this submittal is required and the information contained in the submittal may be built into the work in accordance with the Contract Documents.
   2. MAKE CORRECTIONS NOTED (**B**) - Minor amount of corrections. The content of this submittal has been reviewed by the Architect and has been found in general to be in compliance with the Contract Documents. The notations made on the submittal by the Architect shall be incorporated into the work in accordance with the terms and conditions of the Contract Documents. No further submission of this submittal is required.
   3. AMEND AND RESUBMIT (**C**) - The content of this submittal has been reviewed by the Architect and this review has determined that additional data and/or modification to the submitted data or other changes are required to bring the work represented in this submittal into compliance with the Contract Documents. This submittal shall be reviewed and revised in accordance with the Architect's comments and resubmitted to the Architect for review. The information contained on the resubmittal shall not be incorporated into the work until the submittal is returned to the Contractor marked "NO EXCEPTION TAKEN" or "MAKE CORRECTIONS NOTED".
   4. REJECTED (**D**) - The content of this submittal has been reviewed by the Architect and has been determined not to be in accordance with the requirements contained in the Contract Document and requires too many corrections or other justifiable reason. The submittal shall be corrected and resubmitted or a submittal of an alternate shall be provided. No items are to be fabricated under this mark.
   5. SUBMIT SPECIFIED ITEM (**E**) - The content of this submittal has been reviewed by the Architect and this review has indicated that the work displayed in the submittal is not in compliance with the Contract Documents. The Contractor shall submit another submittal for this portion of the work, which complies with the Contract Documents.
   6. RECEIVED (**R**) - This submittal is accepted on the project and filed for record purposes only, in accordance with the terms and conditions of the Contract Documents. Documents marked "RECEIVED" will not be returned.

C. No payment will be made on any item for which a submission is required if such submission:
   1. has not been made,
   2. has been made but was not stamped "No Exceptions Taken" by Architect,
   3. has been made and stamped "Make Corrections Noted", but contractor has not complied with Architect's notes marked on the submittal,
   4. has been made and stamped "No Exceptions Taken", but item provided does not conform to the shop drawing nor to the Contract Documents.

D. Submittals not required by these specifications will not be recognized or processed.

E. The Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until all related submittals are received. Processing: To avoid the need to delay installation as a result of the time required to process submittals, allow sufficient time for submittal review, including time for re-submittals.
   1. Allow between 10 and 15 business days for initial review of the first round of submittals. Allow additional time if the Architect must delay processing to permit coordination with subsequent submittals.
   2. If an intermediate submittal is necessary, process the same as the initial submittal. Allow an additional 10 business days for processing each submittal.
   3. No extension of Contract Time will be authorized because of contractor's failure to transmit submittals to the Architect sufficiently in advance of the Work to permit processing.

1.11 RESUBMISSIONS

A. Prepare new and additional submissions, make required corrections, and resubmit corrected copies until found in compliance with the Contract Documents.

B. On, or with, re-submittals, clearly describe revisions and changes made, other than the corrections requested by Architect, which did not appear on the previous submissions.

1.12 CONTRACTOR'S RESPONSIBILITIES

A. Architect's review of submittals shall not relieve the Contractor of his/her responsibility for any deviation from the requirements of the Contract Documents nor relieve the Contractor from responsibility for errors or omissions in the submittals.

B. No portion of the work requiring a submission shall be commenced until the Architect has found the submission in general compliance with the Contract Documents.

C. The Contractor shall provide written notification of any specification or drawing deviation.

1.13 EXCESS COSTS FOR ENGINEERING/ARCHITECTURAL SERVICES

A. The Owner will charge to the Contractor, and will deduct from the partial and final payments due the Contractor, all excess engineering and architectural expenses incurred by the Owner for extra services (work) conducted or undertaken by the Architect as stipulated below:
   1. Services and other similar charges because of the Contractor's errors, omissions, or failures to conform to the requirements of the Contract Documents as related to administrative charges associated with non-compliance with the requirements for making project submissions.
   2. Services and other similar charges required to examine and evaluate any changes or alternates proposed by the Contractor and which may vary from the Contract Documents.

3. Services and other similar charges as a result of the Contractor's proposed substitution of materials, equipment or products which require a redesign of any portion of the project, as contained in the Contract Documents at the time of bid.
4. Services and other similar charges as a result of the Contractor's proposed substitution of products which require an engineering and/or architectural evaluation, beyond the time stipulated in Section 012500 - REGULATORY REQUIREMENTS, to determine if the substituted product is equal to that specified.
5. Services and other similar charges as a result of changes by the Contractor to dimensions, weights, sizes, voltages, phase, horsepower, materials of construction, and similar physical or operating characteristics of the product furnished which require redesign of the project in any way.
6. Services and other similar charges for the review of resubmissions of shop drawings that have been marked as "No Exceptions Taken" or "Make Corrections Noted".
7. Services and other similar charges for the review of shop drawings submitted more than two (2) times for the same product or portion of the work.

1.14 MISCELLANEOUS SUBMITTALS

A. Provide a Submittal Schedule within seven (7) calendar days from the date of the Notice to Proceed. The Submittal Schedule shall list all submittals for the project referenced by draft log number. Provide the estimated date that the submittal will be transmitted to the Architect for review.

B. Within seven (7) calendar days from the date of the Pre-Construction Meeting, submit a Proposed Products List. This list shall be a complete listing of all products proposed for use, with name of manufacturer, service headquarters, trade name and model number of each product. Partial listings will not be accepted.

C. For products specified only by reference standards, give manufacturer, trade name, model or catalog designation, and reference standards.

1.15 SUBCONTRACTOR LIST

A. The Contractor shall submit, on AIA Form G705, within FIFTEEN (15) calendar days after the date of the Notice to Proceed, a list of all subcontractors, including the names of the major subcontractors that were submitted at the time of the bid.

B. Indicate M/WBE subcontractors in accordance with the requirements contained in other portions of the Project Manual.

1.16 MATERIAL SAFETY DATA SHEETS (MSDS)

A. Comply with "Right to Know" requirements of Chapter 551 of Laws of New York, 1980, concerning notification of the use of toxic substances.

B. Any product or substance used by the Contractor or its subcontractors which is listed in Subpart Z of OSHA Part 1910 Title 29 of the Code of Federal Regulations entitled "Toxic and Hazardous Substances" shall be identified to the Owner/Architect by the Contractor's submission of a standard Material Safety Data Sheet (MSDS) in accordance with "Right To Know" requirements.

C. Products will not be permitted to be kept on site without a MSDS.

1.17 SHOP DRAWINGS

A. Submit shop drawings for all fabricated work, for all manufactured items and for items specifically required by the specifications.

B. Submit one (1) electronic copy of each standard drawing, catalog cut, or other material. All shop drawings or submittals that are not in the standard 8-1/2" x 11" format shall be submitted electronically and in paper. Samples shall be delivered directly to the office of the Architect. The Architect will return an electronic copy of each submittal once reviewed.

C. Subcontractors shall submit shop drawings directly to the Contractor for checking. Thoroughly check subcontractors' shop drawings for measurements, sizes of members, details, materials, and conformance with the Contract Documents.
   1. Return submittals which are found to be inaccurate or in error.
   2. Do not submit to the Architect until all corrections have been made.

D. Clearly show the relationship of the various parts of the project and where the information provided on the submission depends upon field measurements and existing conditions.

E. The Contractor shall make all measurements, confirm existing conditions, and include them on the shop drawings before making a submission to the Architect.

F. Submissions for a single item, or group of related items shall be complete.

G. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.

H. Coordinate transmittal of different types of submittals for related elements of the Work so processing will not be delayed by the need to review submittals concurrently for coordination.

I. When submitting manufacturers' catalogs, pamphlets or other data sheets, in lieu of prepared shop drawings, clearly mark the items being submitted for review.

J. If the shop drawings contain any departures from the contract requirements, specifically describe them in the letter of transmittal.
   1. Where such departures require revisions to layouts, structural, architectural, electrical, HVAC or any other changes to the work as shown, Contractor shall, at his own expense, prepare and submit revised drawings accordingly.
   2. Make drawings the same size as the Contract Drawings and to the same scale.

K. Submit newly prepared information drawn accurately to scale. Highlight, encircle, or otherwise indicate deviations from the Contract Documents. Do not reproduce Contract Documents or copy standard information as the basis of Shop Drawings. Standard information prepared without specific reference to the Project is not a Shop Drawing.

L. Shop Drawings include fabrication and installation Drawings, setting diagrams, schedules, patterns, templates and similar Drawings. Include the following information:
   1. Dimensions.
   2. Identification of products and materials included by sheet and detail number.
   3. Compliance with specified standards.
   4. Notation of coordination requirements.
   5. Notation of dimensions established by field measurement.

6. Sheet Size: Except for templates, patterns and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 inches by 11 inches but no larger than 36 inches by 48 inches.
7. AII Technical Submittals.

1.18 SAMPLES

A. Where required, or where requested by the Architect, submit sample or test specimens of materials to be used or offered for use.
   1. Samples shall be representative, in all respects, of the material offered or intended, shall be supplied in such quantities and sizes as may be required for proper examination and tests, and shall be delivered to Architect, prepaid, along with identification as to their sources and types of grades.
   2. Submit samples well in advance of anticipated use to permit the making of tests or examinations.

B. Samples will be checked for conformance with the design and for compliance with the Contract Documents.

C. Work shall be in accordance with the approved sample. The use of materials or equipment for which samples are requested or required to be submitted is not permitted until such time that the Architect has completed his review.

1.19 MANUFACTURER'S INSTRUCTIONS

A. When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, to Architect.

B. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation. Provide manufacturer’s instructions with shop drawings.

1.20 CERTIFICATIONS

A. Submit certifications of compliance indicated in the Contract Documents.

B. Certifications shall be complete and exact, they shall be properly authenticated by the written signature, in ink, of an owner, officer or duly authorized representative of the person, firm or organization issuing such certification and they shall guarantee that the materials or equipment are in complete conformance with the requirements of these specifications.

1.21 COLORS AND PATTERNS

A. Unless the precise color and pattern are specified, whenever a choice of color or pattern is available in a specified product, submit accurate color and pattern charts for Architect’s and Owner’s review and selection.

1.22 MANUFACTURER’S SERVICE CENTER

A. The product of a manufacturer who does not maintain an adequate nearby service center and a sufficient stock of spare parts are subject to rejection by Architect solely on that basis.

B. With each submission, submit information on manufacturer's facilities and give complete details of his service policies and capabilities, and a general idea of the stock of spare parts available. Submit this information in the form of a certification. Also include names, addresses and telephone numbers of at least three of the service center's present customers who are in the area of the project.

1.23 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Distribution: It is the contractor's responsibility to coordinate submittals with each subcontracting trade. Each contractor shall be required to provide their subcontractors with a complete list of their submittals in order that other contractors can request required submittal information.
   1. When revisions are made, distribute to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in construction activities.

1.24 DAILY CONSTRUCTION REPORTS

A. Prepare a daily construction report recording the following information concerning events at the site, and submit one copy to the Architect and one copy to the Owner's Construction Representative by 10:00 a.m. the following day. Any contractor not submitting required reports will not receive approval ‹n the subsequent application for payment until such time that all required information is submitted
   1. List of subcontractors at the site.
   2. Count of personnel at the site (substantiates payroll).
   3. High and low temperatures, general weather conditions.
   4. Accidents and unusual events.
   5. Meetings and significant decisions.
   6. Stoppages, delays, shortages, and losses.
   7. Meter readings and similar recordings.
   8. Emergency procedures.
   9. Orders and requests of governing authorities.
   10. Change Orders received, implemented.
   11. Services connected, disconnected.
   12. Equipment or system tests and startups.
   13. Partial Completions, occupancies.
   14. Substantial Completions authorized.

1.25 TEST RESULTS AND INSTALLATION

A. Whenever field startup services are specified, the Contractor shall obtain from the manufacturer and submit to the Architect Manufacturer Startup Reports (MSR's). The report shall detail the results of the field visit and all special conditions resulting from the startup.

B. Whenever field or factory tests are required on materials, equipment and systems, such tests shall be performed and the test results submitted to Architect in the form of a MSR.

C. Do not deliver to the project or incorporate into the work any materials or equipment for which Architect has not completed his review and found same to be in general conformance with the Contract Documents.

D. Submit MSR's within thirty (30) calendar days after the date of the startup or factory test.

1.26 SPARE PARTS LIST

A. Prepare a list of all spare parts specified to be provided in other Sections. Compile the total list for the purposes of reviewing actual spare parts delivered versus spare parts specified to be provided. The list shall reference the Section, model number, and quantity to be provided.

1.27 WAIVER OF CERTAIN SUBMITTAL REQUIREMENTS

A. Unless otherwise specified, the requirement to submit data and samples for products specified for approval will be waived for products specified by brand name if the specifically named products are furnished for the work. In such cases, the Contractor shall submit two (2) copies of required Product Data directly to the Architect's field representative for information and verification during its incorporation into the work. The SUBMISSION TRANSMITTAL FORM shall always be used.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

THIS SPACE LEFT INTENTIONALLY BLANK

CONTRACTOR'S COMPANY NAME
ADDRESS

SUBMISSION TRANSMITTAL FORM

CLIENT NAME: WHITE PLAINS CITY SCHOOL DISTRICT
PROJECT TITLE: AC & VENTILATION AT MAMARONECK ELEMENTARY SCHOOL

H2M PROJECT NO.: WPSD2205

Product, Item, or System Submitted:			
Submission Date:		Submission Log No.:	
Specification Section:		Paragraph Reference:	
Contract Drawing Reference(s):			
Manufacturer's Name:			
Manufacturer's Mailing Address:			
Manufacturer's Contact Information:	*Name*	( ) *Tel. no.*	*Email*
Supplier's Name:			
Supplier's Mailing Address:			
Supplier's Contact Information:	*Name*	( ) *Tel. no.*	*Email*
This item is a substitution for the specified item:		____ No	____ Yes
Contractor's Approval Stamp with Signature & Date		Contractor's Brief Comments or Remarks (attach separate letter as needed): By making this submission, we represent that we have determined and verified all field measurements and dimensions, field construction criteria, site and building constraints in terms of limitations in moving the item into the enclosed space, materials, catalog and model numbers and similar data and that we have checked and coordinated this submission with other work at or adjacent to the installed location in accordance with the requirements contained in the Contract Documents.	

END OF SECTION 013300

H2M

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Codes

B. Governing agencies

C. Permits

1.02 CODES

A. Comply with the requirements of the various codes referred to in these Specifications. Such codes shall be the date of the latest revision in effect at the time of receiving bids.

B. If there is a conflict between local, state, and/or Federal regulatory requirements, seek a consultation with the State Department of Labor. Resolve conflicts to the satisfaction of the State Department of Labor prior to commencing work.

C. Electrical Work: Conform to the requirements of the National Electrical Code (NEC) unless otherwise shown or specified. The Owner will be the sole judge of the interpretation of these rules and requirements.

1.03 GOVERNING AGENCIES

A. All work shall conform to and be performed in strict accordance with all governing agencies such as, but not limited to:
   1. Occupational Safety and Health Act - OSHA
   2. State Department of Environmental Conservation
   3. State Building Code
   4. State Fire Code
   5. National Fire Protection Association - NFPA
   6. National Electrical Code
   7. State Plumbing Code
   8. New York State Energy Code
   9. County Department of Health
   10. Town Codes, Rules, Laws and Ordinances
   11. Sewer District Sewer Use Code
   12. Local Water District
   13. Electric Utility
   14. Gas Utility
   15. State Education Department

1.04 PERMITS AND INSPECTIONS

A. Representatives of the Owner shall have access to the work for inspection purposes. The Contractor shall provide facilities suitable to the Owner to facilitate inspections of the installed work.

B. Obtain and pay for all permits, fees, licenses, certificates, inspections and other use charges required in connection with the work.

C. Such permits include, but are not limited to:

1. Electrical Service
2. Electrical Inspector's Incorporated, Certificate for Electrical Installation or preapproved electrical inspection agency

D. Obtain a New York Board of Fire Underwriters inspection and certificate.

E. The following permits and/or certifications will be obtained by the Owner from the appropriate permitting agencies:
1.

1.05 NOISE CONTROL

A. Control noise in accordance with Town and OSHA requirements.

1.06 PERFORMANCE BONDS

A. The Contractor shall obtain, pay for and submit all bonds required in connection with the work.

1.07 LISTINGS

A. Equipment and materials for which Underwriters' Laboratories, Inc. (UL) provides product listing service, shall be listed and bear the listing mark. Alternately, ETL Testing Laboratories, Inc. Product Safety Testing Listing is acceptable if the listed product has been tested to the applicable UL Standard.

1.08 FIRE RESISTANT CONSTRUCTION MATERIALS AND ASSEMBLIES

A. Conform to the fire rating classifications based upon the test methods and acceptance criteria in the Standard, Fire Tests of Building Construction and Materials for which Underwriters' Laboratories, Inc. (UL) provides listings.

B. Materials and assemblies shall comply with the acceptance criteria, detailed description of the assembly, its performance in the fire test and other pertinent details such as specification of materials, Classification coverage, and alternate assembly details.

C. Alternatively, fire resistance rating classifications by other issuing organizations listed in the Fire and Building Codes are acceptable.

1.09 COORDINATION WITH ELECTRIC UTILITY COMPANY

A. Comply with the utility company requirements for the incoming electric service.

B. Comply with the utility company requirements for the incoming electric service. There are no utility company charges associated with the installation of the incoming service.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION 014100

H2M

PART 1 - GENERAL

1.01 ABBREVIATED SUMMARY

A. This Section explains the format of the specifications.

1.02 SPECIFICATION FORMAT

A. The Specifications are generally arranged according to the Construction Specifications Institute (CSI) format. Most of the technical requirements are specified in the technical specifications of the document, which are grouped into forty-eight (48) major divisions. Most of the legal and administrative requirements are included in Division 01, General Conditions, Information For Bidders, and the Contract (agreement).

B. Technical sections are arranged in numerical order, however section numbers may not be consecutive from section to section.

C. Page numbering is subordinate to each section.

D. Most sections are generally broken down into three (3) parts:

1. PART 1 - GENERAL

2. PART 2 - PRODUCTS

3. PART 3 - EXECUTION

E. Not all these parts may be used and in some cases, the title of some of the parts may be different than listed above. Paragraph numbers are subordinate to each part.

F. The Contractor is advised that the format described here is flexible in nature.
   1. There is some overlapping of specified information between various portions of the Specifications.
   2. In all cases, the entire requirements of the Contract Documents for the project shall apply.

G. Explanations:
   1. Many technical sections begin with a paragraph titled "SECTION INCLUDES", "DESCRIPTION", or similar wording.
      a. In these paragraphs, a brief listing of the specified products may appear or a brief description of the work generally specified in that section is presented.
      b. These descriptions or listings are not all inclusive, but merely are provided as an aid in locating subject matter.
      c. In some cases special cost related items of work are called to the attention of the Contractor in these opening paragraphs.
   2. "RELATED SECTIONS" or "RELATED WORK" or similar wording paragraphs list or reference related work specified elsewhere in the Contract Documents. Such listing is not all inclusive, rather, they are merely an aid to the Contractor in locating some of the other

Specification Sections wherein work is specified which has a particularly close interrelationship with the work specified in that section.

a. It shall be understood that all of the Work, and all of the Specifications and other portions of the Contract Documents, are interrelated, and that the total of all requirements set forth in all of the Contract Documents shall be met.
b. Equipment suppliers and manufacturers shall be advised of the requirements for making submittals and delivering products, as specified in Division 1 sections, even if said sections are not referenced therein that section.

3. "REGULATORY REQUIREMENTS" or "REFERENCES" or similar wording paragraphs describe standards, laws, guidelines, regulations, and standards related to workmanship and installation of the products specified which shall be followed by the Contractor in completing the work specified therein that section as if it was written there in that section. All such requirements and references shall be latest issue in effect at the time of the bid opening.
4. When a "GUARANTEE" or "WARRANTY" paragraph appears in the section it is calling attention to a guarantee which extends beyond the period of the Contractor's Guarantee called for in the administrative portion of the Contract Documents or it states special requirements specific to the equipment, systems or products specified in that section.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION 014223

H2M

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Work of this Section includes the requirements for pre-installation meetings.

1.02 PRE-INSTALLATION MEETINGS

A. As required in individual specification sections, the Contractor shall convene a pre-installation meeting at the site prior to commencing work of the section.

B. Pre-installation meetings are to be convened at least one week prior to commencing work on the section. The contractor shall arrange and require attendance of Owner's Construction Representative, Owner, and Architect and parties directly affecting, or affected by, work of the specific section.
   1. At least seven (7) calendar days advance notice is to be given.
   2. The contractor shall prepare agenda and preside at meeting. At a minimum the following items are to be discussed:
   3. Review conditions of installation, preparation and installation procedures.
   4. Review coordination with related work.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION 014320

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Requirements for monitoring the quality of the constructed project.

B. Work of this Section also includes services of an independent testing laboratory for quality assurance testing.

1.02 REFERENCES

A. ASTM C1077 - Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation.

B. ASTM D3740 - Practice for Evaluation of Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.

C. ASTM D4561 - Practice for Quality Control Systems for an Inspection and Testing Agency for Bituminous Paving Materials.

D. ASTM E699 - Practice for Criteria for Evaluation of Agencies Involved in Testing, Quality Assurance, and Evaluating Building Components in Accordance with Test Methods Promulgated by ASTM Committee E6.

1.03 QUALITY ASSURANCE - CONTROL OF INSTALLATION

A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.

B. Comply with specified standards as a minimum quality for the work except when more stringent tolerances, codes, or specified requirements indicate higher standards or workmanship that is more precise.

C. Perform work by persons qualified to produce workmanship of specified quality.

D. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion or disfigurement.

E. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.

1.04 MOCK-UP

A. Tests will be performed under provisions identified in this Section and identified in the respective product specification sections.

B. Assemble and erect specified items with specified attachment and anchorage devices, flashing, seals, and finishes.

C. Accepted mock-ups shall be a comparison standard for the remaining work.

D. Where a mock-up has been accepted by the Architect and is specified to be removed, then the Contractor shall remove the mock-up and the clear area when directed to do so by the Architect.

1.05 QUALITY ASSURANCE - TESTING LABORATORY

A. In order to establish compliance with the Contract Documents, materials shall be tested, examined and evaluated before they are incorporated into the work. During and after installations, additional tests, examinations, and evaluations shall be made to determine continued compliance throughout the course of the work.

B. Testing laboratory shall be a reputable, experienced firm that is capable of performing all of the required testing and authorized to operate in the state in which the project is located.

C. Perform all sampling and testing in accordance with specified procedures and use the materials, instruments, apparatus, and equipment required by the codes, regulations and standards. Where specific testing requirements or procedures are not described, perform the testing in accordance with all pertinent codes and regulations and with recognized standards for testing.

D. In the event that samples and test specimens are not properly taken, handled, stored or delivered or if other requirements of this Section are not complied with, Architect reserves the right to delegate any or all of this work to others, or to take whatever action deemed necessary to ensure that sampling and testing are properly accomplished, for which all costs shall be borne by Contractor.

E. Architect reserves the right to disapprove the use of a specific testing laboratory, even after prior approval, if the laboratory fails to meet or comply with the requirements of this Section. If this should occur, immediately discharge the testing laboratory and retain the services of a different laboratory acceptable to Architect.

F. The testing laboratory shall meet the following criteria:
   1. Be capable of performing all of the required tests.
   2. Be regularly engaged in performing the types of services required.
   3. Have adequate facilities, materials, equipment, and personnel to perform the services.
   4. Have an adequately trained, experienced and qualified staff.
   5. Have at least one registered professional engineer licensed in the state in which the project is located who shall be capable of performing field tests, supervising laboratory testing and interpreting test results. The professional engineer shall be thoroughly knowledgeable in materials, soils, asphalt paving and concrete.
   6. Shall be able to be on the Project site within two hours after being notified.
   7. Comply with the requirements of ASTM C1077, ASTM D3740, ASTM D4561, ASTM E548 and ASTM E699.
   8. Testing Equipment: Calibrated at reasonable intervals with devices of an accuracy traceable to either National Bureau of Standards or accepted values of natural physical constants.

1.06 REFERENCE STANDARDS

A. Conform to reference standards by date that the project was last bid.

B. Obtain copies of standards when required by Contract Documents.

C. Should specified reference standards conflict with Contract Documents, request clarification from Architect before proceeding.

D. The contractual relationship of the parties to the Contract shall not be altered from the Contract Documents by mention or inference otherwise in any reference document.

1.07 SCHEDULING - LABORATORY SERVICES

A. Except where otherwise specified, the Architect will determine the number of samples to be taken, the date and time samples will be taken and tests made, the number and type of tests to be performed, who will collect the samples, how they will be handled and stored and when laboratory personnel are required on site.

B. Architect will notify Contractor of his/her decision to take samples and/or have tests made and provide him with the pertinent information. Contractor is responsible for notifying the testing laboratory and for having the testing performed, on schedule.

C. In addition to the above, Contractor shall make his own arrangements for the sampling and testing of materials he proposes to incorporate into the work. This shall not be paid for out of the cash allowance.

D. Notify Architect at least 72 hours in advance of the times at which scheduled samples or tests will be conducted.

E. If samples and/or tests cannot be taken or performed when required, delay the work until such time that they can be accomplished. Where possible, any work that has been installed but has not been sampled or tested as required, shall be tested by other means. Upon Architect's request, uncover any work, which has been buried or covered, and perform special tests designated by Architect. If the work cannot be tested by other means, Architect may declare the work unacceptable. All costs associated with noncompliance and for special testing shall be borne by the Contractor and not be paid for out of the cash allowance.

F. Should the testing laboratory be scheduled to take or collect samples or to perform tests, and finds that it is unable to do so as a result of delays in construction, inclement weather, or any other reason, reschedule the tasks for a date acceptable to Architect. Costs associated with times testing laboratory is unable to perform scheduled services shall be borne by the Contractor and will not be paid for under the allowance.

G. Plan all work and operations to allow for the taking and collection of samples and allow adequate time for the performance of tests. Delay the progress of questionable work until the receipt of the certified test reports.

1.08 TESTING REQUIREMENTS

A. Compaction Testing - Soil:
   1. Perform compaction testing in accordance with ASTM D2922, Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth) or ASTM D1556 Density and Unit Weight of Soil In Place by the Sand Cone Method.
   2. Perform tests and analysis of fill material in accordance with ANSI/ASTM D698 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5-lb. Rammer and 12-inch Drop.

B. Concrete Testing:
   1. Collect samples in accordance with ASTM C172, Practice for Sampling Freshly Mixed Concrete.
   2. Make test cylinders in accordance with ASTM C31, Standard Practice for Making and Curing Concrete Test Specimens in the Field.
   3. Test concrete cylinders in accordance with ASTM C39, Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
   4. Test slump and air entrainment.

1.09 TESTING SCHEDULE

A. Compaction Testing of Soil:
   1. Pipe Installation: As directed by the Architect.
   2. Concrete flatwork: As directed by the Architect.
   3. Pavement subgrade: As directed by the Architect.

B. Concrete Testing: Make six (6) concrete test cylinders for each 50 c.y. or fraction thereof.
   1. Test two (2) cylinders at 7 days.
   2. Test two (2) cylinders at 28 days.
   3. The remaining cylinders shall be tested at a time to be determined by the Architect. This requirement shall be subject to change as required by the Architect.

1.10 FIELD OBSERVATION OF CONTRACTOR'S WORK

A. The Architect will provide periodic observation of the Contractor's work.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent Work. Beginning new Work means acceptance of existing conditions. Verify that the existing substrate is capable of structural support or attachment of new Work being applied or attached. Examine and verify specific conditions described in individual specification sections. Verify that utility services are available, of the correct characteristics, and in the correct locations.

3.02 PREPARATION

A. Clean substrate surfaces prior to applying next material or substance. Seal cracks or openings of substrate prior to applying next material or substance.

B. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

3.03 FIELD QUALITY CONTROL

A. Allow representatives of the testing laboratory access to the work at all time. Provide all equipment, labor, materials, and facilities required by the laboratory to properly perform its functions. Cooperate with and assist laboratory personnel during the performance of their work.

B. Test specimens and samples shall be taken by the person(s) designated in other Sections, or as directed by Architect. Conduct field sampling and testing in the presence of Architect. Provide all materials, equipment, facilities and labor for securing samples and test specimens and for performing all field-testing.

END OF SECTION 014500

SECTION 014500.01

STATEMENT OF SPECIAL INSPECTION AND TESTS

NYS EDUCATION DEPARTMENT **Office of Facilities Planning,** **Room 1060 EBA** **Albany, NY 12234**	**STATEMENT OF SPECIAL INSPECTIONS AND TESTS** As required by the 2015 International Building Code (IBC)

BCNYS § 1704.3 requires the project Design Professional to complete the Statement of Special Inspections and Tests. Completion of the Statement of Special Inspections & Tests and submission to the Building Department with the Construction Permit Application is a condition for issuance of the Building Permit.

School District	Building
WHITE PLAINS CITY SCHOOL DISTRICT	George Washington Elementary School

Project Title
AC & VENTILATION AT MAMARONECK ELEMENTARY SCHOOL

SED Project #	Project Address
66-22-00-01-0-010-016	7 NOSBAND AVENUE, WHITE PLAINS, NEW YORK 10604

Architect/Engineer
H2M Architecs + Engineers

Name of Person Completing this Statement	Phone	Date
Guy Page, R.A.	631-756-8000	[]12/17/2020

Comments
N/A

INSPECTION AND TESTING (Continuous & Periodic is as Defined by the BCNYS)	**CONTINUOUS**	**PERIODIC**	**REFERENCE STANDARD**	**BCNYS REFERENCE**	**CREEQCUKI RIEFD**	**IDENTIFY SPEC SECTION AND PROVIDE CLARIFYING NOTES IF NECESSARY**
A. Steel Construction						
1. Material verification of high-strength bolts, nuts and washers.		X	Applicable ASTM material specifications. AISC 360-10 & N5	1704.3	x	051200
2. Inspection of high-strength bolting.		X	AISC 360-10 & N5	1704.3	x	051200

INSPECTION AND TESTING (Continuous & Periodic is as Defined by the BCNYS)	CONTINUOUS	PERIODIC	REFERENCE STANDARD	BCNYS REFERENCE	CREQUIRED	IDENTIFY SPEC SECTION AND PROVIDE CLARIFYING NOTES IF NECESSARY
3. Material verification of structural steel.			ASTM A 6 or A 568 AISC 360-10 & N5	1704.3	x	051200
4. Material verification of weld filler materials.			AISC 360-10 & N5	1704.3	x	051200
5. Inspection of welding:	X	X	AWS D1.1, D1.3, D1.4; ACI 318: 3.5.2 AISC 360-10 & N5	1704.3, 1704.3.1,	x	051200
a. Structural steel			NOTE: Special inspector shall perform ultrasonic testing of all full penetration welds.	1704.3, 1705.12.1	x	051200
b. Reinforcing steel						
6. Inspection of steel frame joint details.				1705.2.3	x	051200
B. Concrete Construction				1705.3 Table 1705.3		
1. Inspection of reinforcing steel, including prestressing tendons, and placement.			ACI 318: Ch. 20, 25.2, 25.3, 26.5.1-26.5.3	1908.4	x	033000
2. Inspection of reinforcing steel welding.			AWS D1.4; ACI 318: 26.5.4	Table 1705.3		
3. Inspection of bolts to be installed in concrete prior to and during placement.	X		ACI 318: 17.8.2	Table 1705.3	x	033000
4. Verify use of required design mix.	X	X	ACI 318: Ch. 19, 26.4.3, 26.4.4	1904.1, 1904.2, 1908.2, 1908.3	x	033000
5. Sampling fresh concrete: slump, air content, temperature, strength test specimens.	X		ASTM C 172, C 31; ACI 318: 26.4.5, 26.12	1704.4, 1905.6, 1914.10	x	033000

INSPECTION AND TESTING (Continuous & Periodic is as Defined by the BCNYS)	CONTINUOUS	PERIODIC	REFERENCE STANDARD		BCNYS REFERENCE	CREQCUKI RIEFD	IDENTIFY SPEC SECTION AND PROVIDE CLARIFYING NOTES IF NECESSARY
6. Inspection of placement for proper application techniques.	X		ACI, 318: 26.4.5		1908.6, 1908.7, 1908.8, 1908.10	x	033000
7. Verify maintenance of specified curing temperature and techniques.		X	ACI, 318: 26.4.7-26.4.9		1908.9	x	033000
8. Inspection of prestressed concrete.			ACI 318: 26.9.2.1		Table 1705.3		
9. Erection of precast concrete members.			ACI 318: Ch. 26.8				
10. Verification of in-situ concrete strength prior to stressing of tendons and prior to removal of shores and forms from beams and slabs. 11. Inspect formwork for shape. location and dimensions of the concrete member being formed		X X	ACI 318: 26.10.2 ACI 318: 26.10.1(b)			x	033000
C. Masonry Construction A= Level A Quality Assurance B = Level B Quality Assurance C = Level C Quality Assurance			ACI 530/ ASCE5/ TMS402 Table 3.1.1	ACI530.1 /ASCE6/ TMS602	1705.4		
Levels A and B A1. Verify to certificates to ensure compliance: B1. Verify certificates to ensure compliance.		X					
Level B B2. Proportions of site prepared mortar and grout.		L1 L2				x	042200

INSPECTION AND TESTING (Continuous & Periodic is as Defined by the BCNYS)	CONTINUOUS	PERIODIC	REFERENCE STANDARD		BCNYS REFERENCE	CRHEEQCUKI RIEFD	IDENTIFY SPEC SECTION AND PROVIDE CLARIFYING NOTES IF NECESSARY
B3. Placement of masonry units and construction of mortar joints.		L1 L2				x	042200
B4. Location and placement of reinforcement, connectors, tendons, anchorages.		L1 L2				x	042200
B5. Prestressing technique and installation.		L1					
B6. Grade and size of tendons and anchorages.		L1					042200
B7. Grout specs prior to grouting.	L2					x	042200
B9. Placement of grout.	L2					x	042200
B10. Grouting of tendons.	L2						
Level C:					1705.4		
C1. Size and location of structural elements.		L1 L2	ACI530/ ASCE5/ TMS402	ACI530.1 /ASCE6/ TMS602	1705.4		042200
C2. Type, size, and location of anchors.	L2	L1					042200
C3. Specified size, grade, and type of reinforcement.		L1 L2					042200
C4. Welding of reinforcing bars.	L1 L2						
C5. Cold/hot weather protection of masonry construction.		L1 L2					042200
C6. Prestressing force measurement and application.	L2	L1					
C7. Inspection prior to grouting.	L2	L1					042200

INSPECTION AND TESTING (Continuous & Periodic is as Defined by the BCNYS)	CONTINUOUS	PERIODIC	REFERENCE STANDARD	BCNYS REFERENCE	CRHEEQCUKI RIEFD	IDENTIFY SPEC SECTION AND PROVIDE CLARIFYING NOTES IF NECESSARY
C8. Grout placement.	L1					042200
C9. Preparation of grout specimens, mortar specimens, and/or prisms.	L1 L2					042200
C10. Compliance with documents and submittals.		L1 L2				042200
D. Wood Construction: 1.Fabrication of wood structural elements and assemblies. 2. High-load diaphrams designed in accordance with Table 2306.3.2				1705.5 1705.11.1 1705.12.2 1705.5		
E. Soils				1705.6		
1. Site preparation.		X			x	312317
2. During fill placement.					x	312317
3. Evaluation of in-place density.					x	312317
F. Pile Foundations: Installation and load tests.				1705.7-.9 Table 1705.7		
G. Pier Foundations: Seismic Design Category C, D, E. F.				1705.12-1705.12.9		
H. Wall Panels and Veneers: Seismic Design Category E, F.				1705.12 - 1705.12.9		

INSPECTION AND TESTING (Continuous & Periodic is as Defined by the BCNYS)	CONTINUOUS	PERIODIC	REFERENCE STANDARD	BCNYS REFERENCE	CHECK IF REQUIRED	IDENTIFY SPEC SECTION AND PROVIDE CLARIFYING NOTES IF NECESSARY
I. Sprayed Fire-Resistant Materials				1705.14		
1. Structural member surface conditions.				1705.14.2		
2. Application.				1705.14.3		
3. Thickness.			ASTM E 605	1705.14.4		
4. Density.			ASTM E 605	1705.14.5		
5. Bond strength.			ASTM E 736	1705.14.6		
J. Exterior Insulation and Finish Systems (EIFS)				1705.16		
K. Mastic and Intumescent Coatings				1705.15		
L. Smoke Control				1705.18		
M. Special Inspections for Seismic Resistance:						
1. Structural steel.	X		AISC 341	1705.12.1		
2. Structural wood.	X			1705.12.2		
3. Cold-formed steel framing.		X		1705.12.3		
4. Storage racks and access floors.		X		1705.12.7		
5. Architectural components.		X		1705.12.5		
6. Mechanical and electrical components.		X		1705.12.6		
7. Seismic isolation system.		X	ASCE7	1705.12.8		
N. Structural Testing for Seismic Resistance: Applicable to specific structures, systems, and components.				1705.13		
1. Testing and verification of masonry materials and assemblies.				1705.13 1708.2		
2. Testing for seismic resistance.				1705.13 1708.2		
3. Reinforcing and prestressing steel.			ACI 318	1705.13		
4. Structural steel.			AISC 341 AWS D1.1	1705.13		
5. Mechanical and electrical equipment.				1705.13		
6. Seismically isolated structures.			Section 17.8 of ASCE 7	1705.13		

INSPECTION AND TESTING (Continuous & Periodic is as Defined by the BCNYS)	CONTINUOUS	PERIODIC	REFERENCE STANDARD	BCNYS REFERENCE	CHECK IF REQUIRED	IDENTIFY SPEC SECTION AND PROVIDE CLARIFYING NOTES IF NECESSARY
O. Structural Observations						
1. Seismic resistance 2 Wind Requirements				1704.6.1 1704.6.2	X	14500
P. Test Safe Load				1708.2		
Q. In-Situ Load Tests				1708.3		
R. Preconstruction Load Tests				1709.1		
S. Other (list)						

END OF SECTION 014500.01

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Asbestos and lead-based paint certification.

B. Moisture control.

1.02 ASBESTOS AND LEAD-BASED PAINT CERTIFICATION

A. Contractor shall submit the enclosed "Asbestos and Lead-Based Paint Certification" upon completion of all work.

1.03 MOISTURE CONTROL

A. The Contractor shall maintain a strict policy and protocol for the control of water infiltration and moisture build-up during the course of the project. The plans and specifications are not intended to depict each and every condition or detail of construction. As the knowledgeable party in the field, the Contractor is in the best position to verify that all construction is completed in a manner which will provide a watertight structure. The Contractor has the sole responsibility for ensuring the watertight integrity of the structure. The Contractor's contractual obligations include, but are not limited, to the following:

B. Water Infiltration: If the Contractor observes water infiltration (unintended) into a completed building or an ongoing construction site, he must immediately report the condition to the Owner and Architect, and shall immediately take steps to investigate the source of the water infiltration, identify the responsible party (person who performed work that resulted in water infiltration) and devise a procedure to promptly eliminate water infiltration into the building.

C. Handling of Water-Damaged Building Materials and Construction:
   1. Contractor shall inspect all building materials delivered to the site for pre-existing water damage, as well as existing mold growth.
   2. If in-place construction becomes wet, notify the Owner and Architect immediately. The Owner and Architect will determine whether or not the work shall be removed and replaced, or if the type of material can be permitted to dry.
   3. Under no circumstances may new or additional construction be placed over, or otherwise enclose, wet building materials.

D. Visible Mold/Mildew:
   1. If the Contractor observes any substance that appears to be mold or other fungal growth and/or an unidentified substance within a completed building or the ongoing construction site, he shall immediately suspend construction operations in the area, and report the condition to the Owner and Architect.
   2. No person shall be allowed back into the affected area without permission of the Owner.

1.04 SUBMITTALS

A. Contractor shall submit completed and notarized "Certification of Asbestos and Lead-Based Paint" form.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

This space left intentionally blank.

Certificate of Asbestos and Lead-Based Paint
(New Work)

Client's Name:_____

Project Location:_____

Project Address:_____

Project Name:_____

Project Number:_____

CERTIFICATION:

This Contractor hereby certifies that no asbestos-containing material and lead-based paint, as defined by applicable federal and state regulations, has been furnished or installed at the referenced project:

Contractor Name:_____

Signature:_____

Address:_____

_____

Telephone:_____ Date Executed: _____

This Form Shall Be Notarized

END OF SECTION 014536

H2M

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes requirements for temporary facilities and controls, including temporary utilities, support facilities, and security and protection facilities.

B. Temporary utilities include, but are not limited to, the following:
   1. Drainage.
   2. Water Service and distribution.
   3. Sanitary facilities, including toilets, wash facilities, and drinking-water facilities.
   4. Ventilation.
   5. Electric power service.
   6. Lighting.
   7. Temporary Heating.

C. Support facilities include, but are not limited to, the following:
   1. Waste disposal facilities.
   2. Field offices.
   3. Storage and fabrication sheds.
   4. Lifts and hoists.
   5. Staging areas.
   6. Construction aids and miscellaneous services and facilities.
   7. Scaffolding and platforms

D. Security and protection facilities include, but are not limited to, the following:
   1. Environmental protection.
   2. Stormwater control.
   3. Tree and plant protection.
   4. Pest Control.
   5. Site enclosure fence.
   6. Security enclosure and lockup.
   7. Barricades, warning signs, and lights.
   8. Covered walkways
   9. Temporary enclosures.
   10. Temporary partitions.
   11. Fire protection.

E. Unless work of this section is indicated to be provided under a specific contract, Contractor must provide, maintain and remove required temporary facilities necessary to perform his own construction activities.

F. Accessible Temporary Egress: Comply with applicable provisions in ICC A117.1.

1.02 QUALITY ASSURANCE

A. Regulations: Comply with industry standards and applicable laws and regulations of authorities having jurisdiction including, but not limited to, the following:
   1. Building code requirements.
   2. Health and safety regulations.
   3. Utility company regulations.
   4. Police, fire department, and rescue squad rules.

5. Environmental protection regulations.

B. Standards: Comply with 1 “Standard for Safeguarding Construction, Alterations, and Demolition Operations,” ANSI A10 Series standards for "Safety Requirements for Construction and Demolition,” and NECA Electrical Design Library "Temporary Electrical Facilities.”
   1. Electrical Service: Comply with NEMA, NECA, and UL standards and regulations for temporary electric service. Install service in compliance with 1 “National Electric Code."

C. Inspections: Arrange for authorities having jurisdiction to inspect and test each temporary utility before use. Obtain required certifications and permits.

1.03 PROJECT CONDITIONS

A. Temporary Utilities: Each contractor will prepare a schedule indicating dates for implementation and termination of each temporary utility. At the earliest feasible time, when acceptable to the Owner, change over from use of temporary service to use of permanent service.

B. Conditions of Use: Keep temporary services and facilities clean and neat in appearance. Operate in a safe and efficient manner. Relocate temporary services and facilities as the work progresses. Do not overload facilities or permit them to interfere with progress. Take necessary fire-preventive measures. Do not allow hazardous, dangerous, or unsanitary conditions, or public nuisances to develop or persist on-site.

1.04 DIVISION OF RESPONSIBILITIES

A. General: These Specifications assign the Contractor responsibilities.

B. Each Contractor is responsible for the following:
   1. Installation, operation, maintenance and removal of each temporary facility considered as its own normal construction activity, as well as the costs and use charges except as listed below.
   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 storage and fabrication sheds.
   4. Hoisting requirements, including hoisting loads in excess of 2 tons, hoisting material or equipment into spaces below grade, and hoisting requirements outside the building enclosure. (Rigging Insurance must be provided by each prime contractor)
   5. Collection and disposal of its own hazardous, dangerous, unsanitary, or other harmful waste material.
   6. Secure lock-up of its own tools, materials and equipment.
   7. Construction aids and miscellaneous services and facilities necessary exclusively for its own construction activities.
   8. Maintaining temporary facilities provided by Contractor.
   9. Complying with the regulations of the Commissioner of Education - 8 NYCRR 155.5 - Uniform Safety Standards for School Construction and Maintenance Projects specified in Division 1 Section 011400.
   10. Containers for non-hazardous waste and debris generated by their own demolition and construction operations.

1.05 USE CHARGES

A. General: Cost or use charges for temporary facilities are not chargeable to Owner, Architect or Owner's Construction Representative and shall be included in the Contract Sum. Allow other

entities to use temporary services and facilities without cost, including, but not limited to, the following:

1. The Owner's Construction Representative.
2. Other Contractors.
3. Owners construction forces.
4. Occupants of Project.
5. Architect .
6. Testing Agencies.
7. Personnel of authorities having jurisdiction.

B. Water Service: Use water from the Owner’s existing water system without metering and without payment of use charges. Access to water shall be approved by the Owner.

C. Electric Power Service: Temporary electric power including set-up and maintenance is the responsibility of the Electrical Contractor.

PART 2 - PRODUCTS

2.01 MATERIALS

A. General: Provide new materials. If acceptable to the Architect / Construction Manager, the Contractor may use undamaged, previously used materials in serviceable condition. P ovide materials suitable for use intended.

B. Lumber and Plywood:
   1. For job-built temporary offices, shops, and sheds within the construction area, provide UL-labeled, fire-treated lumber and plywood for framing, sheathing, and siding.
   2. For signs and directory boards: provide exterior grade APA HDO plywood of sizes and thicknesses indicated.
   3. For vision barriers, provide minimum 3/8-inch-thick exterior plywood.
   4. For safety barriers, sidewalk bridges, and similar uses, provide minimum 5/8-inch-thick exterior plywood over appropriate wood framing.

C. Paint:
   1. Paint surfaces exposed to view from Owner occupied areas in a color selected by the Owner's Construction Representative. Maintain coverage throughout the construction period.

D. Tarpaulins: Provide waterproof, fire-resistant, UL-labeled tarpaulins with flame-spread rating of 15 or less. For temporary enclosures, provide translucent, nylon-reinforced, laminated polyethylene or polyvinyl chloride, fire-retardant tarpaulins.

E. Water: Provide potable water approved by local health authorities. Protect water sources with approved backflow or vacuum breaker devices.

F. Open-Mesh Chain Link Fencing: Provide 0.120-inch-thick, galvanized steel posts, and 2.875" diameter. Gate posts with 6 foot high mesh on stanchion posts spaced 8-foot on center maximum. Provide lockable gates with galvanized chains and security padlocks. Furnish keys to the Owner, Owner's Construction Representative, Prime Contractor represesentatives, and nescessary construction personnel.

G. Temporary Roofing: 5/8" FR plywood roof sheathing and 45 mil reinforced EPDM membrane

H. Temporary Flooring protection : “ Ram Board" or equivalent with taped joints.

2.02 EQUIPMENT

A. General: Provide new equipment. If acceptable to the Architect, the Contractor may use undamaged, previously used equipment in serviceable condition. Provide equipment suitable for use intended.

B. Water Hoses: Provide 3/4-inch, heavy-duty, abrasion-resistant, flexible rubber hoses 100 feet long, with pressure rating greater than the maximum pressure of the water distribution system. Provide adjustable shutoff nozzles at hose discharge and vacuum breakers at hose bib connections .

C. Fire Extinguishers: Provide hand-carried, portable, UL-rated, Class A fire extinguishers for temporary offices and similar spaces. In other locations, provide hand-carried, portable, UL-rated, Class ABC, dry-chemical extinguishers or a combination of extinguishers of NFPA-recommended classes for the potential exposures.
   1. Comply with 1 and 2 for classification, extinguishing agent, and size required by location and class of fire exposure.

PART 3 - EXECUTION

3.01 CONTRACTOR FIELD OFFICES

A. Contractors may, with permission from the Owner and Owner's Construction Representative, establish a field office for their own use. Offices for the individual prime contractors, sub-contractors, specialty contractors and the like shall be of size and design as approved by the Owner and Owner's Construction Manager. Offices shall be located in the designated staging area. Each representative contractor shall arrange for telephone service and electric service, if required, directly with the utility company. (No field offices or storage trailers will be allowed within 100 feet of any building.)

B. Maintain, in the each contractor’s field office, all articles for First Aid treatment. Each contractor shall also establish standing arrangements for the immediate removal and hospital treatment of any employees and other persons on the job site who may be injured or who may become ill during the course work.

3.02 TEMPORARY AND PERMANENT SERVICES, GENERAL

A. The Contractor’s use of any permanent system or service of the building or portions thereof shall be subject to the Owners approval.

B. The Contractor shall be responsible for any and all damage to permanent services used, and shall make good any and all damage to the satisfaction of the owner, prior to final completion and acceptance.

C. NOTE - In accordance with OSHA and other applicable regulations, the representative Contractors performing erection of “skeleton” type work are solely responsible for the netting, guard rail protection and such other safety devices as deemed necessary to protect the workers and public from harm.

3.03 TEMPORARY LIGHT AND POWER

A. Temporary Electric Power Service: Electrical Contractor shall provide and pay all costs to provide a weatherproof, grounded electric power service and distribution system of sufficient size, capacity, and power characteristics to accommodate performance of work during the construction period.
   1. Responsibility: All work under this section to be provided by the Electrical Contractor.
   2. Applicability: This section applies to all renovation and new construction work areas for this Project.
   3. Electrical Contractor shall make arrangements with utility company for temporary and permanent services immediately after award of contract.
   4. Temporary or permanent services for temporarily or permanently installed building equipment such as sump pumps, boilers, cabinet heating and/ or cooling units and fans shall be furnished, installed, operated and maintained so that the said equipment may be operated for drainage and temporary heat when required and/ or when so ordered by the Architect and Owner's Construction Representative.
   5. Electrical Contractor shall maintain all parts of the electrical system (temporary and permanent) active and in-service at all times throughout the contract duration. All temporary lighting to be controlled by standard switches per code (outside of power panels).
   6. Electrical contractor shall provide temporary generator power to maintain power to critical circuits during main electric service switch over. Critical circuits shall include fire alarm, emergency lighting, communication, information technology, heating units, etc. Coordinate required circuits with owner. Contractor shall assume a minimum of (2) 50 kw generators and temporary panels as necessary. Generators shall be located at the building exterior. Provide feeder cables, adequately sized, in accordance with NEC to feed temporary panels or existing sub-panels. Contractor shall include required fuel for operation.
   7. Electrical Contractor shall maintain power during the hours established by Owner's Construction Representative.
   8. Temporary Service: Install service and grounding in compliance with the National Electric Code (1). Include necessary meters, transformers, overload protected disconnect and main distribution switch gear. Comply with all NECA, NEMA and UL Standards
   9. Provide temporary service with an automatic ground-fault interrupter feature, activated from the circuits of the system.
   10. Power Distribution System: Provide circuits of adequate size and proper characteristics for each use. In general run wiring overhead. Rise vertically where wiring will be least exposed to damage from construction operations.
   11. Provide metal conduit, tubing or armored cable for protection of temporary power wiring where exposed to possible damage during construction operations. Where permitted by code, wiring of circuits not exceeding 110-120 Volt 20 Amp rating and wiring of lighting circuits may be non- metallic sheathed cable in areas where located overhead and exposed. Do not wire temporary lighting with plain, exposed (insulated) electrical conductors. Provide metal enclosures or boxes for wiring devices.
   12. Provide overload-protected disconnect switch as required by code.
   13. For power hand tools and task lighting, provide temporary 4-gang outlets at each floor level, spaced so that a 50-foot extension cord can reach each work area. Provide separate 110-120 Volt, 20 Amp circuit for each 4-gang outlet (4 outlets per circuit).
   14. Temporary electric power for Owner's Representative’s field office.
   15. Temporary power and lighting for any sidewalk bridges.

16. Maintaining all existing systems, including but not limited to, power, lighting, fire alarm, intercom, kitchen freezers and refrigerators, etc., within the existing building operational at all times for Owner occupancy and construction.

B. TEMPORARY ELECTRICAL AND TELEPHONE SERVICES
1. Temporary Power Source: At each building / renovation area, use the existing electrical power distribution system for temporary power source.
2. Owner's Requirements: Do not disrupt the Owner's needs for continuous power at each building.
3. Electrical Contractor shall provide temporary power and lighting facilities for use of all trades. All temporary light and power shall be in accordance with the required Codes and Safety Standards. The temporary light and power shall be used until permanent light and power is completed or portions of the building(s) are enclosed.
4. Owner's Construction Representative on-site trailer already has power and data/tel wiring
5. All other contractor trailer use / connection charges for power and telephone to be paid by the respective contractor.

C. TEMPORARY POWER DISTRIBUTION
1. General Requirements: Electrical Contractor shall provide feeders and branch circuits of adequate size and proper characteristics as required to supply temporary receptacle and lighting loads. Size service and feeder conductors to restrict voltage drop to maximum 5 percent at 80 percent power factor. Provide properly sized overcurrent protection for each temporary electrical circuit.

D. RECEPTACLE REQUIREMENTS
1. General Requirements: Provide temporary receptacle outlets as required for operation of portable tools and appliances during the construction period.
2. Minimum Requirements: Provide a minimum of one quad 120 volt receptacle per 2500 square feet of building floor area, with maximum spacing of 50 feet on center.
3. Branch Circuits: All temporary receptacle branch circuits to be rated 20 amps with a maximum of (3) duplex receptacles per circuit. Temporary receptacle branch circuits shall be independent of temporary lighting circuits.

E. LIGHTING REQUIREMENTS
1. General Requirements: Electrical Contractor shall provide both interior and exterior lighting at areas where existing lighting has been removed and at new construction areas, as required to provide adequate illumination for safe and proper construction operations and Project Site security.
2. Minimum Requirements: Provide illumination levels adequate for construction operations and safe traffic conditions. As a minimum provide one 200 watt lamp per 400 square feet of building floor area, with maximum spacing of 20 feet. Any rooms in excess of 500 sf will receive one 400 watt metal halide fixture for each 1000 sq. ft. of area.
3. Stairways: Provide one 200 watt lamp per landing at each stairway.
4. Barricades: Provide adequate lighting for personnel safety at barricades, ladders, openings and other similar locations.
5. Supplemental Lighting: If required, supplemental lighting beyond minimum requirements shall be provided via suitable portable lighting units with cord and plugs, and shall be paid for by the Contractor or Sub-Contractor requiring such additional lighting.
6. Branch Circuits: All temporary lighting branch circuits to be loaded to a maximum of 1400 watts per 20 amp circuit. Temporary lighting branch circuits shall be independent of temporary receptacle circuits.

7. Restrictions: Do not use permanent lighting systems for temporary construction lighting purposes.

F. MAXIMUM LOADS
1. General: Lighting and power loads connected to the temporary power distribution system shall be limited to the following maximum individual loads:

	Load Type	Maximum
a.	120 V, 1 Phase	1.5 KVA
b.	208 V, 1 Phase	2.5 KVA
c.	208 V, 3 Phase	5.0 KVA

2. General: The temporary power distribution system shall be sufficiently sized to provide temporary power as required within this section. Meter and Meter connections to be part of electrical contractors base bid.

G. ELECTRICAL WELDERS
1. Separate Power Sources Required: Power for electric welders and for other loads larger than the maximum allowable sizes shall be taken from portable power sources provided, paid for and operated by the Contractor or Sub-Contractor requiring the use of such equipment. Remove such power sources when no longer needed.

H. ELECTRICAL ENERGY COSTS
1. Paid By Owner: Charges for electrical energy usage for temporary power and lighting will be paid by the Owner, when taken from the Owner's electrical services. Contractor and Sub-Contractors shall exercise measures to conserve energy usage. Use of Owner supplied electric for items not specific to project (e.g. heating construction shanties, etc.) will not be permitted.

I. USE CHARGES
1. General: Cost or use charges for temporary facilities are not chargeable to the Owner or the Architect, Engineer, or Owner's Construction Representative. The Architect and Owner will not accept a prime contractor's cost or use charges for temporary services or facilities as a basis of claim for an adjustment in the Contract Sum or the Contract Time.
   a. Water Service Use Charges: Water from the Owner's existing water system may be used without metering, and without payment for use charges.
   b. Electric Power Service Use Charges: Electric power from the Owner's existing system may be used without payment of use charge

3.04 TEMPORARY TOILET FACILITIES

A. Sanitary Facilities: Sanitary facilities include temporary toilets, wash facilities and drinking water fixtures. Comply with governing regulations including safety and health codes for the type, number, location, operation and maintenance of fixtures and facilities; provide not less than specified requirements. Install in locations which will best serve the project's needs. Owner's existing facilities shall not be used.

B. Responsibilities: The General Construction Contractor is responsible for temporary sanitary facilities and their maintenance, cleaning and supplies for use by all trades. Sufficient quantity/locations to properly handle the amount of workers on-site.

C. Supply and maintain toilet tissue, paper towels, paper cups and other disposable materials as appropriate for each facility, including Owner's Construction Representative temporary offices for full contract duration. Provide covered waste containers for used material.

D. Install self-contained toilets to the extent permitted by governing regulations.

E. Provide separate toilet facilities for male and female construction personnel.

F. Provide separate toilet facilities for Owner's Construction Representative located at _____ at the direction of Owner's Construction Representative.

3.05 TEMPORARY HEATING

A. The Mechanical Contractor will maintain 60 degree temperature in all areas via temporary and/or permanent systems. The Mechanical Contractor will submit a detailed plan including sketches indicating his proposed temporary heating system for engineer approval within 1 week of contract award. The Electrical Contractor will provide permanent or temporary power for the Mechanical Contractor's units for temporary heating. General Work Contractor will insure all windows / doors and work areas are fully enclosed. (Any missing components at time of temporary heat activation will be enclosed via 5/8 inch thick plywood, 2” rigid polyisocyanurate and 6-mil fire-retardant polyethylene sheeting for a weather-tight insulated enclosure.)

B. The fuel, equipment, materials, operating personnel and methods used therefore shall be at all times satisfactory to the Architect and Owner's Construction Representative and adequate for the purpose intended. The use of electric heaters is not acceptable. All required fuel is part of this contract.

C. The Contractor shall maintain the critical installation temperatures provided in the technical provisions of the specifications herein for all work in those areas where same is being performed.

D. The maintenance of proper heating, ventilation and adequate drying out of the work is the responsibility of the contractor and any work damaged by dampness, insufficient or abnormal heating, shall be replaced to the satisfaction of the Architect by and at the sole expense of the contractor.

E. Before and during the placing of gypsum and the application of other interior finishes, taping, varnishing, painting, etc. and until final acceptance by the Owner of all work covered by the Contract, the contractor shall, unless otherwise specified in the contract documents, maintain a temperature of 60 degrees F. Coordinate with Division 9 of the Technical Specifications.

F. Use of the permanent system, if approved by engineer and owner permission granted, shall not shorten, or negate any equipment, or system guarantees required under this contract. (the warranty period starts upon the date of Substantial Completion). Two additional filter changes are to be provided by Mechanical Contractor. A program of use, maintenance and restoration will be submitted with request for use of systems for temporary services.

3.06 TEMPORARY WATER

A. The Plumbing Contractor shall:
   1. Provide and maintain a temporary water system of size and capacity as required below to supply the needs of all Contractors for the work.

2. Provide no less than two 3/4 inch hose bibs conveniently located at each building wing.
3. Provide and pay for all connections and permits.
4. Install such temporary water system so that service shall be available at the commencement of the work. The permanent water risers and lines may be used for temporary water supply. The permanent services shall be turned over to the Owner in perfect condition. Any repairs required due to temporary use shall be made at the sole expense of the plumbing contractor.
5. Protect temporary and permanent lines against any damage.
6. Remove all temporary lines when directed by the Owner's Construction Representative when such lines are no longer required.
7. Water source is only available from building. If contractor decides distance is too far he should use water storage tanks or struck at no additional charge to the owner.

B. Each Contractor shall:
1. Provide all hose and other extensions from connections installed by the Plumbing Contractor and all labor, materials and supplies required to supply water to the work.
2. Prevent water damage to the work.

3.07 STORAGE FACILITIES

A. Each Contractor shall provide temporary storage shanties, tool houses and other facilities as required for their own use. Temporary structures shall be located at the staging area and shall be removed upon completion of the work or when directed.

B. Materials delivered to the site shall be safely stored and adequately protected against loss or damage. Particular care shall be taken to protect and cover materials that are liable to be damaged by the elements.

C. Due to limited on site storage space, each Contractor shall coordinate delivery of his materials with the Owner's Construction Representative who will determine when large deliveries shall be made and shall be designate storage locations on site for delivered materials. All stored materials must be stored in locked, watertight trailers, paid for by applicable contractor.

3.08 SCAFFOLDING AND STAGING

A. All scaffold, staging and appurtenances thereto shall comply in total to the requirements of Safety and Health Regulations for Construction Chapter XVII of OSHA, Part 1926 and all related amendments.

3.09 RUBBISH CONTAINER

A. Each Contractor shall provide suitable rubbish container device(s) for his own use (both demolition and construction debris), properly maintained and serviced, replaced as required and protected from access by the public fencing as may be specified herein or approved by the Architect and Owner's Construction Representative.

B. Contractor and Subcontractor shall sweep up and gather together daily all his own rubbish and removed materials and place same in containers.

3.10 CONSTRUCTION FENCING

A. Construction fencing and barriers shall be provided by the General Construction Contractor, enclosing all work and storage areas as outlined in staging, plan and specified within. Temporary construction fencing shall be of good quality and neat in appearance.

B. Site access gates shall be provided as required, complete with all operating hardware and security devices.

C. Should fencing be required to be relocated or modified during the course of the project due to additional access needed by the contractor, same shall be done at the total expense of the contractor.

D. The construction fence shall be maintained in good order by all contractors throughout the life of the project.

E. Note: Should any contractor damage or cause the need for repair to the construction fence, all costs involved with said repair will be back-charged to the contractor creating the need for repair.

F. General Construction Contractor shall provide a 60’ x 150' fenced staging area at the location designated on the drawing for use by all trades. All fenced areas to be 6' high galvanized chain link fencing, 9 ga fabric on 10’ long framed sections on stanchions. Gate locations as directed by Owner's Construction Representative. If additional storage is necessary, the contractors may use the remote staging area where Owner's Construction Representative's trailer is located.

3.11 JANITORIAL SERVICE/DAILY CLEANUP

A. Each Contractor shall furnish daily janitorial services for the project and perform any required maintenance of facilities as deemed necessary by the Architect and Owner's Construction Representative during the entire life of the contract. If any contractor fails to keep the site safe and broom clean within 4 hours of being notified by Architect or Owner's Construction Representative, either verbally or in writing, the Owner's Construction Representative will have the cleanup work performed by others and the contractors will be back charged accordingly.
   1. The Contractor shall provide daily trash collection and cleanup of the project area and shall dispose of all discarded debris, and the like in a manner approved by the Owner's Construction Representative.

3.12 BURNING

A. Burning will not be permitted.

3.13 MAINTENANCE OF PERMANENT ROADWAYS

A. The General Construction Contractor shall immediately remove dirt and debris which may collect on permanent roadways created by their work, deliveries, manpower, equipment, etc.

B. Temporary roads / entrance mats will be maintained by General Construction Contractor to insure that no mud, dust, dirt goes onto asphalt areas.

3.14 FIRE PREVENTION CONTROL

A. Each Contractor shall comply with the safety provisions of the National Fire Protection Association's "National Fire Codes" pertaining to the work and, particularly, in connection with any cutting or welding performed as part of the work.

3.15 TEMPORARY FIRE PROTECTION

A. Each Contractor shall take all possible precautions for the prevention of fires.
   1. Where flame cutting torches, blow torches, or welding tools are required to be used, their use shall be as approved by the Owner's Construction Representative at the site.
   2. When welding tools or torches of any type are in use, have available in the immediate vicinity of the work a fire extinguisher of the dry chemical 20 lbs. Type. The fire extinguisher(s) shall be provided and maintained by the Contractor doing such work.

B. Fuel for cutting and heating torches shall be gas only and shall be contained in Underwriters laboratory approved containers.

C. Storage of gas shall be in locations as approved by the Owner and subject to Fire Department regulations and requirements.

D. No volatile liquids shall be used for cleaning agents or as fuels for motorized equipment or tools within a building except with the express approval of the Owner and/or Architect and in accordance with local codes. On-site bulk storage of volatile liquids shall be outside the buildings at locations directed by the Owner, who shall determine the extent of volatile liquid allowed within the building at any given time.

E. Each Contractor shall comply with the following requirements relating to compressed gas:
   1. Where compressed gas of any type is used for any purpose at the site, it shall be contained in cylinders complying with ICC regulations. Gases of different types shall not be stored together except when in use and when such proximity is required.
   2. All gas cylinders shall be stored in sheds constructed of noncombustible materials. Sheds shall be well ventilated and without electric lights or fixtures and shall be located as far from other buildings as is practicable. All gas cylinders not in actual use, or in proposed immediate use, shall be removed from the building under construction or reconstruction. Empty gas cylinders shall be removed prior to bringing in a replacement cylinder. Cylinders shall at all times be supported and braced in an upright position. When not in use, the protective cap shall be screwed over the valve.
   3. All persons required to handle gas cylinders or to act as temporary firemen (Fire Watchers) shall be able to read, write and understand the English language; they shall also be required by the Contractor to read Part 3 of Pamphlet P-1 "Safe Handling of Compressed Gases" published by the Compressed Gas Association, 500 Fifth Avenue, New York, NY 10036.
   4. Where local ordinances are in effect regarding gas cylinders, (their use, appurtenances and handling), such ordinances shall supplement the requirements of this paragraph. All personnel engaged in fire watch shall be certified by the Local Fire Department having jurisdiction.
   5. Any cylinder not having the proper ICC markings or re-inspection marking, or any cylinder with a leak shall be isolated immediately away from any building and the supplier shall be immediately notified; such other precautions as may be required to prevent damage or injury shall also be taken by the Contractor.

F. Each Contractor shall comply with the following requirements relating to welding and cutting:
   1. All cutting and/or welding (electric or gas) must be done only by skilled, certified and licensed personnel.
   2. During welding or cutting operations, a contractors man shall act as a fire watcher. The fire watcher shall have proper eye protection and suitable fire fighting equipment including fire extinguisher (bearing current inspection Certificate), protective gloves and any other equipment deemed necessary.
   3. Welding or cutting shall not be done near flammable liquid, vapors or tanks containing such material.
   4. Where cutting or welding is done above or adjacent to (within two feet) combustible material or persons, a shield of incombustible material shall be installed to protect against fire or injury to sparks or hot metal.
   5. Tanks supplying gases for welding or cutting are to be placed in an upright position securely fastened, and close as practical to the operation. Tanks, actives or spares, shall be protected from excess heat and shall not be placed in stairways, hallways or exits. When not in use, protective valve cap shall be screwed on the cylinder.
   6. Adequate fire extinguishing equipment shall be maintained at all welding or cutting operations.
   7. The Contractor shall secure all required inspections.
   8. All equipment, hoses, gauges, pressure reducing valves, torches, etc., shall be maintained in good working order and all defective equipment shall immediately be removed from the job.
   9. No person shall be permitted to do any welding or cutting until his name, address and current license number have been submitted in writing to the Owner.

G. Contractors for work outside the building shall commence operations promptly on award of Contract, and shall be responsible for same being kept clear of materials and debris in connection with their own work and that of other Contractors. If a Contractor for outside work allows other contractors to deposit material and debris over its lines, the Contractor shall be responsible for all delay and extra cost occasioned thereby.

3.16 DISCONTINUE, CHANGES AND REMOVAL

A. All Contractors shall:
   1. Discontinue all temporary services required by the Contract when so directed by the Construction Manager or Architect.
   2. The discontinuance of any such temporary service prior to the completion of the work shall not render the Owner liable for any additional cost entailed thereby and each Contractor shall thereafter furnish, at no additional cost to the Owner, any and all temporary service required by such Contractors work.
   3. Remove and relocate such temporary facilities as directed by the Construction Manager or the Architect without additional cost to the Owner, and shall restore the site and the work to a condition satisfactory to the Owner.

3.17 VENTILATION AND HUMIDITY CONTROL FOR CONSTRUCTION:

A. General Construction Contractor will provide temporary ventilation as required for protecting the building from any adverse effects of high humidity during abatement and construction activities. Select dehumidification and ventilating equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements and have sufficient quantity of units to produce necessary ambient conditions.

1. Each Contractor shall be responsible for his own temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity.
2. Ventilate enclosed area to dissipate humidity, and to prevent accumulation of dust, fumes, vapors or gases.
3. Provide equipment as necessary for air and fresh exchange for the work area per OSHA standards.
4. Remove temporary ventilation equipment prior to the completion of construction.
5. If Contractor fails to adequately ventilate the building during the construction, abatement / roofing process, thereby causing humidity and possible mold issues, the owner will hire others to properly address and deduct costs from the Contractor accordingly.
6. General Construction Contractor will provide negative air machines of sufficient size/qty to fully ventilate the square footage of work areas and exhaust any dust/fumes through flexible duct hose to exterior top eliminate any orders / smoke.
7. Any contractor that allows water infiltration into any building shall be held responsible for the cleanup and provision of commercial dehumidifiers of sufficient size and quantity to prevent the generation of mold spore growth. Failure on the contractors part to address this issue within 4 hours of notice, will result in the Owner hiring outside parties to accomplish the required work in order to insure a safe environment. Owner will subsequently backcharge the contractor responsible for the water infiltration for all associated costs of hiring this outside contractor to carry out the work required.

3.18 TEMPORARY ROADS AND PERMANENT PAVED AREAS:

A. General Construction Contractor shall construct and maintain temporary road areas adequate to support loads and to withstand exposure to traffic during construction period. See staging plan for construction requirements, materials, thicknesses, locations, etc.
   1. Includes access for delivery through staging area to building work areas, and to equipment and storage areas and sheds.
   2. Provide dust-control treatment that is nonpolluting and non-tracking. Reapply treatment as required to minimize dust.
   3. Temporary areas are installed and/or maintained for access to all required areas of the sites.
   4. Contractors will be permitted to utilize existing campus roads, as designated (as segregated by the Owner - if required).
   5. Road Cleaning: Maintain roads and walkways in an acceptably clean condition. This includes the removal of debris daily, if required, and/or a minimum of once a week due to all project traffic. Road cleaning equipment to be wet/vacuum type. The General Construction Contractor will clean roads for debris from building-related activities.
   6. General Construction Contractor shall provide snow plowing of temporary road, parking area, access route, and a 5’ walkway to office trailer. Provide snow removal and walking of walkways to Owner's Construction Representative office trailer. The school district will provide snow plowing of established routes.
   7. Staging Areas:
      a. Temporary parking by construction personnel shall be allowed only in areas so designated and confirmed with the District.
      b. Traffic Regulations:
         1) Access through Owner’s entrances shall be limited. Confirm access locations and time frames with the District or Owner's Construction Representative when required.
         2) Utilize only entrances/temporary roads as designated.
         3) Maintain all District traffic regulations and site access.

4) Construction parking will not be allowed adjacent to District buildings, additions or monuments. Construction parking will be located in areas designated by the District or Owner's Construction Representative.
5) Construction employee parking to be located as directed by the Owner's Construction Representative.

3.19 TRAFFIC CONTROLS:

A. General Construction Construction Contractor shall provide temporary traffic controls at junction of temporary roads with public roads. Include warning signs for public traffic and "STOP" signs for entrance onto public roads, barricades, flagmen, etc. Comply with requirements of authorities having jurisdiction.

3.20 DEWATERING FACILITIES AND DRAINS

A. Each Prime Contractor is directly responsible for dewatering of their excavations. The responsibility of dewatering of the site as to facilitate the work will be the responsibility of the General Construction Contractor, coordinate with the Owner's Construction Representative

B. Comply with requirements in applicable Division 31 Sections for temporary drainage and dewatering facilities and operations not directly associated with construction activities included in individual Sections. Where feasible, common use of dewatering and drainage facilities is recommended. Maintain Project site, excavations, and construction free of water.
1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties, nor endanger permanent drainage systems. Provide temporary drainage where roofing or similar waterproof deck construction has been completed.

C. Remove snow and ice, on a daily basis, to minimize accumulations.

3.21 ROOF PROTECTIONS

A. The General Construction Contractor shall provide temporary protection on the roof surface when it is necessary for work to take place on completed roof areas. Other Primes shall be held responsible to notify the General Construction Contractor of their work and required roof protection areas.

B. When requested by other trades as noted above, the General Construction Contractor shall provide a minimum of 2 inch thick Polyisocyanurate or Extruded Polystyrene (40 psi) rigid insulation with a 5/8” plywood overlay to protect existing roofing system from damage. Provide removable weighting systems to protect against wind uplift / blow-offs of these protective materials.

C. Based upon the requirements noted above, the General Construction Contractor shall assume responsibility for any damage(s) to the roofing system caused by the work of other trades, except that financial responsibility for any damage(s) to the roofing system shall be that of the Contractor responsible for the damage(s) as determined by the Owner's Construction Representative.

3.22 SIGNAGE

A. The General Construction Contractor shall provide signs as required below. Install signs where required or indicated to inform public and persons seeking entrance to project site. All signage and posts provided shall become the property of the District at the conclusion of the project.

B. Prepare temporary signs to provide directional information to construction personnel and visitors.

C. Construct signs in accordance with section 619 of the NYS DOT standard specifications (MUTCD overall sign size, letter size, metal signage). Support on breakaway metal posts or attach to fencing using zip ties to prevent unauthorized removal; do not attach signs to buildings or permanent construction.

D. Paint sign panel and applied graphics with exterior-grade alkyd gloss enamel over exterior primer. Engage an experienced sign painter or fabricator to apply graphics. Signs shall have an orange background with black letters/graphics unless directed otherwise.

E. Include relocating temporary site safety and directional signs as many times as required or directed by the Owner's Construction Representative.

F. The General Construction Contractor shall furnish, install and relocate all construction signage as required at each project site.

G. Project Sign Requirements:
   1. Ten (10) signs shall be provided and located (and relocated) as designated by the District or Owner's Construction Representative for construction traffic control/flow at entrances/exits.
   2. Four (4) signs for "Construction Parking".
   3. Four (4) signs to direct deliveries
   4. Ten (10) signs for "Emergency egress only - Construction Area" per OSHA standards.
   5. Ten (10) signs for “No Smoking” safe work site at multiple locations as directed by Owner's Construction Representative.
   6. Fifteen (15) signs for "Construction Area - Do Not Enter" mount on fence as directed by the Owner's Construction Representative.
   7. Ten (10) signs for "No Trespassing" mounted on construction fence as directed by the Owner's Construction Representative.

H. A pre-mobilization meeting to establish location and quantities of all signage will be held with contractor, Construction Manager, and the Owner. Prior to the start of any actual work the signage must be reviewed / approved by the Owner's Construction Representative.

3.23 ENVIRONMENTAL PROTECTION:

A. The General Construction Contractor shall provide protection, operate temporary facilities, and conduct construction with means and methods that comply with local and state environmental regulations and that minimize possible air, waterway, and subsoil contamination, pollution or other undesirable effects. Avoid using tools and equipment that produce harmful noise. Restrict the use of noise-producing tools and equipment to hours that will minimize complaints from persons, residential occupants, or firms near Project site.

3.24 STORMWATER CONTROL

A. The General Construction Contractor shall provide earthen embankments, silt fencing, haybales, and similar barriers in and around excavations and subgrade construction, sufficient to prevent flooding by runoff of stormwater.

3.25 SECURITY ENCLOSURE AND LOCKUP:

A. Each Contractor shall provide protection and security for partially completed areas of construction. Provide barricades to prevent unauthorized access, vandalism, theft, and similar violations of security.

3.26 BARRICADES, WARNING SIGNS AND LIGHTS:

A. Comply with standards and code requirements for erecting structurally adequate barricades. Paint with appropriate colors, graphics, and warning signs to inform personnel and public of possible hazard.
   1. For safety barriers, sidewalk bridges, and similar uses, provide minimum 5/8-inch thick exterior grade APA BC plywood with structurally adequate supports and/or scaffolding as approved by the Owner's Construction Representative.

3.27 TEMPORARY ENCLOSURES

A. The General Construction Contractor shall provide temporary enclosures for protection of construction from exposure to inclement weather and for safety of any roof related openings. Close openings in roof deck with load bearing wood frame construction members (sized for design roof loads), 5/8" exterior grade, structural 1, APA BC plywood and watertight EPDM adhered membrane.

B. The General Construction Contractor shall fully enclose all windows / door openings. Maintain access and egress for workers via secured temporary doors / gates. During periods of temporary heat provisions, provide 5/8 inch, exterior grade, APA BC plywood with 2 inch rigid polyisocyanurate and 6 mil polyethylene sheeting for a weather-tight, secure and insulated enclosure. Temporary doors shall each have an exit device and door closer.

C. Any other temporary enclosures for specific openings for any contractor to perform their work shall be the responsibility of the contractor requiring / creating the opening. These openings shall be installed to protect the building from exterior elements, security issues, odors and noise resulting from construction operations.

3.28 TEMPORARY PARTITIONS

A. The General Construction Contractor shall erect and maintain dustproof partitions and temporary enclosures to limit dust and dirt migration and to separate work areas.
   1. Construct dustproof, floor to ceiling partitions of not less than 3-5/8” - 20 ga. studs; 2 layers of 6 mil fire-retardant polyethylene sheets inside / outside; 5/8 inch thick exterior grade plywood sheathing; 5/8 inch thick interior, Type X gypsum board, taped spackled (1 coat) and painted.
   2. Cover floor with 2 layer fire retardant polyethylene and extend 18 inches vertically at each side. Overlap and tape all joints.
   3. Sound insulate partitions to provide noise protection to occupied areas
   4. Caulk joints and perimeter to prevent dust migration. Equip partitions with dustproof doors and security locks.
   5. In addition to any temporary partition locations shown on drawings, the General Construction Contractor shall include in its base bid a minimum of six (6), 9 foot by 12 foot temporary partitions meeting criteria listed above for use and located where directed by the Owner's Construction Representative. Each location shall be equipped with a 3

foot wide by 7 foot high hollow metal door/frame with hinges, closer and exit device hardware.

3.29 AREA OF SPECIAL PROTECTION

A. In the event of an emergency (designated by the sounding of the fire alarm system) all construction activities must immediately cease. Contractor's work force will evacuate themselves from work areas and remain outside of work areas until the "all clear" is given. No work operations will be tolerated during the evacuation of the building or during an emergency.

B. Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations, and minimize the possibility that air, waterways, and subsoil might be contaminated or polluted or that other undesirable effects might result. Avoid use of tools and equipment that produce harmful noise. Restrict use of noise-making tools and equipment to hours that will minimize complaints from persons or firms near the site.

3.30 OPERATION, TERMINATION AND REMOVAL:

A. Supervision: Enforce strict discipline in use of temporary facilities. Limit availability of temporary facilities to essential and intended uses to minimize waste and abuse.

B. Maintenance: Maintain facilities in good operating condition until removal. Protect from damage.
   1. Maintain operation of temporary enclosures on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
   2. Protection: Maintain markers for underground lines. Protect from damage during excavation operations.

C. Termination and Removal: Unless the Architect requests that it be maintained longer, remove each temporary facility when the need has ended and no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been affected because of interference with the temporary construction / facilities. Repair damaged work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
   1. Materials and facilities that constitute temporary facilities are the property and responsibility of the General Construction Contractor.
   2. At Substantial Completion, clean, repair and renovate permanent facilities used during the construction period.

END OF SECTION 015000

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. The Work of this Section includes the furnishing of the Owner's Construction Representative's Field Office (Trailer).
   1. The Owner's Construction Representative's Field Office shall be furnished by the General Construction Contractor.
   2. It shall be provided within the time period specified hereinafter.

B. The General Construction Contractor shall also furnish the following to the Owner/ Owner's Construction Representative's all in accordance with the specifications contained herein as follows:
   1. Miscellaneous equipment and supplies
   2. Materials
   3. Computer system with associated peripheral computer related equipment
   4. Services as may be specified herein.

C. The Electrical Contractor shall install two (2) new telephone services (telephone and fax/modem) for the exclusive use of the Owner's Construction Representative's. The telephone services shall be provided to the Construction Manager's construction trailer located on the site as selected by the Owner's Construction Representative's. The costs associated with providing the Owner's Construction Representative's's telephone services shall be included in the price as-bid and is not eligible for payment out of any cash allowance.

D. This Section also specifies the requirements for Field Offices to be established by all Prime Contractors for the exclusive use of the respective Prime Contractor.

1.02 CARE AND PLACEMENT

A. Field offices shall be placed where directed by the Owner's Construction Representatives's in accordance with site utilization requirements.

B. All field offices shall be installed to meet all standards of the Occupational Safety and Health Act of 1970 and subsequent revisions.

C. In the event of damage to existing facilities, including but not limited to: tanks, driveways, walks, pavement, buildings, pipes, conduits, valves, and electrical facilities then immediately make all repairs and replacements to an equal condition prior to the event.

1.03 QUALITY PERFORMANCE

A. Comply with and perform all work in accordance with the requirements of local authorities and utility companies having jurisdiction.

1.04 SUBMITTALS

A. The General Construction Contractor shall submit the following:
   1. Floor plan of the proposed Field Office of the Owner's Construction Representative's.
   2. Catalog cuts of miscellaneous equipment and supplies if they are different from that specified.

B. The Contractor shall also provide a listing of the companies providing specified services with telephone number and contact name. Provide references for each company when requested.

PART 2 - PRODUCTS

2.01 OFFICE OF PRIME CONTRACTORS

A. The General Construction and the other Prime Contractors shall provide and maintain during the life of this contract separate and suitable offices at the site that shall be used as the Contractor's superintendent office.

B. Provide adequate facilities for maintaining record documents, for holding small meetings and a telephone upon which calls may be received from Owner, Architect and others. The telephone shall be equipped with a fax machine and an answering machine.

C. Each Contractor shall install, maintain, and repair if necessary, temporary electric and telephone to their own field office.

2.02 **MATERIALS, EQUIPMENT AND SERVICES FURNISHED TO THE OWNER BY THE GENERAL CONSTRUCTION CONTRACTOR**

A. The General Construction Contractor shall also furnish the following equipment and services that shall not be eligible under any cash allowance. All items specified herein shall be new and remain the property of the Owner unless otherwise stated. The following shall be furnished:
   1. Two (2) 23-gallon plastic wastepaper basket.
   2. New 50-person industrial first aid station, OSHA approved, by Acme United or equal, order no. ACM-1403 (Huntington Business Products) or equal.
   3. Thermometer, with indoor and outdoor sensing bulbs, and high, low instantaneous reading, with magnetic reset function by Radio Shack or equal.
   4. Two U.L. and F.M. approved fire extinguishers with a minimum rating of 4A-60B:C.
   5. Standard manufacturer operating manuals for all equipment supplied.
   6. One (1) 30" x 60" desk with 4 side drawers and a locking center drawer.
   7. One (1) new swivel task chair for use with desk equal to order no. SUP-12223643 by Superior Chair (Huntington Business Products).
   8. One (1) new rolling stand with top, Model No. 76MR/76TP from Plan Hold, catalog #27, or equal.
   9. Two (2) 48" x 60" reference tables.
   10. Six (6) folding chairs.

B. Janitorial Services - Provide janitorial services two (2) times each week. Thoroughly clean and dust entire office and leave in a condition satisfactory to Architect. Provide this service through final completion.

C. Ownership of Furnishings - All items to be provided by Contractor under this paragraph shall remain the property of the Owner unless otherwise stated.

D. Internet Access Service - The Contractor shall also pay for monthly Internet access fees at a cost not to exceed $45.00 per month for the length of the contract up to the date of final completion.
   1. This cost shall be included in the price as bid and shall be billed directly to the General Construction Contractor.

2. The service provider shall be selected by the Architect. The General Construction Contractor shall arrange for the service.
3. Internet access will be used by the Architect and the Owner to send email to manufacturers, vendors, Architect's home office, the Contractor's home office, other prime Contractors, regulatory agencies and the like.
4. The Contractor may use this service at the discretion of the Architect. Only project related transmissions will be allowed.
5. If high speed DSL or cable service is available, then the Contractor shall arrange for this service in lieu of a dial up service.

E. All items specified herein are subject to the approval of the Architect or the Owner's Construction Representative's.

F. Equipment shall be delivered to the site and turned over to the Architect via a type written transmittal form.

G. All equipment that is to remain the property of the Contractor shall be new.
1. Equipment that is to remain the property of the Owner shall also be new and be provided in it's factory packaging, unopened until delivered to the Owner/Architect.
2. Maintenance of all supplied equipment shall be the Contractor's responsibility up to substantial completion.

H. All items shall be delivered prior to the first application for payment, but no later than the day the Owner's Construction Representative's's Trailer is delivered.

I. Construction Manager's Field Trailer:
1. Office - The General Construction Contractor shall furnish, equip, and maintain a field office at the site for the exclusive use of Owner/Architect.
   a. The field office shall be of substantial weatherproof construction, with a usable floor space of not less than 10' x 40' overall.
   b. Office may be in an approved, near new condition, independent trailer, completely skirted with insulation and with sufficient landings and stairs at each door.
   c. Submit a scaled floor plan of the trailer.
2. Duration - Provide office by no later than 30 calendar days from the date of the Notice To Proceed and maintained during the life of the Contract, up to the date of the Final Certificate.
3. Location - As directed by Owner/Architect or Owner's Construction Representative's. Relocate during the progress of the work, without additional cost to Owner, as may be required by the Owner/Architect or Owner's Construction Representative's.
4. Utilities - Provide the following in sufficient size, quantity, and capacity, as approved by the Owner/Architect.
   a. Windows for natural light and ventilation, with locks, screens, and shades or curtains.
   b. Lighting acceptable to the Owner/Architect/Owner's Construction Representative's.
   c. Door with screen, with hasp and padlock and five keys for Owner/Architect's use. Two (2) doors minimum. Provide two (2) commercial grade foot mats at each door.
   d. Air conditioning unit and heater in each room, sized to maintain an indoor temperature of 60 deg. F with an outdoor temperature range of 10 deg. F to 90 deg. F.
   e. 110 volts, 100-amp electric service with sufficient receptacles spaced around the room.

2.03 REMOVALS

A. Remove all items provided under this Section except as otherwise specified.

PART 3 - EXECUTION

3.01 REMOVAL OF UTILITIES, FACILITIES AND CONTROLS

A. Remove temporary above grade or buried utilities, equipment, facilities and materials.

B. Remove underground installations to a minimum depth of 2 feet or as specified elsewhere.

C. Regrade area to existing slope and elevation and restore the surface to its existing condition or to the condition shown on the Contract Drawings.

D. The General Construction Contractor shall inventory all equipment that has been turned back to the Contractor prior to agreeing to final payment.

END OF SECTION 015213

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. This Section includes the general requirements for products that are to be furnished, installed, or otherwise incorporated into the project.

1.02 QUALITY ASSURANCE APPLIES TO ALL PRODUCTS

A. In addition to the Contractor's warranties and guarantees on materials and equipment required under the General Conditions of the Contract and the Technical Specifications contained hereinafter, the Contractor shall also be responsible for all materials, equipment, and products that have or is planned to be incorporated into the work.
   1. The Contractor shall be responsible for the finished work and that it accurately and completely complies with these Contract Documents.
   2. The Contractor shall be responsible for work performed by subcontractors, equipment suppliers, and material vendors.
   3. The Contractor shall be satisfied as to the product's performance before it is ordered for installation. At the Contractor's option, he/she shall have tested each product to determine compliance with these specifications.

B. The Architect may check all or any portion of the work and the Contractor shall afford all necessary assistance to the Architect in carrying out such checks.
   1. Such checking by the Architect shall not relieve the Contractor of any responsibilities for the accuracy or completeness of the work.
   2. Such checking is a courtesy service being provided by the Owner and does not relieve the Contractor of his/her responsibilities under this Construction Contract.

C. If witnessed shop tests or inspections are required at the point of manufacture, the Contractor shall keep the Architect advised as to the progress of the work to allow inspection at the proper time and place. Provide at least two (2) weeks advance notice before scheduled shop tests.

D. Should a dispute arise as to the quality of workmanship, equipment or material performance, then the final decision regarding acceptability with these Contract Documents shall be that of the Owner.

E. At the request of the Architect, the Contractor shall promptly provide the services of a competent representative of the manufacturer at the project site, fully equipped and prepared to answer questions, perform tests, make adjustments and to prove compliance with the Contract Documents free of all additional charges. Proof of compliance shall be the responsibility of the Contractor, and such special visits to the project site by the manufacturer shall not be eligible under any cash allowances or stipulated man-hours necessary to startup the system and/or train the Owner as may be specified in the Technical Specifications.

1.03 QUALITY ASSURANCE - EQUIPMENT

A. Erect and install products under the supervision of a competent and experienced superintendent. The method of installation, including anchorage, clearances, and tolerances for rotating assemblies, methods of support for equipment and adjacent piping, shall be as recommended by the equipment manufacturer unless detailed on the Drawings or specified.

B. All material furnished shall be new, and guaranteed free from defects in workmanship, installation, and design.

C. Design and fabricate equipment in conformance with ANSI, ASTM, ASME, ASHRAE, IEEE, NEC and NEMA Standards.
   1. Equipment shall withstand the stresses that may occur during fabrication, testing, transportation, installation and conditions of operation.
   2. Pumps shall conform to the requirements of the Hydraulic Institute.
   3. Equipment shall comply with the latest OSHA regulations and the ANSI Safety Standards.

D. Equipment shall be products of manufacturers who produce evidence of their ability to promptly furnish any and all interchangeable replacement parts as may be needed at any time within the expected life of the equipment.

E. Manufacturers shall also have readily available access to suitable and accurate testing facilities for performing the required shop tests.

PART 2 - PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. Equipment shall have been in successful regular operation under comparable conditions for a period of at least five (5) years.
   1. This time requirement does not apply when the manufacturer posts an Owner/Architect acceptable Performance Bond or Letter of Credit for the duration of the time period that will guarantee replacement of the equipment in the event of failure.
   2. The bond shall be in a form that is acceptable to the Owner’s legal council.

B. The Owner reserves the right to reject any material or equipment manufacturer who, although he appears to be qualified and meets the technical requirements, does not provide satisfactory evidence indicating adequate and prompt post-installation repair and maintenance service, as required to suit the operational requirements of the Owner.

C. Whenever it is required that the Contractor furnish materials or manufactured articles or shall do work for which no detailed specifications are set forth, the materials or manufactured articles shall be of the best grade in quality and workmanship obtainable on the market from firms of established good reputation, or, if not ordinarily carried in stock, shall conform to the usual standards for first-class materials or articles of the kind required.

D. Perform work in full conformity and harmony with the intent to secure the best standard of construction and equipment of the work as a whole or in part.

E. Items of any one type of material or equipment shall be the product of a single manufacturer.
   1. For ease of the Owner in maintaining and obtaining service for equipment and for obtaining spare parts from as few places as possible, to the maximum extent possible, use equipment of a single manufacturer.
   2. The Architect reserves the right to reject any equipment from various manufacturers if suitable equipment can be secured from fewer manufacturers and to require that source of materials be unified to the maximum extent possible.

F. Substitute equipment shall not be fabricated nor installed until after written decision to accept request is received from the Architect.

2.02 CONTROL PANELS, MCC'S AND SWITCHBOARDS

A. All control panels, motor control centers, and switchboards shall be fabricated with pilot lights, selector switches, PLC, graphics display panels, elapsed time meters and other components that shall match.
   1. This does not require that all components be one manufacturer, but does require that the like components be of the same manufacturer.
   2. The Contractor shall coordinate the shop drawing submittals to indicate that all components have been selected on this basis.
   3. This requires the Contractor to advise each control panel supplier that product options are limited in this regard.

B. Replacement of unlike products delivered to the job site shall be the responsibility of the Contractor.

C. All costs associated with the replacement shall be borne by the Contractor.

2.03 NAMEPLATES

A. Each unit of equipment shall have the manufacturer's name or trademark on a stainless steel nameplate securely affixed in a conspicuous place.

B. The manufacturer's name or trademark may be cast integrally with stamp, or otherwise permanently marked upon the item of equipment.

C. Such other information as the manufacturer may consider necessary for complete identification shall be shown on the nameplate.

2.04 FABRICATIONS

A. Insofar as possible, shop prefabricate all items complete and ready for installation.

B. Accurately fabricate all items to the details shown on the Drawings and on the shop drawings found in compliance with the Contract Documents.

PART 3 - EXECUTION

3.01 PREPARATION

A. Prior to work under any Section, carefully inspect the existing work and verify that it is complete to the point where the work under that Section may properly commence.

B. Avoid the need to remove and replace work and to avoid unnecessary cutting and patching.

C. Inspect all surfaces to be sure that they have been properly prepared before applying new work to such surfaces.

D. Verify that all work can be installed in strict accordance with the drawings and the approved shop drawings. Immediately report discrepancies to Architect.

E. Do not proceed with the work under any Section until these conditions are obtained.

3.02 INSTALLATION

A. Furnish and install materials and equipment in accordance with the instructions of the applicable manufacturer, fabricator or processors, except as otherwise provided in the Contract Documents.

B. All work shall be done in a workmanlike manner and set to proper lines and grades. The work shall be square, plumb and/or level as the case may be.

C. Where performance criteria are specified, do all work necessary to attain the required end results.

3.03 FIELD QUALITY CONTROL

A. Neither observations by Architect nor inspections, tests or approvals by other persons shall relieve the Contractor from his obligations to perform the work in accordance with the requirements of the Contract Documents.

B. If the Contract Documents, laws, ordinances, rules, regulations or orders of any public authority having jurisdiction require any work to specifically be inspected, tested or approved by some public body, the Contractor shall assume full responsibility therefore, pay all costs in connection therewith, and furnish the Architect with the required certificates of inspection, testing or approval.

C. The Owner reserves the right to independently perform laboratory tests on random samples of material or performance tests on equipment delivered to the site.
   1. These tests, if made, will be conducted in accordance with the appropriate referenced standards or specification requirements.
   2. The entire shipment represented by a given sample, samples or piece of equipment may be rejected on the basis of the failure of samples or pieces of equipment to meet specified test requirements.
   3. All rejected materials or equipment shall be removed from the site, whether stored or installed in the work, and the required replacements shall be made, all at no additional cost to Owner.

3.04 ADJUST AND CLEAN

A. Upon the completion of installations, and as a condition of its acceptance, visually inspect all work, adjust all components for proper alignment and touch-up abrasions and scratches to make them completely invisible.

B. Thoroughly examine all materials and equipment with protective or decorative finishes for defects and damage prior to being covered.
   1. In the case of buried items of work, restore protective surface covers so as to conform to the Contract Documents prior to being backfilled, buried or embedded, as the case may be.
   2. In the case of exposed items of work, for which a decorative finish is required, all scratches, discoloration’s, unmatched colors, disfigurations and damages shall be repaired and touched-up so as to provide a neat, clean finish, and be uniform in color.

3.05 UNCOVERING WORK

A. Unless otherwise specified or directed by Architect, no work shall be covered until it has been observed, tested, photographed, measured, and authorized to be covered by Architect.

B. Tie distances to above ground physical structures as reference points to all underground utilities, conduits, pits, manholes, valves, and pipelines shall be obtained by the Contractor prior to covering the work. Immediately comply with the Architect's direction to uncover the work if tie distances were not obtained.

C. If any work has been covered with Architect's consent and Architect considers it necessary or advisable that covered work be observed or tested, the Contractor, at Architect's request, shall uncover, expose or otherwise make available for observation, or testing as Architect may require, that portion of the work in question, furnishing all necessary labor, material and equipment.
   1. If it is found that such work is defective, the Contractor shall bear all the expenses of such uncovering, exposure, observation, and testing of satisfactory reconstruction, including compensation for additional engineering services and an appropriate deductive change order shall be issued.
   2. If, however, such work is not found to be defective, the Contractor shall be allowed an increase in the contract price or an extension of the contract time, or both, directly attributable to such uncovering, exposure, observation, testing and reconstruction if he makes a claim therefore as provided in the General Conditions.

3.06 DEFECTIVE WORK

A. The repair, removal, replacement and correction of defective work is a part of this Contract and shall be promptly performed in accordance with the requirements set forth in the General Conditions or other portions of the Contract Documents. All costs in connection with the correction of defective work shall be borne by the Contractor.

B. Products that fail to maintain the performance or other salient requirements of the Contract Documents, shows undue wear, or other deleterious effects during the maintenance period, shall be considered defective.

END OF SECTION 016100

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. The Section includes the transportation, handling, storage and protection of products that are to be incorporated into the work.

B. The procedures for turning equipment over to the Owner for installation by others is also included herein.

1.02 GENERAL

A. Items shall be delivered as complete assemblies direct from the manufacturer with all internal wiring, piping, valving, and control devices intact except where partial disassembly is required by transportation regulations, protection of components, or where physical constraints may exist or be created for the setting of the item.

B. Coordinate the disassembly and reassembly requirements with the manufacturer. Determine the need and extent of reassembly prior to bid.
   1. All labor, material and equipment costs associated with the disassembly and reassembly of the product shall be included in the Contract Price.
   2. Where reassembly of equipment is necessary, then the manufacturer shall provide reassembly instruction at the project site.
   3. A technician shall be present during the entire reassembly procedure and the manufacturer shall certify, in writing, that the unit was reassembled properly in accordance with instructions provided by the manufacturer and that all as-specified warranties remain in effect.
   4. The manufacturer's reassembly inspection time shall be in addition to the field service time specified and shall be included in the Contract Price. This time shall not be eligible for payment under any cash allowance item.

C. In the case where equipment is to be installed by others, then the supplying contractor shall be responsible for its reassembly. If reassembly is necessary and the unit(s) are to be set inside an enclosure or building, reassemble the equipment inside said enclosure. The equipment once reassembled shall be turned over to the installing contractor as specified below.

1.03 PACKING

A. Transport products in containers, crates, boxes or similar means such that the products are protected against damage that may occur during transportation.

B. All parts shall be packaged separately or in container where parts of similar systems are grouped.

C. Part numbers shall be indicated on the individual part. Use indelible ink to mark part numbers.

D. All equipment shipments shall be included with a parts list showing a description (name) of the part and the manufacturer's part number.
   1. The parts list shall be shipped in a plastic zippered envelope with the words "Parts List" lettered on it in indelible ink.
   2. The parts list shall be placed inside the shipping container so that it is on the top of the contents.

E. Equipment shall be shipped with storage, handling and installation instructions.
   1. The Engineer reserves the right to withhold payment for equipment delivered to the site until such time as the storage, handling and installation instructions are supplied by the manufacturer.
   2. In the case where operation and maintenance manuals have been provided by the manufacturer, which includes the installation instructions, then the installation instructions shall also be included with the equipment shipment.

F. Delicate instruments and devices, reagents, chemicals, and glassware shall be shipped in packaging normally provided by the manufacturer.

G. The Contractor shall require the manufacturer to be responsible for the proper packing of all products.

1.04 SHIPPING AND DELIVERY

A. Product deliveries shall be accompanied with a bill of lading indicating the place of origination and the Contractor's purchase order number.

B. Inspect shipments immediately upon delivery, to assure compliance with requirements of the Contract Documents and those products are undamaged.

C. Promptly remove damaged material and unsuitable items from the job site.

D. Provide equipment and personnel to handle products by methods to prevent soiling; disfigurement or damage.

1.05 STORAGE

A. Store sensitive products and all spare parts in weather tight, climate controlled enclosures in an environment favorable to product.

B. Store and protect products in accordance with the manufacturer's instructions.

C. All other products that are to be installed underground or products such as pipe, valves, and fittings shall be stored outdoors but shall be blocked off the ground and covered with impervious sheet coverings.

D. Store fabricated products above the ground on blocking or skids.

E. Store loose granular materials in well-drained areas on solid surfaces to prevent mixing with foreign matter.

F. Provide adequate ventilation to avoid condensation.

G. In accordance with manufacturer's instructions protect bearings, couplings, shafts, rotating components, and assemblies. Protection of said equipment shall be continuous until the time the equipment is placed into permanent service.

H. Arrange storage in a manner to provide easy access for inspection. Make periodic inspections of stored products to assure that products are maintained under specified conditions, and free from damage or deterioration.

I. Do not store volatile liquids in any building on site.

J. Storage of products shall be the responsibility of the supplying contractor. The installing contractor shall take all necessary precautions to protect the equipment being furnished by others.

K. Store with seals and labels intact and legible.

1.06 EQUIPMENT INSTALLED BY OTHERS

A. All products, except products noted on the Drawings or specified, shall be furnished and installed under this Contract.
   1. Only noted or specified products shall be furnished under this Contract for installation by others.
   2. If it is not noted on the Drawings or specified, then the product shall be furnished and installed under the Contract.

B. The Contractor shall furnish these products to the Owner. These products shall be stored as specified above.

C. The Owner will then advise the installing contractor that the product(s) are ready for installation.
   1. In the case where the product is stored in a proper enclosure, but not stored inside the building to be constructed under this project, then the installing contractor shall move the product into the building to a location adjacent to the final location shown on the Drawings.
   2. In all cases, the installing contractor shall be responsible for moving from storage, uncrating, anchoring, mounting and installing the product as required by the Contract Documents.

D. The Contractor and installing contractor(s) shall be present at the time the equipment is turned over to the Owner. Immediately thereafter, the Owner will turn the product over to the installing contractor for installation.

E. The Owner, Contractor, Architect and the installing contractor shall inspect the condition of the product at this time.
   1. Any defects in the product will be noted and the Contractor will be advised to make all repairs immediately.
   2. The installing contractor shall still be required to install the product if the damage is deemed cosmetic by the Architect.
   3. The manufacturer's installation instructions or wiring diagram shall be turned over to the installing contractor at this time by the Contractor.
   4. Any damage occurring to the product during moving, setting and mounting the unit(s) shall be the responsibility of the installing contractor.
   5. The Contractor is advised to take photographs to document the condition prior to it being turned over to the installing contractor.
   6. The installing contractor is advised to take photographs to document the condition prior to its acceptance.

F. The supplied unit(s) remain the property of the Contractor until final acceptance of the work.

G. Any damage caused to the unit(s) due to improper installation, workmanship, and non-compliance with the manufacturer's written installation instructions shall be the responsibility of the contractor who caused said damage. The burden of proof shall rest with the supplying Contractor.

H. In the event the Contractor discovers misuse, abuse or improper installation of the unit(s) by the installing contractor, then he shall immediately notify the Architect in writing. The Architect will investigate the accusations and make a determination. The Architect's determination shall be binding and agreed to by both parties.

I. If the Architect's determination substantiates the accusations of the Contractor, then the Contractor shall install the unit(s), the costs for which will be paid for as extra work. All costs associated with the extra work change order, including engineering and attorney fees of the Owner and Contractor will be deducted from money due the installing contractor.

1.07 PROTECTION OF WORK

A. The Contractor shall protect the installed work. All costs for protection shall be borne by the Contractor. Provide coverings as necessary to protect installed products from damage, from traffic and subsequent construction operations. Remove when no longer needed.

B. Cover and protect equipment from dust, moisture or physical damage. Protect finished floor surfaces prior to allowing equipment or materials to be moved over such surfaces. Maintain finished surfaces clean, unmarred and suitably protected until accepted by the Owner.

C. Additional time required to secure replacements and to make repairs will not be considered by the Architect to justify any extension in the Contract Time of Completion. In the event of the damage, promptly make replacement and repairs to the approval of the Engineer at no additional costs.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION 016500

PART 1 - GENERAL

1.01 SUMMARY

A. This Section This Section includes administrative and procedural requirements for cutting and patching.

B. Definition: "Cutting and patching" includes cutting into existing construction to provide for the installation or performance of other work and subsequent fitting and patching required to restore surfaces to their original condition, and does not apply to new construction procedures, except when new construction is already completed and must be cut and patched due to incorrect sequencing of work and/or improper coordination.

C. Provisions of this Section apply to the construction activities of the Contractor. Contractors are reminded that they will need to hire tradesman skilled in the patching finishes that are impacted by their activities. (e.g. plumber will need to have a mason patch back existing walls opened for new roughing , Heating Contractor will hire carpenter for existing ceiling replacements after new air handler installed, etc)

D. Related Sections: The following Sections contain requirements that relate to this Section:
   1. Division 1 Section 013100 - SPECIFICATION FORMAT for procedures for coordinating cutting and patching with other construction activities.
   2. Refer to other Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.
      a. Requirements of this Section apply to all trades. Refer to specification sections for other requirements and limitations applicable to cutting and patching mechanical and electrical installations.

1.02 RESPONSIBILITIES

A. General: The Contractor is responsible to perform cutting and patching for their portion of the Work. Patching work shall restore all surfaces to their original condition.

B. Cutting and patching of completed new construction required due to out of sequence construction and/or improper coordination is the responsibility of the prime Contractor responsible for the out of sequence construction or improper coordination. Cutting and patching of new construction for these purposes shall be accomplished by the General Construction Contractor and shall be paid for by the prime Contractor responsible. The Owner's Construction Representative shall be the sole judge of the responsibility for such cutting and patching, and shall prepare change orders to delete monies from the responsible prime Contract and credit those monies to the General Construction Contractor.
   1. The Contractor shall cooperate with the Owner's Construction Representative to accomplish cutting and patching with minimal disruption to the construction and at reasonable cost.

1.03 SUBMITTALS

A. Cutting and Patching Plan: If the Owner requires approval of cutting and patching procedures before proceeding, submit a plan describing cutting and patching procedures well in advance of the time cutting and patching will be performed and request approval to proceed. Include the following information, as applicable, in the submittal:
   1. Describe the extent of cutting and patching required. Show how it will be performed and indicate why it cannot be avoided.

2. Describe anticipated results in terms of changes to existing construction. Include changes to structural elements and operating components as well as changes in the building's appearance and other significant visual elements.
3. List products to be used and firms or entities that will perform the work.
4. Indicate dates when cutting and patching will be performed.
5. Utilities: List utilities that cutting and patching procedures will disturb or affect. List utilities that will be relocated, including their new locations, and those that will be required to be placed temporarily out-of-service. Indicate how long service will be disrupted and when service will be restored..
6. Where cutting and patching involves adding reinforcement to structural elements, submit details and engineering calculations showing integration of additional reinforcement with the original structure.
    a. Approval by the Architect to proceed with cutting and patching does not waive the Architect's right to later require complete removal and replacement of unsatisfactory work.
    b. Submit a detailed plan, including an area-specific drawing, indicating how dust mitigation and noise control will be handled to prevent disruption/dusting of adjacent areas. Identify routes of waste removal and dumpster locations, material handling from staging area, placement of protections, controls, etc.

1.04 QUALITY ASSURANCE

A. Requirements for Structural Work: Do not cut and patch structural elements in a manner that would change their load-carrying capacity or load-deflection ratio.
    1. Obtain approval of the cutting and patching proposal before cutting and patching the following structural elements:
        a. Bearing and retaining walls.
        b. Structural concrete.
        c. Structural steel.
        d. Lintels.
        e. Structural decking.
        f. Miscellaneous structural metals.
        g. Exterior curtain-wall construction.
        h. Equipment supports.
        i. Piping, ductwork, vessels, and equipment

B. Operational Limitations: Do not cut and patch operating elements or related components in a manner that would result in reducing their capacity to perform as intended. Do not cut and patch operating elements or related components in a manner that would result in increased maintenance or decreased operational life or safety.
    1. Obtain approval of the cutting and patching proposal before cutting and patching the following operating elements or safety related systems:
        a. Primary operational systems and equipment.
        b. Air or smoke barriers.
        c. Water, moisture, or vapor barriers.
        d. Membranes and flashings.
        e. Fire protection systems.
        f. Noise and vibration control elements and systems.
        g. Control systems.
        h. Communication systems.
        i. Conveying systems.
        j. Electrical wiring systems.

C. Visual Requirements: Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in the Architect's opinion, reduce the building's aesthetic qualities. Do not cut and patch construction in a manner that would result in visual evidence of cutting and patching. Remove and replace construction cut and patched in a visually unsatisfactory manner.

1.05 WARRANTY

A. Existing Warranties: Replace, patch, and repair material and surfaces cut or damaged by methods and with materials in such a manner so as not to void any existing or required warranties.

B. Utilize manufacturer certified installers for work on any existing roof area, which are impacted, to ensure that the owners current warranty is maintained in full force.

PART 2 - PRODUCTS

2.01 MATERIALS, GENERAL

A. Use materials identical to existing materials. For exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible. If identical materials are not available or cannot be used, use materials whose installed performance will be equal to or surpass that of the existing materials.

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine surfaces to be cut and patched and conditions under which cutting and patching is to be performed before cutting. If unsafe or unsatisfactory conditions are encountered, take corrective action before proceeding.
   1. Before proceeding, meet at the Project Site with parties involved in cutting and patching, including but not limited to; Owner's Construction Representative, mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

3.02 PREPARATION

A. Temporary Support: Provide temporary support of work to be cut, including shoring, lumber, plywood, etc.

B. Protection: Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of the Project that might be exposed during cutting and patching operations.

C. Avoid interference with the use of adjoining areas or interruption of free passage to adjoining areas.

D. Avoid cutting existing pipe, conduit, or ductwork serving the building but scheduled to be removed or relocated until provisions have been made to bypass them.

3.03 PERFORMANCE

A. General: Employ skilled workmen to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time and complete without delay.
   1. Cut existing construction to provide for installation of other components or performance of other construction activities and the subsequent fitting and patching required to restore surfaces to their original condition.

B. Cutting: Cut existing construction using methods least likely to damage elements retained or adjoining construction. Where possible, review proposed procedures with the original Installer; comply with the original Installer's recommendations.
   1. In general, where cutting, use hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
   2. To avoid marring existing finished surfaces, cut or drill from the exposed or finished side into concealed surfaces.
   3. Cut through concrete and masonry using a cutting machine, such as a Carborundum saw or a diamond-core drill.
   4. Comply with requirements of applicable Division 2 Sections where cutting and patching requires excavating and backfilling.
   5. Where services are required to be removed, relocated, or abandoned, by-pass utility services, such as pipe or conduit, before cutting. Cut-off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal the remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after by-passing and cutting.

C. Patching: Patch with durable seams that are as invisible as possible or to match existing where exposed for aesthetic appearance. Comply with specified tolerances. Patching will be done utilizing tradesmen skilled for the surface to be patched. (e.g. mason for brickwork, ceramic tile installer for ceramic tile, etc)
   1. Where feasible, inspect and test patched areas to demonstrate integrity of the installation.
   2. 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. If patched area does not match the adjacent surface, the contractor will refinish the entire wall to achieve a uniform surface.
   3. Where removal of walls or partitions extends one finished area into another, patch and repair floor, ceiling and wall surfaces in the new space. Provide an aligned, flush surface of uniform color and appearance. Provide grinding, leveling and/or self-leveling of surfaces since adjacent room surfaces may vary in elevation. Remove existing floor and wall coverings and ceiling materials and replace with new materials, if necessary, to achieve uniform color and appearance.
      a. Where patching occurs in a smooth painted surface, extend final paint coat over entire unbroken surface containing the patch after the area has received primer and second coat.
   4. Patch, repair, or re-hang existing ceilings as necessary to provide an even-plane surface of uniform appearance.

3.04 CLEANING

A. Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar items. Thoroughly clean piping, conduit, and similar features

before applying primer and paint or other finishing materials. Restore damaged pipe covering to its original condition

END OF SECTION 017329

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Cleaning during the progress of the work.

B. Maintain all premises and public properties/roadways free from accumulations of waste, debris, dirt, mud and rubbish caused by operations on a daily basis.

C. At completion of work, remove waste materials, rubbish tools, equipment, machinery and surplus materials, and clean all exposed surfaces; leave project clean, dust free and ready for occupancy,

D. Remove all overspray caused by construction operations from adjacent construction, surfaces and vehicles.

E. Cleaning prior to final payment

1.02 SCHEDULING

A. Sequence, schedule, and coordinate final cleaning work with the final cleaning work to be performed by other contractors.

1.03 SAFETY REQUIREMENTS

A. Standards: Maintain project in accord with OSHA and other applicable safety and insurance standards.

B. Hazard Control / Cleaning Products:
   1. Store volatile organic containing / flammable waste in covered metal containers and remove from premises daily.
   2. Provide adequate ventilation during use of VOC containing or noxious substances.

C. Conduct cleaning and disposal operations to comply with local ordinances, OTC regulations and local anti-pollution laws and ordinances.

D. Dispose of all waste legally, off-site.

E. Do not dispose of VOC / flammable waste such as mineral spirits, oil, or paint thinners into storm or sanitary drains.

F. Do not burn or bury rubbish and waste materials on project site.

G. Do not dispose of any waste into surface waters such as ponds, lakes, streams or waterways

PART 2 - PRODUCTS

2.01 MATERIALS

A. Cleaning materials shall be appropriate to the surface and materials being cleaned.

B. Materials: Use only cleaning materials recommended by manufacturer of surface to be cleaned

C. Provide pads to protect finished surfaces from cleaning materials.

PART 3 - EXECUTION

3.01 PREPARATION

A. Post signs to advise building occupants if wet and/or slippery floor conditions exist during cleaning operations.

3.02 PROGRESS CLEANING

A. Keep all buildings, enclosures, and confined areas where work is being performed under the Contract free from unattended combustible materials.

B. Remove rust spots as they develop.

C. Execute daily cleaning to ensure that building, grounds, and public properties and roadways are maintained free from accumulations of waste materials, rubbish, dirt, mud and dust.

D. Wet down dry materials and rubbish to lay dust and prevent blowing dust.

E. Each day, each contractor shall adhere to the following:
   1. Areas of intense activity, such as cutting and sawing must be swept clean and reorganized at the end of each day. Utilize dust control methods such as plastic containment enclosures and/or wetting of surfaces.
   2. Areas of moderate activity, such as installation of plumbing, ductwork, electrical work, must be returned to operating / safe order at the end of each day.
   3. Debris below scaffolds including areas of shoring and re-shoring, must be kept sufficiently cleared and consolidated to keep walkways free of tripping hazards at all times. These work areas must also be swept clean immediately after removal of scaffolds, shoring, etc.
   4. All swept up debris, waste materials, and packing must be removed and placed in a dumpster by the end of the workday.
   5. All stored material must be protected and kept in good order.
   6. As portions of the work are completed, all used and excess materials shall be removed promptly.
   7. Daily Clean-up and good housekeeping is the responsibility of each contractor individually and will be monitored by the Owner's Construction Representative. If any contractor fails to perform cleaning when directed or does not properly clean within 4 hours of being notified by Owner's Construction Representative, the Owner will hire others and charge the responsible contractor accordingly.
   8. Contractors shall promptly comply with requests to organize scattered materials.
   9. Daily sweep and weekly damp mop of all work areas.

F. Each Contractor is responsible for furnishing dumpsters or other such containers as required for collection, storage and legal disposal of all debris and rubbish resultant from their individual construction operations (both demolition and daily construction debris). The Owner's Construction Representative shall direct contractors to locate, maintain and move such containers as necessary and legally dispose of waste as containers are filled. Each contractor shall separate and recycle waste as required by authorities, contract requirements and local regulations / ordinances.

G. The General Construction Contractor shall vacuum clean areas when ready to receive finish painting, and continue vacuum cleaning, on an as needed basis, until the building(s) is (are) ready for Substantial Completion.

H. Handle materials in a controlled manner to reduce handling to the extent possible. Do not drop or throw materials from heights.

I. Schedule cleaning operations so that dust and other containment resulting from cleaning process will not fall on wet, newly painted surfaces.

3.03 FINAL CLEANING

A. Remove dust, dirt, grease, stains, paint drips and runs, plastic, labels, tape, glue, rope, and other foreign materials from visible interior and exterior surfaces.

B. Do not move dust from spot to spot. Remove directly from the surface on which it lies by the most effective mean such as appropriately treated dusting cloths or vacuum tools. When doing high cleaning, do not allow dust to fall from high areas onto furniture and equipment below.

C. Dismantle and remove all temporary structures, scaffolding, fencing, and equipment. Remove waste materials, rubbish, lumber, block, tools, machinery, and surplus materials.

D. Perform the following prior to final payment:
   1. Broom clean all exterior concrete surfaces and vacuum clean all interior concrete surfaces.
   2. Dust and spot clean painted and vinyl covered walls.
   3. Vacuum clean acoustic ceilings.
   4. Repair, patch, and touch-up marred surfaces to specified finish and to match adjacent surfaces.
   5. Remove foreign material from exterior masonry.
   6. Wash and clean interior and exterior window surfaces. All glass shall be clean and free of dirt, grime, streaks and excessive moisture. Wipe drippings and other marks from windowsills, sashes and woodwork. Do not use windowsills in lieu of ladders.
   7. Polish bright metal by damp wiping and drying with a suitable cloth. If a polished appearance is not thereby produced, apply appropriate metal polish.
   8. Clean and polish all stainless steel surfaces, including control panels supplied under this Contract.
   9. Clean all paved roads, lots and drives which were paved as work under this Contract and all existing paved surfaces using a mechanical street cleaner.
   10. Repair or repaint damaged pavement markings.
   11. Clean supply vents and exhaust grilles. Clean gutters and downspouts.
   12. Remove all rust spots and stains from new and pre-existing concrete, painted surfaces, and all other surfaces.
   13. Wash all existing floors that were in any way impacted by the construction operations.
   14. Rake clean landscaped surfaces. Final mow all areas grassed and sodded during the work.
   15. Inspect interior and exterior surfaces, and all work areas, to verify that the entire work is clean and ready for use by the Owner. The project will not be considered substantially complete until all final cleaning has been performed.
   16. Magnet sweep all exterior lawn and walkway areas to ensure that stray nails / screws, etc. remain in lawn areas nor on walkways.

3.04 RUBBISH REMOVAL

A. A. Contractors shall comply with all Local, State and Federal Laws, Codes and Requirements regarding recycling and trash or rubbish removal.

END OF SECTION 017423

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Work of this Section includes the following:
   1. Starting systems
   2. Testing, adjusting, and balancing
   3. Updating of manufacturer's operations and maintenance manuals and wiring diagrams

B. Work of this Section also includes stipulated man-hours that shall be provided by the **Prime Electrical Construction Contractor** for startup participation of equipment and systems.

1.02 STARTING SYSTEMS

A. The Contractor shall coordinate, schedule, and sequence the start-up of various equipment and systems.

B. Where the start-up of a system or piece of equipment is dependent upon the start-up of other system(s) or equipment, then the Contractor shall schedule and sequence the start-ups to coincide.

C. Notify the Architect at least 14 calendar days prior to the start-up of each item or system so that he can schedule the startup with the Owner, utilities, and other Prime Contractors.

D. Where applicable, verify that each piece of equipment or system has been checked for proper:
   1. lubrication,
   2. drive rotation,
   3. belt tension,
   4. motor starter heater size,
   5. fuse size,
   6. water pressures,
   7. terminal connections,
   8. control sequence,
   9. for conditions which may cause damage or delay the start-up procedure.

E. Verify that the equipment has been installed in accordance with the manufacturer's requirements.

F. Complete all pre-startup checklists that may be required by the system vendor.
   1. In the event that start-up activities are delayed as a result of the Contractor's failure to properly check the completed installation and a manufacturer's representative is on the job site waiting for corrections to be made, then the Architect may, at his/her sole discretion, postpone start-up until such time as the corrections have been made without any extra costs.
   2. The Owner may deduct from money due the Contractor the excess cost of engineering associated with having the Architect present during the start-up.
   3. The deduction shall be equal to the Architect's effective billing rate times the total number of hours delayed during the start-up activities.

G. Verify that tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.

H. Verify that wiring and support components for equipment are complete and tested.

I. Execute start-up under supervision of applicable Contractor's personnel in accordance with manufacturer's instructions.

J. The Contractor shall have the job site superintendent present during all start-up activities.

K. Provide manufacturer's authorized technician at the site when specified and in accordance with the requirements contained in Section 014500 - Quality Control.

L. Submit manufacturer's start-up reports (MSR's) in accordance with Section 013300.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION 017500

H2M

PART 1 - GENERAL

1.01 SUBMITTALS

A. Submit the following documents to the Architect before Substantial Completion:
   1. Project Record Documents as specified in Section 017839 - PROJECT RECORD DOCUMENTS.
   2. Operations and Maintenance Manuals prepared in accordance with Section 017823 - OPERATING AND MAINTENANCE DATA and be updated as a result of start-up activities.
   3. Manufacturer's Start-up Reports (MSR's) for all equipment and systems where manufacturer field time is specified.
      a. Each MSR shall be signed by the field technician(s) who attended the start-up.
      b. If the manufacturer is taking exception to the installation or if the warranty is voided, he shall provide a statement to that effect and provide reasons and justification to explain the company's position.
   4. One binder containing original counterparts of all warranties, guarantees, bonds, or affidavits as specified in the Technical Specification Sections. These documents shall contain the original signatures and be placed in a plastic sheet protector, one document per protector.
   5. Spare parts checklist itemizing all spare parts furnished under the Contract summarized by Section.
   6. Electrical Underwriter's Certificate where the prime construction contract includes electrical construction or where this Contract is for a Prime Electrical Construction Contract.

B. Submit the following items to the Architect with the final application for payment:
   1. Maintenance Bond prepared in accordance with the Contract or General Conditions.
   2. Utility company sign-offs and inspection approvals, if applicable.
   3. Federal, state, county, town and local sign-offs and inspection approvals, where applicable.
   4. Final Application for Payment and continuation (G732a/CMa and G703)
   5. Contractor's Certified Payrolls
   6. OSHA cards for all workers
   7. Contractor's Affidavit of Payment of Debts and Claims (G706)
   8. Contractor's Affidavit of Release of Liens (G706A)
   9. Final list of Subcontractors (G705)
   10. Subcontractor's Affidavit of Payment of Debts and Claims (G706) - (for each subcontractor used)
   11. Subcontractor's Affidavit of Release of Liens (G706A) - (for each subcontractor used)
   12. Consent of Surety to Final Payment (G707)
   13. 2 year Maintenance Bond - <u>100% of contract including change orders</u>
   14. Contractors letter guaranteeing workmanship 2 years
   15. Product data, Maintenance manuals and Warranty Information
   16. As Built Documentation
   17. Attic Stock / Spare Parts (provide proof of delivery transmittal signed by owner)
   18. Training and Demonstrations (provide sign-in from training session)
   19. Asbestos Affidavit and waste manifests

C. All documents shall be complete, signed, dated, and notarized (where applicable) and be subject to the Architect's acknowledgment of receipt or approval.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION 017800

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. This Section specifies the requirements for Operations and Maintenance Manuals required to be prepared by system suppliers and equipment manufacturers.

B. The Contractor shall submit Operations and Maintenance Manuals for all equipment.

C. Where the technical specifications call for the submission of manuals, said manuals shall be prepared in accordance with the requirements contained herein. It being understood that manuals shall be submitted for all equipment even if it is not specifically called out in the specifications.

1.02 MANUAL CONTENTS AND FORMAT

A. All Operations and Maintenance Manuals shall be as specified hereinafter.

B. The binder shall be 8 1/2" x 11", metal hinge, vinyl, large capacity by National or Equal. It shall show the name of the manufacturer or supplier and project name on the spine of the binder.

C. A cover shall be provided showing the names of the Owner, Architect, Contractor, and Manufacturer.
   1. It shall show the Contractor's order number and manufacturer's project number.
   2. The address of the manufacturer, service station telephone number, project title, contract number, and year shall also be shown.

D. Provide tabbed color dividers for each separate product and system.
   1. The name of the product shall be typed on the tab.
   2. A separate tab shall also be provided for information such as troubleshooting instructions, spare parts list, etc.

E. An index shall be provided in the back of the binder, with a separate tab, providing a quick way for the operator to find key and important topics contained in the manual.

F. A separate listing for all charts, graphs, tables, figures and shop drawings shall be provided directly following the table of contents.

G. Each manual shall contain one (1) copy of all shop drawings deemed in compliance with the Contract Documents by the Architect submitted for the equipment or system for which the manual is prepared.
   1. Only these shop drawings shall be included in the manual.
   2. All shop drawings larger than 8 1/2" x 11" shall be folded and placed in a heavy duty, top loading plastic sheet protector with the title of the drawing showing; one (1) drawing per protector page.

H. For systems being furnished with control panels, each manual shall contain a catalog cut for every electrical device installed inside the control panel or motor control center.

I. Where emergency generator(s) are included as work of this Contract, the manufacturer's standard manual will be allowed if the manual clearly shows the instructions for the particular model of generator. Cross out chapters and paragraphs that do not apply to the Owner's generator.

J. Each manual shall contain the following as a minimum:
   1. Table of contents
   2. Final version of the warranty statement approved by the Architect
   3. Nameplate data of each component, year of installation, contract number and specification number
   4. Name, address and telephone number of the manufacturer and the manufacturer's local representative(s)
   5. Installation instructions
   6. Operation instructions including adjustments, the interrelation of components and the control sequence describing break-in, start-up, operation and shutdown
   7. Emergency operating instructions and capabilities
   8. Maintenance requirements include routine procedures and guide for preventative maintenance and troubleshooting; disassembly, repair and reassembly instructions; and alignment, adjusting, balancing, and checking instructions
   9. Troubleshooting guide and corrective maintenance (repair) procedures for all electrical and mechanical equipment. These guides shall list the most frequent and common problems, together with the symptoms, possible causes of the trouble, and remedies
   10. Drawings (pictures or exploded views) which clearly depict and identify each part, suitable for assembly and disassembly of entire system and each component
   11. Wiring and control diagrams, if applicable
   12. Panelboard circuit directories including electrical service characteristics, if applicable
   13. Part list with current prices; ordering information; and recommended quantities of spare parts to be maintained in storage
   14. Charts of valve tag numbers, with location and function of each valve, keyed to the process and instrumentation diagram prepared as part of the Contract Documents
   15. Name, address, and telephone number of nearest parts supply house and nearest authorized repair service center.
   16. List of recommended spare parts and the recommended number of each per unit and per group of units.

K. All electronic Operations and Maintenance Manuals shall be as specified hereinafter.
   1. All files shall be in Adobe PDF format and submitted on compact discs.
   2. Files shall be organized by specification section and then by product.
   3. An electronic index and list of all charts, graphs, tables, figures, and shop drawings shall be included.
   4. All information provided in the paper Operations and Maintenance Manual shall be included in the electronic version.

L. Submit two (2) copies of a preliminary draft manual at least fourteen (14) calendar days prior to the date set for start-up.
   1. The Architect will review the manual for content and compliance with these specifications.
   2. Written comments will be provided, but the manual will not be returned.
   3. One (1) manual will be used at start-up, to record changes that should be made to the final manual.
   4. This copy of the manual will be retained on the site until such time as the final, updated manual is provided.

M. Two (2) weeks after the date the unit was placed into service and the Owner has gained beneficial use, submit five (5) copies of the final updated Operations and Maintenance Manual. Refer to Section 017500 - STARTING AND ADJUSTING for requirements related to updating the manual(s).

N. Where installation instructions are not included with the manual, they shall be shipped at least ten (10) days prior to the date the equipment is scheduled for installation.

1.03 RETAINAGE

A. The Architect will retain from payment due the Contractor, for failure to submit manuals as specified, an amount equal to 2% of the scheduled value for the equipment or system for which the manual applies. This Contract requirement only applies when a manual is specified to be provided in the Technical Specifications for a particular system or piece of equipment.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION 017823

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. This Section includes:
   1. Maintenance of documents
   2. Recording of record information
   3. Submission of record documents

1.02 PLANS AND SPECIFICATIONS FURNISHED TO THE CONTRACTOR

A. Two (2) complete sets of Contract Documents (plans, specifications and addenda) will be furnished to the Contractor.

B. Additional sets will be furnished to the Contractor at $250 per set.

C. One (1) complete set of Contract Documents shall be kept in the field office.

D. One (1) complete set of Contract Documents in AutoCAD 2008, or newer, digital format for the Contractor's use to create as-built drawings.

1.03 MAINTENANCE OF DOCUMENTS

A. The Contractor shall maintain at the site one (1) set of the following: drawings, specifications, addenda, change orders, approved shop drawings, test reports, operation and maintenance manuals, and shop drawing log.

B. The Contractor shall make these documents available for use by the Owner, Architect, regulatory agencies and other parties designated by the Owner.

C. Maintain these documents in a clean, dry, legible condition throughout the entire contract period.

D. Make documents available at all times for inspection by Engineer and Owner.

1.04 RECORDING OF RECORD INFORMATION

A. Affix a stamp to each Contract Drawing and Shop Drawing reading as follows: "RECORD DOCUMENT" - "NAME OF PROJECT" - "CONTRACTOR NAME" in 2-inch high printed letters. The stamp shall be specifically prepared for this project.

B. Keep the record documents current as the work progresses. Record information concurrent with construction progress.

C. Do not permanently conceal any work until required information has been recorded.

D. Legibly mark the Contract Plans to record actual construction, including, but not limited to the following:
   1. All as-built work.
   2. All approved field changes and conditions.

E. Shop Drawings: Maintain as record documents. Legibly mark-up to show changes made due to field conditions encountered during construction.

F. The contractor shall be required to keep accurate record drawings, in hard copy format, as well as AutoCAD 2008 or newer digital format, of the work actually performed which is in accordance with the contract documents and that which deviates from them.

G. As work progresses, the contractor shall maintain an on the field set of hard copy drawings, a complete and accurate set of field notes clearly delineating all work as it is actually installed. This set of drawings shall be available at all times for the engineer to review and shall be examined at all jobsite meetings.

H. Do not permanently conceal any work until required information has been recorded.

I. Concurrent with each submission of a contractor partial payment requisition, the contractor shall submit a paper copy of up to date record drawings, including the latest corrections. Incomplete or inaccurate record drawings will be sufficient grounds for refusal to process payment requisition.

J. Final record drawings shall be hard copy format and AutoCAD 2008 or newer digital format, completed by a competent draftsman or CAD operator with the following information as a minimum:
   1. Complete and accurate listing of all imbedded and underground conduits. Drawings shall accurately show all exact locations of conduits including horizontal and vertical dimensions and explicitly list all conduits and fix their location off of building structures or monuments. Imbedded conduits shall include those below the floor slab and those installed in building walls.
   2. Complete and accurate listing of all exposed conduits.
   3. In a neatly logically organized table, a complete listing of all conduits with each individual conduit being given its own number and each junction or pullbox being given its own designation. This table shall list the starting and ending point of all major home runs along with all branch conduits and conduits main function.
   4. In a neatly logically organized table a complete listing of all conductors within the conduits listed above. Each conductor table shall individually list the conductors installed within each conduit and for each conductor shall designate the starting point or termination, complete path through all conduits and junction boxes, final point or termination, conductor color or marking and circuit function. This shall be done for each conductor installed through the project.
   5. An accurate frontal elevation drawing of all motor control centers, control centers other major equipment installed. Drawings shall show all devices as installed in door or faces or equipment.
   6. A dimensioned drawing of all equipment installed including generator sets, load banks, transformers and all major equipment.
   7. Field changes of dimension and detail.
   8. Changes made by Change Order.
   9. Clarification plans not on original contract.

K. At final contract closeout engineer will review preliminary set of final record drawings. After approval of this submission, the contractor will be required to submit one (1) set of hard copy drawings and one (1) digital CD-ROM disc including all as-built drawings in AutoCAD 2008 or newer format as detailed above. No portion of the line item bid amount in the proposal for the record drawings will be released until final record drawings have been submitted and approved. No exceptions.

1.05 SUBMITTAL OF RECORD DOCUMENTS

A. At Substantial Completion, the Contractor shall deliver one (1) preliminary record set of as-built documents to the Architect with all changes conspicuously ballooned or otherwise emphasized.

B. The work will not be considered substantially complete until such time as the preliminary record documents are delivered and acceptable to the Architect. Mark this set "Preliminary Record Drawings".

C. Prior to Final Completion, the Contractor shall conform the preliminary record drawings to the comments made by the Architect and then provide the Owner a complete reproducible set of as-built drawings on mylar (or mylar sepia) and one set of blue line prints.

D. As-built drawings shall be the same size as the Contract Drawings, with 1/2-inch margins space on three sides and a 2-inch margin on the left side for binding.

E. Each drawing shall bear in the title box the words "FINAL RECORD DRAWINGS" and the name of the Contractor in heavy black lettering 1/2 inch high and be certified as complete and accurate.

F. As a convenience, Architect will make available to the Contractor mylar sepias or electronic media of the Contract Drawings for the sole purpose of the Contractor preparing as-built drawings.

G. Electronic media made available is without guarantee of compatibility with the Contractor's software or hardware.
   1. If the Contractor wishes to take advantage of this offer, the Contractor will be required to execute an indemnification and hold harmless agreement with the Architect.

H. At completion of project project prior to the final project close-out meeting, deliver marked-up record documents to the Engineer.

I. Accompany submittal with transmittal letter, containing:
   1. Date.
   2. Project title and number.
   3. Contractor's name and address.
   4. Title and number of each record document.
   5. Certification that each document as submitted is complete and accurate.
   6. Signature of Contractor or its authorized representative.

J. Upon completion of the work, Contractor shall prepare and furnish the Engineer a set of marked up prints of the as-built drawings for review, with all changes conspicuously circled or otherwise emphasized.

K. Prior to final payment, Contractor shall conform the drawings to the comments made by the Engineer and then provide the Owner a complete reproducible sets of as-built drawings on 24" x 36" paper and a set in digital CD-ROM AutoCAD 2008 or newer format.

L. As-built drawings shall be the same size as the contract drawings, with 1/2 inch margins space on three sides and a 2 inch margin on the left side for binding. Each drawing shall bear the legend "AS-BUILT" and the name of the Contractor in heavy black lettering 1/2 inch high and be certified as complete and accurate.

M. As a convenience, Engineer will make available to the Contractor electronic media of the contract drawings for the sole purpose of the Contractor preparing as-built drawings. Electronic media made available is without guarantee of compatibility with the Contractor's software or hardware. If the Contractor wishes to take advantage of the offer, the Contractor will be required to execute an indemnification and hold harmless agreement with the Engineer and pay the Engineer $20.00 per contract set to cover the cost of providing electronic media. Payment shall be by check, payable to Holzmacher, McLendon & Murrell, P.C., in advance of picking up the requested materials. Electronic media shall be returned to the Engineer upon acceptance of the as-built drawings by the Owner.

1.06 RELATED DOCUMENTS

A. Provide certificate of release of liens if requested by the Architect.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION 017839

H2M

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. The Section includes the requirements for delivering spare parts specified to be furnished under the provisions of the Contract Documents.

1.02 QUALITY ASSURANCE

A. Spare parts shall be delivered as complete assemblies direct from the manufacturer such that the part is fully functional and ready to be installed.

1.03 DELIVERY, STORAGE AND HANDLING OF SPARE PARTS

A. Comply with the requirements of Section 016500 for packing, delivery, storage and handling requirements for all parts delivered to the site of the work.

B. All spare parts required to be furnished under a Section of the Specifications shall be packaged in one separate box, crate or container with the words "SPARE PARTS" lettered on all sides of the container.

C. The equipment name or system name for which the spare parts are being provided shall also be lettered on the container.

D. A separate packing list for the spare parts shall be included in the container.

E. The Contractor shall store all spare parts indoors immediately upon delivery of the spare parts to the site. Spare parts will not be accepted by the Owner/Architect if the spare parts have been stored outdoors for more than 8 hours upon delivery to the site.

F. The storage location shall be secure.

1.04 TURN OVER OF SPARE PARTS

A. Spare parts shall be turned over to the Owner/Engineer approximately two (2) weeks prior to the Architect's preparation of the Final Punch List.
   1. Spare parts will not be accepted until this time.
   2. The Certificate of Substantial Completion will not be issued until all spare parts are delivered.

B. The following procedure shall be followed:
   1. The Contractor shall provide a formal letter of transmittal listing the name or description of the part, part number, model number, manufacturer (or supplier), and system component name and the Section where it was specified to be provided.
   2. Two (2) counterparts of the letter shall be provided.
   3. The Contractor shall turn each part individually over to the Owner/Architect.
   4. The Owner/Architect will initial next to the part description on each counterpart of the transmittal letter.
   5. The initials represent that the part was received.
   6. One transmittal counterpart will be returned to the Contractor.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION 017843

H2M

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Work of this Section includes the requirements for demonstrating and training of installed systems, equipment, and products.

B. Manufacturer field services and the credit for unused service time is also included herein.

1.02 MANUFACTURER'S FIELD SERVICES

A. When specified in individual specification sections require field services to be provided, said services shall be provided by qualified, authorized and factory trained representative(s) of the manufacturer (supplier).

B. Field services shall generally consist of:
   1. installation supervision,
   2. verify terms of the manufacturer's warranty,
   3. equipment and system calibration,
   4. startup supervision,
   5. and operation and maintenance instructions to the Owner's employees.

C. Such services do not include service time to correct a factory fault, correct problems resulting from a factory wiring or control logic error, or errors caused by poor or improper installation by the Contractor.

D. The time specified to be provided under the specification sections shall be exclusive of travel time to and from the facility or site. For the purposes of this Contract, one (1) day shall be defined as eight (8) hours exclusive of breaks or mealtime.

E. The times specified to be provided by the manufacturer does not relieve the manufacturer from providing sufficient service time to place the equipment or systems into satisfactory operation and to obtain the specified performance. The manufacturer shall provide, as a minimum, the times specified in the Specification Sections.

1.03 SUBMITTALS

A. The Contractor shall prepare a list of all manufacturer specified field time required by the technical specifications. Compile this summary listing and submit it to the Engineer for review in accordance with the requirements contained in Section 013300 - SUBMITTALS.

B. Manufacturer's Startup Reports

1.04 QUALITY CONTROL

A. The Contractor shall adhere to all instructions provided by the manufacturer's authorized representative.

B. All verbal instructions necessary to satisfy performance of the equipment or the system shall be immediately provided by the Contractor. The manufacturer shall document all verbal orders in writing at a time suitable to the Contractor.

C. All written instructions provided in operation, maintenance, and installation guides and manuals, provided by the manufacturer of such equipment and or system, shall be complied with by the Contractor.

D. The Contractor shall comply with all manufacturer requirements such that written or implied warranties remain in full force during the time period so specified elsewhere in the technical specifications.

E. Should manufacturer's instructions conflict with Contract Documents, request clarification from Engineer before proceeding.

F. Actions and/or non performance by the Contractor that may void manufacturer warranties shall not constitute a release of the specified warranty, and all warranty claims made by the Owner shall be paid for by the Contractor as if the manufacturer's warranty was still in effect.

1.05 SCHEDULING - FIELD SERVICES

A. The Contractor shall arrange field service on dates acceptable to the Owner and Architect.

B. The service visits shall be scheduled at least 2 weeks in advance so that the Owner and Architect can adequately staff the date.

C. Operator training will not be allowed until such time as the Manufacturer's Operation and Maintenance Manuals have been supplied and approved by the Architect.
   1. The field service technician shall review the contents of the manual with designated employees of the Owner.
   2. Field services will not be deemed provided until the MSR is provided.

1.06 DEMONSTRATION AND INSTRUCTIONS

A. Demonstrate operation and maintenance of products to Owner's personnel prior to date of Substantial Completion.

B. Utilize manufacturer's and vendor's Operation and Maintenance Manuals as basis for instruction. Review contents of the manual with the Owner's personnel in detail to explain all aspects of operation and maintenance.

C. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of the equipment or of the system.

D. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.

E. The Contractor shall arrange to have the manufacturer's Operation and Maintenance Manuals updated with information that has been added during start-up activities.

F. The final manual shall contain the most recent information and reflect all operational and maintenance aspects of the final installed and functioning system or equipment component of the system.

G. Any changes to control panel wiring diagrams or interconnection wiring schematics shall be made and new prints provided as an update to previously approved manuals.

H. Manufacturer field time shall be as specified in individual Sections of the Technical Specifications.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION 017900

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Demolition and removal of selected portions of building or structure.
   2. Demolition and removal of selected site elements.
   3. Salvage of existing items to be reused or recycled.

1.03 DEFINITIONS

A. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged or removed and reinstalled.

B. Remove and Salvage: Carefully detach from existing construction, in a manner to prevent damage, and deliver to Owner ready for reuse.

C. Remove and Reinstall: Detach items from existing construction, prepare for reuse, and reinstall where indicated.

D. Existing to Remain: Existing items of construction that are not to be permanently removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.04 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition waste becomes property of Contractor.

B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition shall remain the property of Owner.
   1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.05 PREINSTALLATION MEETINGS

A. Predemolition Conference: Conduct conference at Project site.
   1. Inspect and discuss condition of construction to be selectively demolished.
   2. Review structural load limitations of existing structure.
   3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
   4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
   5. Review areas where existing construction is to remain and requires protection.
   6. Review procedures for turning over salvaged materials to the Owner and protected off-site storage of materials to be reused in the work of the project..

1.06 INFORMATIONAL SUBMITTALS

A. Qualification Data: For refrigerant recovery technician.

B. Proposed Protection Measures: Submit report, including drawings, that indicates the measures proposed for protecting the public, pedestrian access and circulation areas and property , for environmental protection , for dust control and , for noise control. Indicate proposed locations and construction of barriers.

C. Schedule of Selective Demolition Activities: Indicate the following:
   1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's on-site operations are uninterrupted.
   2. Interruption of utility services. Indicate how long utility services will be interrupted.
   3. Coordination for shutoff, capping, and continuation of utility services.
   4. Use of elevator and stairs.
   5. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.

D. Inventory: Submit a list of items to be removed, salvaged and delivered to Owner prior to start of demolition.

E. removed, salvaged Photographs or Video: Submit before Work begins.

F. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

G. Warranties: Documentation indicated that existing warranties are still in effect after completion of selective demolition.

1.07 CLOSEOUT SUBMITTALS

A. Inventory: Submit a list of items that have been removed and salvaged.

B. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

1.08 QUALITY ASSURANCE

A. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program.

1.09 FIELD CONDITIONS

A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.

B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

D. Hazardous Materials: Hazardous materials are present in buildings and structures to be selectively demolished. A report on the presence of hazardous materials is on file for review and use and is included in this Division of the specifications . Examine report and / or the appropriate specification section to become aware of locations where hazardous materials are present.
   1. Hazardous material remediation is specified elsewhere in the Contract Documents.
   2. Do not disturb hazardous materials or items suspected of containing hazardous materials except under procedures specified elsewhere in the Contract Documents.
   3. Owner will provide material safety data sheets for suspected hazardous materials that are known to be present in buildings and structures to be selectively demolished because of building operations or processes performed there.

E. Storage or sale of removed items or materials on-site is not permitted.

F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
   1. Maintain fire-protection facilities in service during selective demolition operations.
   2. Provide a Fire Watch or other method acceptable to the authority having jurisdiction should the existing fire protection facilities have to be shut down during the work.
   3. Do not disable or disrupt building fire or life safety systems without five (5) days prior written notice to Architect.

1.10 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties. Notify warrantor before proceeding.

B. Notify warrantor on completion of selective demolition, and obtain documentation verifying that existing system has been inspected and warranty remains in effect. Submit documentation at Project closeout.

PART 2 - PRODUCTS

2.01 PEFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ANSI/ASSE A10.6 and NFPA 241.

C. LEED Requirements for Building Reuse:
   1. Credit MR 1.1 and Credit MR 1.2: Maintain existing building structure (including structural floor and roof decking) and envelope (exterior skin and framing, excluding window assemblies and nonstructural roofing material) not indicated to be demolished; do not demolish such existing construction beyond indicated limits.

2. Credit MR 1.3: Maintain existing interior nonstructural elements (interior walls, doors, floor coverings, and ceiling systems) not indicated to be demolished; do not demolish such existing construction beyond indicated limits.
3. Credit MR 1.2 and Credit MR 1.3: Maintain existing nonshell, nonstructural components (walls, flooring, and ceilings) not indicated to be demolished; do not demolish such existing construction beyond indicated limits.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that utilities have been disconnected and capped before starting selective demolition operations.

B. Review record documents of existing construction provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in record documents.

C. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.

E. Engage a professional engineer to perform an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective building demolition operations.
   1. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

F. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs .
   1. Inventory and record the condition of items to be removed and salvaged. Provide photographs of conditions that might be misconstrued as damage caused by salvage operations.
   2. Before selective demolition or removal of existing building elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.

3.02 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.
   1. Comply with requirements for existing services/systems interruptions specified in Section 011000 "Summary."

B. Existing Services/Systems to be removed, relocated, or abandoned: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.
   1. Arrange to shut off indicated utilities with utility companies. Provide 5 days notice to the Architect prior to any utility shut-downs.

2. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
3. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated to be removed.
   a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap, plug or reconnect remaining piping with same or compatible piping material.
   b. Equipment to Be Removed: Disconnect and cap services and remove equipment.
   c. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug or reconnect remaining ducts with same or compatible ductwork material.

C. Refrigerant: Remove refrigerant from mechanical equipment to be selectively demolished according to 40 CFR 82 and regulations of authorities having jurisdiction.

3.03 PREPARATION

A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
   1. Comply with requirements for access and protection specified in Section 015000 "Temporary Facilities and Controls."

B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
   1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building. Maintain existing required widths of egress pathways throughout.
   2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
   3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
   4. Cover and protect furniture, furnishings, and equipment that have not been removed.
   5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Section 015000 "Temporary Facilities and Controls."

C. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
   1. Strengthen or add new supports when required during progress of selective demolition.

3.04 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
   1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
   2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and

chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.

3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain fire watch and portable fire-suppression devices during flame-cutting operations.
5. Maintain adequate ventilation when using cutting torches.
6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
7. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
8. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
9. Dispose of demolished items and materials promptly.

B. Reuse of Building Elements: Project has been designed to result in end-of-Project rates for reuse of building elements as follows. Do not demolish building elements beyond what is indicated on Drawings without Architect's approval.
   1. Building Structure and Shell: 75 percent.
   2. Nonshell Elements: 50 percent.
   3. Nonshell Elements: 40 percent.

C. Removed and Salvaged Items:
   1. Clean salvaged items.
   2. Pack or crate items after cleaning. Identify contents of containers.
   3. Store items in a secure area until delivery to Owner.
   4. Transport items to Owner's storage area designated by Owner or as indicated on Drawings.
   5. Protect items from damage during transport and storage.

D. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.05 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

A. Concrete: Demolish in small sections. Using power-driven saw, cut concrete to a depth of at least 1 inch (19 mm) at junctures with construction to remain. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete. Neatly trim openings to dimensions indicated.

B. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, then remove masonry between saw cuts.

C. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, then break up and remove.

D. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI's "Recommended Work Practices for the Removal of Resilient Floor Coverings." Do not use methods requiring solvent-based adhesive strippers.

3.06 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Except for items or materials indicated to be recycled, reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.
   1. Do not allow demolished materials to accumulate on-site.
   2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
   3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.

B. Burning: Do not burn demolished materials.

C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.07 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

3.08 SELECTIVE DEMOLITION SCHEDULE

A. Remove, store, relocate, salvage and protect the following materials and equipment:
   1. Existing Items to Be Removed: Items indicated on contract drawings and items listed in technical specifications sections.
   2. Existing Items to Be Removed, relocated and/or Salvaged: Items required to be removed, relocated salvaged and/or stored to complete the work as indicated or called for in these construction documents.

B. Existing Items to Remain: to complete and conform to the work of the project shall be as indicated on the contract drawings and items listed in the technical specification sections..

END OF SECTION 024119

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Formwork, shoring, bracing and anchorage.

B. Concrete reinforcement and accessories.

C. Cast-in-place concrete, equipment pads.

D. Concrete curing and finishing.

E. Grout.

1.02 RELATED SECTIONS

A. Section 014500 - QUALITY CONTROL.

1.03 REFERENCES

A. ACI 301 - Specifications for Structural Concrete; 2016.

B. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; 2000 (Reapproved 2009).

C. ACI 305R - Guide to Hot Weather Concreting; 2010.

D. ACI 308R - Guide to External Curing of Concrete; 2016.

E. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; 2014 (Errata 2018).

F. ANSI/ASTM A185 - Welded Steel Wire Fabric for Concrete Reinforcement.

G. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2016.

H. ASTM A775/A775M - Standard Specification for Epoxy-Coated Steel Reinforcing Bars; 2017.

I. ASTM C150/C150M - Standard Specification for Portland Cement; 2016.

J. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete; 2010a (Reapproved 2016).

K. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete; 2019.

L. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2018.

M. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2017.

N. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete; 2019.

O. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types); 2018.

P. ASTM D2103 - Standard Specification for Polyethylene Film and Sheeting; 2015.

Q. CRSI 63 - Recommended Practice for Placing Reinforcing Bars.

1.04 SUBMITTALS

A. Submit under provisions of Section 013300 - SUBMITTALS.

B. Shop Drawings: Indicate reinforcement sizes, spacings, and locations of reinforcing steel and wire fabric, bending and cutting schedules, splicing, and supporting and spacing devices. Indicate formwork dimensioning, materials, arrangement of joints and ties.

C. Design Data: Provide a concrete mix design for each type of concrete to be utilized on the project prior to commencement of work. The Contractor's testing laboratory shall develop concrete mix designs and test all materials and mixes for conformance with these specifications. The costs associated with development of the design mix and testing of samples shall not be paid out stipulated cash allowance and shall be included in the bid price.

D. Furnish the Engineer's field representative with transit-mix delivery slips.

1.05 QUALITY ASSURANCE

A. Perform work in accordance with ACI 301.

B. Maintain one copy of document on site.

C. Concrete Testing Service: Engage a testing laboratory acceptable to the Architect to perform material evaluation tests and to design concrete mixes under provisions of Section 014500 - QUALITY CONTROL.

D. For each mix proposed, make and cure four (4) standard 6 inch concrete test specimens in the lab in accordance with ASTM C192. Furnish compression test results made in accordance with ASTM C39/C39M. Break two (2) cylinders at seven (7) days and two (2) at twenty-eight (28) days.

1.06 QUALIFICATIONS

A. Prepare shop drawings under seal of professional structural engineer licensed in the state in which the project is located.

1.07 REGULATORY REQUIREMENTS

A. Conform to ACI 301 and all applicable codes for placement of concrete and related work.

1.08 COORDINATION

A. Coordinate work prior to commencement of work.

B. Coordinate work of other sections in forming and setting openings, slots, recesses, chases, sleeves, bolts, anchors and other inserts.

C. Notify Engineer minimum 72 hours prior to commencement of concreting operations.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Conform to .

B. Plywood Forms: Douglas Fir species; solid one side grade; sound undamaged sheets. Thickness of wood shall be as required to support weight of concrete with minimal deflection.

C. Steel Forms: Minimum 16 gage (1.5 mm) thick, stiffened to support weight of concrete with minimum deflection.

D. Tubular Column Type Forms: Round, spirally wound laminated fiber material; inside surface treated with release agent.

E. Form Ties: Snap-off metal, of fixed length, cone ends.

F. Reinforcing: ASTM A615/A615M, 60 ksi (414 MPa) yield grade billet steel deformed bars; uncoated; size and dimensions as indicated on the plans.

G. Welded Steel Wire Fabric: Plain type, ANSI/ASTM A185; in flat sheets; size and dimensions as indicated on the plans.

H. Cement: ASTM C150, Type I - Normal.

I. Fine and Coarse Aggregates: ASTM C33.

J. Water: Clean and not detrimental to concrete.

2.02 ACCESSORIES

A. Air Entraining Admixture: ASTM C260.

B. Chemical Admixture: ASTM C494, Type as required.

C. Bonding Agent: Polymer resin emulsion manufactured by SPECCO INDUSTRIES, INC., or specifically approved equal.

D. Vapor Barrier: ASTM C1745, 6 mil (0.15 mm) thick clear polyethylene film.

E. Non-Shrink Grout: Premixed compound with non-metallic aggregate, cement, water reducing and plasticizing agents; capable of minimum compressive strength of 2400 psi (16.5 MPa) at 48 hours and 7000 psi (48.3 MPa) at 28 days.

F. Expansion Joints: ASTM C1063; 1/2 inch (13 mm) thick asphalt impregnated fiberboard or felt.

G. Form Release Agent: Colorless material which will not stain concrete, absorb moisture or impair natural bonding or color characteristics of coating intended for use on concrete; manufactured by SPECCO INDUSTRIES, INC. or specifically approved equal. Agent shall not be detrimental to the environment.

H. Sealant: ASTM D1190; hot applied rubber compound manufactured by THE BURKE COMPANY or specifically approved equal.

I. Absorptive Mat: Burlap-polyethylene, 8 oz/sq yd (270 g/sq m), bonded to prevent separation during use.

J. Membrane Curing Compound: ASTM C1315, Type 2, Class A.

K. Clear Sealer: Siloxane type; manufactured by THE BURKE COMPANY or specifically approved equal.

2.03 MIXES

A. Mix concrete in accordance with ASTM C94, Alternative No. 2, to achieve the following:
   1. Compressive Strength (28 day): 4,000 psi
   2. Slump:
      a. 3 +/-1 inches (initial/conventional mix)
      b. 7 +/-1 inches (final/pump mix)
   3. Air Entrainment: 5 ½ +/-1 percent
   4. Water/Cement Ration: 0.50 maximum
   5. Large Aggregate: ¾" crushed stone, ASTM C33, No. 67

B. Use admixtures only when approved by the Engineer.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify existing conditions prior to commencement of work.

B. Verify lines, levels, and measurement before proceeding with formwork. Ensure that dimensions agree with the plans.

3.02 PREPARATION

A. Hand trim sides and bottom of earth forms; remove loose dirt.

B. Align form joints.

C. Do not apply form release agent where concrete surfaces are to receive special finishes or applied coatings which may be affected by the agent.

D. Where new concrete is dowelled to existing work, drill holes in existing concrete, insert steel dowels and pack with non-shrinking grout.

E. Prepare previously placed concrete by cleaning with steel brush and apply bonding agent in accordance with manufacturer's instructions.

3.03 INSTALLATION

A. Place, support, and secure reinforcement against displacement at the locations and to the dimensions as indicated on the plans.

B. Use reinforcing splices at a minimum of locations and only at locations of minimum stress. Review locations of splices with Engineer.

C. Splice overlap shall be a minimum length of 40 diameters.

D. Ensure reinforcement, inserts, embedded parts, formed joint fillers, joint devices and waterstops are not disturbed during concrete placement.

E. Install joint fillers in accordance with manufacturer's instructions.

F. Extend joint filler from bottom of slab to within 1/2 inch (13 mm) of finished slab surface.

G. Install joint devices in accordance with manufacturer's instructions.

H. Maintain records of concrete placement. Record date, location, quantity, air temperature and test samples taken.

I. Place concrete continuously between predetermined expansion, control and construction joints.

J. Do not interrupt successive placement; do not permit cold joints to occur.

3.04 INSTALLATION - SLABS

A. Place slabs in checkerboard pattern.

B. Saw cut control joints at an optimum time after finishing. Cut slabs with 3/16 inch (4.8 mm) thick blade, cutting 1/4 of depth of slab thickness.

C. Separate slabs on grade from vertical surfaces with joint filler. Extend joint filler from bottom of slab to within 1/4 inch (6 mm) of finished slab surface.

D. Steel trowel all surfaces except as noted.

E. Cure floor surfaces in accordance with ASTM C31.

F. Apply curing compound in accordance with manufacturer's instructions in 2 coats with second coat at right angles to the first.

3.05 TOLERANCES

A. Equipment Pads: Provide Class B tolerance to floor slabs according to ASTM E1155.

3.06 FIELD QUALITY CONTROL

A. Field inspection and testing of concrete will be performed under provisions of Section 014500 - QUALITY CONTROL.

B. Testing firm will take cylinders and perform slump and air entrainment tests in accordance with ASTM C31.

C. Four concrete test cylinders will be taken for every 50 cu yds, or fraction thereof, for each class of concrete placed each day.

D. One additional test cylinder will be taken during cold weather and be cured on site under same conditions as concrete it represents.

E. One slump test will be taken for each set of test cylinders taken.

3.07 PROTECTION

A. Protect finished work until completion of project.

B. Protect concrete from damage and deformation until project is accepted by the Owner.

3.08 SCHEDULE: CONCRETE FINISHES

A. Equipment Pads: Broom finish, trim edge.

B. All Other Finishes: Steel trowel surface, unless otherwise noted.

END OF SECTION 030000

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Liquid-applied self-leveling floor underlayment.
   1. Cementitious type._____.

1.02 REFERENCE STANDARDS

A. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or (50-mm) Cube Specimens); 2016a.

B. ASTM C1602/C1602M - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete; 2012.

C. ASTM C348 - Standard Test Method for Flexural Strength of Hydraulic-Cement Mortars; 2019.

D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018a.

E. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride; 2016a.

F. ICRI 310.2R - Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays, and Concrete Repair; 2013.

1.03 SUBMITTALS

A. See Section 013300 - SUBMITTALS, for submittal procedures.

B. Product Data: Provide manufacturer's data sheets documenting physical characteristics and product limitations of underlayment materials. Include information on surface preparation, environmental limitations, and installation instructions.

C. Certificate: Certify that products meet or exceed specified requirements.

D. Manufacturer's Instructions.

1.04 QUALITY ASSURANCE

A. Applicator Qualifications: Company specializing in performing the work of this section, and approved by manufacturer.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Keep dry and protect from direct sun exposure, freezing, and ambient temperature greater than 105 degrees F (41 degrees C).

1.06 MOCK-UP

A. Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
   1. Prepare mock-up in location designated by Architect.
   2. Area: 6 ft by 6 ft (2 m by 2 m).
   3. Do not proceed with underlayment work until workmanship of mock-up has been approved by Architect.

B. Mock-up may remain as part of the Work.

1.07 FIELD CONDITIONS

A. Do not install underlayment until floor penetrations and peripheral work are complete.

B. Maintain minimum ambient temperatures of 50 degrees F (10 degrees C) 24 hours before, during and 72 hours after installation of underlayment.

C. During the curing process, ventilate spaces to remove excess moisture.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Cementitious Underlayment:
   1. ARDEX Engineered Cements; ARDEX V 1200 with ARDEX P51 Primer: www.ardexamericas.com/#sle.
   2. Custom Building Products; CL-150 Self-Leveling Underlayment: www.custombuildingproducts.com/#sle.
   3. MAPEI Corp.; Novoplan 2 Plus (standard set) or Ultraplan 1 Plus (rapid set) with Primer T: www.mapei.com
   4. UZIN, a division of UFLOOR Systems Inc; UZIN PE 260 primer with UZIN NC 170 LevelStar: www.ufloorsystems.com/#sle.
   5. W. R. Meadows, Inc; Floor-Top STG: www.wrmeadows.com/#sle.
   6. Substitutions: See Section 016000 - Product Requirements.

2.02 MATERIALS

A. Cast Underlayments, General:
   1. Comply with applicable code for combustibility or flame spread requirements.
   2. Provide certificate of compliance from authority having jurisdiction indicating approval of underlayment materials in the required fire rated assembly.

B. Cementitious Underlayment: Blended cement mix, that when mixed with water in accordance with manufacturer's directions will produce self-leveling underlayment with the following properties:
   1. Compressive Strength: Minimum 5000 pounds per square inch (34.5 MPa) after 28 days, tested per ASTM C109/C109M.
   2. Flexural Strength: Minimum 1250 psi (8.6 MPa) after 28 days, tested per ASTM C348.
   3. Density: 125 pounds per cubic foot (2002 kg/cu m), nominal.
   4. Final Set Time: 1-1/2 to 2 hours, maximum.
   5. Thickness: Capable of thicknesses from feather edge to maximum 3-1/2 inch (89 mm).

6. Surface Burning Characteristics: Flame spread/Smoke developed index of 0/0 in accordance with ASTM E84.

C. Aggregate: Dry, well graded, washed silica aggregate, approximately 1/8 inch (3 mm) in size and acceptable to underlayment manufacturer.

D. Reinforcement: Galvanized metal lath complying with recommendations of underlayment manufacturer for specific project circumstances.

E. Water: ASTM C1602/C1602M; clean, potable, and not detrimental to underlayment mix materials.

F. Primer: Manufacturer's recommended type.

G. Joint and Crack Filler: Latex based filler, as recommended by manufacturer.

2.03 MIXING

A. Site mix materials in accordance with manufacturer's instructions.

B. Add aggregate for areas where thickness will exceed 1/2 inch (12.7 mm). Mix underlayment and water for at least two minutes before adding aggregate, and continue mixing to assure that aggregate has been thoroughly coated.

C. Mix to self-leveling consistency without over-watering.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are clean, dry, unfrozen, do not contain petroleum byproducts, or other compounds detrimental to underlayment material bond to substrate.

3.02 PREPARATION

A. General: Prepare and clean substrate according to manufacturer's written instructions.
   1. Treat nonmoving substrate cracks according to manufacturer's written instructions to prevent cracks from telegraphing (reflecting) through underlayment.
   2. Fill substrate voids to prevent underlayment from leaking.

B. Concrete Substrates: Mechanically remove, according to manufacturer's written instructions, laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants that might impair underlayment bond.
   1. Moisture Testing: Perform anhydrous calcium chloride test, ASTM F1869. Proceed with installation only after substrates do not exceed a maximum moisture-vapor-emission rate of Insert value in 24 hours.

C. Adhesion Tests: After substrate preparation, test substrate for adhesion with underlayment according to manufacturer's written instructions.

D. Concrete: Prepare surfaces according to ICRI 310.2R, CSP 6 (medium scarification)

E. Wood: Install metal lath for reinforcement of underlayment.

F. Remove substrate surface irregularities. Fill voids and deck joints with filler. Finish smooth.

G. Vacuum clean surfaces.

H. Prime substrate in accordance with manufacturer's instructions. Allow to dry.

I. Close floor openings.

3.03 APPLICATION

A. Install underlayment in accordance with manufacturer's instructions.

B. Pump or pour material onto substrate. Do not retemper or add water.
   1. Pump, move, and screed while the material is still highly flowable.
   2. Be careful not to create cold joints.
   3. Wear spiked shoes while working in the wet material to avoid leaving marks.

C. Place to indicated thickness, with top surface level to 1/16 inch in 10 ft (1:2000).

D. For final thickness over 1-1/2 inches (38 mm), place underlayment in layers. Allow initial layer to harden to the point where the material has lost its evaporative moisture. Immediately prime and begin application of the subsequent layer within 24 hours.

E. Place before partition installation.

F. Where additional aggregate has been used in the mix, add a top layer of neat mix (without aggregate), if needed to level and smooth the surface.

G. If a fine, feathered edge is desired, steel trowel the edge after initial set, but before it is completely hard.

3.04 CURING

A. Once underlayment starts to set, prohibit foot traffic until final set has been reached.

B. Air cure in accordance with manufacturer's instructions.

3.05 FIELD QUALITY CONTROL

A. An independent testing agency will perform field inspection and testing, as specified in Section 014000 - Quality Requirements.

B. Placed Material: Agency will inspect and test for compliance with specification requirements.

3.06 PROTECTION

A. Protect against direct sunlight, heat, and wind; prevent rapid drying to avoid shrinkage and cracking.

B. Do not permit traffic over unprotected floor underlayment surfaces.

END OF SECTION 035400

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes
1. Face brick.
2. Fireclay brick.
3. Mortar and grout.
4. Refractory Mortar.
5. Reinforcement.
6. Ties and anchors.
7. Thermal Brick Support System.
8. Cavity Drainage Mat System.
9. Miscellaneous masonry accessories.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For the following:
1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.

C. Samples for Initial Selection:
1. Face brick, in the form of straps of five or more bricks.
2. Colored mortar.

D. Samples for Verification: For each type and color of the following:
1. Face brick, in the form of straps of five or more bricks.
2. Pigmented and colored-aggregate mortar. Make Samples using same sand and mortar ingredients to be used on Project.

1.04 INFORMATIONAL SUBMITTALS

A. Material Certificates: For each type and size of the following:
1. Masonry units.
2. Pre-blended, dry mortar mixes. Include description of type and proportions of ingredients.
3. Anchors, ties, and metal accessories.

B. Cold-Weather and Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

1.05 QUALITY ASSURANCE

A. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.

B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.

C. Masonry Standard: Comply with ACI 530.1/ASCE 6/TMS 602 unless modified by requirements in the Contract Documents.
   1. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable; 2018.
   2. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.
   3. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.
   4. ASTM A240/A240M - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications; 2016.
   5. ASTM A580/A580M - Standard Specification for Stainless Steel Wire; 2015.
   6. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.
   7. ASTM A951/A951M - Standard Specification for Steel Wire for Masonry Joint Reinforcement; 2016.
   8. ASTM B117 - Standard Practice for Operating Salt Spray (Fog) Apparatus; 2019.
   9. ASTM C199 - Standard Test Method for Pier Test for Refractory Mortars; 1984 (Reapproved 2016).
   10. ASTM C216 - Standard Specification for Facing Brick (Solid Masonry Units Made From Clay or Shale); 2016.
   11. ASTM C27 - Standard Classification of Fireclay and High-Alumina Refractory Brick; 1998 (Reapproved 2013).
   12. ASTM C67 - Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile; 2014.
   13. ASTM C954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness; 2018.
   14. ASTM D1056 - Standard Specification for Flexible Cellular Materials-Sponge or Expanded Rubber; 2014.

D. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
   1. Build mockup of typical wall area as shown on Drawings.
   2. Build mockups for each type of exposed unit masonry construction in sizes approximately 60 inches long by 48 inches high by full thickness, including accessories.
      a. Include a sealant-filled joint at least 16 inches long in mockup.
      b. Include through-wall flashing installed for a 24 inch (600-mm) length in corner of exterior wall mockup approximately 16 inches down from top of mockup, with a 12 inch length of flashing left exposed to view (omit masonry above half of flashing).
      c. Include metal studs, sheathing, building wrap, veneer anchors, flashing, cavity drainage material, and weep holes in mockup.
   3. Clean one-half of exposed faces of mockups with masonry cleaner as indicated.
   4. Protect accepted mockups from the elements with weather-resistant membrane.

5. Approval of mockups is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; and aesthetic qualities of workmanship.
    a. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless such deviations are specifically approved by Architect in writing.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Deliver pre-blended, dry mortar mix in moisture-resistant containers designed for use with dispensing silos. Store pre-blended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in covered weatherproof dispensing silos.

E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.07 PROJECT CONDITIONS

A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
    1. Extend cover a minimum of 24 inches down both sides of walls and hold cover securely in place.

B. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
    1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
    2. Protect sills, ledges, and projections from mortar droppings.
    3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
    4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.

C. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ERTA/ASCE 6/TMS 602.

D. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ERTA/ASCE 6/TMS 602.

PART 2 - PRODUCTS

2.01 MASONRY UNITS, GENERAL

A. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not use units where such defects will be exposed in the completed Work.

2.02 BRICK

A. General: Provide shapes indicated and as follows, with exposed surfaces matching finish and color of exposed faces of adjacent units.
   1. For ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces, provide units without cores or frogs and with exposed surfaces finished.
   2. Provide special shapes for applications where stretcher units cannot accommodate special conditions, including those at corners, movement joints, bond beams, sashes, and lintels.
   3. Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.

B. Face Brick: Facing brick complying with ASTM C216.
   1. Products: Subject to compliance with requirements, provide the following:
      a. Standard Modular size brick unless indicated otherwise. Texture, Type, Color, and Finish shall be selected by Architect from a manufacturer's standard brick selection.
      b. Architect approved equivalent.
   2. Grade: SW.
   3. Type: FBS
   4. Initial Rate of Absorption: Less than 30g/30 sq. in. (30g/194 sq. cm) per minute when tested per ASTM C67.
   5. Efflorescence: Provide brick that has been tested according to ASTM C67 and is rated "not effloresced."

C. Fireclay Refractory Brick: ASTM C27, Class Super-duty.
   1. Special shapes: Molded units as required by conditions indicated, unless standard units can be sawn to produce equivalent effect.
   2. Manufacturer: Superior Clay Corporation or Architect approved equivalent.
   3. Size: 9 inches long by 4 1/2 inches deep by 2 1/2 inches thick or as indicated on the drawings.
   4. Color: Buff.
   5. Temperature Range: 3000 degree F.

2.03 REINFORCEMENT

A. Masonry Joint Reinforcement, General: ASTM A951/A951M.

B. Masonry Joint Reinforcement for Veneers Anchored with Seismic Masonry-Veneer Anchors: Single 0.187 inch (4.75 mm) diameter, hot-dip galvanized, carbon-steel continuous wire.

2.04 TIES AND ANCHORS

A. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated:

1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M; with ASTM A153/A153M, Class B-2 coating.
2. Stainless-Steel Wire: ASTM A580/A580M, Type 304.
3. Steel Sheet, Galvanized after Fabrication: ASTM A1008/A1008M, Commercial Steel, with ASTM A153/A153M, Class B coating.
4. Stainless-Steel Sheet: ASTM A666, Type 304.

B. Wire Ties, General: Unless otherwise indicated, size wire ties to extend at least halfway through veneer but with at least 5/8-inch cover on outside face. Outer ends of wires are bent 90 degrees and extend 2 inches parallel to face of veneer.

C. Adjustable Anchors for Connecting to Structural Steel Framing: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
   1. Tie Section: Triangular-shaped wire tie, sized to extend within 1 inch (25.4 mm) of masonry face, made from 0.187-inch diameter, hot-dip galvanized steel wire. Mill-galvanized wire may be used at interior walls unless otherwise indicated.

D. Adjustable Masonry-Veneer Anchors:
   1. General: Provide anchors that allow vertical adjustment but resist tension and compression forces perpendicular to plane of wall, for attachment over sheathing to metal studs, and as follows:
      a. Structural Performance Characteristics: Capable of withstanding a 100-lbf (445-N) load in both tension and compression without deforming or developing play in excess of 0.05 inch (1.3 mm).
   2. Screw-Attached, Masonry-Veneer Anchors: Units consisting of a wire tie and a metal anchor section.
      a. Products: Subject to compliance with requirements, provide one of the following:
         1) Heckmann Building Products Inc.; 315-D.
         2) Hohmann & Barnard, Inc.; DW-10HS.
   3. Thermal Wing Nut Anchor for Metal Stud Construction: 2-Seal reinforced flame-resistant plastic Wing Nut Anchor with 1 1/2 inch diameter Type 304 Stainless Steel / bonded EPDM washer to seal against insulation and secure insulation to backup. Additional washer on Anchor barrel seals against the Air Barrier. Length of each Anchor shall be as required by the detailed sheathing and insulation depths. Each anchor shall be provided with a Hot-Dip Galvanized, 3/16 inch diameter Compressed Leg 2X-Hook with offsets as required to provide a minimum of 2 inch engagement of the masonry veneer. Space 16 inches on center in each direction maximum or less if indicated on the drawings.
      a. Manufacturer:
         1) Hohmann & Barnard, Inc.
         2) Or approved equal.
      b. For Seismic requirements, provide 3/16 inch diameter continuous Hot-Dip Galvanized wire in conjunction with the 2X-HOOK Seismic Pintle.
   4. Polymer-Coated, Steel Drill Screws for Steel Studs: ASTM C954 except manufactured with hex washer head and neoprene or EPDM washer, No. 10 (4.83-mm) diameter by length required to penetrate steel stud flange with not less than three exposed threads, and with organic polymer coating with salt-spray resistance to red rust of more than 800 hours per ASTM B117.

2.05 THERMAL BRICK SUPPORT SYSTEM

A. Thermal Brick Support System with components fabricated from hot-dip galvanized steel as manufactured by Hohmann & Barnard or Architect approved equal. Type: TBS-B (Bracket Style) and TBS-F (Fin Style) as indicated on the drawings.
   1. Bracket Depth: As indicated on the drawings.
   2. Bracket Length: As indicated on the drawings.
   3. Projecting Leg Depth: As indicated on the drawings.

B. Fasteners:
   1. Provide fasteners of type, grade, and class required to produce connections suitable for anchoring brick support system to other types of construction indicated and capable of withstanding design loads.
   2. Fastener Materials: Fabricate fasteners and anchors from stainless steel, ASTM A240/A240M or ASTM A666, Type 304 stainless steel; temper as required to support loads imposed without exceeding allowable design stresses.

C. Finishes:
   1. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A153/A153M for steel hardware and with ASTM A123/A123M for other steel products.
   2. Stainless Steel: Mill-produced finish.

2.06 EMBEDDED FLASHING MATERIALS

A. Metal Flashing: Provide metal flashing complying with SMACNA's "Architectural Sheet Metal Manual" and as follows:
   1. Fabricate through-wall metal flashing embedded in masonry from stainless steel, with ribs at 3-inch (76-mm) intervals along length of flashing to provide an integral mortar bond.

B. Flexible Flashing: Use the following unless otherwise indicated:
   1. Elastomeric Thermoplastic Flashing: Composite flashing product consisting of a polyester-reinforced ethylene interpolymer alloy.
      a. Products: Subject to compliance with requirements, provide the following:
         1) Mortar Net USA, Ltd.; Total Flash.
         2) Or approved equal.
      b. Monolithic Sheet: TPO Elastomeric thermoplastic flashing, 0.040 inch (1.0 mm) thick with integral stainless steel drip edge, drainage matrix, stainless steel termination bar with #14 x 2" fasteners at 6" o.c., integral weeps.
      c. Accessories: Provide preformed corners, end dams, other special shapes, and seaming materials produced by flashing manufacturer.

C. Application: Unless otherwise indicated, use the following:
   1. Where flashing is indicated to receive counterflashing, use metal flashing.
   2. Where flashing is indicated to be turned down at or beyond the wall face, use metal flashing.
   3. Where flashing is partly exposed and is indicated to terminate at the wall face, use metal flashing with a drip edge.
   4. Where flashing is fully concealed, use flexible flashing.

2.07 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Pre-molded filler strips complying with ASTM D1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene.

B. Weep/Vent Products: Use one of the following unless otherwise indicated:
   1. Cellular Plastic Weep/Vent: One-piece, flexible extrusion made from UV-resistant polypropylene copolymer, full height and width of head joint and depth 1/8 inch (3 mm) less than depth of outer wythe, in color selected from manufacturer's standard.
      a. Products: Subject to compliance with requirements, provide one of the following:
         1) Heckmann Building Products Inc.; No. 85 Cell Vent.
         2) Hohmann & Barnard, Inc.; Quadro-Vent.
         3) Wire-Bond; Cell Vent.
   2. Mesh Weep/Vent: Free-draining mesh; made from polyethylene strands, full height and width of head joint and depth 1/8 inch (3 mm) less than depth of outer wythe; in color selected by the Architect from manufacturer's standard.
      a. Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
         1) Mortar Net USA, Ltd.; Mortar Net Weep Vents.
         2) Or approved equal.

C. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Dayton Superior Corporation, Dur-O-Wal Division; Polytite MortarStop.
      b. Mortar Net USA, Ltd.; Mortar Net.
      c. CavClear Masonry Mat; MasonPro, Inc.
   2. Provide one of the following:
      a. Cavity Wall Drainage System: Total Flash System as manufactured by Mortar Net USA, Ltd. System is an all-inclusive flashing/drainage system with adhered cavity drainage/mortar collection material, drip edge, termination bar, weep tabs with included fasteners and adhesives. This system replaces the separate requirements for flashing, weeps, mortar collection products, drip edge and termination bar.
      b. Or an approved equal system.

2.08 FULL HEIGHT MASONRY DRAINAGE MAT

A. Manufacturer and Type: CavClear Masonry Mat as manufactured by Archovations, Inc., 701 Second Street, Hudson, WI 54016, (715) 381-5773 or approved equal.
   1. Description: Full-height Air Space Maintenance and Cavity Drainage Mat. The masonry drainage mat shall be specifically designed for masonry cavities to prevent mortar from contacting the backup and ensure water management. The masonry drainage mat shall be fluid conducting, non-absorbent, mold and mildew resistant polymer mesh consisting of 100% recycled plastic with binder fibers. Masonry drainage mat is to be a non-woven textile product in random pattern and have voids no greater than 1/4" in diameter. Masonry mat is to be designed for substantially continuous installation behind the full-height of all masonry.
   2. Masonry Drainage Mat Thickness: Select masonry mat thickness of as indicated on the drawings inches to allow no more than 3/8 inch tolerance between the masonry mat and masonry wythe.

3. Sizes: 16 inch high by 8 foot length pieces and/or 8 inch high by 8 foot long pieces as needed to accommodate building components.

2.09 WEEP VENTS

A. Manufacturer and Type: CavClear Weep Vents as manufactured by Archovations, Inc., 701 Second Street, Hudson, WI 54016, (715) 381-5773 or approved equal.
   1. Description: Non-woven mesh with notched bottom.
   2. Color: as selected by the Architect from the manufacturer's full color offering to match mortar.
   3. Size: 3/8 inch by size to match masonry unit dimensions.

2.10 MASONRY CLEANERS

A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.
   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. EaCo Chem, Inc.
      b. ProSoCo, Inc.

2.11 MORTAR MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.
   1. Do not use calcium chloride in mortar.
   2. Use Portland cement-lime mortar unless otherwise indicated.
   3. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.

B. Pre-blended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a pre-blended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

C. Pigmented Mortar: Use colored cement product or select and proportion pigments with other ingredients to produce color required. Do not add pigments to colored cement products.
   1. Pigments shall not exceed 10 percent of Portland cement by weight.
   2. Pigments shall not exceed 5 percent of masonry cement by weight.
   3. Mix to match Architect's sample.
   4. Application: Use pigmented mortar for exposed mortar joints with the following units:
      a. Face brick.

D. Colored-Aggregate Mortar: Produce required mortar color by using colored aggregates and natural color or white cement as necessary to produce required mortar color.
   1. Application: Use colored aggregate mortar for exposed mortar joints with the following units:
      a. Face brick.

E. Refractory Mortar: Provide hydraulic-setting or premixed high-alumina refractory mortar containing calcium aluminate cements, ground fire clay, ganister, etc. and complying with ASTM C199.

2.12 WATER REPELLANT

A. Water Repellent: Chemical treatment application to reduce water infiltration in natural stone, stucco, concrete, brick and other masonry substrates. R97 water repellent, environmentally safe, 50 state VOC compliant, free of flammable solvents and fumes, caustics and MUST NOT contain Silanes, Siloxanes or derivatives of Silanes and or Siloxanes. Products must be compatible with all porous masonry substrates including repair and replacement materials. Cathedral Stone Products; contact Technical Representative at Tel: 410-782-9150; fax: 410-782-9155.
   1. Water repellent must not contain or produce any VOC's
   2. Minimum rating of 80 perms when applied to manufactures specification.
   3. Water Repellant must not lower the water vapor transmission (WVT) of the substrate by more than 1/3 of its pretreated value.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION, GENERAL

A. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to opening.

B. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

C. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.
   1. Mix units from several pallets or cubes as they are placed.

D. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30g/30 sq. in. (30 g/194 sq. cm) per minute when tested per ASTM C67. Allow units to absorb water so they are damp but not wet at time of laying.

3.03 TOLERANCES

A. Dimensions and Locations of Elements:
   1. For dimensions in cross section or elevation do not vary by more than plus 1/2 inch or minus 1/4 inch.
   2. For location of elements in plan do not vary from that indicated by more than plus or minus 1/2 inch.

3. For location of elements in elevation do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2 inch total.

B. Lines and Levels:
1. For bed joints and top surfaces of bearing walls do not vary from level by more than 1/4 inch in 10 feet, or 1/2 inch maximum.
2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet , 1/4 inch in 20 feet, or 1/2 inch maximum.
3. For vertical lines and surfaces do not vary from plumb by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet (9 mm in 6 m), or 1/2 inch (12 mm) maximum.
4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2 inch (12 mm) maximum.
5. For lines and surfaces do not vary from straight by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch (12 mm) maximum.
6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet (6 mm in 3 m) or 1/2 inch (12 mm) maximum.
7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch except due to warpage of masonry units within tolerances specified for warpage of units.

C. Joints:
1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch , with a maximum thickness limited to 1/2 inch; do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch (3 mm).
2. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm). Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch (3 mm).
3. For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than 1/16 inch from one masonry unit to the next.

3.04 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in bond pattern indicated on Drawings; do not use units with less than nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.

C. Stopping and Resuming Work: Stop work by racking back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.

D. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.

E. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.

3.05 MORTAR BEDDING AND JOINTING

A. Lay hollow brick as follows:
   1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.
   2. With entire units, including areas under cells, fully bedded in mortar at starting course on footings or foundation walls.

B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.

C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

3.06 ANCHORING MASONRY TO STRUCTURAL STEEL AND CONCRETE

A. Anchor masonry to structural steel and concrete where masonry abuts or faces structural steel or concrete to comply with the following:
   1. Provide an open space not less than 1/2 inch (13 mm) wide between masonry and structural steel or concrete unless otherwise indicated. Keep open space free of mortar and other rigid materials.
   2. Anchor masonry with anchors embedded in masonry joints and attached to structure.
   3. Space anchors as indicated, but not more than 16 inches o.c. vertically and 24 inches o.c. horizontally.

3.07 ANCHORING MASONRY VENEERS

A. Anchor masonry veneers to wall framing with masonry-veneer anchors to comply with the following requirements:
   1. Fasten anchors with metal fasteners of type indicate as specified by manufacturers. Use two fasteners unless anchor design only uses one fastener.
   2. Embed tie sections in masonry joints. Provide not less than 2 inches (50 mm) of air space between back of masonry veneer and face of sheathing.
   3. Locate anchor sections to allow maximum vertical differential movement of ties up and down.
   4. Maximum vertical offset of bed joints from one wythe to the other shall be 1 1/4 inch when utilizing adjustable wall ties such as pintle ties.
   5. Pintle ties shall have two legs of W2.8 wire size minimum.
   6. Space anchors as indicated, but not more than 16 inches o.c. vertically and 16 inches (407 mm) o.c. horizontally, with not less than 1 anchor for each 1.77 sq. ft. of wall area. Install additional anchors within 12 inches (305 mm) of openings and at intervals, not exceeding 8 inches (203 mm), around perimeter.

3.08 EXPANSION JOINTS

A. General: Install expansion joint materials in unit masonry as masonry progresses. Do not allow materials to span expansion joints without provision to allow for in-plane wall or partition movement.

B. Form expansion joints in brick as follows:

1. Build flanges of metal expansion strips into masonry. Lap each joint 4 inches in direction of water flow. Seal joints below grade and at junctures with horizontal expansion joints if any.
2. Build flanges of factory-fabricated, expansion-joint units into masonry.
3. Build in compressible joint fillers where indicated.
4. Form open joint full depth of brick wythe and of width indicated, but not less than 3/8 inch for installation of sealant and backer rod specified in Section 079200 - JOINT SEALANTS.

C. Provide horizontal, pressure-relieving joints by either leaving an air space or inserting a compressible filler of width required for installing sealant and backer rod specified in Section 079200 - JOINT SEALANTS, but not less than 3/8 inch (10 mm).
   1. Locate horizontal, pressure-relieving joints beneath shelf angles supporting masonry.

3.09 LINTELS

A. Install galvanized steel lintels where indicated on drawings.

B. Provide minimum bearing of 8 inches at each jamb unless otherwise indicated.

3.10 FLASHING, WEEP HOLES, CAVITY DRAINAGE, AND VENTS

A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated. Install vents at shelf angles, ledges, and other obstructions to upward flow of air in cavities, and where indicated.

B. Install flashing as follows unless otherwise indicated:
   1. For Total Flash System at base of wall: Install as directed by manufacturer.
   2. At lintels, extend flashing a minimum of 8 inches (204 mm) into masonry at each end. At heads and sills, extend flashing 8 inches at ends and turn up not less than 2 inches to form end dams.

C. Install reglets and nailers for flashing and other related construction where they are shown to be built into masonry.

D. Install vents in head joints in exterior wythes at spacing indicated. Use specified weep/vent products to form vents.

E. Install masonry drainage mat continuously throughout full-height of all exterior masonry cavities during construction of exterior wythe; follow manufacturer's installation instructions. Verify that air space width is no more than 3/8 inch greater than masonry mat thickness. Install horizontally between joint reinforcement. Stagger end joints in adjacent rows. Use multiple layers at bottom of wall and above through-wall flashings when air space depth exceeds masonry mat thickness by more than 3/8 inch. Extend extra mat at least to top of base flashing. Butt adjacent pieces to moderate contact. Fit to perimeter construction and penetrations without voids.

F. Place weep vents in head joints at exterior wythe of cavity wall located immediately above ledges and flashing, spaced 24 inches on center, unless otherwise shown. Leave the side of the masonry units forming the vent space un-buttered and clear of mortar. Install with notched side down. Slide vent material into joint as the two masonry units forming the weep vent are placed.

3.11 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas, as needed to perform tests and inspections. Retesting of materials that fail to meet specified requirements shall be done at Contractor's expense.

B. Inspections: Level 1 special inspections according to the "International Building Code."
   1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.

3.12 REPAIRING, POINTING, AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.

C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
   1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
   2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
   3. Protect adjacent stone and non-masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
   4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
   5. Clean brick by bucket-and-brush hand-cleaning method described in "BIA Technical Notes 20."
   6. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.

3.13 MASONRY WASTE DISPOSAL

A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property.

B. Waste Disposal as Fill Material: Dispose of clean masonry waste; including excess or soil-contaminated sand, waste mortar, and broken masonry units and masonry cut-offs by crushing and mixing with fill material as fill is placed.
   1. Crush masonry waste to less than 4 inches (100 mm) in each dimension.
   2. Do not dispose of masonry waste as fill within 18 inches (450 mm) of finished grade.

C. Legally dispose of off-site, any excess masonry waste.

END OF SECTION 042113

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
1. Concrete masonry units.
2. Architectural concrete masonry units.
3. Structural Glazed Clay Tile.
4. Autoclaved Aerated Concrete (AAC) units.
5. Masonry Lintels.
6. Hi-R Masonry Wall System
7. ICMU - Insulated Concrete Masonry Units.
8. Mortar and grout.
9. Steel reinforcing bars.
10. Masonry joint reinforcement.
11. Ties and anchors.
12. Embedded flashing.
13. Cavity Drainage System.
14. Miscellaneous masonry accessories.
15. Masonry Cell Insulation.
16. Installation of Door Frames, Lintels and items furnished by other sections.
17. Surface applied Waterproofing
18. Cleaning of masonry.

1.03 DEFINITIONS

A. AAC unit: Autoclaved Aerated Concrete Unit or Autoclaved Aerated Concrete Block.

B. AAC Masonry Block System: Combination of AAC units and thin-bed mortar bonded together vertically and horizontally to form complete assembly; for load-bearing and non-loadbearing applications.

C. Strength Class: AAC-2, AAC-3, AAC-4, or AAC-6

D. CMU(s): Concrete masonry unit(s).

E. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.04 PERFORMANCE REQUIREMENTS

A. Provide unit masonry that develops indicated net-area compressive strengths at 28 days.
1. Determine net-area compressive strength of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.
2. Determine net-area compressive strength of masonry by testing masonry prisms according to ASTM C1314.

B. AAC manufacturer shall be a current member of the Autoclaved Aerated Concrete Products Association (AACPA).

C. Fire Rated Assemblies: Tested in accordance with ANSI/UL 263 "Fire Tests of Building Construction and Materials" conforming to UL Assembly No. U906.

1.05 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Owner will engage a qualified independent testing agency to perform preconstruction testing indicated below. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.
   1. Concrete Masonry Unit Test: For each type of unit required, according to ASTM C140/C140M for compressive strength.
   2. Mortar Test (Property Specification): For each mix required, according to ASTM C109/C109M for compressive strength, ASTM C 1506 for water retention, and ASTM C91/C91M for air content.
   3. Mortar Test (Property Specification): For each mix required, according to ASTM C780 for compressive strength.
   4. Grout Test (Compressive Strength): For each mix required, according to ASTM C1019.
   5. Prism Test: For each type of construction required, according to ASTM C1314.

1.06 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Manufacturer’s product data for the AAC Integrated Construction System, including AAC units and thin-bed mortar. Provide actual AAC unit dimensions.

C. Shop Drawings: For the following:
   1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
   2. Reinforcing Steel: Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement." Show elevations of reinforced walls.
   3. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.

D. Material Safety Data Sheets (MSDS) for AAC, thin-bed mortar, and finish materials.

E. Samples for Initial Selection:
   1. Architectural CMUs, in the form of small-scale units.
   2. Autoclaved Aerated Concrete (AAC) units.
   3. Colored mortar.
   4. Weep holes/vents.

F. Samples for Verification: For each type and color of the following:
   1. Exposed CMUs.
   2. Pigmented mortar. Make Samples using same sand and mortar ingredients to be used on Project.
   3. Accessories embedded in masonry.

1.07 INFORMATIONAL SUBMITTALS

A. List of Materials Used in Constructing Mockups: List generic product names together with manufacturers, manufacturers' product names, model numbers, lot numbers, batch numbers, source of supply, and other information as required to identify materials used. Include mix proportions for mortar and grout and source of aggregates.
   1. Submittal is for information only. Neither receipt of list nor approval of mockup constitutes approval of deviations from the Contract Documents unless such deviations are specifically brought to the attention of Architect and approved in writing.

B. Qualification Data: For testing agency.

C. Material Certificates: For each type and size of the following:
   1. Masonry units.
      a. Include data on material properties material test reports substantiating compliance with requirements.
      b. For masonry units, include data and calculations establishing average net-area compressive strength of units.
      c. Certificate from the AAC manufacturer indicating AAC product is manufactured in accordance with ASTM C 1693.
      d. Current Legacy Report number or Evaluation Report number for the AAC manufacturer.
   2. Cementitious materials. Include brand, type, and name of manufacturer.
   3. Pre-blended, dry mortar mixes. Include description of type and proportions of ingredients.
   4. Grout mixes. Include description of type and proportions of ingredients.
   5. Reinforcing bars.
   6. Joint reinforcement.
   7. Anchors, ties, and metal accessories.

D. Mix Designs: For each type of mortar. Include description of type and proportions of ingredients.
   1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C109/C109M for compressive strength, ASTM C 1506 for water retention, and ASTM C91/C91M for air content.
   2. Include test reports, according to ASTM C1019, for grout mixes required to comply with compressive strength requirement.

E. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 402/602.

F. Cold-Weather and Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

1.08 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM C1093 for testing indicated.

B. Special Testing Inspections: Owner shall employ a Special Inspection Agency to provide required inspections in accordance with current [] Section 1704.5 and 1704.5.1 (Level 1).

C. Installer Qualifications: Engage an AAC trained installer who has the necessary equipment and experience in AAC system handling, placement and installation.

D. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.

E. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.

F. Masonry Standard: Comply with ACI 530.1/ASCE 6/TMS 402/602 unless modified by requirements in the Contract Documents.

G. Mock-up Panels: Build sample panels to verify selections made under sample submittals and to demonstrate aesthetic effects. Comply with requirements in Section 014500 - PREVAILING WAGE RATES for mockups.
   1. Build sample panels for typical exterior wall in sizes approximately 72 inches long by 48 inches high by full thickness.
   2. Where masonry is to match existing, erect panels adjacent and parallel to existing surface.
   3. Protect approved sample panels from the elements with weather-resistant membrane.
   4. Approval of sample mock-up panel is for the following items:
      a. Color, texture, and blending of masonry units;
      b. Relationship of mortar and sealant colors to masonry unit colors;
      c. Tooling of joints;
      d. Aesthetic qualities of workmanship;
      e. Reinforcing, flashing, control joint and sealant installations;
      f. Other material and construction qualities specifically requested by Architect in writing.
   5. Approval of sample panels does not constitute approval of deviations from the Contract Documents contained in sample panels unless such deviations are specifically approved by Architect in writing.

1.09 DELIVERY, STORAGE, AND HANDLING

A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.

B. Designated storage area shall be located at or near the staging areas, minimizing excessive handling of AAC material.

C. AAC units shall be stored in an area and manner to prevent breakage, cracking, chipping, spalling or other damage.

D. Protect AAC units from oil and chemical staining

E. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

F. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

G. Deliver pre-blended, dry mortar mix in moisture-resistant containers designed for use with dispensing silos. Store pre-blended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in covered weatherproof dispensing silos.

H. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.10 PROJECT CONDITIONS

A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
   1. Extend cover a minimum of 24 inches down both sides of walls and hold cover securely in place.

B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three days after building masonry walls or columns.

C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
   1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
   2. Protect sills, ledges, and projections from mortar droppings.
   3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
   4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.

D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/ACI 530/530.1/ERTA.
   1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F (4 deg C) and higher and will remain so until masonry has dried, but not less than 7 days after completing cleaning.
   2. Do not lay AAC units having either a temperature below 20°F or containing frozen moisture, visible ice, or snow on their surface.
   3. Do not heat water or aggregates used in mortar or grout above 140°F.

E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 402/602.
   1. Preparation – Prior to conducting AAC masonry work:
      a. When the ambient air temperature exceeds 100°F. or exceeds 90°F. with wind velocity in excess of 8 mph:
         1) Spread mortar beds no more than 4’-0” ahead of AAC units.
         2) Set AAC unit within one minute after spreading mortar.
      b. When the ambient air temperature exceeds 115°F, or exceeds 105°F with a wind velocity greater than 8 mph, follow paragraph 1.a. above plus shade materials and mixing equipment from direct sunlight.
   2. Construction – While AAC masonry work is in progress:

a. When the ambient air temperature exceeds 100°F or exceeds 90°F with a wind velocity greater than 8 mph:
   1) Maintain temperature of mortar and grout below 120°F.
   2) Flush mixer and mortar transport container with cool water before they come into contact with mortar ingredients or mortar.
b. When the ambient temperature exceeds 115°F, or exceeds 105°F with a wind velocity greater than 8 mph, follow paragraph 2.a. above plus use cool mixing water for mortar and grout.
c. Do not apply base coating or textured coating when ambient temperatures are over 90°F. Protect base coating from excessive evaporation during hot, windy, or dry conditions by pre-wetting substrate. Protect from rain.
d. Do not apply joint sealant when ambient temperatures are over 100°F.

3. Protection – When the mean daily temperature exceeds 100°F, or exceeds 90°F with a wind velocity greater than 8 mph, fog spray newly constructed masonry until damp, at least three times a day until the AAC masonry is three days old.

PART 2 - PRODUCTS

2.01 MASONRY UNITS, GENERAL

A. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not use units where such defects will be exposed in the completed Work.

B. Fire-Resistance Ratings: Where indicated, provide units that comply with requirements for fire-resistance ratings indicated as determined by testing according to ASTM E119, by equivalent masonry thickness, or by other means, as acceptable to authorities having jurisdiction.

2.02 CONCRETE MASONRY UNITS

A. Regional Materials: CMUs shall be manufactured within 500 miles of Project site from aggregates and cement that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of the Project site.

B. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.
   1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
   2. Provide bullnose units for outside corners unless otherwise indicated.

C. Integral Water Repellent: Provide units made with integral water repellent for exposed units and where indicated.
   1. Integral Water Repellent: Liquid polymeric, integral water-repellent admixture that does not reduce flexural bond strength. Units made with integral water repellent, when tested according to ASTM E 514 as a wall assembly made with mortar containing integral water-repellent manufacturer's mortar additive, with test period extended to 24 hours, shall show no visible water or leaks on the back of test specimen.
      a. Products : Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
         1) ACM Chemistries, Inc.; RainBloc.
         2) BASF Group; MasterPel 240
         3) Grace Construction Products, W. R. Grace & Co.; Dry-Block.

D. CMUs: ASTM C90.
   1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2800 psi(19.3 MPa).
   2. Density Classification: Normal weight.
   3. Size (Width): Manufactured to dimensions 3/8 inch less than nominal dimensions.
   4. Exposed Faces: Provide color and texture matching the range represented by Architect's sample.
   5. Faces to Receive Plaster: Where units are indicated to receive a direct application of plaster, provide textured-face units made with gap-graded aggregates.

E. Architectural CMUs: ASTM C90.
   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. Barrasso & Sons, Inc.
      b. A. Jandris & Sons, Inc.
      c. Palumbo Block Co., Inc.
      d. Or approved equal.
   2. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2800 psi.
   3. Density Classification: Normal weight.
   4. Size (Width): Manufactured to dimensions specified in "CMUs" Paragraph.
   5. Pattern and Texture:
      a. Standard pattern, Ground-face finish.
      b. Standard Pattern, Polished finish.
      c. Standard Pattern, Weathered Polished finish.
      d. Standard pattern, split-face finish.
   6. Colors: As selected by Architect from manufacturer's full range.
   7. Special Aggregate: Provide units made with aggregate matching aggregate in Architect's sample.

F. Structural Glazed Clay Tile: Structural glazed Brick shall be brick unit masonry as manufactured by Elgin Butler Company or approved equal. Colors and finishes shall be as selected by the Architect from the manufacturer's full range of options. Provide all special shapes and configurations for a complete installation, including but not limited to: internal and external corners, sills, coves, jambs and caps with radius edges. All units shall conform to the requirements of ASTM C-126 and the Facing Tile Institute for grade Sized Select (Grade SS). Nominal sizes shall be as indicated on the drawings.
   1. Allow for the quantity of colors, finishes and and textures needed to achieve the design intent of the drawings as determined by the Architect. Once selections are made, the contractor shall provide shop drawings detailing specific blocks in colors, textures and finishes required to match the design intent illustrated on the contract documents.

G. AAC (Autoclaved Aerated Concrete units):
   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. AERCON Florida, LLC.; 3701 C.R. 544, Haines City, FL 33844; Telephone: (863) 422-6360; Fax (863) 422-6361.
      b. E-Crete, LLC; 2151 E. Broadway Road #115, Tempe, AZ 85250; Telephone (480) 596-3819, Fax (480) 596-3952.
      c. Texas Contec, Inc.; 1535 Brady Blvd., Suite 2, San Antonio, TX 78237; Telephone: (210)402-3223, Fax (210) 402-6390 (Subsidiary of Contec Mexicana).

2. Composition: Autoclaved aerated concrete mixture consisting of quartz / sand / silica source, lime, cement, proprietary additives, and water.
3. Nominal dimensions:
   a. Standard Block; square head joints: 8 inch nominal height by 24" nominal length. See plans for required thicknesses. Strength Class: AAC-4.
   b. Tongue and Groove Block: 8" nominal height by 24" nominal length. See plans for required thicknesses. Strength Class: AAC-4.
   c. Jumbo Block: 24" nominal height by 24 inch nominal length. See plans for required thicknesses. Strength Class: AAC-4.
   d. Tongue and Groove Jumbo Block: 24" nominal height by 24" nominal length. See plans for required thicknesses. Strength Class: AAC-4.
   e. Solid lintel units; reinforced: Same width as walls by 16 inch nominal height; Strength Class: AC4.
   f. Lintel "U-Block" units: Same width as walls by 12 inch nominal height by 24 inch nominal length; Strength Class AC4.
4. Compression Strength and Density: In accordance with ASTM C 1386.
5. Fire ratings: In accordance with UL 263 or ASTM E 119.
6. Acoustical ratings: In accordance with ASTM E 90.

2.03 MASONRY LINTELS

A. General:
   1. Masonry Lintels: Prefabricated or built-in-place masonry lintels made from bond beam CMUs with reinforcing bars placed as indicated and filled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.
   2. Steel Lintels: Install multiple Steel angle lintels as indicated on the drawings. Provide Hot-dip galvanized lintels for exterior installations.

2.04 HI-R MASONRY WALL SYSTEM

A. Hi-R Masonry wall system comprised of concrete masonry units cast in a configuration to accept flame-retardant treated expandable polystyrene inserts to produce an assembly capable of providing enhanced R-values in single wythe masonry construction.
   1. Manufacturer: Concrete Block Insulating Systems, Tel.: 800-628-8476; Email: korfil@cbisinc.com.

B. The insulation shall conform to ASTM C 578, Type X - Specification for Rigid Cellular Polystyrene Insulation. The insulation shall have the following Physical Properties:

Property	**Value**
Typical Density (p.c.f.)	1.3
Thermal Resistance (R) per inch at 75 degrees	5.00
Water Vapor Permeance per inch	1.1
Water Absorption % Volume	<1.0
Flame spread Rating	<5.0

C. Masonry units shall conform to ASTM C 90 - Standard specification for Load Bearing Concrete Masonry Units.
   1. Unit Thickness: 8 inch.
   2. Unit Face Dimensions: 8 inch x 16 inch conforming to ASTM C 90.
   3. Block Density: 80 pcf.

4. R-value: 10.27 (8 inch Block at 100 pcf)
5. Block Face: Smooth
6. Color: As selected by the Architect from the manufacturer's full color offering.

2.05 NRG ICMU (INSULATED CONCRETE MASONRY UNITS)

A. Insulated, web-less, normal weight concrete masonry units as manufactured by licensed manufacturers. Units shall be manufactured with approved integral water-repellent admixture at the time of production. Units shall be manufactured to contain an integral Expanded Polystyrene Insert at the time of manufacture. Units shall be constructed in a Dovetail configuration of offset cores to lock the insulation together with the inside and outside CMU modules to form a single insulated CMU without a thermal bridge through the unit.
   1. The insulation shall conform to ASTM C 578, Type X - Specification for Rigid Cellular Polystyrene Insulation.
   2. Manufacturers:
      a. Anchor Concrete Products, 800-682-5625.
      b. Southern Tier Concrete Products, 911 State Route 21, Alfred, NY. (607) 587-9292

B. Vertical Core Reinforcing: Contractor shall coordinate the location of the vertical steel core reinforcing with the Block manufacturer prior to foundation construction. The location of the reinforced cores will vary with both the manufacturer and the size of the CMU indicated on the drawings.

C. Masonry units shall conform to ASTM C 90 - Standard specification for Load Bearing Concrete Masonry Units.
   1. Unit Thickness: 8 inch.
   2. Unit Face Dimensions: 8 inch x 16 inch conforming to ASTM C 90.
   3. Block Density: 80 pcf.
   4. R-value: 13.77 (8 inch Block)
   5. Block Face: Smooth and ___.
   6. Color: As selected by the Architect from the manufacturer's full color offering.

D. Installation of the ICMU shall be performed in strict compliance with the manufacturers' recommendations regarding orientation of the units and maintaining the thermal plane through the wall section.

E. Fire Resistance Ratings:
   1. 10" and 12" units: Four-Hour
   2. 8" units: Two-Hour

2.06 MORTAR AND GROUT MATERIALS

A. Regional Materials: Aggregate for mortar and grout, cement, and lime shall be extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.

B. Portland Cement: ASTM C150/C150M, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.

C. Hydrated Lime: ASTM C207, Type S.

D. Portland Cement-Lime Mix: Packaged blend of Portland cement and hydrated lime containing no other ingredients.

E. Masonry Cement: ASTM C91/C91M.
   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. Essroc, Italcementi Group; Brixment or Velvet.
      b. Holcim (US) Inc; Mortamix Masonry Cement.
      c. Lafarge North America Inc.; Magnolia Masonry Cement.
      d. Lehigh Cement Company; Lehigh Masonry Cement.

F. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C979/C979M. Use only pigments with a record of satisfactory performance in masonry mortar.
   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. Davis Colors; True Tone Mortar Colors.
      b. Lanxess Corporation; Bayferrox Iron Oxide Pigments.
      c. Solomon Colors, Inc.; SGS Mortar Colors.

G. Colored Cement Product: Packaged blend made from Portland cement and hydrated lime or mortar cement and mortar pigments, all complying with specified requirements, and containing no other ingredients.

H. Aggregate for Mortar: ASTM C144.
   1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
   2. For joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.
   3. White-Mortar Aggregates: Natural white sand or crushed white stone.
   4. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.

I. Mortar for AAC Units:
   1. AAC unit head joint and bed joint Thin Bed Mortar. Mortar shall be supplied by the approved AAC unit manufacturer.
   2. AAC unit head joint and bed joint mortar: Mix in accordance with manufacturer's mixing instructions.
   3. Proportion materials by volume in accordance with ASTM C270 for leveling course only. Use AAC thin-bed mortar for head and bed joints and other joints in AAC work.

J. Grout: ASTM C476. 2,000 psi minimum
   1. Fine aggregate: sand.
   2. Coarse aggregate: 3/8" chip gravel

K. Aggregate for Grout: ASTM C404.

L. Cold-Weather Admixture: Non-chloride, noncorrosive, accelerating admixture complying with ASTM C494/C494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.
   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. Euclid Chemical Company (The); Accelguard 80.
      b. Grace Construction Products, W. R. Grace & Co.; Morset.

c. Sonneborn Products, BASF Aktiengesellschaft; Trimix-NCA.

M. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with CMUs, containing integral water repellent by same manufacturer.
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. ACM Chemistries, Inc.; RainBloc for Mortar.
b. BASF Aktiengesellschaft; MasterPel 240MA Mortar Admixture.
c. Grace Construction Products, W. R. Grace & Co. - Conn.; Dry-Block Mortar Admixture.

N. Surface Applied Silane/Siloxane Waterproofer: Breathable, water-based, silane / siloxane blended water-repellant shall be provided for waterproofing purposes should the integral means specified herein not produce the level of waterproofing required. Material for waterproofing Concrete Masonry Units shall be MasterProtect H 185 as manufactured by BASF or approved equal. Material for Brick Masonry units shall be MasterProtect H 177 as manufactured by BASF or approved equal.

O. Water: Potable.

2.07 REINFORCEMENT

A. Uncoated Steel Reinforcing Bars: ASTM A615/A615M or ASTM A996/A996M, Grade 60 (Grade 420).

B. Epoxy coated reinforcement shall conform to ASTM A775/A775M.

C. Masonry Joint Reinforcement, General: ASTM A951/A951M.
1. Interior Walls: Mill- galvanized, carbon steel.
2. Exterior Walls: Hot-dip galvanized, carbon steel.
3. Wire Size for Side Rods: 0.187-inch diameter.
4. Wire Size for Cross Rods: 0.148-inch diameter.
5. Wire Size for Veneer Ties: 0.187-inch diameter.
6. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches o.c.
7. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units.

D. Masonry Joint Reinforcement for Single-Wythe Masonry: Either ladder or truss type with single pair of side rods.

2.08 TIES AND ANCHORS

A. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated.
1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M; with ASTM A153/A153M, Class B-2 coating.
2. Steel Sheet, Galvanized after Fabrication: ASTM A 1008/A 1008M, Commercial Steel, with ASTM A153/A153M, Class B coating.
3. Steel Plates, Shapes, and Bars: ASTM A36/A36M.

B. Adjustable Anchors for Connecting to Structural Steel Framing: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.

1. Anchor Section for Welding to Steel Frame: Crimped 1/4-inch diameter, hot-dip galvanized steel wire.
2. Tie Section: Triangular-shaped wire tie, sized to extend within 1 inch (25 mm)of masonry face, made from 0.187-inch diameter, hot-dip galvanized steel wire.

C. Adjustable Anchors for Connecting to Concrete: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
1. Connector Section: Dovetail tabs for inserting into dovetail slots in concrete and attached to tie section; formed from 0.060-inch thick, steel sheet, galvanized after fabrication 01.05-inch thick, steel sheet, galvanized after fabrication.
a. 0.108-inch thick, galvanized sheet may be used at interior walls unless otherwise indicated.
2. Tie Section: Triangular-shaped wire tie, sized to extend within 1 inch of masonry face, made from 0.25-inch diameter, hot-dip galvanized steel wire.
3. Corrugated Metal Ties: Metal strips not less than 7/8 inch wide with corrugations having a wavelength of 0.3 to 0.5 inch and an amplitude of 0.06 to 0.10 inch made from 01.05-inch thick, steel sheet, galvanized after fabrication with dovetail tabs for inserting into dovetail slots in concrete and sized to extend to within 1 inch of masonry face.

D. Partition Top anchors:
1. PTA type, Model 420 by Hohmann & Barnard, Inc. or approved equal, 0.105-inch thick metal plate with 3/8-inch diameter metal rod 6 inches long welded to plate and with closed-end plastic tube fitted over rod that allows rod to move in and out of tube.
2. PTA type, Model 422, by Hohmann & Barnard or approved equal, 12 gauge thick with 7/16 inch holes. Fabricate from steel, Hot-dip galvanized after fabrication. Use in conjunction with NS Neoprene Sponge to allow for vertical expansion and contraction.

E. Rigid Anchors for intersecting walls: Fabricate from steel bars 1-1/2 inches wide by 1/4 inch thick by 24 inches long, with ends turned up 2 inches or with cross pins unless otherwise indicated.
1. Corrosion Protection: Hot-dip galvanized to comply with ASTM A153/A153M.

2.09 MISCELLANEOUS ANCHORS

A. Unit Type Inserts in Concrete: Cast-iron or malleable-iron wedge-type inserts.

B. Dovetail Slots in Concrete: Furnish dovetail slots with filler strips, of slot size indicated, fabricated from 0.034-inch, galvanized steel sheet.

C. Anchor Bolts: L-shaped steel bolts complying with ASTM A307, Grade A (ASTM F 568M, Property Class 4.6); with ASTM A563 hex nuts and, where indicated, flat washers; hot-dip galvanized to comply with ASTM A153/A153M, Class C; of dimensions indicated.

D. Post-installed Anchors: chemical anchors.
1. Load Capacity: 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/E488M, conducted by a qualified independent testing agency.
2. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941, Class Fe/Zn 5 unless otherwise indicated.
3. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 A1 stainless-steel bolts, ASTM F593, and nuts, ASTM F594.

E. AAC Fasteners and Anchors: Compatible with AAC materials. Allowable loading determined by independent laboratory or manufacturer's testing. The use of powder-actuated fasteners in AAC is strictly prohibited.

2.10 EMBEDDED FLASHING MATERIALS

A. Metal Flashing: Provide metal flashing complying with SMACNA's "Architectural Sheet Metal Manual" and as follows:
   1. Fabricate continuous flashings in sections 96 inches long minimum, but not exceeding 12 feet. Provide splice plates at joints of formed, smooth metal flashing.
   2. Fabricate through-wall metal flashing embedded in masonry from copper, with ribs at 3-inch intervals along length of flashing to provide an integral mortar bond.
      a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
         1) Cheney Flashing Company; Cheney 3-Way Flashing (Sawtooth).
         2) Keystone Flashing Company, Inc; Keystone 3-Way Interlocking Thruwall Flashing.
         3) Sandell Manufacturing Co., Inc; Mechanically Keyed Flashing.
   3. Fabricate through-wall flashing with snaplock receiver on exterior face where indicated to receive counterflashing.
   4. Fabricate through-wall flashing with drip edge unless otherwise indicated. Fabricate by extending flashing 1/2 inch out from wall, with outer edge bent down 30 degrees and hemmed.
   5. Metal Drip Edge: Fabricate from stainless steel. Extend at least 3 inches into wall and 1/2 inch out from wall, with outer edge bent down 30 degrees and hemmed.
   6. Metal Expansion-Joint Strips: Fabricate from stainless steel to shapes indicated.

B. Flexible Flashing: Use the following unless otherwise indicated:
   1. Elastomeric Thermoplastic Flashing: Composite flashing product consisting of a polyester-reinforced ethylene interpolymer alloy.
      a. Products: Subject to compliance with requirements, provide the following:
         1) Mortar Net USA, Ltd.; Total Flash.
         2) CavClear Masonry Mat; MasonPro, Inc.
         3) Or approved equal.
         4) Monolithic Sheet: TPO Elastomeric thermoplastic flashing, 0.040 inch thick with integral stainless steel drip edge, drainage matrix, integral weeps, stainless steel termination bar and #14 x 2 Stainless fasteners spaced 6" apart.
         5) Accessories: Provide preformed corners, end dams, other special shapes, and seaming materials produced by flashing manufacturer.

C. Application: Unless otherwise indicated, use the following:
   1. Where flashing is indicated to receive counterflashing, use metal flashing.
   2. Where flashing is indicated to be turned down at or beyond the wall face, use metal flashing.
   3. Where flashing is partly exposed and is indicated to terminate at the wall face, use metal flashing or flexible flashing with a metal drip edge.
   4. Where flashing is fully concealed, use flexible flashing.

D. Solder and Sealants for Sheet Metal Flashings: As specified in Section 076200 - SHEET METAL FLASHING AND TRIM.

1. Solder for Stainless Steel: ASTM B32, Grade Sn60, with acid flux of type recommended by stainless-steel sheet manufacturer.
2. Solder for Copper: ASTM B32, Grade Sn50, 50 percent tin and 50 percent lead.
3. Elastomeric Sealant: ASTM C920, chemically curing urethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

E. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.

2.11 MASONRY DRAINAGE MAT

A. Manufacturer and Type: CavClear Masonry Mat as manufactured by Archovations, Inc., 701 Second Street, Hudson, WI 54016, (715) 381-5773 or approved equal.
   1. Description: Full-height Air Space Maintenance and Cavity Drainage Mat. The masonry drainage mat shall be specifically designed for masonry cavities to prevent mortar from contacting the backup and ensure water management. The masonry drainage mat shall be fluid conducting, non-absorbent, mold and mildew resistant polymer mesh consisting of 100% recycled plastic with binder fibers. Masonry drainage mat is to be a non-woven textile product in random pattern and have voids no greater than 1/4" in diameter. Masonry mat is to be designed for substantially continuous installation behind the full-height of all masonry.
   2. Masonry Drainage Mat Thickness: Select masonry mat thickness of as indicated on the drawings inches to allow no more than 3/8 inch tolerance between the masonry mat and masonry wythe.
   3. Sizes: 16 inch high by 8 foot length pieces and/or 8 inch high by 8 foot long pieces as needed to accommodate building components.

2.12 WEEP VENTS

A. Manufacturer and Type: CavClear Weep Vents as manufactured by Archovations, Inc., 701 Second Street, Hudson, WI 54016, (715) 381-5773 or approved equal.
   1. Description: Non-woven mesh with notched bottom.
   2. Color: as selected by the Architect from the manufacturer's full color offering to match mortar.
   3. Size: 3/8 inch by size to match masonry unit dimensions.

2.13 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Pre-molded filler strips complying with ASTM D1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene.

B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D2000, Designation M2AA-805 or PVC, complying with ASTM D 2287, Type PVC-65406 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.

C. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D226/D226M, Type I (No. 15 asphalt felt).

D. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and hold reinforcing bars in center of cells. Units are formed from 0.148-inch steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.

E. Single Wythe Cavity Weep units: Provide continuously in base joint of single wythe masonry installations. Units shall be Cavity Weep TM CV 5010 as manufactured by MTI or approved equal.

F. Grout Stop: Provide Hohmann & Barnard, Inc. - HGS Mortar / Grout Screen or approved equal; ASTM D5034, non-corrosive, high strength 1/4 inch mesh polypropylene monofilament screening in widths conforming to CMU units. Cut away as required to allow grout flow at reinforced core locations.

2.14 MASONRY CELL INSULATION

A. Molded-Polystyrene Insulation Units: Rigid, cellular thermal insulation formed by the expansion of polystyrene-resin beads or granules in a closed mold to comply with ASTM C578, Type I. Provide specially shaped units designed for installing in cores of masonry units.
   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. Concrete Block Insulating System; Korfil.
      b. Or approved equal.

2.15 CAST ALUMINUM BRICK VENT

A. BVC100 Cast Aluminum Brick Vent as manufactured by Ruskin®, 3900 Dr. Greaves Rd., Kansas City, MO 64030, Phone (816) 761-7476 or Architect approved equivalent.
   1. Material: #356 Aluminum Casting with asphaltum coating on parts built into masonry.
   2. Wall Thickness: nominal Aluminum Casting.
   3. Frame Construction: 4" Frame Depth with formed water stop at back edge and 1/4 inch drip at head and sill at exterior face.
   4. Standard Frame Size: As indicated on the drawings.
   5. Blades:
      a. Style: Straight with 39% free area. Blades overlap for visual screening.
      b. Material: Formed Aluminum, Alloy 6063-T5
      c. Thickness: 0.100 inch, Nominal
      d. Angle: 45 Degrees
   6. Insect Screen: 7 x 7 Aluminum Mesh
   7. Finish: 70 percent PVDF Fluoropolymer Based Paint Finish, AAMA 2605, Standard 2 Coat.
      a. Color: As selected by the Architect from the manufacturer's full color offering.

2.16 MORTAR AND GROUT MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.
   1. Do not use calcium chloride in mortar or grout.
   2. Use Portland cement-lime masonry cement mortar unless otherwise indicated.
   3. For exterior masonry, use Portland cement-lime masonry cement mortar.
   4. For reinforced masonry, use Portland cement-lime masonry cement mortar.

5. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.

B. Pre-blended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a pre-blended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

C. Mortar for Unit Masonry: Comply with ASTM C270, Property Specification. Provide the following types of mortar for applications stated unless another type is indicated or needed to provide required compressive strength of masonry.
   1. For masonry below grade or in contact with earth, use Type M.
   2. For reinforced masonry, use Type S.
   3. For mortar parge coats, use Type N.
   4. For exterior, above-grade, load-bearing and non-load-bearing walls and parapet walls; for interior load-bearing walls; for interior non-load-bearing partitions; and for other applications where another type is not indicated, use Type N.
   5. For interior non-load-bearing partitions, Type O may be used instead of Type N.

D. Pigmented Mortar: Use colored cement product or select and proportion pigments with other ingredients to produce color required. Do not add pigments to colored cement products.
   1. Pigments shall not exceed 10 percent of Portland cement by weight.
   2. Mix to match Architect's sample.
   3. Application: Use pigmented mortar for exposed mortar joints with the following units:
      a. Architectural CMUs.
      b. Cast stone trim units.

E. Colored-Aggregate Mortar: Produce required mortar color by using colored aggregates and natural color or white cement as necessary to produce required mortar color.
   1. Mix to match Architect's sample.
   2. Application: Use colored aggregate mortar for exposed mortar joints with the following units:
      a. Architectural CMUs.
      b. Cast stone trim units.

F. Grout for Unit Masonry: Comply with ASTM C476.
   1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 1.15.1 in ACI 530.1/ASCE 6/TMS 402/602 for dimensions of grout spaces and pour height.
   2. Proportion grout in accordance with ASTM C476, Table 1 or paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 2000 psi(14 MPa).
   3. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C143/C143M.

G. Grout for AAC units:
   1. Grout proportions:
      a. Fine and Coarse Grout: Proportion materials by volume in accordance with ASTM C476.
      b. Slump: 8” to 11” measured in accordance with ASTM C143.

H. Finishes for AAC units:

1. All paints, stucco, coatings, etc. shall be specifically formulated for use with AAC. Vapor permeability (PERM rating of the coating) as determined in accordance with ASTM E 96 shall not be less than 5.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
   1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
   2. Verify that foundations are within tolerances specified.
   3. Verify that reinforcing dowels are properly placed.

B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION, GENERAL

A. Take particular care to keep AAC units clean.

B. Lay units in running bond with 4” minimum head joints lap in alternate courses. Align units to allow cores and openings to be filled with grout, when required.

C. Cut AAC units with unit manufacturer recommended hand type saw or electric bandsaw specially designed for cutting AAC units. Layout units to minimize cutting.

D. Build chases and recesses to accommodate items specified in this and other Sections.

E. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to opening.

F. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

3.03 TOLERANCES

A. Dimensions and Locations of Elements:
   1. For dimensions in cross section or elevation do not vary by more than plus 1/2 inch or minus 1/4 inch .
   2. For location of elements in plan do not vary from that indicated by more than plus or minus 1/2 inch.
   3. For location of elements in elevation do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2 inch total.

B. Lines and Levels:
   1. For bed joints and top surfaces of bearing walls do not vary from level by more than 1/4 inch in 10 feet, or 1/2 inch maximum.

2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
3. For vertical lines and surfaces do not vary from plumb by more than 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet or 1/2 inch maximum.
4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
5. For lines and surfaces do not vary from straight by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch maximum.
6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet, or 1/2 inch maximum.

C. Joints:
1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch with a maximum thickness limited to 1/2 inch.
2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch or minus 1/4 inch.
4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch. 3 mm.

D. AAC Joints:
1. Head and bed joints:
   a. Lay first course in full bed of leveling bed mortar in thickness necessary to level AAC unit top; not less than 1/4”.
   b. Clean head joint and bed joint of dust and loose particles and apply AAC unit head joint, and bed joint mortar on full face of AAC unit already laid.
   c. Place each block as close to head joint as possible before lowering the block onto the bed joint. Avoid excessive movement along bed joint. Make adjustment while mortar is still soft and plastic by tapping to plumb and bringing to alignment.
   d. Check each AAC unit as laid with mason’s level for level and plumb with wall below. Rasp top of block course, if necessary, to ensure a level bed joint for the next course.
   e. Remove and replace mortar with fresh mortar, where adjustment must be made after mortar has started to set.
   f. Keep bed and head joints uniform in width.
   g. Standard thickness for both horizontal and vertical mortar joints:
      1) Base leveling course bed joint: 1/4 inch, nominal, +/- 1/16 inch.
      2) Other vertical coursing and head joints: 1/16”, nominal.
   h. Take particular care to avoid spreading mortar on exposed face of AAC unit. Only normal mortar droppings will be accepted on face of AAC unit; remove only after mortar has dried enough not to smear.
2. Prior to grouting operations, thoroughly wet all cells and grout contact surfaces.

3.04 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

B. Bond Pattern for Exposed Masonry: Lay exposed masonry in running bond unless indicated otherwise on the Contract Drawings; do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.

C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 4-inches. Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.

D. Stopping and Resuming Work: Stop work by racking back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar before laying fresh masonry.

E. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.

F. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.

G. Fill cores in hollow CMUs with grout 24 inches under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.

H. Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above unless otherwise indicated.
   1. Install compressible filler in joint between top of partition and underside of structure above.
   2. Fasten partition top anchors to structure above and build into top of partition. Grout cells of CMUs solidly around plastic tubes of anchors and push tubes down into grout to provide 1/2-inch clearance between end of anchor rod and end of tube. Space anchors 48 inches o.c. unless otherwise indicated.
   3. Wedge non-load-bearing partitions against structure above with small pieces of tile, slate, or metal. Fill joint with mortar after dead-load deflection of structure above approaches final position.
   4. At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Section 078446 - FIRE-RESISTIVE JOINT SYSTEMS.

3.05 MORTAR BEDDING AND JOINTING

A. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.

B. Set cast-stone trim units in full bed of mortar with full vertical joints. Fill dowel, anchor, and similar holes.
   1. Clean soiled surfaces with fiber brush and soap powder and rinse thoroughly with clear water.
   2. Allow cleaned surfaces to dry before setting.
   3. Wet joint surfaces thoroughly before applying mortar.

C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

D. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

3.06 MASONRY-CELL INSULATION

A. Pour granular insulation into cavities to fill void spaces. Maintain inspection ports to show presence of insulation at extremities of each pour area. Close the ports after filling has been confirmed. Limit the fall of insulation to one story high, but not more than 20 feet.

B. Install molded-polystyrene insulation units into masonry unit cells before laying units.

3.07 MASONRY JOINT REINFORCEMENT

A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch (16 mm) on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.
   1. Space reinforcement not more than 16 inches o.c.
   2. Space reinforcement not more than 8 inches o.c. in foundation walls and parapet walls.
   3. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings in addition to continuous reinforcement.

B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.

C. Provide continuity at wall intersections by using prefabricated T-shaped units.

D. Provide continuity at corners by using prefabricated L-shaped units.

E. Cut and bend reinforcing units as directed by manufacturer for continuity at corners, returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.08 ANCHORING MASONRY TO STRUCTURAL STEEL AND CONCRETE

A. Anchor masonry to structural steel and concrete where masonry abuts or faces structural steel or concrete to comply with the following:
   1. Provide an open space not less than 2 inches wide between masonry and structural steel or concrete unless otherwise indicated. Keep open space free of mortar and other rigid materials.
   2. Anchor masonry with anchors embedded in masonry joints and attached to structure.
   3. Space anchors as indicated, but not more than 24 inches o.c. vertically and 36 inches o.c. horizontally.

3.09 CONTROL AND EXPANSION JOINTS

A. General: Install control and expansion joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.

B. Form control joints in concrete masonry using one of the following methods:
   1. Fit bond-breaker strips into hollow contour in ends of CMUs on one side of control joint. Fill resultant core with grout and rake out joints in exposed faces for application of sealant.
   2. Install preformed control-joint gaskets designed to fit standard sash block.
   3. Install interlocking units designed for control joints. Install bond-breaker strips at joint. Keep head joints free and clear of mortar or rake out joint for application of sealant.
   4. Install temporary foam-plastic filler in head joints and remove filler when unit masonry is complete for application of sealant.

C. Control Joint Locations:
   1. At major changes in wall height.
   2. At changes in wall thickness.
   3. At control joints in foundations, roofs and floors.
   4. At chases and recesses for piping, columns, fixtures, etc.
   5. At one side of wall openings less than 6 feet unless indicated otherwise.
   6. At both sides of wall opening exceeding 6 feet.
   7. At or near wall intersections.
   8. Near return wall angles in L, T, and U shaped structures.
   9. All other cases, maximum spacing between joints shall not exceed 30 feet.

3.10 LINTELS

A. Provide masonry lintels where shown and where openings of more than 12 inches for brick-size units and 24 inches for block-size units are shown without structural steel or other supporting lintels.

B. Provide minimum bearing of 8 inches at each jamb unless otherwise indicated.

3.11 FLASHING

A. General: Install embedded flashing in masonry at lintels, ledges, other obstructions to downward flow of water in wall, and where indicated.

B. Install flashing as follows unless otherwise indicated:
   1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
   2. At lintels, extend flashing a minimum of 6 inches into masonry at each end. At heads and sills, extend flashing 6 inches at ends and turn up not less than 2 inches to form end dams.
   3. Interlock end joints of ribbed sheet metal flashing by overlapping ribs not less than 1-1/2 inches or as recommended by flashing manufacturer, and seal lap with elastomeric sealant complying with requirements in Section 079200 "Joint Sealants" for application indicated.
   4. Install metal drip edges with ribbed sheet metal flashing by interlocking hemmed edges to form hooked seam. Seal seam with elastomeric sealant complying with requirements in Section 079200 - JOINT SEALANTS for application indicated.
   5. Install metal drip edges beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch back from outside face of wall and adhere flexible flashing to top of metal drip edge.
   6. Install metal flashing termination beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch back from outside face of wall and adhere flexible flashing to top of metal flashing termination.
   7. Cut flexible flashing off flush with face of wall after masonry wall construction is completed.

C. Install single-wythe CMU flashing system in bed joints of CMU walls where indicated to comply with manufacturer's written instructions. Install CMU cell pans with upturned edges located below face shells and webs of CMUs above and with weep spouts aligned with face of wall.

Install CMU web covers so that they cover upturned edges of CMU cell pans at CMU webs and extend from face shell to face shell.

D. Install reglets and nailers for flashing and other related construction where they are shown to be built into masonry.

3.12 DRAINAGE MAT INSTALLATIONS

A. Install masonry drainage mat continuously throughout full-height of all exterior masonry cavities during construction of exterior wythe; follow manufacturer's installation instructions. Verify that air space width is no more than 3/8 inch greater than masonry mat thickness. Install horizontally between joint reinforcement. Stagger end joints in adjacent rows. Use multiple layers at bottom of wall and above through-wall flashings when air space depth exceeds masonry mat thickness by more than 3/8 inch. Extend extra mat at least to top of base flashing. Butt adjacent pieces to moderate contact. Fit to perimeter construction and penetrations without voids.

3.13 WEEP VENT INSTALLATIONS

A. Place weep vents in head joints at exterior wythe of cavity wall located immediately above ledges and flashing, spaced 24 inches on center, unless otherwise shown. Leave the side of the masonry units forming the vent space unbuttered and clear of mortar. Install with notched side down. Slide vent material into joint as the two masonry units forming the weep vent are placed.

3.14 REINFORCED UNIT MASONRY INSTALLATION

A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.
   1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
   2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other loads that may be placed on them during construction.

B. Placing Reinforcement: Comply with requirements in ACI 530.1/ASCE 6/TMS 402/602.

C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.
   1. Comply with requirements in ACI 530.1/ASCE 6/TMS 402/602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
   2. Limit height of vertical grout pours to not more than 60 inches.

D. Steel reinforcement bars, unless otherwise detailed on plans, shall be placed as follows:
   1. Install #5 bar, vertically at all corners and at door and window jambs and 32" o.c. typical in all 10" walls.
   2. Install #5 bar, vertically at all corners and at door and window jambs and 48" o.c. typical in all 12" walls.
   3. Fill all concrete masonry unit cells containing reinforcement bars solid with mortar.
   4. Remove pre-molded insulation from block cores containing vertical reinforcing bars.
   5. Reinforcement Bars shall be lapped at splices as follows:

Bar Size	Min. Lap Distance
#4	24 inches
#5	30 inches
#6	36 inches
#7	42 inches

3.15 SURFACE APPLIED WATERPROOFING APPLICATION

A. Apply surface-applied waterproofing required for Brick and Concrete Block Unit installations in strict accordance with the manufacturer's specifications and recommendations for each type material respectively. Provide MSDS information to workers and conform to all protections and environmental requirements accordingly.

3.16 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas, as needed to perform tests and inspections. Retesting of materials that fail to meet specified requirements shall be done at Contractor's expense.

B. Inspections: Level 1 special inspections according to the NYSBC.
   1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
   2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
   3. Place grout only after inspectors have verified proportions of site-prepared grout.

C. Testing Prior to Construction: One set of tests.

D. Testing Frequency: One set of tests for each 5000 sq. ft. of wall area or portion thereof.

E. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C140/C140M for compressive strength.

F. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C 780.

G. Mortar Test (Property Specification): For each mix provided, according to ASTM C780. Test mortar for compressive strength.

H. Grout Test (Compressive Strength): For each mix provided, according to ASTM C1019.

I. Prism Test: For each type of construction provided, according to ASTM C1314 at 28 days.

3.17 PARGING

A. Parge exterior faces of below-grade masonry walls, where indicated, in 2 uniform coats to a total thickness of 3/4 inch. Dampen wall before applying first coat and scarify first coat to ensure full bond to subsequent coat.

B. Use a steel-trowel finish to produce a smooth, flat, dense surface with a maximum surface variation of 1/8 inch per foot. Form a wash at top of parging and a cove at bottom.

C. Damp-cure parging for at least 24 hours and protect parging until cured.

3.18 REPAIRING, POINTING, AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.

C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
   1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
   2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
   3. Protect adjacent stone and non-masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
   4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
   5. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.
   6. Patch AAC units with excessive chips.

3.19 MASONRY WASTE DISPOSAL

A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.

B. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.
   1. Crush masonry waste to less than 4 inches in each dimension.
   2. Mix masonry waste with at least two parts of specified fill material for each part of masonry waste. Fill material is specified in Section 312323 - FILL.
   3. Do not dispose of masonry waste as fill within 18 inches of finished grade.

C. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 042200

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Structural steel.
   2. Grout.
   3. Base Plates.

B. Related Requirements:
   1. Division 01 - "Quality Requirements" for independent testing agency procedures and administrative requirements.
   2. Section 053100 - "Metal Decking" for field installation of shear connectors through deck.
   3. Section 055000 - "Metal Fabrications" for steel lintels and shelf angles not attached to structural-steel frame not defined as structural steel.
   4. Section 055100 "Metal Stairs".
   5. Section 099113 "Exterior Painting" and Section 099123 "Interior Painting" and for surface-preparation and priming requirements.

1.03 DEFINITIONS

A. Structural Steel: Elements of the structural frame indicated on Drawings and as described in AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

B. Seismic-Load-Resisting System: Elements of structural-steel frame designated as "SLRS" or along grid lines designated as "SLRS" on Drawings, including columns, beams, and braces and their connections.

C. Heavy Sections: Rolled and built-up sections as follows:
   1. Shapes included in ASTM A6/A6M with flanges thicker than 1-1/2 inches (38 mm).
   2. Welded built-up members with plates thicker than 2 inches (50 mm).
   3. Column base plates thicker than 2 inches (50 mm).

1.04 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 anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

1.05 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.06 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show fabrication of structural-steel components.
   1. Shop drawings and required calculations shall bear the seal and signature of a registered Professional Engineer licensed in the state in which the project is located. Structural steel shop drawings will not be reviewed without said seal and signature.
      a. A full set of engineered calculations for all beam to column moment connections shall be submitted to the engineer of record for approval. The steel fabricator drawings shall not be reviewed without said engineering calculations affixed with a seal and signature of a professional engineer licensed in the state in which the project is located.
   2. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
   3. Include embedment Drawings.
   4. Indicate profiles, sizes, spacing and locations of structural members, openings, attachments, fasteners, connections, cambers, holes and other pertinent data. Include locations of structural members, openings, attachments and loads.
   5. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
   6. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical, high-strength bolted connections.
   7. For structural steel connections indicated to comply with design loads, include structural design data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Delegated-Design Submittal: For structural-steel connections indicated to comply with design loads, include analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.07 INFORMATIONAL SUBMITTALS

A. Qualification Data: For installer / fabricator.

B. Welding certificates: Submit certificates certifying that welders employed in the work have met AWS qualifications within in the previous 12 months.

C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

D. Mill test reports for structural steel, including chemical and physical properties. Indicate structural strength, destructive and non-destructive test analysis.

E. Product Test Reports: For the following:
   1. Bolts, nuts, and washers including mechanical properties and chemical analysis.
   2. Direct-tension indicators.
   3. Tension-control, high-strength, bolt-nut-washer assemblies.
   4. Shear stud connectors.
   5. Shop primers.
   6. Non-shrink grout.

1.08 QUALITY ASSURANCE

A. Fabricator shall have a minimum of five (5) years documented experience with performing the work of this section.

B. Installer Qualifications: A qualified installer specializing in performing the work of this section with a minimum of three (3) years of documented experience.

C. Delegated Connection Designer: Connections not fully detailed on the contract drawings shall be designed under the direct supervision of a professional structural engineer experienced in the design of this work and licensed in the state in which the work is located. The shop drawings shall bear the seal and signature of same professional engineer.

D. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
   1. Welders and welding operators performing work on bottom-flange, demand-critical welds shall pass the supplemental welder qualification testing, as required by AWS D1.8/D1.8M. FCAW-S and FCAW-G shall be considered separate processes for welding personnel qualification.
   2. Welders who are welding structural members fabricated in the shop or in the field, in the five boroughs must have a NYCDOB issued welder licence.

E. Comply with applicable provisions of the following specifications and documents:
   1. AISC Code of Standard Practice for Steel Buildings and Bridges - AISC 303.
   2. AISC Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings - AISC 360.
   3. RCSC's "Specification for Structural Joints Using ASTM A325 or ASTM A490 Bolts."

1.09 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store and handle products to/at the site under the supervision of Division 01 of this Project Manual.

B. Schedule deliveries of materials to the site at intervals which will ensure uninterrupted progress of the work.

C. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.
   1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

D. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.
   1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.
   2. Clean and experience. who bolts and nuts that become dry or rusty before use.
   3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F1852 fasteners and for retesting fasteners after lubrication.

1.10 COORDINATION

A. Coordinate the work under Division 01 specification of this Project Manual.

B. Coordinate the selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturer's recommendations to ensure that shop primers and topcoats are compatible with one another.

C. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions and directions for installation.

D. Coordinate the work of this section with utility installations and all other adjacent work.

E. Coordinate the work of this section such that general progress of the Work in not interrupted.

1.11 FIELD MEASUREMENTS

A. Verify that field measurements are as shown on the plans and approved shop drawings.

B. The contractor is responsible for the proper location and elevations of the work.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Connections: Provide details of simple shear connections required by the Contract Documents to be selected or completed by structural-steel fabricator, including comprehensive engineering analysis by a qualified professional engineer, to withstand loads indicated and comply with other information and restrictions indicated where beam end reactions are not shown on drawings. Connection designer shall design shear connections to resist the reaction resulting from the maximum allowable uniform load of the beam found in the AISC Specification being applied along its full length.
   1. Select and complete connections using AISC 360.
   2. Use Load and Resistance Factor Design; data are given at factored-load level.

B. Moment Connections: Type FR, fully restrained. Provide design and details of moment connections to resist forces shown on the contract drawings.

C. Construction: Moment frame and Braced frame.

2.02 STRUCTURAL-STEEL MATERIALS

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. W-Shapes: ASTM A 992/A 992M.

C. Channels, Angles, M-Shapes: ASTM A 36/A 36M.

D. Plate and Bar: ASTM A 36/A 36M.

E. Cold-Formed Hollow Structural Sections: ASTM A500/A500M, Grade C, seamless structural tubing.

F. Steel Pipe: ASTM A53/A53M, Type E or Type S, Grade B.
   1. Weight Class: as indicated on the contract documents.
   2. Finish: Black except where indicated to be galvanized.

G. Welding Electrodes: Comply with AWS requirements.

2.03 BOLTS, CONNECTORS, AND ANCHORS

A. Zinc-Coated High-Strength Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A 325 (ASTM A 325M), Type 1, heavy-hex steel structural bolts; ASTM A563, Grade DH (ASTM A 563M, Class 10S) heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers.
   1. Finish: Hot-dip zinc coating.
   2. Direct-Tension Indicators: ASTM F959/F959M, Type 325 (ASTM F 959M, Type 8.8), compressible-washer type with mechanically deposited zinc coating finish.

B. High-Strength Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A325, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade C, heavy-hex carbon-steel nuts; and ASTM F436, Type 1, hardened carbon-steel washers; all with plain finish.

C. High-Strength Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A490 (A 490M), Type 1, heavy-hex steel structural bolts or tension-control, bolt-nut-washer assemblies with splined ends; ASTM A563, Grade DH, (ASTM A563M, Class 10S) heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers with plain finish.
   1. Direct-Tension Indicators: ASTM F959, Type 490 (ASTM F 959M, Type 10.9), compressible-washer type with plain finish.

D. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F1852, Type 1, round head assemblies consisting of steel structural bolts with splined ends, heavy-hex carbon-steel nuts, and hardened carbon-steel washers.
   1. Finish: Plain.

E. Shear Connectors: ASTM A108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1/D1.1M, Type B.

F. Anchor Bolts: ASTM A307, Grade C for non-moment resisting anchor rods. ASTM F1554, 36 and 55 ksi yield strength for moment resisting anchor rods.
   1. Nuts: ASTM A563 heavy-hex carbon steel.
   2. Plate Washers: ASTM A36/A36M carbon steel.
   3. Washers: ASTM F436/F436M, Type 1, hardened carbon steel.
   4. Finish: Hot-dip zinc coating, ASTM A 153/A 153M, Class C.

G. Threaded Rods: ASTM A 36/A 36M.
   1. Nuts: ASTM A563 ASTM A563M heavy-hex carbon steel.
   2. Washers: ASTM F 436 (ASTM F 436M), Type 1, hardened carbon steel.
   3. Finish: Plain.

H. Clevises: Made from cold-finished carbon steel bars, ASTM A108, Grade 1035.

I. Eye Bolts and Nuts: Made from cold-finished carbon steel bars, ASTM A108, Grade 1030.

J. Sleeve Nuts: Made from cold-finished carbon steel bars, ASTM A108, Grade 1018.

2.04 PRIMER

A. Primer: Comply with Division 09

B. Primer: SSPC-Paint 15, Type I, red oxide.

C. Ensure primer is compatible with required topcoat.

D. Galvanizing Repair Paint: ASTM A 780/A 780M.

2.05 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C1107/C1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

B. Grout shall consist of a premixed compound with cement, water reducing and plasticizing additives capable of developing a minimum compressive strength of 7000 psi at 28 days.

2.06 FABRICATION

A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," and to AISC 360.
   1. Camber structural-steel members where indicated.
   2. Fabricate beams with rolling camber up.
   3. Identify high-strength structural steel according to ASTM A6/A6M and maintain markings until structural steel has been erected.
   4. Mark and match-mark materials for field assembly.
   5. All wide flange structural steel members shall be fabricated in accordance with ASTM A992/A992M. All miscellaneous steel members including channels, angles, S, HP, and M shapes shall be fabricated in accordance with ASTM A36/A36M.
   6. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.
   7. All shop connections shall be welded or high strength bolted.
   8. Bearing surfaces shall be planed true to provide full bearing over the entire surface.
   9. Continuously seal joined members by intermittent welds and plastic filler. Grind welds smooth where exposed or where interference with other building materials is encountered,
   10. Splicing is not permitted unless indicated on the Contract Documents or accepted on the final approved Shop Drawings.

B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.
   1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M.

C. Bolt Holes: Cut, drill, or punch standard bolt holes perpendicular to metal surfaces. Mechanically thermal cut bolt holes shall not be permitted unless prior approval by the Architect is obtained in writing.

D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.

E. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 2, "Hand Tool Cleaning." or SSPC-SP 3, "Power Tool Cleaning." unless a more stringent cleaning method is required for selected primers and / or other coatings.

F. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.

G. Shop prime non-exposed steel members after fabrication in accordance with SSPC- PA. Do not prime surfaces that will be fireproofed, field welded or are in contact with concrete or high strength bolts.

H. Paint exposed structural steel members in accordance with the applicable Division 09 Specification section.

I. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel members.
   1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning unless approved by the Architect in writing.
   2. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
   3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

2.07 SHOP CONNECTIONS

A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM F3125/F3125M, Grade A325 or Grade A490 Bolts" for type of bolt and type of joint specified.
   1. Joint Type: Snug tightened unless otherwise shown on the contract documents or required by the connection designer.

B. Weld Connections: Comply with AWS D1.1/D1.1M and AWS D1.8/D1.8M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
   1. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in AISC 303 for mill material.

2.08 SHOP PRIMING

A. Shop prime steel surfaces except the following:
   1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches (50 mm).
   2. Surfaces to be field welded.
   3. Surfaces of high-strength bolted, slip-critical connections.
   4. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
   5. Galvanized surfaces.

B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:

1. SSPC-SP 2, "Hand Tool Cleaning."
2. SSPC-SP 3, "Power Tool Cleaning."

C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils (0.038 mm). Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.
   1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
   2. Apply two coats of shop paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

2.09 GALVANIZING

A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A123/A123M.
   1. Fill vent and drain holes that are exposed in the finished Work unless they function as weep holes, by plugging with zinc solder and filing off smooth.
   2. Galvanize lintels, shelf angles and welded door frames attached to structural-steel frame and located in exterior walls.

2.10 SOURCE QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform shop tests and inspections.
   1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.

B. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.
   1. Inspection and Tests will not relieve the contractor of responsibility for providing materials, fabrication and erection procedures in compliance with the specified requirements. The contractor shall verify that all materials meet or exceed the requirements specified in these specifications, Contract drawings and related references. Materials not in compliance with the specified requirements will be rejected and required to be removed from the site.

C. Bolted Connections: Inspect and test shop-bolted connections according to RCSC's "Specification for Structural Joints Using ASTM F3125/F3125M , Grade A325 or Grade A490 Bolts."

D. Welded Connections: Visually inspect shop-welded connections according to AWS D1.1/D1.1M type required for materials being welded and the following inspection procedures, at testing agency's option:
   1. Liquid Penetrant Inspection: ASTM E165/E165M.
   2. Magnetic Particle Inspection: ASTM E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
   3. Ultrasonic Inspection: ASTM E164.
   4. Radiographic Inspection: ASTM E94.

E. In addition to visual inspection, test and inspect shop-welded shear connectors according to requirements in AWS D1.1/D1.1M for stud welding and as follows:
   1. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.

2. Conduct tests according to requirements in AWS D1.1/D1.1M on additional shear connectors if weld fracture occurs on shear connectors already tested.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify, with certified steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other drawings for compliance with requirements.
   1. Prepare a certified survey of existing conditions. Include bearing surfaces, anchor rods, bearing plates, and other drawings showing dimensions, locations, angles, and elevations.

B. Proceed with installation only after unsatisfactory conditions have been corrected. Commencement of installation will indicate that the erector accepts the conditions which exist.

3.02 PREPARATION

A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated.
   1. Do not remove temporary shoring supporting composite deck construction until cast-in-place concrete has attained its design compressive strength.
   2. Clean bearing surfaces and other surfaces which will be in permanent contact with the work.

3.03 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.

B. Proceed with the installation only after unsatisfactory conditions have been corrected. Commencement of installation will indicate that the erector accepts the conditions which exist.

C. Allow for erection loads and for sufficient temporary bracing to maintain structure safe, plumb and in true alignment until completion of erection and installation of permanent bracing.

D. Coordinate placement of anchors in concrete or masonry construction for securing bearing plates.

E. Erect all components in accordance with the approved shop drawings.

F. Field weld components and shear studs as indicated on approved shop drawings and in accordance with AWS D1.1/D1.1M.

G. Do not field cut or alter structural members without written approval of the Engineer.

H. Bearing Plates and Leveling Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.
   1. Set plates for structural members on wedges, shims, or setting nuts as required.
   2. Weld plate washers to top of baseplate.

3. Snug-tighten Pretension anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
4. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.
5. Coordinate placement of anchors in concrete or masonry construction for securing base plates.

I. Maintain erection tolerances of structural steel within AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

J. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that are in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
1. Level and plumb individual members of structure.
2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.

K. Splice members only where indicated.

L. Do not use thermal cutting during erection unless approved by Architect. Finish thermally cut sections within smoothness limits in AWS D1.1/D1.1M.

M. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

N. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.

O. Erect all components in accordance with approved shop drawings. After erection, prime welds, abrasions and surfaces not shop primed or galvanized as required, except surfaces to be in contact with concrete.

P. Field weld components and shear studs as indicated on the approved shop drawings and in accordance with AWS D1.1/D1.1M.

3.04 FIELD CONNECTIONS

A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM F3125/F3125M, Grade A325 or Grade A490 Bolts" for type of bolt and type of joint specified.
1. Joint Type: Snug tightened Pretensioned unless specifically identified as pretensioned or slip-critical on the. contract documents or calculations by the Delegated Connection designer.

B. Weld Connections: Comply with AWS D1.1/D1.1M and AWS D1.8/D1.8M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
1. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.

2. Remove backing bars or runoff tabs where indicated, back gouge, and grind steel smooth.
3. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," for mill material.
4. Connections and abrasions shall be cleaned, prepared and finished in the same manner and with the same materials used in shop finishing.

3.05 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:
   1. Verify structural-steel materials and inspect steel frame joint details.
   2. Verify weld materials and inspect welds.
   3. Verify connection materials and inspect high-strength bolted connections.

B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

C. Bolted Connections: Inspect and test high strength bolted connections according to RCSC's "Specification for Structural Joints Using ASTM F3125/F3125M, Grade A325 or Grade A490 Bolts."

D. Welded Connections: Visually inspect field welds according to AWS D1.1/D1.1M.
   1. In addition to visual inspection, test and inspect field welds according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
      a. Liquid Penetrant Inspection: ASTM E165/E165M.
      b. Magnetic Particle Inspection: ASTM E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
      c. Ultrasonic Inspection: ASTM E164.
      d. Radiographic Inspection: ASTM E94.

E. Post Installed Mechanical Anchors, Adhesive Anchors and Screw Anchors: Comply with 2020 New York State Building Code Table 1705.3.
   1. The special inspection shall include the verification of compliance with approved construction documents and standards established by the Commissioner pursuant to Section 28-113.2.2 of the Administrative Code.

F. In addition to visual inspection, test and inspect field-welded shear connectors according to requirements in AWS D1.1/D1.1M for stud welding and as follows:
   1. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
   2. Conduct tests according to requirements in AWS D1.1/D1.1M on additional shear connectors if weld fracture occurs on shear connectors already tested.

G. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

3.06 TOLERANCES

A. All members shall be installed within AISC tolerances and as follows:
   1. Maximum variation from plumb: 1/4" (6mm) per story, non-cumulative.
   2. Maximum offset from true alignment: 1/4" (6mm).

3.07 REPAIRS AND PROTECTION

A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing and repair galvanizing to comply with ASTM A780/A780M.

B. Touchup Painting: Immediately after erection, clean exposed areas where primer is damaged or missing and paint with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
   1. Clean and prepare surfaces by SSSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.

C. Touchup Painting: Cleaning and touchup painting are specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

D. Touchup Priming: Cleaning and touchup priming as specified in Division 9 "High-Performance Coatings" or compatible primer established at the fabricators shop to be compatible with the final finish.

3.08 ADJUSTING

A. All misfits due to errors in location, fabrication, inaccuracies in the setting of anchor bolts or other items of attachment or support shall be immediately reported to the Engineer and corrected in a manner subject to the approval of the Engineer.

B. Submit method of correction to the Architect under Division 01 Specification provisions.

C. Proceed with corrective work only after receiving written approval from the Architect.

D. All corrections shall be made at no additional cost to the Owner.

END OF SECTION 051200

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Steel framing and supports for applications where framing and supports are not specified on other sections.
   2. Aluminum framing and supports for applications where framing and supports are not specified in other Sections.

B. Products furnished, but not installed, under this Section include the following:
   1. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.

1.03 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of metal fabrications that are anchored to or that receive other work. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
   1. Provide templates for anchors and bolts specified for installation under other sections.
   2. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by a Qualified Professional Engineer responsible for their preparation.

1.04 INFORMATIONAL SUBMITTALS

A. Qualification Data: For professional engineer.

B. Welding certificates.

C. Research/Evaluation Reports: For post-installed anchors, from ICC-ES.

1.05 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:
   1. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."

1.06 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication and indicate measurements on the shop drawings.

1. Established dimensions: Where field measurements cannot be made without delaying the work, establish dimensions and proceed with fabricating metal fabrications without field measurements. Coordinate wall and other contiguous construction to ensure that actual dimensions correspond with established dimensions.
2. Provide allowance for trimming and fitting at the site.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design aluminum fabrications.

2.02 METALS

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

B. Steel Pipe: ASTM A 53/A 53M, Standard Weight (Schedule 40) unless otherwise indicated.

2.03 FASTENERS

A. General: Unless otherwise indicated, provide Type 316 stainless-steel fasteners. (ASTM F 1941M)

B. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563 (ASTM A 563M); and, where indicated, flat washers.

C. Anchors, General: Anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488/E 488M, conducted by a qualified independent testing agency.

D. Post-Installed Anchors: Torque-controlled expansion anchors and/or chemical anchors.
1. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 (A1) stainless-steel bolts, ASTM F 593 (ASTM F 738M), and nuts, ASTM F 594 (ASTM F 836M).

2.04 MISCELLANEOUS MATERIALS

A. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.

2.05 FABRICATION, GENERAL

A. Shop Assembly: Pre-assemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form exposed work with accurate angles and surfaces and straight edges.

D. Weld corners and seams continuously to comply with the following:
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove welding flux immediately.
   4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

E. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.

F. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

G. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

H. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

2.06 SHELF ANGLES

A. Furnish wedge-type concrete inserts, complete with fasteners, to attach shelf angles to cast-in-place concrete.

2.07 FINISHES, GENERAL

A. Finish metal fabrications after assembly.

B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.08 ALUMINUM FINISHES

A. As-Fabricated Finish: AA-M12 or as selected by the architect from manufacturer's full color range.

B. Clear Anodic Finish: AAMA 611, Class I, AA-M12C22A41.

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. Field Welding: Comply with the following requirements:
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove welding flux immediately.
   4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

END OF SECTION 055050

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
1. Treated Wood Members.
2. Miscellaneous Framing and Sheathing.
3. Plywood Subfloors.
4. Fasteners.
5. Structural Hold Downs, Connectors and Framing Accessories.
6. Framing with timber.
7. Framing with engineered wood products.
8. Wood blocking, cants, and nailers.
9. Wood furring and grounds.

1.03 REFERENCES:

A. AWPA - (American Wood Preservers Association) C1 - All Timber Products Preservative Treatment by Pressure Process.

B. APA - American Plywood Association.

C. AITC - American Institute of Timber Construction.

D. US Department of Commerce (DOC):
1. DOC PS 1 - Performance Standard for Structural Plywood.
2. DOC PS 2 - Performance Standard for Wood-Based Structural Panels.

E. International Code Council (ICC):
1. ICC IBC - International Building Code

1.04 DEFINITIONS

A. Exposed Framing: Framing not concealed by other construction.

B. Dimension Lumber: Lumber of 2 inches nominal or greater but less than 5 inches nominal in least dimension.

C. Timber: Lumber of 5 inches nominal or greater in least dimension.

D. Lumber grading agencies, and the abbreviations used to reference them, include the following:
1. NeLMA: Northeastern Lumber Manufacturers' Association.
2. NLGA: National Lumber Grades Authority.
3. SPIB: The Southern Pine Inspection Bureau.
4. WCLIB: West Coast Lumber Inspection Bureau.
5. WWPA: Western Wood Products Association.

1.05 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
   1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
   2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
   3. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5664.
   4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
   5. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

1.06 INFORMATIONAL SUBMITTALS

A. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.

B. Evaluation Reports: For the following, from ICC-ES:
   1. Wood-preservative-treated wood.
   2. Fire-retardant-treated wood.
   3. Plywood.
   4. Engineered wood products.
   5. Shear panels.
   6. Power-driven fasteners.
   7. Powder-actuated fasteners.
   8. Expansion anchors.
   9. Metal framing anchors.

1.07 QUALITY ASSURANCE

A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Handle, Transport and Store Plywood Panels in accordance with the APA Storage and Handling recommendations.

B. Stack lumber flat with spacers beneath and between each bundle to provide air circulation. Protect lumber from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

C. Stack panels flat with a minimum of three, full panel width, 4 inch by 4 inch spacers per eight foot panel length beneath and between each bundle to provide air circulation. Protect sheathing from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.01 WOOD PRODUCTS, GENERAL

A. Certified Wood: Materials shall be produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship" for the following:
   1. Dimension lumber framing.
   2. Timber.
   3. Laminated-veneer lumber.
   4. Parallel-strand lumber.
   5. Miscellaneous lumber.

B. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
   1. Factory mark each piece of lumber with grade stamp of grading agency.
   2. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece or omit grade stamp and provide certificates of grade compliance issued by grading agency.
   3. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
   4. Provide dressed lumber, S4S, unless otherwise indicated.

C. Maximum Moisture Content of Lumber: 15 percent for 2-inch nominal thickness or less, 19 percent for more than 2-inch nominal thickness 15 percent for 2-inch nominal thickness or less, no limit for more than 2-inch nominal thickness unless otherwise indicated.

D. Engineered Wood Products: Provide engineered wood products acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that show compliance with building code in effect for Project.
   1. Allowable Design Stresses: Provide engineered wood products with allowable design stresses, as published by manufacturer that meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

E. Plywood: Conform to requirements and recommendations provided in DOC PS 1 - Voluntary Product Standard for Construction and Industrial Structural Plywood.

2.02 WOOD-PRESERVATIVE-TREATED LUMBER

A. Preservative Treatment by Pressure Process: AWPA U1; UC2 (Interior Construction - Above Ground - Damp) for interior construction not in contact with the ground, Use Category UC3B

(Above Ground Exposed) for exterior construction not in contact with the ground, and UC4B (Ground Contact or Fresh Water - Heavy Duty) for items in contact with the ground.

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium. Do not use inorganic boron (SBX) for sill plates.
2. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece or omit marking and provide certificates of treatment compliance issued by inspection agency.

D. Application: Treat items indicated on Drawings, and the following:

1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
4. Wood framing members that are less than 18 inches (460 mm) above the ground in crawlspaces or unexcavated areas.
5. Wood floor plates that are installed over concrete slabs-on-grade.

2.03 FIRE-RETARDANT-TREATED MATERIALS

A. General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame spread index of 25 or less when tested according to ASTM E84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.

1. Use treatment that does not promote corrosion of metal fasteners.
2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D2898. Use for exterior locations and where indicated.
3. Design Value Adjustment Factors: Treated lumber shall be tested according ASTM D 5664 and design value adjustment factors shall be calculated according to ASTM D 6841.

C. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Kiln-dry plywood after treatment to a maximum moisture content of 15 percent.

D. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency. Mark panels on surfaces that will not be exposed in the final construction.

1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece.

E. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not bleed through, contain colorants, or otherwise adversely affect finishes.

F. Application: Treat items indicated on Drawings, and the following:
1. Concealed blocking.
2. Framing for non-load-bearing exterior walls.
3. Roof construction.

2.04 DIMENSION LUMBER FRAMING

A. Non-Load-Bearing Interior Partitions: Construction or No. 2 grade.
1. Application: Interior partitions not indicated as load-bearing.
2. Species:
a. Hem-fir (north); NLGA.
b. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.
c. Northern species; NLGA.

B. Load-Bearing Partitions: No. 2 grade.
1. Species:
a. Southern pine; SPIB.
b. Douglas fir-larch; WCLIB or WWPA.
c. Hem-fir; WCLIB or WWPA.
d. Douglas fir-larch (north); NLGA.
e. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.

C. Load-Bearing Partitions: Any species and grade with a modulus of elasticity of at least 1,600,000 psi and an extreme fiber stress in bending of at least for 2-inch nominal thickness and 12-inch nominal width for single-member use.
1. Application: Exterior walls and interior load-bearing partitions.

D. Ceiling Joists: Construction or No. 2 grade.
1. Species:
a. Southern pine; SPIB.
b. Hem-fir; WCLIB or WWPA.
c. Douglas fir-south; WWPA.
d. Eastern softwoods; NeLMA.

E. Joists, Rafters, and Other Framing Not Listed Above: No. 1 grade.
1. Species:
a. Douglas fir-larch; WCLIB or WWPA.
b. Douglas fir-larch (north); NLGA.
c. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.

F. Joists, Rafters, and Other Framing Not Listed Above: Any species and grade with a modulus of elasticity of at least 1,500,000 psi (10 350 MPa) and an extreme fiber stress in bending of at least 1000 psi (6.9 MPa) for 2-inch nominal thickness and 12-inch nominal width for single-member use.

G. Exposed Framing: Provide material hand-selected for uniformity of appearance and freedom from characteristics, on exposed surfaces and edges, that would impair finish appearance, including decay, honeycomb, knot-holes, shake, splits, torn grain, and wane.
   1. Species and Grade: Southern pine; No. 1 grade; SPIB.
   2. Species and Grade: Douglas fir-south; No. 1 grade; WWPA.
   3. Species and Grade: Hem-fir; No. 1 grade; WCLIB or WWPA.

2.05 TIMBER FRAMING

A. Provide timber framing complying with the following requirements, according to grading rules of grading agency indicated:
   1. Species and Grade: Douglas fir-larch, Douglas fir-larch (north), or Douglas fir-south; No. 1 grade; NLGA, WCLIB, or WWPA.
   2. Species and Grade: Eastern hemlock, eastern hemlock-tamarack, or eastern hemlock-tamarack (north); No. 1 grade; NeLMA or NLGA.
   3. Species and Grade: Mixed oak; Select Structural grade; NeLMA.

2.06 PLYWOOD SUBFLOORS

A. Plywood Subflooring: 3/4 Performance category APA Rated STURD-I-FLOOR, 24" o.c., Group 1, Exterior, 48 inch by 96 inch, B-C face grades, Tongue and Groove (T&G) edges.

2.07 CONSTRUCTION MOUNTING PANELS

A. Communications and Electrical Room Mounting Boards: PS 1, APA rated A-D faced plywood or MDF; 3/4 inch thick; flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.

2.08 ENGINEERED WOOD PRODUCTS

A. Source Limitations: Obtain each type of engineered wood product from single source from a single manufacturer.

B. Laminated-Veneer Lumber: Structural composite lumber made from wood veneers with grain primarily parallel to member lengths, evaluated and monitored according to ASTM D 5456 and manufactured with an exterior-type adhesive complying with ASTM D 2559.
   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. Georgia-Pacific.
      b. Louisiana-Pacific Corporation.
      c. Weyerhauser Company
      d. Or approved equal.
   2. Extreme Fiber Stress in Bending, Edgewise: 2900 psi for 12-inch nominal depth members.
   3. Modulus of Elasticity, Edgewise: 1,900,000 psi .

C. Parallel-Strand Lumber: Structural composite lumber made from wood strand elements with grain primarily parallel to member lengths, evaluated and monitored according to ASTM D 5456 and manufactured with an exterior-type adhesive complying with ASTM D2559

2.09 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
   1. Blocking.
   2. Nailers.
   3. Grounds.

B. For items of dimension lumber size, provide Construction or No. 2 grade lumber and any of the following species:
   1. Hem-fir (north); NLGA.
   2. Mixed southern pine; SPIB.
   3. Hem-fir; WCLIB or WWPA.
   4. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.

C. For concealed boards, provide lumber with 15 percent maximum moisture content and any of the following species and grades:
   1. Spruce-pine-fir (south) or spruce-pine-fir; Construction or No. 2 Common grade; NeLMA, NLGA, WCLIB, or WWPA.
   2. Eastern softwoods; No. 2 Common grade; NeLMA.

D. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.

E. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

F. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.10 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
   1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A153/A153M or Type 304 stainless steel.

B. Power-Driven Fasteners: NES NER-272.

C. Wood Screws: ASME B16.1.

D. Lag Bolts: ASME B18.2.1.

E. Bolts: Steel bolts complying with ASTM A307, Grade A; with ASTM A563 hex nuts and, where indicated, flat washers.

F. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry assemblies and equal to four times the load imposed when installed in concrete as

determined by testing per ASTM E488/E488M conducted by a qualified independent testing and inspecting agency.

1. Material: Stainless steel with bolts and nuts complying with ASTM F593 and ASTM F594, Alloy Group 1 or 2.

2.11 METAL FRAMING ANCHORS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   1. Cleveland Steel Specialty Co.
   2. Simpson Strong-Tie Co., Inc.
   3. USP Structural Connectors.

B. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer, that meet or exceed those of products of manufacturers listed. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

C. Provide products that have been approved by the ICC-Evaluation Service with an accompanying Evaluation Service Report (ESR) listing locations of allowable use.

D. Joist Hangers: U-shaped joist hangers with 2-inch long seat and 1-1/4-inch wide nailing flanges at least 85 percent of joist depth.
   1. Thickness: 0.062 inch.

E. I-Joist Hangers: U-shaped joist hangers with 2-inch long seat and 1-1/4-inch wide nailing flanges full depth of joist. Nailing flanges provide lateral support at joist top chord.
   1. Thickness: 0.062 inch.

F. Top Flange Hangers: U-shaped joist hangers, full depth of joist, formed from metal strap with tabs bent to extend over and be fastened to supporting member.
   1. Strap Width: 1-1/2 inches.
   2. Thickness: 0.062 inch.

G. Bridging: Rigid, V-section, nail-less type, 0.050 inch thick, length to suit joist size and spacing.

H. Joist Ties: Flat straps, with holes for fasteners, for tying joists together over supports.
   1. Width: 1-1/4 inches.
   2. Thickness: 0.062 inch.
   3. Length: As indicated.

I. Rafter Tie-Downs: Bent strap tie for fastening rafters or roof trusses to wall studs below, 1-1/2 inches wide by 0.050 inch thick. Tie fasteners to side of rafter or truss, face of top plates, and side of stud below.

J. Rafter Tie-Downs (Hurricane or Seismic Ties): Bent strap tie for fastening rafters or roof trusses to wall studs below, 2-1/4 inches wide by 0.062 inch thick. Tie fits over top of rafter or truss and fastens to both sides of rafter or truss, face of top plates, and side of stud below.

K. Floor-to-Floor Ties: Flat straps, with holes for fasteners, for tying upper floor wall studs to band joists and lower floor studs, 1-1/4 inches wide by 0.050 inch thick by 36 inches long.

L. Hold-Downs: Brackets for bolting to wall studs and securing to foundation walls with anchor bolts or to other hold-downs with threaded rods and designed with first of two bolts placed seven bolt diameters from reinforced base.
   1. Bolt Diameter: 3/4 inch.
   2. Width: 3-3/16 inches.
   3. Body Thickness: 0.138 inch.
   4. Base Reinforcement Thickness: 0.108 inch.

M. Wall Bracing: T-shaped bracing made for letting into studs in saw kerf, 1-1/8 inches (29 mm) wide by 9/16 inch deep by 0.034 inch thick with hemmed edges.

N. Wall Bracing: Angle bracing made for letting into studs in saw kerf, 15/16 by 15/16 by 0.040 inch thick with hemmed edges.

2.12 MISCELLANEOUS MATERIALS

A. Sill-Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to suit width of sill members indicated.

B. Adhesives for Gluing Furring to Concrete or Masonry: Formulation complying with ASTM D 3498 that is approved for use indicated by adhesive manufacturer.

PART 3 - EXECUTION

3.01 PREPARATION OF SURFACES

A. Surfaces to receive new wood members shall be free of all dirt, debris, and loose materials. Exposed surfaces shall be mechanically scraped if necessary, to remove projections.

B. Surfaces shall have no free water present in any form (rain, dew, frost, snow or ice).

C. Contractor is responsible to inspect all exposed surfaces to see that conditions are satisfactory for installation of new work.

3.02 INSTALLATION, GENERAL

A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.

B. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.

C. Make provisions for erection loads, and for sufficient temporary bracing to maintain structure safe, plumb and in true alignment until completion of erection and installation of permanent bracing.

D. Place horizontal members flat, crown side up.

E. Construct load bearing framing and curb members full length without splices.

F. Double members at all openings. Space short members over and under opening to member spacing.

G. Bridge framing in excess of 8 feet span at midspan.

H. Coordinate installation of adjacent construction.

I. Framing with Engineered Wood Products: Install engineered wood products to comply with manufacturer's written instructions.

J. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels.

K. Metal Framing Anchors: Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.

L. Install sill sealer gasket to form continuous seal between sill plates and foundation walls.

M. Do not splice structural members between supports unless otherwise indicated.

N. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
   1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches o.c.

O. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:
   1. Fire block furred spaces of walls, at each floor level, at ceiling, and at not more than 96 inches o.c. with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.
   2. Fire block concealed spaces of wood-framed walls and partitions at each floor level, at ceiling line of top story, and at not more than 96 inches o.c. Where fire blocking is not inherent in framing system used, provide closely fitted solid wood blocks of same width as framing members and 2-inch nominal thickness.
   3. Fire block concealed spaces behind combustible cornices and exterior trim at not more than 20 feet o.c.

P. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.

Q. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
   1. NES NER-272 for power-driven fasteners.
   2. Table 2304.10.1, "Fastening Schedule," in ICC's "International Building Code" and the 2020 Building Code of New York State".
   3. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's International Residential Code for One- and Two-Family Dwellings.

R. Warped wood members shall not be used unless they can be fastened adequately to permanently hold them in their required alignment.

S. For exposed work, arrange fasteners in straight rows parallel with edges of members, with fasteners evenly spaced, and with adjacent rows staggered.
   1. Comply with approved fastener patterns where applicable. Before fastening, mark fastener locations, using a template made of sheet metal, plastic, or cardboard.
   2. Use finishing nails unless otherwise indicated. Countersink nail heads and fill holes with wood filler.
   3. Use common nails unless otherwise indicated. Drive nails snug but do not countersink nail heads.

3.03 WOOD GROUND, BLOCKING, AND NAILER INSTALLATION

A. Install where indicated and where required for screeding or attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.

C. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.

D. Provide permanent grounds of dressed, pressure-preservative-treated, key-beveled lumber not less than 1-1/2 inches wide and of thickness required to bring face of ground to exact thickness of finish material. Remove temporary grounds when no longer required.

3.04 WOOD FURRING INSTALLATION

A. Install level and plumb with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.

3.05 WALL AND PARTITION FRAMING INSTALLATION

A. General: Provide single bottom plate and double top plates using members of 2-inch nominal (38-mm actual) thickness whose widths equal that of studs, except single top plate may be used for non-load-bearing partitions and for load-bearing partitions where framing members bearing on partition are located directly over studs. Fasten plates to supporting construction unless otherwise indicated.
   1. For exterior walls, provide 2-by-6-inch nominal size wood studs spaced 24 inches o.c. unless otherwise indicated.
   2. For interior partitions and walls, provide 2-by-4-inch nominal size wood studs spaced 16 inches o.c. unless otherwise indicated.

B. Frame openings with multiple studs and headers. Provide nailed header members of thickness equal to width of studs. Support headers on jamb studs.
   1. For non-load-bearing partitions, provide double-jamb studs and headers not less than 4-inch nominal depth for openings 48 inches and less in width, 6-inch nominal depth for openings 48 to 72 inches in width, 8-inch nominal depth for openings 72 to 120 inches in width, and not less than 10-inch nominal depth for openings 10 to 12 feet in width.
   2. For load-bearing walls, provide double-jamb studs for openings 60 inches and less in width, and triple-jamb studs for wider openings. Provide headers of depth indicated or, if not indicated, according to Table R602.7(1) or Table R602.7(2), as applicable, in ICC's International Residential Code for One- and Two-Family Dwellings.

3.06 FLOOR JOIST FRAMING INSTALLATION

A. General: Install floor joists with crown edge up and support ends of each member with not less than 1-1/2 inches of bearing on wood or metal, or 3 inches on masonry. Attach floor joists as follows:
   1. Where supported on wood members, by toe nailing or by using metal framing anchors.
   2. Where framed into wood supporting members, by using wood ledgers as indicated or, if not indicated, by using metal joist hangers.

B. Fire Cuts: At joists built into masonry, bevel cut ends 3 inches and do not embed more than 4 inches.

C. Frame openings with headers and trimmers supported by metal joist hangers; double headers and trimmers where span of header exceeds 48 inches.

D. Do not notch in middle third of joists; limit notches to one-sixth depth of joist, one-third at ends. Do not bore holes larger than 1/3 depth of joist; do not locate closer than 2 inches from top or bottom.

E. Provide solid blocking of 2-inch nominal thickness by depth of joist at ends of joists unless nailed to header or band.

F. Lap members framing from opposite sides of beams, girders, or partitions not less than 4 inches or securely tie opposing members together. Provide solid blocking of 2-inch nominal thickness by depth of joist over supports.

G. Anchor members paralleling masonry with 1/4-by-1-1/4 inch metal strap anchors spaced not more than 96 inches o.c., extending over and fastening to three joists. Embed anchors at least 4 inches into grouted masonry with ends bent at right angles and extending 4 inches beyond bend.

H. Provide solid blocking between joists under jamb studs for openings.

I. Under non-load-bearing partitions, provide double joists separated by solid blocking equal to depth of studs above.
   1. Provide triple joists separated as above, under partitions receiving ceramic tile and similar heavy finishes or fixtures.

J. Provide bridging of type indicated below, at intervals of 96 inches o.c., between joists.
   1. Diagonal wood bridging formed from bevel-cut, 1-by-3-inch nominal size lumber, double-crossed and nailed at both ends to joists.
   2. Steel bridging installed to comply with bridging manufacturer's written instructions.

3.07 CEILING JOIST AND RAFTER FRAMING INSTALLATION

A. Ceiling Joists: Install ceiling joists with crown edge up and complying with requirements specified above for floor joists. Face nail to ends of parallel rafters.
   1. Where ceiling joists are at right angles to rafters, provide additional short joists parallel to rafters from wall plate to first joist; nail to ends of rafters and to top plate and nail to first joist or anchor with framing anchors or metal straps. Provide 1-by-8-inch nominal size or 2-by-4-inch nominal size stringers spaced 48 inches o.c. crosswise over main ceiling joists.

B. Rafters: Notch to fit exterior wall plates and toe nail or use metal framing anchors. Double rafters to form headers and trimmers at openings in roof framing, if any, and support with metal hangers. Where rafters abut at ridge, place directly opposite each other and nail to ridge member or use metal ridge hangers.
   1. At valleys, provide double-valley rafters of size indicated or, if not indicated, of same thickness as regular rafters and 2 inches deeper. Bevel ends of jack rafters for full bearing against valley rafters.
   2. At hips, provide hip rafter of size indicated or, if not indicated, of same thickness as regular rafters and 2 inches deeper. Bevel ends of jack rafters for full bearing against hip rafter.

C. Provide collar beams (ties) as indicated or, if not indicated, provide 1-by-6-inch nominal size boards between every third pair of rafters, but not more than 48 inches o.c. Locate below ridge member, at third point of rafter span. Cut ends to fit roof slope and nail to rafters.

D. Provide special framing as indicated for eaves, overhangs, dormers, and similar conditions if any.

3.08 STAIR FRAMING INSTALLATION

A. Provide stair framing members of size, space, and configuration indicated or, if not indicated, to comply with the following requirements:
   1. Size: 2-by-12-inch nominal size, minimum.
   2. Material: solid lumber.
   3. Notching: Notch rough carriages to receive treads, risers, and supports; leave at least 3-1/2 inches of effective depth.
   4. Spacing: At least three framing members for each 36-inch clear width of stair.

B. Provide stair framing with no more than 3/16-inch variation between adjacent treads and risers and no more than 3/8-inch variation between largest and smallest treads and risers within each flight.

3.09 TOLERANCES

A. Surface Flatness of Floor: 1/8 inch in 10 feet maximum, and 1/4 inch in 30 feet maximum.

3.10 PROTECTION

A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 061000

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Finish carpentry items.

B. Wood door frames, glazed frames.

C. Wood casings and moldings.

D. Hardware and attachment accessories.

1.02 RELATED REQUIREMENTS

A. Section 061000 - Rough Carpentry: Support framing, grounds, and concealed blocking.

B. Section 081433 - Stile and Rail Wood Doors.

C. Section 099123 - Interior Painting: Painting of finish carpentry items.

1.03 REFERENCE STANDARDS

A. ANSI A135.4 - Basic Hardboard; 2012 (R2020).

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018a.

C. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).

D. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 3.1; 2017, with Errata (2019).

E. WI (CCP) - Certified Compliance Program (CCP); Current Edition.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the work with plumbing rough-in, electrical rough-in, installation of associated and adjacent components, and provision of plumbing fixture templates.

1.05 SUBMITTALS

A. See Section 013300 - SUBMITTALS for submittal procedures.

B. Product Data:
   1. Provide data on fire retardant treatment materials and application instructions.
   2. Provide instructions for attachment hardware, finish hardware, and support hardware.

C. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
   1. Scale of Drawings: 1-1/2 inch to 1 foot (125 mm to 1 m), minimum.
   2. Provide the information required by AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS).
   3. Include certification program label.

D. Samples: Submit two samples of finish plywood, 6 x 6 inch (152 x152 mm) in size illustrating wood grain and specified finish.

E. Samples: Submit two samples of wood trim 6 inch (152 mm) long.

F. Certificate: Submit labels and certificates required by quality assurance and quality control programs.

1.06 QUALITY ASSURANCE

A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.
   1. Accredited participant in the specified certification program prior to the commencement of fabrication and throughout the duration of the project.
   2. Single Source Responsibility: Provide and install this work from single fabricator.

B. Quality Certification:
   1. Provide labels or certificates indicating that the work complies with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade or grades specified.
   2. Provide designated labels on shop drawings as required by certification program.
   3. Provide designated labels on installed products as required by certification program.
   4. Submit certifications upon completion of installation that verifies this work is in compliance with specified requirements.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Protect work from moisture damage.

PART 2 PRODUCTS

2.01 FINISH CARPENTRY ITEMS

A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

B. Surface Burning Characteristics: Provide materials having fire and smoke properties as required by applicable code.

C. Interior Woodwork Items:
   1. Moldings, Bases, Casings, Crown and Miscellaneous Trim: White Oak; prepare for stain and/or paint to match existing finish.
   2. Door, Glazed Light, and Pocket Door Frames: White Oak; prepare for paint finish.
   3. Window Sills: White Oak; prepare for stain to match existing finish.
   4. Whote Oak Wood Molding, stain and/or paint to match existing..

2.02 WOOD-BASED COMPONENTS

A. Wood fabricated from old growth timber is not permitted.

B. Provide sustainably harvested wood, certified or labeled as specified in Section 016100 - PRODUCT SUBSTITUTION PROCEDURES.

C. Wood fabricated from timber recovered from riverbeds or otherwise abandoned is permitted, unless indicated otherwise, and provided it is clean and free of contamination, identify source; provide lumber re-graded by an inspection service accredited by the American Lumber Standard Committee, Inc. (ALSC).

2.03 LUMBER MATERIALS

A. Softwood Lumber: Clear Heart Cedar species, Planed, maximum moisture content of 6 percent; with vertical grain, of quality suitable for transparent finish.
   1. Grading: In accordance with rules certified by ALSC; www.alsc.org.

B. Hardwood Lumber: Sapele species, Abrasive Planed, maximum moisture content of 6 percent; with vertical grain, of quality suitable for transparent finish.

2.04 SHEET MATERIALS

A. Softwood Plywood, Not Exposed to View: Any face species, medium density fiberboard core; PS 1 Grade A-B, glue type as recommended for application.

B. Softwood Plywood, Exposed to View: Face species as indicated, plain sawn, medium density fiberboard core; PS 1 Grade A-B, glue type as recommended for application.

C. Hardwood Plywood: Face species as indicated, plain sawn, book matched, medium density fiberboard core; HPVA HP-1, Front Face Grade AA, Back Face Grade 1, glue type as recommended for application.

2.05 PLASTIC LAMINATE MATERIALS

A. Plastic Laminate: NEMA LD 3, HGS; color as selected by Architect; textured, low gloss finish; color and pattern as selected by the Architect manufactured by Formica or approved equal.

B. Laminate Backing Sheet: NEMA LD 3, BKL; undecorated plastic laminate; _____ manufactured by _____.

C. Laminate Adhesive: Type recommended by laminate manufacturer to suit application; not containing formaldehyde or other volatile organic compounds.

2.06 FASTENINGS

A. Adhesive for Purposes Other Than Laminate Installation: Suitable for the purpose; not containing formaldehyde or other volatile organic compounds.

B. Concealed Joint Fasteners: Threaded steel.

2.07 ACCESSORIES

A. Lumber for Shimming and Blocking: Softwood lumber of Cedar or Pine species.

B. Primer: As specified in Section 099123.

C. Wood Filler: Solvent base, tinted to match surface finish color.

2.08 HARDWARE

A. Hardware: Comply with BHMA A156.9.

B. Standard Shelf, Countertop, and Workstation Brackets:
   1. Material: Steel.
   2. Finish: Powder-coated paint in color as selected by the Architect.
   3. Products:
      a. A&M Hardware, Inc ; Standard Brackets: http://www.aandmhardware.com/#sle.

C. Americans with Disabilities Act (ADA)-Compliant Vanity and Countertop Brackets:
   1. Material: Stainless steel.
   2. Finish: Brushed.
   3. Products:
      a. A&M Hardware, Inc ; ADA Vanity Brackets: http://www.aandmhardware.com/#sle.

D. Specialty Shelf Brackets:
   1. Material: Steel.
   2. Manufacturer's standard, factory-applied, textured powder coat.
   3. Color: Black.
   4. Products:
      a. A&M Hardware, Inc; Concealed Flat Brackets: http://www.aandmhardware.com/#sle.

2.09 WOOD TREATMENT

A. Wood Preservative by Pressure Treatment (PT Type): Provide AWPA U1 treatment using waterborne preservative with 0.25 percent retainage.

B. Deliver fire retardant treated materials cut to required sizes. Minimize field cutting.

C. Redry wood after pressure treatment to maximum 15 percent moisture content.

2.10 FABRICATION

A. Shop assemble work for delivery to site, permitting passage through building openings.

B. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

C. Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises. Locate counter butt joints minimum 2 feet from sink cut-outs. (Locate counter butt joints minimum 600 mm from sink cut-outs.)

D. Apply laminate backing sheet to reverse face of plastic laminate finished surfaces.

2.11 SHOP FINISHING

A. Sand work smooth and set exposed nails and screws.

B. Apply wood filler in exposed nail and screw indentations.

C. On items to receive transparent finishes, use wood filler that matches surrounding surfaces and is of type recommended for the applicable finish.

D. Finish work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified and as follows:
   1. Transparent:
      a. System - 1, Lacquer, Nitrocellulose.
      b. Stain: As selected by Architect.
      c. Sheen: Flat.

E. Back prime woodwork items to be field finished, prior to installation.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify adequacy of backing and support framing.

B. Verify mechanical, electrical, and building items affecting work of this section are placed and ready to receive this work.

C. See Section 061000 - Statement of Special Inspection and Tests-NJ for installation of recessed wood blocking.

3.02 INSTALLATION

A. Install work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade indicated.

B. Set and secure materials and components in place, plumb and level.

C. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch (0.79 mm). Do not use additional overlay trim to conceal larger gaps.

D. Install hardware in accordance with manufacturer's written instructions.

3.03 SITE APPLIED WOOD TREATMENT

A. Apply preservative treatment in accordance with manufacturer's instructions.

B. Brush apply one coat(s) of preservative treatment on wood in contact with cementitious materials. Treat site-sawn cuts.

C. Allow preservative to dry prior to erecting members.

3.04 PREPARATION FOR SITE FINISHING

A. Set exposed fasteners. Apply wood filler in exposed fastener indentations. Sand work smooth.

B. Site Finishing: See Section 099123.

C. Before installation, prime paint surfaces of items or assemblies to be in contact with cementitious materials.

3.05 TOLERANCES

A. Maximum Variation from True Position: 1/16 inch (1.6 mm).

B. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch (0.79 mm).

END OF SECTION 062000

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Extruded Polystyrene foam board insulation.
   2. Vapor retarders.

1.03 ACTION SUBMITTALS

A. See Section 013300 - SUBMITTALS, for submittal procedures.

B. Product Data: For each type of product indicated.

C. Manufacturer's Certificate: Certify panels will conform to specified performance requirements.

1.04 INFORMATIONAL SUBMITTALS

A. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each product.

B. Research/Evaluation Reports: For foam-plastic insulation, from ICC-ES.

1.05 QUALITY ASSURANCE

A. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1.06 PRE-INSTALLATION MEETING

A. Pre-Installation Meeting: Convene minimum one week prior to commencing Work of this section. Review installation procedures and coordination required with Related Work and include the following:
   1. Participants: Authorized representatives of the Contractor, Architect, Installer, and Manufacturer.
   2. Review wall assemblies for potential interference and conflicts and coordinate layout and support provisions for interfacing work.
   3. Review continuous insulation wall panels installation methods and procedures related to application, including manufacturer’s installation guidelines.
   4. Review firestopping requirements and weather resistive membrane requirements and placement locations.
   5. Review field quality control procedures.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

B. Protect foam-plastic board insulation as follows:
   1. Do not expose to sunlight except to necessary extent for period of installation and concealment.
   2. Protect against ignition at all times. Do not deliver foam-plastic board materials to Project site before installation time.
   3. Quickly complete installation and concealment of foam-plastic board insulation in each area of construction.

C. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2 - PRODUCTS

2.01 FOAM-PLASTIC BOARD INSULATION

A. Extruded-Polystyrene Board Insulation: ASTM C578, of type and minimum compressive strength indicated below, with maximum flame-spread and smoke-developed indexes of 25 and 450, respectively, per ASTM E84, Class A.
   1. Products:
      a. DuPont de Nemours, Inc. Chemical Company; STYROFOAM HIGHLOAD 40: www.DuPont de Nemours, Inc.buildingsolutions.com/#sle.
      b. Kingspan Insulation LLC; GreenGuard XPS Type VI, 40 psi: www.kingspan.com/#sle.
      c. Owens Corning Corporation; FOAMULAR Extruded Polystyrene (XPS) Insulation: www.ocbuildingspec.com/#sle.
   2. Type VI: 40.0 psi (Compressive Strength), 1.80 pcf (Density) minimum.
   3. Complies with fire resistance requirements indicated on drawings as part of an exterior non-load-bearing exterior wall assembly when tested in accordance with NFPA 285.
   4. Type and Thermal Resistance, R-value: Type VI, 5.0 (0.88) per 1 inch thickness at 75 degrees F mean temperature.

B. Unfaced Wall Insulation Drainage Panels (Vertical Use): Extruded-polystyrene board insulation complying with ASTM C578, Type VI: 40.0 psi (Compressive Strength) minimum compressive strength; unfaced; fabricated with shiplap or channel edges and with one side having grooved drainage channels.
   1. Styrofoam Perimate.
   2. Or approved equal.

C. Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates.

D. Tape joints in rigid insulation with Henry Blueskin SA or equivalent material as recommended by the approved insulation manufacturer.

2.02 INSULATION FASTENERS

A. Adhesively Attached, Spindle-Type Anchors: Plate welded to projecting spindle; capable of holding insulation of specified thickness securely in position indicated with self-locking washer in place.
   1. Plate: Perforated, galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
   2. Spindle: Copper-coated, low-carbon steel; fully annealed; 0.105 inch in diameter; length to suit depth of insulation indicated.

B. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch thick galvanized-steel sheet, with beveled edge for increased stiffness, sized as required to hold insulation securely in place, but not less than 1-1/2 inches square or in diameter.
   1. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in the following locations:
      a. Ceiling plenums.

C. Insulation Standoff: Spacer fabricated from galvanized mild-steel sheet for fitting over spindle of insulation anchor to maintain air space of 1 inch between face of insulation and substrate to which anchor is attached.

D. Insulation Fasteners: Lengths of galvanized, 13 gauge, 0.072 inch (1.83 mm) high carbon spring steel with chisel or mitered tips, held in place by tension, length to suit insulation thickness and substrate, capable of securely supporting insulation in place.

E. Insulation Fasteners: Impaling clip of galvanized steel with washer retainer and clips, to be adhered to surface to receive insulation, length to suit insulation thickness and substrate, capable of securely and rigidly fastening insulation in place.

F. Wire Mesh: Galvanized steel, hexagonal wire mesh.

G. Adhesive: Gun grade, interior and exterior, and compatible with insulation and substrates; complies with ASTM C557.
   1. Application Temperature: 40 to 100 degrees F (5 to 38 degrees C) at contact surfaces.
   2. Volatile Organic Content (VOC): Less than 7 percent by weight.

H. Anchor Adhesive: Product with demonstrated capability to bond insulation anchors securely to substrates indicated without damaging insulation, fasteners, and substrates.

PART 3 - EXECUTION

3.01 PREPARATION

A. Clean substrates of substances that are harmful to insulation or vapor retarders, including removing projections capable of puncturing vapor retarders, or that interfere with insulation attachment.

3.02 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and applications indicated.

B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.

C. Extend insulation to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

D. Provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

3.03 INSTALLATION OF BELOW-GRADE INSULATION

A. On vertical surfaces, set insulation units using manufacturer's recommended adhesive according to manufacturer's written instructions.
   1. If not otherwise indicated, extend insulation a minimum of 24 inches below exterior grade line.

B. On horizontal surfaces, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.
   1. If not otherwise indicated, extend insulation a minimum of 48 inches in from exterior walls.

3.04 INSTALLATION OF CAVITY-WALL INSULATION

A. Foam-Plastic Board Insulation: Install pads of adhesive spaced approximately 24 inches o.c. both ways on inside face, and as recommended by manufacturer. Fit courses of insulation between wall ties and other obstructions, with edges butted tightly in both directions. Press units firmly against inside substrates.
   1. Supplement adhesive attachment of insulation by securing boards with two-piece wall ties designed for this purpose and specified in Division 04

3.05 INSTALLATION OF INSULATION FOR FRAMED CONSTRUCTION

A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.

B. Foam-Plastic Board Insulation: Seal joints between units by applying adhesive, mastic, or sealant to edges of each unit to form a tight seal as units are shoved into place. Fill voids in completed installation with adhesive, mastic, or sealant as recommended by insulation manufacturer.

C. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:
   1. Spray Polyurethane Insulation: Apply according to manufacturer's written instructions.

3.06 INSTALLATION OF INSULATION IN CEILINGS FOR SOUND ATTENUATION

A. Where glass-fiber blankets are indicated for sound attenuation above ceilings, install blanket insulation over entire ceiling area in thicknesses indicated. Extend insulation 48 inches up either side of partitions.

3.07 INSTALLATION OF INSULATION FOR CONCRETE SUBSTRATES

A. Install board insulation on concrete substrates by adhesively attached, spindle-type insulation anchors as follows:
   1. Fasten insulation anchors to concrete substrates with insulation anchor adhesive according to anchor manufacturer's written instructions. Space anchors according to insulation manufacturer's written instructions for insulation type, thickness, and application indicated.
   2. Apply insulation standoffs to each spindle to create cavity width indicated between concrete substrate and insulation.
   3. After adhesive has dried, install board insulation by pressing insulation into position over spindles and securing it tightly in place with insulation-retaining washers, taking care not to compress insulation below indicated thickness.
   4. Where insulation will not be covered by other building materials, apply capped washers to tips of spindles.

3.08 INSTALLATION OF CURTAIN-WALL INSULATION

A. Install board insulation in curtain-wall construction where indicated on Drawings according to curtain-wall manufacturer's written instructions.
   1. Hold insulation in place by securing metal clips and straps or integral pockets within window frames, spaced at intervals recommended in writing by insulation manufacturer to hold insulation securely in place without touching spandrel glass. Maintain cavity width of dimension indicated between insulation and glass.
   2. Install insulation where it contacts perimeter fire-containment system to prevent insulation from bowing under pressure from perimeter fire-containment system.

3.09 INSTALLATION OF VAPOR RETARDERS

A. Place vapor retarders on side of construction indicated on Drawings. Extend vapor retarders to extremities of areas to protect from vapor transmission. Secure vapor retarders in place with adhesives or other anchorage system as indicated. Extend vapor retarders to cover miscellaneous voids in insulated substrates, including those filled with loose-fiber insulation.

B. Seal joints caused by pipes, conduits, electrical boxes, and similar items penetrating vapor retarders with vapor-retarder tape to create an airtight seal between penetrating objects and vapor retarders.

C. Repair tears or punctures in vapor retarders immediately before concealment by other work. Cover with vapor-retarder tape or another layer of vapor retarders.

3.10 CLEANING

A. Progress Cleaning: Perform cleanup as work progresses in accordance with Section and 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL.

B. Final Cleaning: Upon completion, remove surplus materials, rubbish, tools and equipment in accordance with Section 017423 - CLEANING.

C. Waste Management:
   1. Coordinate recycling of waste materials with Section 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL.

3.11 PROTECTION

A. Protect installed insulation and vapor retarders from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 072100

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Agreement, including General and Supplementary Conditions, and Division 01 of the Project Manual, apply to work of this Section.

1.02 SUMMARY

A. This section includes, but not limited to, the following:
   1. Installation of a fluid-applied air and water-resistive barrier via spray application to all exterior CMU back-up walls.

B. Related Sections: The following sections contain requirements that relate to this section:
   1. Section 040523 - Masonry Accessories
   2. Section 042200 - Concrete Unit Masonry for requirement that backup masonry joints are flush and completely filled with mortar, and that excess mortar on veneer ties will be removed; requirement for gap at deflection joints and fillers; coordination with sequencing of through-wall flashing.

1.03 REFERENCES

A. ASTM D412 "Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers—Tension".

B. ASTM D4263 "Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method".

C. ASTM D4541 "Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers".

D. ASTM E84 "Standard Test Method for Surface Burning Characteristics of Building Materials".

E. ASTM E96 "Standard Test Methods for Water Vapor Transmission of Materials".

F. ASTM E2178 "Standard Test Method for Determining Air Leakage Rate and Calculation of Air Permeance of Building Materials".

G. ASTM E2357 "Standard Test Method for Determining Air Leakage Rate of Air Barrier Assemblies".

1.04 PERFORMANCE REQUIREMENTS

A. Material Performance: Provide materials which have an air permeance not to exceed 0.004 cubic feet per minute per square foot under a pressure differential of 0.3 in. water (1.57 psf) (0.02L/m2 @ 75 Pa.) when tested according to ASTM E 2178.

B. Connections to Adjacent Materials: Provide connections to prevent air leakage and vapor migration at the following locations:
   1. Foundation and walls, including penetrations, ties and anchors.
   2. Walls, windows, curtain walls, storefronts, louvers or doors.
   3. Different wall assemblies and fixed openings within those assemblies.
   4. Wall and roof connections and penetrations.

5. Expansion joints,
6. All other leakage pathways in the building envelope.

1.05 SUBMITTALS

A. Submit pursuant to Section 013300 - Submittal Procedures

B. Submit pursuant to Section 016000 - Product Requirements.

C. Quality Assurance Program: Submit evidence of current accreditation and certification under the Air Barrier Association of America's (ABAA) Quality Assurance Program.
   1. Submit accreditation number of manufacturer.
   2. Air barrier installer shall be currently accredited under the ABAA and ensure applicators are certified in accordance with the ABAA Quality Assurance Program.

D. Product Data: Submit manufacturer's product data, installation instructions and manufacturer's printed instructions for evaluation, preparing and treating substrate, temperature and other limitations of installation conditions, technical data and tested physical and performance properties.
   1. Submit letter from primary materials manufacturer indicating approval of products not manufactured by primary manufacturer.
   2. Include statement that materials are compatible with adjacent materials proposed for use.

E. Compatibility: Submit letter from manufacturer stating that materials proposed for use are permanently chemically compatible and adhesively compatible with adjacent materials proposed for use. Submit letter from manufacturer stating that cleaning materials used during installation are chemically compatible with each of the adjacent materials proposed for use.

1.06 QUALITY ASSURANCE

A. Air Barrier Installer Qualifications: Currently accredited by the Air Barrier Association of America (ABAA) whose applicators are certified in accordance with the ABAA Quality Assurance Program.

B. Manufacturer: Obtain primary materials from a single manufacturer regularly engaged in manufacturing air and vapor barrier membranes. Obtain secondary materials from a source acceptable to the primary materials manufacturer.

C. VOC Regulations: Provide products which comply with applicable regulations controlling the use of volatile organic compounds.

D. Preconstruction Meeting: Convene a minimum of two weeks prior to commencing Work of this Section. Agenda shall include, at a minimum, construction and testing of mock-up, sequence of construction, coordination with substrate preparation, materials approved for use, compatibility of materials, coordination with installation of adjacent and covering materials and details of construction. Attendance is required by representatives of related trades including covering materials, substrate materials and adjacent materials.

E. Field Quality Assurance: Implement the ABAA Quality Assurance Program requirements. Cooperate with ABAA inspectors and independent testing and inspection agencies engaged by the Owner. Do not cover air and vapor barrier until it has been inspected, tested and accepted.

F. Mock-Ups: Build mock-up representative of primary exterior wall assemblies including backup wall and typical penetrations as acceptable to the Architect. Mock-up shall be part of masonry sample panel.

1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to Project site in original packages with seals unbroken, labeled with manufacturer's name, product, date of manufacture, and directions for storage.

B. Store materials in their original undamaged packages in a clean, dry, protected location and within temperature range required by air and vapor barrier membrane manufacturer. Protect stored materials from direct sunlight.

C. Handle materials in accordance with manufacturer's recommendations.

1.08 PROJECT CONDITIONS

A. Temperature: Install air and vapor barrier within range of ambient and substrate temperatures recommended by air and vapor barrier manufacturer.

B. Field Conditions: Do not install air and vapor barrier in snow, rain, fog or mist without temporary protection and supplemental heat as required. Do not install air and vapor barrier when the temperature of substrate surfaces and surrounding air temperatures are below those recommended by the manufacturer. Apply membrane to a surface dry substrate, or in accordance with manufacturer's recommendations.

C. Minimize UV exposure to three months maximum (unless manufacturer dictates a shorter duration) as the product is not intended for uses subject to abuse or permanent exposure to the elements.

1.09 WARRANTY

A. Material warranty: Provide manufacturer's standard product warranty, for a minimum of three (3) years from date of Substantial Completion.

B. Installation Warranty: Provide installer's 2-year warranty form date of Substantial Completion, including all components of the air and vapor barrier assembly, against failures including loss of air tight seal, loss of watertight seal, loss of adhesion, loss of cohesion, failure to cure properly.

PART 2 PRODUCT

2.01 MATERIALS

A. Fluid-Applied Air and Vapor Barrier: Fluid-applied proprietary materials as specified. Use regular or low-temperature formulation depending on site conditions, within temperature ranges specified by manufacturer. Provide related accessories including primer, seam tape, mastic, fluid and sealant recommended by manufacturer. Subject to compliance with requirements, provide one of the following:
   1. GCP Applied Technologies:
      a. Fluid-Applied Air and Vapor Barrier: Perm-A-Barrier® Liquid, 60 mils thick (wet).
      b. Water-Based Primer: Perm-A-Barrier® WB Primer.
      c. Solvent-Based Primer: Bituthene Primer B2 and Bituthene Primer B2 LVC.

d. Through-Wall Flashings or Shelf Angle Flashings: Perm-A-Barrier® Wall Flashing.
e. Mastics, Adhesive and Tapes: As recommended by GCP Applied Technologies.
f. Transition Strip: Perm-A-Barrier® Detail Membrane and Perm-A-Barrier® Wall Flashing.
g. Transition Strip: Bituthene Primer B02
h. Termination Mastic: Bituthene Liquid Membrane and as recommended by GCP Applied Technologies.
i. Window Flashings and Detail Membrane: Perm-A-Barrier® Detail Membrane and Perm-A-Barrier Wall Flashing.

2. Tremco, Inc.: www.tremcosealants.com
   a. Fluid-Applied Air and Vapor Barrier: ExoAir 120SP (spray-applied) and ExoAir 120R (roller-grade), 60 mils (wet) (25 square feet per gallon for sheathing panels and 20 square feet per gallon for unparged masonry walls).
   b. Water-Based Primer: ExoAir WB Primer
   c. Solvent-Based Primer: ExoAir Primer or GM Primer or ExoAir 10 Primer as recommended.
   d. Counterflashing for Masonry Through-Wall Flashings: ExoAir TWF.
   e. Mastics, Adhesives and Tapes: As recommended by manufacturer.
3. Architect Approved Equivalent.

2.02 AUXILIARY MATERIALS

A. Sealant at Transitions in Substrate and Connections to Adjacent Elements: Low-modulus pre-cured silicone extrusion and sealant for bonding extrusions to substrates; Tremco Silicone Extruded Sheet by Tremco, Spectrem EZ Seal by Tremco, Sika® Silbridge-300 by SIKA USA, or approved product of the air barrier manufacturer.

B. Transition Membrane between Air and Vapor Barrier Membrane and Roofing and Other Adjacent Materials: Comply with both air and vapor barrier manufacturer's recommendations and roofing material manufacturer's recommendations.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas and conditions under which air and vapor barrier assemblies will be applied, with Installer present, for compliance with requirements.
   1. Verify that surfaces and conditions are suitable prior to commencing work of this section. Do not proceed with installation until unsatisfactory conditions have been corrected.
   2. Do not proceed with installation until after minimum concrete curing period recommended by air and vapor barrier manufacturer.
   3. Ensure that the following conditions are met:
      a. Surfaces are sound, dry, even, and free of oil, grease, dirt, excess mortar or other contaminants.
      b. Concrete surfaces are cured and dry, smooth and without large voids, spalled areas or sharp protrusions.
      c. Masonry joints are flush and completely filled with mortar, and all excess mortar sitting on masonry ties has been removed.
   4. Verify substrate is surface dry. Test for capillary moisture by plastic sheet method according to ASTM D 4263 and take suitable measures until substrate passes moisture test. Surface dry is an acceptable substrate condition if acceptable to the manufacturer.

5. Verify sealants used in sheathing are compatible with membrane proposed for use. Perform field peel-adhesion test on materials to which sealants are adhered.
6. Notify Architect in writing of anticipated problems using air and vapor barrier over substrate prior to proceeding.

3.02 SURFACE PREPARATION

A. Clean, prepare and treat substrate according to manufacturer's written instructions. Mask off adjoining surfaces to prevent overspray and spillage.

B. Prime substrate for application of sheet membrane transition strips as recommended by manufacturer and as follows:
1. Prime masonry, concrete substrates with conditioning primer.
2. Prime glass-fiber surfaced gypsum sheathing an adequate number of coats to achieve required bond, with adequate drying time between coats.
3. Prime wood, metal and painted substrates with primer.
4. Prepare, treat and seal vertical and horizontal surfaces at terminations and penetrations through air and vapor barrier and at protrusions.

C. Prime substrate for application of fluid-applied air and vapor barrier if recommended by manufacturer based on project conditions and as follows.

3.03 INSTALLATION

A. Air and Vapor Barrier Installation: Install transition strip materials and fluid-applied air and vapor barrier to provide continuity throughout the building envelope. Install materials in accordance with manufacturer's recommendations and as follows, unless manufacturer recommends other procedures in writing based on project conditions or requirements of their recommended materials:
1. Apply primer for transition strips at rate recommended by manufacturer. Allow primer to dry completely before transition strip application. Apply as many coats as necessary for proper adhesion.
2. Apply primer for fluid-applied air and vapor barrier as recommended by fluid-applied air and vapor barrier manufacturer. Based on manufacturer's recommendation, no primer may be required for the fluid-applied materials.
3. Apply fluid-applied air and vapor barrier using equipment and methods recommended by manufacturer, to achieve a dry film thickness as recommended by the manufacturer.
4. Apply fluid-applied air and vapor barrier and transition strips to shed water naturally without interception by a sheet edge, unless that edge is sealed with permanently flexible termination mastic.
5. Position subsequent sheets of transition strips applied above so that membrane overlaps the membrane sheet below by a minimum of 2 inches (50mm), unless greater overlap is recommended by manufacturer. Roll into place with roller.
6. Overlap horizontally adjacent pieces of transition strips a minimum of 2 inches (50mm), unless greater overlap is recommended by manufacturer. Roll seams with roller.
7. Seal around all penetrations with termination mastic, extruded silicone sealant, membrane counterflashing or other procedure in accordance with manufacturer's recommendations.
8. Connect air and vapor barrier in exterior wall assembly continuously to the air barrier of the roof, to concrete below-grade structures, to windows, curtain wall, storefront, louvers, exterior doors and other intersection conditions and perform sealing penetrations, using accessory materials and in accordance with the manufacturer's recommendations.
9. At changes in substrate plane, provide transition material (bead of sealant, mastic, extruded silicone sealant, membrane counterflashing or other material recommended by

manufacturer) under membrane to eliminate all sharp 90 degree inside corners and to make a smooth transition from one plane to another.

10. Provide mechanically fastened non-corrosive metal sheet to span gaps in substrate plane and to make a smooth transition from one plane to another. Membrane shall be continuously supported by substrate or as recommended by the manufacturer.
11. At through-wall flashings, provide an additional 6-inch-wide strip of manufacturer's recommended membrane counterflashing to seal top of through-wall flashing to membrane or as recommended by manufacturer. Seal exposed top edge of strip with bead of mastic or as recommended by manufacturer.
12. At deflection and control joints, provide backup for the membrane to accommodate anticipated movement.
13. At expansion and seismic joints provide transition to the joint assemblies.
14. Apply a bead or trowel coat of mastic along membrane seams at reverse lapped seams, rough cuts and as recommended by the manufacturer.
15. At end of each working day, seal top edge of membrane to substrate with termination mastic.
16. Do not allow materials to come in contact with chemically incompatible materials.
17. Do not expose membrane to sunlight longer than is recommended by the manufacturer.
18. Inspect installation prior to enclosing assembly and repair punctures, damaged areas and inadequately lapped seams with a patch of membrane lapped as recommended by manufacturer.

3.04 FIELD QUALITY CONTROL

A. Owner's Inspection and Testing: Cooperate with Owner's testing agency. Allow access to work areas and staging. Notify Owner's testing agency in writing of schedule of Work of this Section to allow sufficient time for testing and inspection. Daily inspection and testing may be required. Do not cover Work of this Section until testing and inspection is accepted.

3.05 PROTECTING AND CLEANING

A. Protect air and vapor barrier assemblies from damage during application and remainder of construction period, according to manufacturer's written instructions.
   1. Coordinate with installation of materials which cover air and vapor membrane, to ensure exposure period does not exceed that recommended by the air and vapor barrier manufacturer or stated above.

B. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction and acceptable to the primary material manufacturer.

END OF SECTION 072726

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Drip edges.
   2. Base and Counter flashing.

1.03 COORDINATION

A. Coordinate sheet metal flashing and trim layout and seams with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials.

B. Coordinate sheet metal flashing and trim installation with adjoining roofing and wall materials, joints, and seams to provide leakproof, secure, and noncorrosive installation.

1.04 REFERENCES:

A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.

B. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.

C. ASTM B32 - Standard Specification for Solder Metal; 2008 (Reapproved 2014).

D. ASTM B370 - Standard Specification for Copper Sheet and Strip for Building Construction; 2012.

E. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

1.05 ACTION SUBMITTALS

A. See Section 013300 - SUBMITTALS, for Submittal Procedures.

B. LEED Data Submissions: See Section 018113 - SUSTAINABILITY DESIGN REQUIREMENTS for required submittals.

C. Product Data: For each type of product.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.

D. Shop Drawings: For sheet metal flashing and trim.
   1. Detail fabrication and installation layouts, details. Distinguish between shop- and field-assembled work.
   2. Include identification of material, thickness, weight, and finish for each item and location in Project.
   3. Include details for forming, including profiles, shapes, seams, and dimensions.

4. Include details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.
5. Include details of termination points and assemblies.
6. Include details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction from fixed points.
7. Include details of roof-penetration flashing.
8. Include details of edge conditions, including eaves, ridges, valleys, rakes, crickets, and counterflashings as applicable.
9. Include details of special conditions.
10. Include details of through wall scuppers including section details, dimensions of scupper openings and height above finished roof surface, edge sealing details, interface and sealing with roof membrane system, counterflashing and exposed exterior fascia conditions.
11. Include details of connections to adjoining work.

E. Samples for Verification: For each type of exposed finish.

1.06 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator.

B. Product Certificates: For each type of coping, scupper, roof edge and flashing required to complete the roofing system. All sheet metal shall be SPRI ES-1 tested and FM approved for this project.

C. Product Test Reports: For each product, for tests performed by a qualified testing agency.

1.07 QUALITY ASSURANCE

A. Fabricator Qualifications: Employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.

B. For copings and roof edge flashings that are SPRI ES-1 tested and FM Approvals approved, shop shall be listed as able to fabricate required details as tested and approved.

C. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.

D. Perform work in accordance with SMACNA (ASMM), CDA A4050, and approved manufacturers requirements and standard details, except as otherwise indicated.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.

B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to extent necessary for period of sheet metal flashing and trim installation.

1.09 WARRANTY

A. Special Warranty on Finishes: Manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.
   1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
      a. Color fading more than 5 Hunter units when tested according to ASTM D2244.
      b. Chalking in excess of a No. 8 rating when tested according to ASTM D4214.
      c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
   2. Finish Warranty Period: 20 years from date of Substantial Completion.

B. Metal Copings, Gravel Stops, scuppers, roof edges, counterflashing, and other components incorporated or in contact with the Roofing System shall be pre-approved by and made integral to the 20-year Total Roofing System warranty specified in Division 07. Shop drawings and components shall be reviewed and approved by the Roofing manufacturer prior to submittal to the architect for approval. Submit a letter signed by a current representative of the manufacturer on Roofing manufacturer letterhead, attesting to this approval and warranty acceptability. Submit this certification letter as part of the Shop Drawing submittals for this section.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. General: Sheet metal flashing and trim assemblies shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.

B. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual" SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated or required by the approved roofing manufacturer responsible for providing the Total System Warranty for the roof system.

C. Sheet Metal Standard for Copper: Comply with CDA's "Copper in Architecture Handbook." Conform to dimensions and profiles shown unless more stringent requirements are indicated.

D. FM Approvals Listing: Manufacture and install copings, roof edge flashings that are listed in FM Approvals' "RoofNav" and approved for windstorm classification, Class 1-180 Identify materials with name of fabricator and design approved by FM Approvals.

E. SPRI Wind Design Standard: Manufacture and install Metal Copings, Gravel Stops, Scuppers, Roof edges, Counterflashing, and other components of roof metal work tested according to SPRI ES-1 and capable of resisting the required design pressure.

F. Recycled Content of Copper-Sheet Flashing and Trim: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 40 percent.

G. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
   1. Temperature Change: 120 deg F, ambient; 180 deg F, material

2.02 SHEET METALS

A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.

B. Aluminum Sheet: ASTM B209, alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required; with smooth, flat surface.
   1. Thickness: 0.040 inch minimum or as indicated on the drawings.
   2. Exposed Coil-Coated Finish:
      a. Two-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
      b. Modified Silicone Polyester Coating: Pigmented Organic Coating System, AAMA 2603; baked enamel finish system.
      c. Color: as selected by the Architect from the maunfacturer's full range of color offerings.
   3. Anodized Finishes:
      a. Clear Anodized Finish: AAMA 611 AA-M12C22A41 Class I clear anodic coating not less than 0.7 mils (0.018 mm) thick.
      b. Color Anodized Finish: AAMA 611 AA-M12C22A42/44 Class I integrally or electrolytically colored anodic coating not less than 0.7 mils (0.018 mm) thick.
   4. Color: as selected by the Architect from the maunfacturer's full range of color offerings.
   5. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with minimum total dry film thickness of 0.5 mil.

C. Stainless Steel: ASTM A666, Type 304, soft temper, 28 gage thick; smooth No. 4 finish.

2.03 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.

B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.
   1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
      a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.
      b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
   2. Fasteners for Copper Sheet: Copper, hardware bronze or passivated Series 300 stainless steel.
   3. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.

C. Solder:
   1. For Copper: ASTM B32, with maximum lead content of 0.2 percent.

D. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.

E. Elastomeric Sealant: ASTM C920, elastomeric polyurethane silicone polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

F. Butyl Sealant: ASTM C1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.

2.04 FABRICATION, GENERAL

A. General: Custom fabricate sheet metal flashing and trim to comply with details shown and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required. Fabricate sheet metal flashing and trim in shop to greatest extent possible.
   1. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
   2. Obtain field measurements for accurate fit before shop fabrication.
   3. Form sheet metal flashing and trim to fit substrates without excessive oil canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
   4. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.

B. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

C. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.
   1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.

D. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal to provide for proper installation of elastomeric sealant according to cited sheet metal standard.

E. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, non-corrosive metal.

F. Fabricate cleats and attachment devices of sizes as recommended by cited sheet metal standard and by FM Global Property Loss Prevention Data Sheet 1-49 for application, but not less than thickness of metal being secured.

G. Seams: Fabricate non-moving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.

2.05 ROOF-DRAINAGE SHEET METAL FABRICATIONS

A. Hanging Gutters: Fabricate to cross section required, complete with end pieces, outlet tubes, and other accessories as required. Fabricate in minimum 96-inch long sections. Furnish

flat-stock gutter brackets and flat-stock gutter spacers and straps fabricated from same metal as gutters, of size recommended by cited sheet metal standard but with thickness not less than twice the gutter thickness. Fabricate expansion joints, expansion-joint covers, gutter bead reinforcing bars, and gutter accessories from same metal as gutters. Shop fabricate interior and exterior corners.

1. Gutter Profile: Style A according to cited sheet metal standard and as detailed on the architectural drawings.
2. Expansion Joints: Butt type with cover plate.
3. Accessories: Continuous, removable leaf screen with sheet metal frame and hardware cloth screen.
4. Gutters with Girth up to 15 Inches: Fabricate from the following materials:
   a. Copper: 16 ounce
   b. Aluminum: 0.040 inch thick.
   c. Galvanized Steel: 24 gauge with PVDF Powder coat in color as selected by the Architect unless noted otherwise.
   d. Stainless Steel: 24 gauge
   e. Zinc: 24 gauge (0.7mm)
5. Gutters with Girth 16 to 20 Inches: Fabricate from the following materials:
   a. Copper: 20 ounce
   b. Aluminum: 0.050 inch thick.
   c. Galvanized Steel: 22 gauge with PVDF Powder coat in color as selected by the Architect unless noted otherwise.
   d. Stainless Steel: 24 gauge
   e. Zinc: 22 gauge (0.8mm)

B. Built-in Gutters: Fabricate to cross section required, with riveted and soldered joints, complete with end pieces, outlet tubes, and other special accessories as required. Fabricate in minimum 96-inch long sections. Fabricate expansion joints and accessories from same metal as gutters unless otherwise indicated.

C. Downspouts: Fabricate rectangular downspouts to dimensions indicated, complete with mitered elbows. Furnish with metal hangers from same material as downspouts and anchors .Shop fabricate elbows.
   1. Fabricated Hanger Style: Fig 1-34B according to SMACNA's "Architectural Sheet Metal Manual-Third Edition"
   2. Manufactured Hanger Style: Fig 1-34B according to SMACNA's "Architectural Sheet Metal Manual- Third Edition" or as detailed on the drawings.
   3. Fabricate from the following materials:
      a. Copper: 20 ounce
      b. Aluminum: 0.040 inch thick.
      c. Galvanized Steel: 22 gauge with PVDF Powder coat in color as selected by the Architect unless noted otherwise.
      d. Stainless Steel: 24 gauge
      e. Zinc: 24 gauge (0.7mm)

D. Conductor Heads: Fabricate conductor heads with flanged back and stiffened top edge and of dimensions and shape required, complete with outlet tubes, exterior flange trim, and built-in overflows. Fabricate from the following materials:
   1. Copper: 20 ounce
   2. Aluminum: 0.063 inch thick.
   3. Stainless Steel: 22 gauge
   4. Zinc: 20 gauge (1.0 mm)

E. Splash Pans: Fabricate to dimensions and shape required and from the following materials:
   1. Copper-Clad Stainless Steel: 0.0216 inches thick (0.8927 psf).
   2. Zinc: 20 gauge (1.0 mm)

F. Scuppers: Fabricate sheet metal scuppers in width, height and depths required by the drawings or to match existing conditions, as applicable. Materials shall be 0.050 inch thick Aluminum or 20 gauge (1.0 mm) Zinc to match and provide compatibility with adjacent metals. Fabricate in accordance with SMACNA or CDA standards in accordance with the base metal required. Construct scupper pan in one formed piece with extended drip edge, roof extension plate and side flanges for interface with roofing. Provide separate counterflashing as required by details or field conditions in compatible and matching sheet metal. Weld / solder joints to produce a watertight installation.
   1. Provide certification of the scupper design / detailing by the approved roof manufacturer stating that the scupper installation shall be acceptable the manufacturer and be included in the warranty coverage specified for the roofing system.

2.06 STEEP-SLOPE ROOF SHEET METAL FABRICATIONS

A. Apron, Step, Cricket, and Backer Flashing: Fabricate from the following materials:
   1. Copper: 16 oz./sq. ft..
   2. Aluminum: 0.040 inch thick. Finish color as selected by the Architect.
   3. Galvanized Steel: 22 gauge with PVDF Powder coat in color as selected by the Architect unless noted otherwise.
   4. Stainless Steel: 22 gauge
   5. Zinc: 22 gauge (0.8mm)

B. Valley Flashing: Fabricate from the following materials:
   1. Copper: 20 oz./sq. ft.
   2. Aluminum: 0.050 inch thick. Finish color as selected by the Architect.
   3. Galvanized Steel: 22 gauge with PVDF Powder coat in color as selected by the Architect unless noted otherwise.
   4. Stainless Steel: 22 gauge
   5. Zinc: 20 gauge (1.0 mm)

C. Drip Edges: Fabricate from the following materials:
   1. Aluminum: 0.040 inch thick. Finish color as selected by the Architect.
   2. Copper: 20 oz./sq. ft.
   3. Galvanized Steel: 22 gauge with PVDF Powder coat in color as selected by the Architect unless noted otherwise.
   4. Stainless Steel: 22 gauge
   5. Zinc: 20 gauge (1.0 mm)

D. Eave, Rake Flashing: Fabricate from the following materials:
   1. Copper: 16 oz./sq. ft.
   2. Aluminum: 0.040 inch thick. Finish color as selected by the Architect.
   3. Galvanized Steel: 22 gauge with PVDF Powder coat in color as selected by the Architect unless noted otherwise.
   4. Stainless Steel: 22 gauge
   5. Zinc: 22 gauge (0.8mm)

E. Counterflashing: Shop fabricate interior and exterior corners. Fabricate from the following materials:
   1. Copper: 16 oz./sq. ft..
   2. Aluminum: 0.040 inch thick. Finish color as selected by the Architect.
   3. Galvanized Steel: 22 gauge with PVDF Powder coat in color as selected by the Architect unless noted otherwise.
   4. Stainless Steel: 22 gauge
   5. Zinc: 22 gauge (0.8mm)

F. Flashing Receivers: Fabricate from the following materials:
   1. Copper: 16 oz./sq. ft.
   2. Aluminum: 0.032 inch thick. Finish color as selected by the Architect.
   3. Galvanized Steel: 22 gauge with PVDF Powder coat in color as selected by the Architect unless noted otherwise.
   4. Stainless Steel: 22 gauge
   5. Zinc: 22 gauge (0.8mm)

G. Roof-Penetration Flashing: Fabricate from the following materials:
   1. Copper: 16 oz./sq. ft.
   2. Aluminum: 0.050 inch thick. Finish color as selected by the Architect.
   3. Galvanized Steel: 22 gauge with PVDF Powder coat in color as selected by the Architect unless noted otherwise.
   4. Stainless Steel: 22 gauge
   5. Zinc: 22 gauge (0.8mm)

2.07 WALL SHEET METAL FABRICATIONS

A. Opening Flashings: Fabricate head, sill, jamb, and similar flashings to extend 6 inches beyond wall openings. Form head and sill flashing with 2-inch (50-mm-) high, end dams. Fabricate from the following materials:
   1. Copper: 16 oz./sq. ft.
   2. Aluminum: 0.032 inch thick. Finish color as selected by the Architect
   3. Galvanized Steel: 22 gauge with PVDF Powder coat in color as selected by the Architect unless noted otherwise.
   4. Stainless Steel: 22 gauge
   5. Zinc: 22 gauge (0.8mm)

2.08 COPINGS

A. Copings: Manufactured coping system consisting of formed-metal coping cap in section lengths not exceeding 12 feet, concealed anchorage; corner units, end cap units, and concealed splice plates with same finish as coping caps.

B. When utilized in conjunction with Low slope roof applications, all metals must be purchased through the manufacturer providing the Total System Warranty for the project and be included in the Total System warranty.

C. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   1. Metal-Era, Inc.
   2. Hickman Company, W. P.

3. Merchant & Evans, Inc
4. MM Systems Corporation.
5. Perimeter Systems; a division of Southern Aluminum Finishing Company, Inc.
6. Petersen Aluminum Corporation.

D. Coping Material: aluminum, 0.063 inch thick.
1. Finish: Three-coat fluoropolymer.
2. Color: As selected by Architect from manufacturer's full range.
3. Corners: Factory mitered and continuously welded.
4. Coping-Cap Attachment Method: Snap-on, fabricated from coping-cap material.
5. Snap-on-Coping Anchor Plates: Concealed, galvanized-steel sheet, 12 inches wide, with integral cleats.

2.09 MISCELLANEOUS FLASHINGS - COORDINATED SHEET METAL FABRICATIONS

A. Equipment Support Flashing: Fabricate from the following materials:
1. Copper: 16 oz./sq. ft.
2. Aluminum Sheet: 0.040 inch thick. Finish color as selected by the Architect.
3. Galvanized Steel: 22 gauge with PVDF Powder coat in color as selected by the Architect unless noted otherwise.
4. Stainless Steel: 0.018 (26 gauge) thick.
5. Zinc: 20 gauge (1.0 mm)

B. Overhead-Piping Safety Pans: Required where plumbing, sprinkler and/or heating piping containing liquid pass over or near electrical panels, electrical switches or other water sensitive equipment. Fabricate from the following materials:
1. Stainless Steel: 0.030 inch thick (22 gauge) thick.
2. Pans shall be a minimum of 1-1/2" deep.
3. Provide minimum one inch drain line for each four square feet of pan area.
4. Pans and drain fittings shall be watertight.
5. Suspend pans from structure above via chains or all thread and unistrut.

2.10 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical and painted 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.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, substrate, and other conditions affecting performance of the Work.
1. Verify compliance with requirements for installation tolerances of substrates.

2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
3. Verify that air- or water-resistant barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 UNDERLAYMENT INSTALLATION

A. Self-Adhering Sheet Underlayment: Install self-adhering sheet underlayment, wrinkle free. Prime substrate if recommended by underlayment manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation; use primer for installing underlayment at low temperatures. Apply in shingle fashion to shed water, with end laps of not less than 6 inches staggered 24 inches between courses. Overlap side edges not less than 3-1/2 inches. Roll laps and edges with roller. Cover underlayment within 14 days.

B. Apply slip sheet, wrinkle free, over underlayment before installing sheet metal flashing and trim.

3.03 INSTALLATION, GENERAL

A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
1. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
3. Space cleats not more than 12 inches apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
4. Install exposed sheet metal flashing and trim with limited oil canning, and free of buckling and tool marks.
5. Torch cutting of sheet metal flashing and trim is not permitted.
6. Do not use graphite pencils to mark metal surfaces.

B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.
1. Coat concealed side of sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.
2. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.

C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at maximum of 10 feet with no joints within 24 inches of corner or intersection.

D. Fasteners: Use fastener sizes that penetrate wood blocking or sheathing not less than 1-1/4 inches (32 mm) for nails and not less than 3/4 inch (19 mm) for wood screws.

E. Seal joints as required for watertight construction.

1. Use sealant-filled joints unless otherwise indicated. Embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F.
2. Prepare joints and apply sealants to comply with requirements in Section 079200 - JOINT SEALANTS.

F. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets with solder to width of 1-1/2 inches; however, reduce pre-tinning where pre-tinned surface would show in completed Work.
1. Do not solder aluminum sheet.
2. Do not use torches for soldering.
3. Heat surfaces to receive solder, and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.
4. Stainless-Steel Soldering: Tin edges of uncoated sheets, using solder for stainless steel and acid flux. Promptly remove acid flux residue from metal after tinning and soldering. Comply with solder manufacturer's recommended methods for cleaning and neutralization.

3.04 ROOF-DRAINAGE SYSTEM INSTALLATION

A. General: Install sheet metal roof-drainage items to produce complete roof-drainage system according to cited sheet metal standard unless otherwise indicated. Coordinate installation of roof perimeter flashing with installation of roof-drainage system.

B. Hanging Gutters: Join sections with riveted and soldered joints. Provide for thermal expansion. Attach gutters at eave or fascia to firmly anchor them in position. Provide end closures and seal watertight with sealant. Slope to downspouts.
1. Fasten gutter spacers to front and back of gutter.
2. Anchor and loosely lock back edge of gutter to continuous eave or apron flashing.
3. Anchor gutter with gutter brackets spaced not more than 30 inches apart to roof deck, unless otherwise indicated, and loosely lock to front gutter bead.
4. Install gutter with expansion joints at locations indicated, but not exceeding, 50 feet apart. Install expansion-joint caps.
5. Install continuous gutter screens on gutters with noncorrosive fasteners, hinged to swing open for cleaning gutters.

C. Downspouts: Join sections with 1-1/2-inch telescoping joints.
1. Provide hangers with fasteners designed to hold downspouts securely to walls. Locate hangers at top and bottom and at approximately 60 inches on center.
2. Connect downspouts to underground drainage system.

D. Conductor Heads: Anchor securely to wall, with elevation of conductor head rim at minimum of 1 inch below level of scupper discharge.

3.05 ROOF FLASHING INSTALLATION

A. General: Install sheet metal flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and cited sheet metal standard. Provide concealed fasteners where possible, and set units true to line, levels, and slopes. Install work with laps, joints, and seams that are permanently watertight and weather resistant.

B. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in FM Global Property Loss Prevention Data Sheet 1-49 for FM Approvals' listing for required windstorm classification.

C. Copings: Anchor to resist uplift and outward forces according to recommendations in FM Global Property Loss Prevention Data Sheet 1-49 for specified FM Approvals' listing for required windstorm classification.

D. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending minimum of 4 inches over base flashing. Install stainless-steel draw band and tighten.

E. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches over base flashing. Lap counterflashing joints minimum of 4 inches. Secure in waterproof manner by means of snap-in installation and sealant or lead wedges and sealant unless otherwise indicated.

F. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with elastomeric sealant and clamp flashing to pipes that penetrate roof.

3.06 WALL FLASHING INSTALLATION

A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to cited sheet metal standard unless otherwise indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.

B. Through-Wall Flashing: Installation of through-wall flashing is specified in Division 04.

C. Opening Flashings in Frame Construction: Install continuous head, sill, jamb, and similar flashings to extend 6 inches beyond wall openings.

3.07 MISCELLANEOUS FLASHING INSTALLATION

A. Equipment Support Flashing: Coordinate installation of equipment support flashing with installation of roofing and equipment. Weld or seal flashing with elastomeric sealant to equipment support member.

B. Overhead-Piping Safety Pans: Suspend pans from structure above, independent of other overhead items such as equipment, piping, and conduit, unless otherwise indicated on Contract Drawings. Slightly pitch pans towards pan drain location. Pipe and install drain line to plumbing waste or drainage system.

3.08 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.09 CLEANING AND PROTECTION

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Soldering operations: Clean and neutralize flux materials. Clean off excess solder.

C. Clean off excess sealants.

D. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions. Upon completion of sheet metal flashing and trim installations, remove unused materials and clean finished surfaces as recommended by sheet metal flashing and trim manufacturer. Maintain sheet metal flashing and trim in clean condition during construction.

E. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 076200

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Penetrations in fire-resistance-rated walls.
   2. Penetrations in horizontal assemblies.
   3. Penetrations in smoke barriers.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product specified.

B. Product Schedule: For each penetration firestopping system. Include location and design designation of qualified testing and inspecting agency.

1.04 FIELD QUALITY CONTROL

A. Section 014500 - QUALITY CONTROL: Field inspection and testing.
   1. Inspect the installed firestopping after application and curing for integrity, prior to its concealment.
   2. Ensure that actual thicknesses, densities, and bond strengths meet requirements for specified ratings.
   3. Re-inspect the installed firestopping for integrity of fire protection, after installation of subsequent work.
   4. Provide written inspection report and certification to the Architect, indicating installation meets or exceeds requirements of contract documents.

1.05 FIELD MOCK-UP

A. 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.

1.06 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Installer Certificates: From Installer indicating penetration firestopping has been installed in compliance with requirements and manufacturer's written recommendations.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for penetration firestopping.

1.07 QUALITY ASSURANCE

A. Installer Qualifications: A firm that has been approved by FM Global according to FM 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with its "Qualified Firestop Contractor Program Requirements."

B. Installer Qualifications: A firm experienced in installing penetration firestopping similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful performance. Qualifications include having the necessary experience, staff, and training to install manufacturer's products per specified requirements. Manufacturer's willingness to sell its penetration firestopping products to Contractor or to Installer engaged by Contractor does not in itself confer qualification on buyer.

C. Fire-Test-Response Characteristics: Penetration firestopping shall comply with the following requirements:
   1. Penetration firestopping tests are performed by a qualified testing agency acceptable to authorities having jurisdiction.
   2. Penetration firestopping is identical to those tested per testing standard referenced in "Penetration Firestopping" Article. Provide rated systems complying with the following requirements:
      a. Penetration firestopping products bear classification marking of qualified testing and inspecting agency.
      b. Classification markings on penetration firestopping correspond to designations listed by the following:
         1) FM Global in its "Building Materials Approval Guide."
         2) UL Fire Resistance Directory.
            (a) Firestop Devices (XHJI)
            (b) Fire Resistance ratings (BXRH)
            (c) Through Penetration Firestop Systems (XHEZ)
            (d) Fill Voids or Cavity Materials (XHHW)
            (e) Forming Materials (XHKU)

D. Preinstallation Conference: Conduct conference at Project site.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials undamaged in manufacturer's clearly labeled, unopened containers, identified with brand, type, and UL label where applicable.

B. Coordinate delivery of materials with scheduled installation date to allow minimum storage time at job-site.

C. Store materials under cover and protect from weather and damage in compliance with manufacturer's requirements.

D. Comply with recommended procedures, precautions or remedies described in material safety data sheets as applicable.

E. Do not use damaged or expired materials.

1.09 PROJECT CONDITIONS

A. Environmental Limitations: Do not install penetration firestopping when ambient or substrate temperatures are outside limits permitted by penetration firestopping manufacturers or when substrates are wet because of rain, frost, condensation, or other causes.

B. Install and cure penetration firestopping per manufacturer's written instructions using natural means of ventilation's or, where this is inadequate, forced-air circulation.

1.10 COORDINATION

A. Do not use materials that contain flammable solvents.

B. Scheduling:
   1. Schedule installation of Cast in Place firestop devices after completion of floor formwork, metal form deck, or composite deck but before placement of concrete.
   2. Schedule installation of other firestopping materials after completion of penetrating item installation but prior to covering or concealing of openings.

C. Verify existing conditions and substrates before starting work. Correct unsatisfactory conditions before proceeding.

D. Weather Conditions: Do not proceed with installation of firestop materials when temperatures exceed the manufacturer's recommended limitations for installation printed on product label and product data sheet.

E. During installation, provide masking and drop cloths to prevent firestopping materials from contaminating any adjacent surfaces.

F. Coordinate construction of openings and penetrating items to ensure that penetration firestopping is installed according to specified requirements.

G. Coordinate sizing of sleeves, openings, core-drilled holes, Cast-in place sleeves or cut openings to accommodate penetration firestopping.

H. Coordinate construction of openings and penetrating items to ensure that penetration firestopping is installed according to specified requirements.

I. Coordinate sizing of sleeves, openings, core-drilled holes, Cast-in place sleeves or cut openings to accommodate penetration firestopping.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Hilti, Inc.
   2. 3M Fire Protection Products.
   3. STI Firestop
   4. Tremco, Inc.; Tremco Fire Protection Systems Group.
   5. USG Corporation.

2.02 PENETRATION FIRESTOPPING

A. Provide penetration firestopping that is produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.

B. Penetrations in Fire-Resistance-Rated Walls: Provide penetration firestopping with ratings determined per ASTM E814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
   1. Fire-resistance-rated walls include fire walls fire-barrier walls smoke-barrier walls and fire partitions.
   2. F-Rating: Not less than the fire-resistance rating of constructions penetrated.

C. Penetrations in Horizontal Assemblies: Provide penetration firestopping with ratings determined per ASTM E814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
   1. Horizontal assemblies include floors floor/ceiling assemblies and ceiling membranes of roof/ceiling assemblies.
   2. F-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated.
   3. T-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.

D. Penetrations in Smoke Barriers: Provide penetration firestopping with ratings determined per UL 1479.
   1. L-Rating: Not exceeding 5.0 cfm/sq. ft. of penetration opening at 0.30-inch wg at both ambient and elevated temperatures.

E. W-Rating: Provide penetration firestopping showing no evidence of water leakage when tested according to UL 1479.

F. Exposed Penetration Firestopping: Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E84.

G. VOC Content: Penetration firestopping sealants and sealant primers shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
   1. Sealants: 250 g/L.
   2. Sealant Primers for Nonporous Substrates: 250 g/L.
   3. Sealant Primers for Porous Substrates: 775 g/L.

H. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping manufacturer and approved by qualified testing and inspecting agency for firestopping indicated.
   1. Permanent forming/damming/backing materials, including the following:
      a. Slag-wool-fiber or rock-wool-fiber insulation.
      b. Sealants used in combination with other forming/damming/backing materials to prevent leakage of fill materials in liquid state.
      c. Fire-rated form board.
      d. Fillers for sealants.

2. Temporary forming materials.
3. Substrate primers.
4. Collars.
5. Steel sleeves.

I. Identification Labels:
   1. Furnished by fire stopping manufacturer of suitable material for permanent field identification of through-penetration firestops.
   2. Identify the following:
      a. Warning Wording
      b. Manufacturer Name.
      c. Product Catalog number.
      d. Tested System number.
      e. F-rating.
      f. T-rating, if applicable.
      g. Firestop Contractor name.
      h. Firestop Contractor Contact Number.
      i. Firestop Inspection Date & Inspector Initials.
   3. Field fabricated labels are not acceptable.

2.03 FILL MATERIALS

A. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer metallic sleeve lined with an intumescent strip, a radial extended flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.
   1. Hilti CP 680 M or P Cast-In-Place Firestop Device
      a. Add Aerator adapter when used in conjunction with aerator ("sovent") system.
   2. Hilti CP 681 Tub Box Kit for use with tub installations.
   3. Specified Technologies Inc. CID cast-in devices.

B. Sealants, caulking materials or foams for use with non-combustible items including items including steel pipe. copper pipe, rigid steel conduit and electrical metallic tubing (EMT), the following products are acceptable:
   1. Hilti FS-ONE MAX Intumescent Firestop Sealant.
   2. Hilti CP 604 Self-leveling Firestop Sealant.
   3. Hilti CP 620 Fire Foam
   4. Hilti CP 606 Flexible Firestop Sealant
   5. Hilti CP 601s Elastomeric Firestop Sealant.

C. Sealants, caulking materials or foams for use with sheet metal ducts the following products are acceptable:
   1. Hilti FS-ONE MAX Intumescent Firestop Sealant.
   2. Hilti CP 606 Flexible Firestop Sealant
   3. Hilti CP 601s Elastomeric Firestop Sealant:

D. Firestop Joint Spray: sprayable fire-rated mastic for deck flutes and joints where greater movement is expected:
   1. Hilti Firestop Joint Spray CFS-SP-WB.

E. Mineral Wool plugs for filling steel deck flute and wall gap openings:

1. Hilti CP 777 Friction Fit sized and cut to depth for deck flute openings as recommended by the manufacturer.
2. Hilti CP 767 continuous filler strip for filling continuous gaps at top of walls.

F. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.
1. Hilti FS-ONE MAX Intumescent Firestop Sealant
2. Hilti CP 620 Fire Foam
3. Hilti CP 601s Elastomeric Firestop Sealant
4. Hilti CP 606 Flexible Firestop Sealant.

G. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced elastomeric sheet bonded to galvanized-steel sheet.

H. Intumescent Putties: Nonhardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.
1. Hilti FS-ONE MAX Intumescent Firestop Sealant
2. Hilti CP 604 Self-leveling Firestop Sealant

I. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with steel lining on one side.
1. Hilti CP 643N Firestop Collar
2. Hilti CP 644 Firestop Collar.
3. Hilti CP 645 / 648 E Wrap Strips.

J. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.
1. Acceptable materials are "BIO FIRESHIELD "Novasit K-10".

K. Pillows/Bags / Pads: Reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives. Where exposed, cover openings with steel-reinforcing wire mesh to protect pillows/bags from being easily removed.
1. Hilti CP 617 Firestop Putty Pad

L. Foams, intumescent sealants, or caulking materials for use with flexible cable or cable bundles, the following products are acceptable:
1. Hilti FS-ONE MAX High Performance Intumescent Firestop sealant
2. Hilti CP 620 Fire Foam
3. Hilti CP 601s Elastomeric Firestop Sealant.
4. Hilti CP 606 FS Flexible Firestop Sealant.

M. Sleeves: Re-penetrable cable management device for electrical and telecommunication cabling and cable bundles for use with appropriate Firestopping sealant, fill mortar, putty or other devices and materials. Concrete assemblies up to 3 hour and Gypsum Board assemblies up to 4 hour.
1. Hilti CP 653 Speed Sleeve.

N. Non-curing, re-penetrable intumescent putty or foam materials for use with flexible cable or cable bundles, the following products are acceptable:
1. Hilti CP 618 Firestop Putty Stick

2. Hilti CP 658T Firestop Plug.

O. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below:
   1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces, and nonsag formulation for openings in vertical and sloped surfaces, unless indicated firestopping limits use of nonsag grade for both opening conditions.

P. Non-curing, re-penetrable materials used for large openings and complex penetrations made to accommodate cable trays and bundles, multiple steel and copper pipes, electrical busways in raceways, the following products are acceptable.
   1. Hilti FS 657 Fire Block
   2. Hilti CP 675T Firestop Board / Brick

Q. Materials used for large openings and complex penetrations made to accommodate cable trays and bundles, multiple steel and copper pipes. electrical busways in raceways, the following products are acceptable:
   1. Hilti FS 637 Trowelable Firestop Compound.

R. Mineral Fiber Fire Safing insulation:
   1. Provide insulation as manufactured by USG INTERIORS, INC. Product "Thermafiber Safing", CAFCO INDUSTRIES LTD., FIBREX INC. or approved equal. Density shall be 4 pcf with thickness to suit condition
      a. Provide 20 gauge minimum metal plate where required for fire safing support to comply with fire ratings
      b. Do not use fibrous safing insulation unless it is in conjunction with a compatible smoke seal as specified herein.

S. Mineral Wool
   1. Loose mineral wool, rated noncombustible when tested according to ASTM E136, free of asbestos and glass fiber, and suitable for stuffing into metal deck flutes to an in place density of 6 to 12 pcf.

2.04 MIXING

A. For those products requiring mixing before application, comply with penetration firestopping manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Verification of Conditions: Examine areas and conditions under which Work is to be performed and identify conditions detrimental to proper or timely completion.

B. Surface Cleaning: Clean out openings immediately before installing penetration firestopping to comply with manufacturer's written instructions and with the following requirements:
   1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetration firestopping.
   2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping. Remove loose particles remaining from cleaning operation.
   3. Remove laitance and form-release agents from concrete.

C. Priming: Prime substrates where recommended in writing by manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

D. Masking Tape: Use masking tape to prevent penetration firestopping from contacting adjoining surfaces that will remain exposed on completion of the Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove stains. Remove tape as soon as possible without disturbing firestopping seal with substrates.

3.03 INSTALLATION

A. General: Install penetration firestopping to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.

B. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
   1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of firestopping.

C. Install fill materials for firestopping by proven techniques to produce the following results:
   1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
   2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
   3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.04 IDENTIFICATION

A. Identify penetration firestopping with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of firestopping edge so labels will be visible to anyone seeking to remove penetrating items or firestopping. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:
   1. Identify the following:
      a. "WARNING - FIRESTOP MATERIAL - DO NOT DISTURB. NOTIFY BUILDING MANAGEMENT OF ANY DAMAGE".

b. Manufacturer Name: _____.
c. Product Catalog number:_____.
d. Tested System number: _____.
e. F rating:_____.
f. T rating, if applicable.
g. Firestop Contractor name:_____.
h. Firestop Contractor Contact Number: _____.
i. Firestop Inspection Date & Initials:_____.
j. T-rating, if applicable.
k. Firestop Contractor name.
l. Firestop Contractor Contact Number.
m. Firestop Inspection Date & Inspector Initials.

3.05 CLEANING AND PROTECTION

A. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping manufacturers and that do not damage materials in which openings occur.

B. Provide final protection and maintain conditions during and after installation that ensure that penetration firestopping is without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated penetration firestopping and install new materials to produce systems complying with specified requirements.

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		
Example No. 3	CW-S-2006	Curtain Wall/Perimeter	6" to 12"	NA	NA	4 ½" Reinforced LW concrete	2 Hour	2 Hour	NA	1 CFM/ Lin Ft.	

END OF SECTION 078413

PART 1 - GENERAL

1.01 **SECTION INCLUDES**

A. Provide through penetration firestopping. The work of this section shall include, but not be limited to, the following:
   1. Provide firestopping at all openings in floors and fire rated walls and partitions to prevent the passage of fire, smoke or toxic gases and to maintain required fire ratings.
   2. Provide firestopping at all electrical, plumbing and electrical duct and pipe penetrations in floors, and fire-rated walls and partitions, to prevent the passage of fire, smoke or toxic gases.

1.02 **QUALITY ASSURANCE**

A. Qualifications: The work of this section shall be performed by a qualified and experienced installer, acceptable to the Architect/Engineer. The term "installer", as used herein shall mean a firm of established reputation; which has been trained by the manufacturer in the proper installation of fire safing material and which is regularly engaged in, and maintains a regular force of workers skilled in the installation of fire safing material of the type specified.

1.03 **REFERENCES**

A. Codes and Regulations: Comply with applicable regulations of governmental authorities having jurisdiction.

B. ASTM E119, Method for Fire Tests of Building Construction and Materials.

C. ASTM E814, Fire Tests of Through Penetration.

D. U.L. 1479, Standards for Fire Tests of Through Penetration Firestops.

E. Factory Mutual Systems.

1.04 **SUBMITTALS**

A. Shop Drawings: Shop drawings shall indicate the locations and types of the various fire safing material to be used throughout the building, and material and methods of installation of damming for the various floor, wall and ceiling construction. Details of damming shall be large scale and shall indicate material and methods of installation.

B. Product Data: Submit manufacturer's technical data and installation instructions.

C. Test Reports: Submit copies of test reports, by an independent testing laboratory, indicating that the fire safing material complies with the specified requirements.

1.05 **FIELD QUALITY CONTROL**

A. Section 014500 - Quality Control: field inspection and testing.

B. Tests for thickness and density of applied material will be performed by an independent testing agency. Where test results are unsatisfactory in sample areas, additional tests in other areas may be made. Such further testing, if required, shall be by the same testing agency but shall be paid for by the installer.

C. Independent Testing Agency will:
   1. Inspect the installed firestopping after application and curing for integrity, prior to its concealment.
   2. Ensure that actual thicknesses, densities, and bond strengths meet requirements for specified ratings.
   3. Re-inspect the installed firestopping for integrity of fire protection, after installation of subsequent work.
   4. Provide written certification to the Architect, indicating installation meets or exceeds requirements of contract documents.

1.06 **WARRANTY**

A. Provide standard manufacturer's warranty on material composition and resistance to breakdown.

PART 2 - PRODUCTS

2.01 **FIRE RESISTANT SILICONE FOAM**

A. Acceptable materials are DOW CORNING Silicone RTV Foam, Chase-Foam CTCPR-855 by CHASE TECHNOLOGY CORP., Pensil RTV 851 by GENERAL ELECTRIC, or approved equal.

B. Foam sealant shall conform to the required fire rating in accordance with the requirements of ASTM E119, with a flamespread rating of 15 in accordance with ASTM E84. Foam sealant shall also conform to UL Standard 1479: "Standards for Fire Tests of Through Penetration Firestops".

C. The foam sealant shall provide a fire resistance equal to the construction into which it is installed; in accordance with "Through Penetration Firestop Systems (XHEZ)" in the Underwriters Laboratories "Building Materials Directory".

D. Dams: Provide dams as recommended by the manufacturer, as required for proper installation and for required fire rating.

2.02 **MINERAL FIBER FIRE SAFING INSULATION**

A. Provide insulation as manufactured by USG INTERIORS, INC. Product "Thermafiber Safing", CAFCO INDUSTRIES LTD., FIBREX INC. or approved equal. Density shall be 4 pcf with thickness to suit condition.

B. Provide 20 gauge minimum metal plate where required for fire safing support to comply with fire ratings.

C. Do not use fibrous safing insulation unless it is in conjunction with a compatible smoke seal as specified herein.

2.03 **MINERAL WOOL**

A. Loose mineral wool, rated noncombustible when tested according to ASTM E136, free of asbestos and glass fiber, and suitable for stuffing into metal deck flutes to an in place density of 6 to 12 pcf.

2.04 **FIRESTOPPING SEALANT**

A. Provide a silicone firestop sealant classified for both flame and temperature ratings under ASTM E814.

B. Acceptable materials are USG INTERIORS "Smoke Seal Compound", DOW CORNING "Firestop Sealant", BIO FIRESHIELD "Biotherm", 3M "Fire-Barrier Caulk", GENERAL ELECTRIC "RTV 7403" or approved equal.

2.05 **FIRESTOPPING MORTAR**

A. Provide Portland cement/fly ash mortar with an air dried density of 50 to 55 pounds per cu.ft. Mortar shall be classified for both flame and temperature ratings under ASTM E814.

B. Acceptable materials are BIO FIRESHIELD "Novasit K-10" or approved equal.

2.06 **PREFORMED PIPE SEALS**

A. Provide preformed intumescent collars classified for both flame and temperature under ASTM E814.

B. Acceptable materials are BIO FIRESHIELD "Firestop Collars", 3M "Wrap/Strip FS 195" or approved equal.

2.07 **ACCESSORIES**

A. Provide anchorage assemblies complying with U.L. designs and other components and accessories as needed.

PART 3 - EXECUTION

3.01 **DELIVERY AND STORAGE**

A. Deliver material and products in unopened packages and containers, clearly indicating name of manufacturer and U.L. labeling. Store and handle in strict compliance with manufacturer's instructions and recommendations. Protect from damage. Protect material from freezing or overheating in accordance with manufacturer's instructions.

3.02 **INSPECTION**

A. Examine all surfaces to which the firestopping materials are to be applied, and notify the Architect/Engineer in writing of any conditions detrimental to the proper and expeditious installation of the work. Starting of work within an area shall be construed as acceptance of the conditions of that area.

B. Thoroughly clean all surfaces to receive firestopping material to eliminate mill scale, dirt, grime, oil, grease, dust, loose rust or paint, and all other foreign material.

C. Cleaning shall be accomplished just prior to application of firestopping material.

3.03 **INSTALLATION (GENERAL)**

A. Material and equipment shall be as approved by the manufacturer. Application procedures shall be in strict accordance with the manufacturer's directions and specifications. Only experienced, skilled mechanics approved by the material manufacturer shall be allowed to place the material.

B. Provide firestopping material at thicknesses as required to provide indicated ratings. Where not otherwise indicated, comply with U.L. standard designs. In multiple layer work, offset joints by at least 6 inches.

C. Anchor firestopping using manufacturer's recommended system and in compliance with U.L. standard designs.

D. Install firestopping without gaps and voids of any kind. Do not use damaged materials. Remove and replace nonfitting or disturbed work.

3.04 **MINERAL SAFING INSULATION**

A. Use mineral safing insulation at top of fire-rated partitions at underside of metal deck to provide complete fire-rated seal.

B. Mineral safing insulation must be used in conjunction with a sealant or foam firestop to ensure a continuous smoke seal.

3.05 **FIRESTOPPING SEALANT**

A. Use firestopping sealant at narrow joints at fire-rated floor and wall penetrations, and at penetrations subject to vibration or movement. Typical penetrations requiring sealant are plumbing and HVAC piping, electric conduit and ductwork.

B. Where openings are large enough, use mineral safing insulation in thicknesses required to dam the joint, and apply 1/2 inch minimum depth of sealant, or as required to achieve the rated assembly.

3.06 **FOAM-IN-PLACE FIRESTOPPING**

A. Apply foam-in-place firestopping material in depths required to meet the fire ratings indicated or required by U.L. standards. Provide clips or other approved means to contain the foam-in-place material which will enable the foam to solidly fill the areas intended. Mixing and application shall be in strict accordance with the manufacturer's written instructions.

B. Foam firestopping may be used in lieu of sealant or mortar material at the Contractor's option, provided details conform to manufacturer's recommendations for maintaining the integrity of the assembly in question.

3.07 **FIRESTOPPING MORTAR**

A. Mortar may be used to firestop all large, nonmoving openings in fire-rated assemblies, including multiple openings in floor slabs.

B. Mix mortar with clean water in accordance with the manufacturer's printed instructions. Wet all surfaces with water prior to application of mortar. Apply by hand or pump and vibrate in penetrations to prevent voids from forming.

C. Do not apply mortar if ambient or substrate temperature is below 35°F during the 24 hour period before application.

3.08 PREFORMED PIPE SEALS

A. Use preformed pipe seals for firestopping nonmetallic pipes or conduit penetrating rated assemblies. Preformed collars may be surface mounted or embedded in firestop mortar as space permits to seal PVC or ABS pipe penetrations. Size selection and installation shall be in strict accordance with manufacturer's written instructions.

3.09 FIELD QUALITY CONTROL

A. Coordinate installation of firestopping work with other work to minimize cutting and removal of installed firestopping. As work of other trades is completed, review firestopping work and repair or replace work which has been damaged or removed. Inspections will be performed to verify compliance with requirements.

3.10 CLEANING AND PROTECTION

A. Upon completion of the work, remove all unused materials from the site. Clean floors, walls and other adjacent surfaces that are stained, marred or otherwise damaged by this work. Leave all work and the adjacent areas in a clean condition.

B. Protect all completed work from damage, by methods recommended by the manufacturer of installed material.

3.11 SYSTEMS AND APPLICATION SCHEDULE

	CONSTRUCTION CONDITION	UL DESIGNATION
B.	Metal Pipe or Conduit	220, 221, 223
	1. Through Round Opening	316, 400, 425
C.	Insulated Metal Pipe	301, 310, 402, 403
	1. Through Round Opening	
D.	Metal Pipes or Conduits	399
	1. Through Large Openings	
E.	Cables Through Opening	222, 224, 307, 425
F.	Nonmetallic (Plastic) Pipe	300
	1. or Conduit through Opening	
G.	Metal Pipe or Conduit	425
	1. Through Gypsum Board Wall	
H.	Nonmetallic (Plastic) Pipe	226, 227, 228, 312

1. or Conduit Through Gypsum
2. Board Wall

I.	Cables Through Gypsum 1. Board Wall	425
J.	Mixed Penetrating Items	218, 219
K.	1. Ductwork Insulated 1. Through Gypsum Board Wall in 2. Sleeve Opening	301 227, 313
L.	1. Ductwork 1. 2 Hr Gypsum Wall	218, 219 312

3.12 PROVIDE ADDITIONAL UL DESIGNATION AS REQUIRED TO ACHIEVE FIRESTOPPING RATINGS EQUAL TO OR GREATER THAN ASSEMBLY PENETRATION.

END OF SECTION 078413

PART 1 - GENERAL

1.01 **SECTION INCLUDES**

A. Provide through penetration firestopping. The work of this section shall include, but not be limited to, the following:
   1. Provide firestopping at all openings in floors and fire rated walls and partitions to prevent the passage of fire, smoke or toxic gases and to maintain required fire ratings.
   2. Provide firestopping at all electrical, plumbing and electrical duct and pipe penetrations in floors, and fire-rated walls and partitions, to prevent the passage of fire, smoke or toxic gases.

1.02 **QUALITY ASSURANCE**

A. Qualifications: The work of this section shall be performed by a qualified and experienced installer, acceptable to the Architect/Engineer. The term "installer", as used herein shall mean a firm of established reputation; which has been trained by the manufacturer in the proper installation of fire safing material and which is regularly engaged in, and maintains a regular force of workers skilled in the installation of fire safing material of the type specified.

1.03 **REFERENCES**

A. Codes and Regulations: Comply with applicable regulations of governmental authorities having jurisdiction.

B. ASTM E119, Method for Fire Tests of Building Construction and Materials.

C. ASTM E814, Fire Tests of Through Penetration.

D. U.L. 1479, Standards for Fire Tests of Through Penetration Firestops.

E. Factory Mutual Systems.

1.04 **SUBMITTALS**

A. Shop Drawings: Shop drawings shall indicate the locations and types of the various fire safing material to be used throughout the building, and material and methods of installation of damming for the various floor, wall and ceiling construction. Details of damming shall be large scale and shall indicate material and methods of installation.

B. Product Data: Submit manufacturer's technical data and installation instructions.

C. Test Reports: Submit copies of test reports, by an independent testing laboratory, indicating that the fire safing material complies with the specified requirements.

1.05 **FIELD QUALITY CONTROL**

A. Section 014500 - Quality Control: field inspection and testing.

B. Tests for thickness and density of applied material will be performed by an independent testing agency. Where test results are unsatisfactory in sample areas, additional tests in other areas may be made. Such further testing, if required, shall be by the same testing agency but shall be paid for by the installer.

C. Independent Testing Agency will:
   1. Inspect the installed firestopping after application and curing for integrity, prior to its concealment.
   2. Ensure that actual thicknesses, densities, and bond strengths meet requirements for specified ratings.
   3. Re-inspect the installed firestopping for integrity of fire protection, after installation of subsequent work.
   4. Provide written certification to the Architect, indicating installation meets or exceeds requirements of contract documents.

1.06 **WARRANTY**

A. Provide standard manufacturer's warranty on material composition and resistance to breakdown.

PART 2 - PRODUCTS

2.01 **FIRE RESISTANT SILICONE FOAM**

A. Acceptable materials are DOW CORNING Silicone RTV Foam, Chase-Foam CTCPR-855 by CHASE TECHNOLOGY CORP., Pensil RTV 851 by GENERAL ELECTRIC, or approved equal.

B. Foam sealant shall conform to the required fire rating in accordance with the requirements of ASTM E119, with a flamespread rating of 15 in accordance with ASTM E84. Foam sealant shall also conform to UL Standard 1479: "Standards for Fire Tests of Through Penetration Firestops".

C. The foam sealant shall provide a fire resistance equal to the construction into which it is installed; in accordance with "Through Penetration Firestop Systems (XHEZ)" in the Underwriters Laboratories "Building Materials Directory".

D. Dams: Provide dams as recommended by the manufacturer, as required for proper installation and for required fire rating.

2.02 **MINERAL FIBER FIRE SAFING INSULATION**

A. Provide insulation as manufactured by USG INTERIORS, INC. Product "Thermafiber Safing", CAFCO INDUSTRIES LTD., FIBREX INC. or approved equal. Density shall be 4 pcf with thickness to suit condition.

B. Provide 20 gauge minimum metal plate where required for fire safing support to comply with fire ratings.

C. Do not use fibrous safing insulation unless it is in conjunction with a compatible smoke seal as specified herein.

2.03 **MINERAL WOOL**

A. Loose mineral wool, rated noncombustible when tested according to ASTM E136, free of asbestos and glass fiber, and suitable for stuffing into metal deck flutes to an in place density of 6 to 12 pcf.

2.04 **FIRESTOPPING SEALANT**

A. Provide a silicone firestop sealant classified for both flame and temperature ratings under ASTM E814.

B. Acceptable materials are USG INTERIORS "Smoke Seal Compound", DOW CORNING "Firestop Sealant", BIO FIRESHIELD "Biotherm", 3M "Fire-Barrier Caulk", GENERAL ELECTRIC "RTV 7403" or approved equal.

2.05 **FIRESTOPPING MORTAR**

A. Provide Portland cement/fly ash mortar with an air dried density of 50 to 55 pounds per cu.ft. Mortar shall be classified for both flame and temperature ratings under ASTM E814.

B. Acceptable materials are BIO FIRESHIELD "Novasit K-10" or approved equal.

2.06 **PREFORMED PIPE SEALS**

A. Provide preformed intumescent collars classified for both flame and temperature under ASTM E814.

B. Acceptable materials are BIO FIRESHIELD "Firestop Collars", 3M "Wrap/Strip FS 195" or approved equal.

2.07 **ACCESSORIES**

A. Provide anchorage assemblies complying with U.L. designs and other components and accessories as needed.

PART 3 - EXECUTION

3.01 **DELIVERY AND STORAGE**

A. Deliver material and products in unopened packages and containers, clearly indicating name of manufacturer and U.L. labeling. Store and handle in strict compliance with manufacturer's instructions and recommendations. Protect from damage. Protect material from freezing or overheating in accordance with manufacturer's instructions.

3.02 **INSPECTION**

A. Examine all surfaces to which the firestopping materials are to be applied, and notify the Architect/Engineer in writing of any conditions detrimental to the proper and expeditious installation of the work. Starting of work within an area shall be construed as acceptance of the conditions of that area.

B. Thoroughly clean all surfaces to receive firestopping material to eliminate mill scale, dirt, grime, oil, grease, dust, loose rust or paint, and all other foreign material.

C. Cleaning shall be accomplished just prior to application of firestopping material.

3.03 **INSTALLATION (GENERAL)**

A. Material and equipment shall be as approved by the manufacturer. Application procedures shall be in strict accordance with the manufacturer's directions and specifications. Only experienced, skilled mechanics approved by the material manufacturer shall be allowed to place the material.

B. Provide firestopping material at thicknesses as required to provide indicated ratings. Where not otherwise indicated, comply with U.L. standard designs. In multiple layer work, offset joints by at least 6 inches.

C. Anchor firestopping using manufacturer's recommended system and in compliance with U.L. standard designs.

D. Install firestopping without gaps and voids of any kind. Do not use damaged materials. Remove and replace nonfitting or disturbed work.

3.04 **MINERAL SAFING INSULATION**

A. Use mineral safing insulation at top of fire-rated partitions at underside of metal deck to provide complete fire-rated seal.

B. Mineral safing insulation must be used in conjunction with a sealant or foam firestop to ensure a continuous smoke seal.

3.05 **FIRESTOPPING SEALANT**

A. Use firestopping sealant at narrow joints at fire-rated floor and wall penetrations, and at penetrations subject to vibration or movement. Typical penetrations requiring sealant are plumbing and HVAC piping, electric conduit and ductwork.

B. Where openings are large enough, use mineral safing insulation in thicknesses required to dam the joint, and apply 1/2 inch minimum depth of sealant, or as required to achieve the rated assembly.

3.06 **FOAM-IN-PLACE FIRESTOPPING**

A. Apply foam-in-place firestopping material in depths required to meet the fire ratings indicated or required by U.L. standards. Provide clips or other approved means to contain the foam-in-place material which will enable the foam to solidly fill the areas intended. Mixing and application shall be in strict accordance with the manufacturer's written instructions.

B. Foam firestopping may be used in lieu of sealant or mortar material at the Contractor's option, provided details conform to manufacturer's recommendations for maintaining the integrity of the assembly in question.

3.07 **FIRESTOPPING MORTAR**

A. Mortar may be used to firestop all large, nonmoving openings in fire-rated assemblies, including multiple openings in floor slabs.

B. Mix mortar with clean water in accordance with the manufacturer's printed instructions. Wet all surfaces with water prior to application of mortar. Apply by hand or pump and vibrate in penetrations to prevent voids from forming.

C. Do not apply mortar if ambient or substrate temperature is below 35°F during the 24 hour period before application.

3.08 PREFORMED PIPE SEALS

A. Use preformed pipe seals for firestopping nonmetallic pipes or conduit penetrating rated assemblies. Preformed collars may be surface mounted or embedded in firestop mortar as space permits to seal PVC or ABS pipe penetrations. Size selection and installation shall be in strict accordance with manufacturer's written instructions.

3.09 FIELD QUALITY CONTROL

A. Coordinate installation of firestopping work with other work to minimize cutting and removal of installed firestopping. As work of other trades is completed, review firestopping work and repair or replace work which has been damaged or removed. Inspections will be performed to verify compliance with requirements.

3.10 CLEANING AND PROTECTION

A. Upon completion of the work, remove all unused materials from the site. Clean floors, walls and other adjacent surfaces that are stained, marred or otherwise damaged by this work. Leave all work and the adjacent areas in a clean condition.

B. Protect all completed work from damage, by methods recommended by the manufacturer of installed material.

3.11 SYSTEMS AND APPLICATION SCHEDULE

	CONSTRUCTION CONDITION	UL DESIGNATION
B.	Metal Pipe or Conduit	220, 221, 223
	1. Through Round Opening	316, 400, 425
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	1. Through Round Opening	
D.	Metal Pipes or Conduits	399
	1. Through Large Openings	
E.	Cables Through Opening	222, 224, 307, 425
F.	Nonmetallic (Plastic) Pipe	300
	1. or Conduit through Opening	
G.	Metal Pipe or Conduit	425
	1. Through Gypsum Board Wall	
H.	Nonmetallic (Plastic) Pipe	226, 227, 228, 312

1. or Conduit Through Gypsum
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3.12 PROVIDE ADDITIONAL UL DESIGNATION AS REQUIRED TO ACHIEVE FIRESTOPPING RATINGS EQUAL TO OR GREATER THAN ASSEMBLY PENETRATION.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Silicone joint sealants.
   2. Polyurethane joint sealants.
   3. Latex joint sealants.
   4. Preformed joint sealants.
   5. Acoustical joint sealants.

1.03 PRECONSTRUCTION TESTING

A. Preconstruction Compatibility and Adhesion Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.
   1. Use ASTM C1087 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
   2. Samples for Verification: For each type of sealant submit a color sample board and one sample joint, 1/2" wide by 6" long including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.
   3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
   4. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures including use of specially formulated primers.
   5. Testing will not be required if joint-sealant manufacturers submit joint preparation data that are based on previous testing, not older than 24 months, of sealant products for adhesion to, and compatibility with, joint substrates and other materials matching those submitted.

1.04 ACTION SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

B. 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.

C. Joint-Sealant Schedule: Include the following information:
   1. Joint-sealant application, joint location, and designation.
   2. Joint-sealant manufacturer and product name.
   3. Joint-sealant formulation.
   4. Joint-sealant color.

1.05 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer and testing agency.

B. Product Certificates: For each kind of joint sealant and accessory, from manufacturer.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that sealants comply with requirements.

D. Preconstruction Compatibility and Adhesion 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 needed for adhesion.

E. Warranties: Sample of special warranties.

1.06 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project with a minimum of three-years experience in the installation of the work of this section.

B. Source Limitations: Obtain each kind of joint sealant from single source from single manufacturer.

C. Product Testing: Test joint sealants using a qualified testing agency.
   1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C1021 to conduct the testing indicated.
   2. Test according to SWRI's Sealant Validation Program for compliance with requirements specified by reference to ASTM C920 for adhesion and cohesion under cyclic movement, adhesion-in-peel, and indentation hardness.

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.

1.07 PROJECT CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:
   1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 degrees F.
   2. When joint substrates are wet.
   3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
   4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.08 WARRANTY

A. Special Installer's Warranty: Manufacturer's standard form in which 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's standard form in which joint-sealant manufacturer agrees to furnish joint sealants to repair or replace those 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.

C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:
   1. Movement of the structure caused by structural settlement or errors attributable to design or construction resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
   2. Disintegration of joint substrates from natural 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.

PART 2 - PRODUCTS

2.01 MATERIALS, 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. VOC Content of Interior Sealants: Sealants and sealant primers used inside the weatherproofing system shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
   1. Architectural Sealants: 250 g/L.
   2. Sealant Primers for Nonporous Substrates: 250 g/L.
   3. Sealant Primers for Porous Substrates: 775 g/L.

C. Liquid-Applied Joint Sealants: Comply with ASTM C920 and other requirements indicated for each liquid-applied joint sealant specified, including those referencing ASTM C920 classifications for type, grade, class, and uses related to exposure and joint substrates.
   1. Suitability for Immersion in Liquids. Where sealants are indicated for Use I for joints that will be continuously immersed in liquids, provide products that have undergone testing according to ASTM C 1247. Liquid used for testing sealants is deionized water, unless otherwise indicated.

D. Stain-Test-Response Characteristics: Where sealants are specified to be non-staining to porous substrates, provide products that have undergone testing according to ASTM C1248 and have not stained porous joint substrates indicated for Project.

E. Suitability for Contact with Food: Where sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.

F. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full color range.

2.02 SILICONE JOINT SEALANTS

A. Single-Component, Non-sag, Neutral-Curing Silicone Joint Sealant: ASTM C920, Type S, Grade NS, Class 100/50, for Use NT.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   a. Dow Corning Corporation; 790.
   b. Pecora Corporation; 301 NS
   c. Sika Corporation, Construction Products Division; SikaSil-WS 290
   d. Tremco Incorporated; Spectrem 1.

B. Single-Component, Non-sag, Traffic-Grade, Neutral-Curing Silicone Joint Sealant: ASTM C920, Type S, Grade NS, Class 100/50, for Use T.
   1. Products: Subject to compliance with requirements, provide the following:
      a. Pecora Corporation; 311 NS.
      b. Tremco Incorporated; Spectrem 800.

C. Single-Component, Pourable, Traffic-Grade, Neutral-Curing Silicone Joint Sealant: ASTM C920, Type S, Grade P, Class 100/50, for Use T.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Dow Corning Corporation; 890-SL.
      b. Pecora Corporation; 310 SL.
      c. Tremco Incorporated; Spectrem 900 SL.

D. Mildew-Resistant, Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C920, Type S, Grade NS, Class 25, for Use NT.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Tremco Incorporated: Tremsil 200.
      b. Pecora Corporation; 898.
      c. Or Approved Equal.

2.03 POLYURETHANE JOINT SEALANTS

A. Single-Component, Non-sag, Polyurethane Joint Sealant: ASTM C920, Type S, Grade NS, Class 100/50, for Use NT.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Sika Corporation, Construction Products Division; Sikaflex - 15LM.
      b. Tremco Incorporated; Dymonic 100.
      c. Or approved Equal.

B. Single-Component, Nonsag, Traffic-Grade, Polyurethane Joint Sealant: ASTM C920. Type S, Grade NS, Class 25, for Use T.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. BASF Building Systems; Masterseal NP1.
      b. Sika Corporation, Construction Products Division; Sikaflex - 1a.
      c. Tremco Incorporated; Vulkem 116, Dymonic FC.

C. Single-Component, Pourable, Traffic-Grade, Polyurethane Joint Sealant: ASTM C920, Type S, Grade P, Class 25, for 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. BASF Building Systems; MasterSeal SL 1.
      b. Pecora Corporation; Urexpan NR-201.
      c. Sherwin-Williams Company, Loxon SL1 Self-Leveling.
      d. Sika Corporation. Construction Products Division; Sikaflex - 1CSL.
      e. Tremco Incorporated; Vulkem 45.

D. Immersible Multicomponent, Nonsag, Traffic-Grade, Polyurethane Joint Sealant: ASTM C920, Type M, Grade NS, Class 25, for Uses T and I.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. BASF Building Systems; MasterSeal NP 2.
      b. Pecora Corporation; Dynatred.
      c. Tremco Incorporated; THC 901.

2.04 LATEX JOINT SEALANTS

A. Latex Joint Sealant: Acrylic latex or siliconized acrylic latex, ASTM C834, Type OP, Grade NF.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. BASF Building Systems; Sonolac.
      b. Bostik, Inc.; Chem-Calk 600.
      c. Pecora Corporation; AC-20+.
      d. Tremco Incorporated; Tremflex 834.
      e. Sherwin Williams Company (SherMax Urethanized Elastomeric Sealant).

2.05 PREFORMED JOINT SEALANTS

A. Preformed Foam Joint Sealant: Manufacturer's standard preformed, precompressed, open-cell foam sealant manufactured from Polyurethane foam with minimum density of 10 lb/cu. ft. (160 kg/cu. m) and impregnated with a nondrying, water-repellent agent. Factory produce in precompressed sizes in roll or stick form to fit joint widths indicated; coated on one side with a pressure-sensitive adhesive and covered with protective wrapping.
   1. Products: Subject to compliance with requirements, provide the following:
      a. Tremco Incorporated; Spectrum SimpleSeal.
      b. Tremco Incorporated; Illmod 600
      c. Dayton Superior Specialty Chemicals; Polytite Standard.
      d. Sandell Manufacturing Co., Inc.; Polyseal.

2.06 ACOUSTICAL JOINT SEALANTS

A. Acoustical Joint Sealant: Manufacturer's standard non-sag, paintable, non-staining latex sealant complying with ASTM C834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E90.
   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; AC-20 FTR.
      b. Sherwin-Williams Company, Sher-Max Urethanized Elastomeric Sealant
      c. Tremco Incorporated; Tremflex 834, Acoustical/Curtain Wall Sealant
      d. USG Corporation; SHEETROCK Acoustical Sealant.

2.07 JOINT SEALANT BACKING

A. General: Provide sealant backings of material that are non-staining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C1330, Type C (closed-cell material with a surface skin) 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.

C. 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.

2.08 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.

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: Non-staining, non-absorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.01 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 joint-sealant performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 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.
      b. Masonry.
      c. Unglazed surfaces of ceramic tile.
   3. Remove laitance and form-release agents from concrete.

4. 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. Metal.
   b. 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.

3.03 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.
   4. Provide flush joint profile where indicated per Figure 8B in ASTM C1193.
   5. Provide recessed joint configuration of recess depth and at locations indicated per Figure 8C in ASTM C1193.

a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

G. Acoustical Sealant Installation: At sound-rated assemblies and elsewhere as indicated, seal construction at perimeters, behind control joints, and at openings and penetrations and at perimeters of acoustical Panel edge channels of Acoustical Panel Ceiling systems. with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C919 and with manufacturer's written recommendations.

3.04 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 1 test for each 500 feet of joint length thereafter or 1 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 passes 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 fill, 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.

3.05 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.

3.06 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 and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.07 JOINT-SEALANT SCHEDULE

A. Joint-Sealant Application: Exterior joints in horizontal traffic surfaces.
   1. Joint Locations:
      a. Control and expansion joints in paver and pavement installations.
      b. Isolation and contraction joints in cast-in-place concrete slabs.
      c. Tile control and expansion joints.
   2. Silicone Joint Sealant: Single component, non-sag, traffic grade, neutral curing.
   3. Polyurethane Joint Sealant: Single component, non-sag, traffic grade Single component, pourable, traffic grade.
   4. Preformed Joint Sealant: Preformed foam sealant.
   5. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

B. Joint-Sealant Application: Exterior joints in horizontal traffic surfaces subject to water immersion.
   1. Joint Locations:
      a. Joints in pedestrian plazas.
   2. Polyurethane Joint Sealant: Immersible, multicomponent, non-sag, traffic grade.
   3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

C. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal non-traffic surfaces.
   1. Joint Locations:
      a. Construction joints in cast-in-place concrete.
      b. Control and expansion joints in unit masonry.
      c. Joints in dimension stone cladding.
      d. Joints between metal panels.
      e. Joints between different materials listed above.
      f. Perimeter joints between materials listed above and frames of doors windows and louvers.
      g. Control and expansion joints in ceilings and other overhead surfaces.
   2. Silicone Joint Sealant: Single component, non-sag, neutral curing, Class 100/50.
   3. Polyurethane Joint Sealant: Single component, non-sag, Class 100/50.
   4. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

D. Joint-Sealant Application: Interior joints in horizontal traffic surfaces.
   1. Joint Locations:
      a. Isolation joints in cast-in-place concrete slabs.
      b. Control and expansion joints in tile flooring.
   2. Polyurethane Joint Sealant: Single component, non-sag, traffic grade.
   3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

E. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal non-traffic surfaces.
   1. Joint Locations:
      a. Perimeter joints of exterior openings where indicated.
      b. Tile control and expansion joints.
      c. Vertical joints on exposed surfaces of walls and partitions.
      d. Perimeter joints between interior wall surfaces and frames of interior doors windows and elevator entrances.
   2. Joint Sealant: Latex Acrylic based.

3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

F. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal non-traffic surfaces.
   1. Joint Sealant Location:
      a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
      b. Tile control and expansion joints where indicated.
   2. Joint Sealant: Mildew resistant, single component, non-sag, neutral curing, Silicone.
   3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

G. Joint-Sealant Application: Interior acoustical joints in vertical surfaces and horizontal non-traffic surfaces.
   1. Joint Location:
      a. Acoustical joints where indicated.
      b. Other joints as indicated.
   2. Joint Sealant: Acoustical joint sealant.

3.08 SEALANT INSTALLATION LOG

A. A tabular log of all sealant installations on the project shall be be keep and submitted with the O & M manuals at the completion of the project.

B. Tabular log shall have columns for:
   1. Sealant type
   2. Sealant installation location
   3. Temperature during installation
   4. Date of Installation
   5. Manufacturer
   6. Sealant color installed.

END OF SECTION 079200

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fire-rated hollow metal frames for non-hollow metal doors.

1.02 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

B. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors; 2018.

C. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100); 2017.

D. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 2020.

E. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.

F. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable; 2018.

G. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2018a.

H. ASTM C476 - Standard Specification for Grout for Masonry; 2016.

I. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete; 2015a.

J. BHMA A156.115 - Hardware Preparation in Steel Doors and Steel Frames; 2016.

K. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

L. ITS (DIR) - Directory of Listed Products; current edition.

M. NAAMM HMMA 830 - Hardware Selection for Hollow Metal Doors and Frames; 2002.

N. NAAMM HMMA 831 - Hardware Locations for Hollow Metal Doors and Frames; 2011.

O. NAAMM HMMA 840 - Guide Specifications For Receipt, Storage and Installation of Hollow Metal Doors and Frames; 2017.

P. NFPA 80 -Standard for Fire Doors and Other Opening Protectives; 2013

Q. NFPA 105 - Standard for Smoke Door Assemblies and Other Opening Protectives; 2022.

R. UL (DIR) - Online Certifications Directory; Current Edition.

S. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; 2009

T. UL 1784 - Standard for Air Leakage Tests of Door Assemblies; Current Edition, Including All Revisions.

1.03 SUBMITTALS

A. See Section 013300 - SUBMITTALS for submittal procedures.

B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes; and one copy of referenced grade standard.

C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and identifying location of different finishes, if any.

D. Installation Instructions: Manufacturer's published instructions, including any special installation instructions relating to this project.

E. Manufacturer's Certificate: Certification that products meet or exceed specified requirements.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years of documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store in accordance with applicable requirements and in compliance with standards and/or custom guidelines as indicated.

B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Hollow Metal Frames with Integral Casings:
1. Ceco Door, an Assa Abloy Group company: www.assaabloydss.com.
2. Republic Doors: www.republicdoor.com.
3. Steelcraft, an Allegion brand: www.allegion.com/sle.
4. Or approved equal.

2.02 PERFORMANCE REQUIREMENTS

A. Refer to Door and Frame Schedule on the drawings for frame sizes, fire ratings, sound ratings, finishing, door hardware to be installed, and other variations, if any.

B. Door Frame Type: Provide hollow metal door frames with integral casings.

C. Steel used for fabrication of frames shall comply with one or more of the following requirements; Galvannealed steel conforming to ASTM A653/A653M, cold-rolled steel conforming to ASTM A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel conforming to ASTM A1011/A1011M, Commercial Steel (CS) Type B for each.

D. Accessibility: Comply with ICC A117.1 and ADA Standards.

E. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with the specified requirements for each type; for instance, an exterior frame that is also indicated as being sound-rated must comply with the requirements specified for exterior frames and for sound-rated frames; where two requirements conflict, comply with the most stringent.

F. Hardware Preparations, Selections and Locations: Comply with BHMA A156.115, NAAMM HMMA 830 and NAAMM HMMA 831 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.

G. Provide mortar guard boxes for hardware cut-outs in frames to be installed in masonry or to be grouted.

H. Frames for Interior Glazing or Borrowed Lites: Construction and face dimensions to match door frames, and as indicated on drawings.

I. Frames in Masonry Walls: Size to suit masonry coursing with head member 4 inch high (102 mm) to fill opening without cutting masonry units.

2.03 HOLLOW METAL DOOR FRAMES WITH INTEGRAL CASINGS

A. Fire-Rated Door Frames:
   1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
      a. Level 3 - Extra Heavy-duty.
      b. Physical Performance Level A, 1,000,000 cycles; in accordance with ANSI/SDI A250.4.
      c. Frame Metal Thickness: 16 gauge, 0.053 inch (1.3 mm), minimum.
   2. Fire Rating: As indicated on Door and Frame Schedule, tested in accordance with UL 10C or NFPA 252 ("positive pressure fire tests").
   3. Provide units listed and labeled by ITS (DIR) or UL (DIR).
      a. Attach fire rating label to each fire rated unit.
   4. Smoke- and Draft- Control Doors (Indicated with letter "S" on Drawings and/or Door Schedule): Self-closing or automatic closing framed doors in accordance with NFPA 80 and NFPA 105, with fire-resistance-rated wall construction rated the same or greater than the fire-rated doors, and the following;
      a. Maximum Air Leakage: 3.0 cfm/sq ft (0.02 cu m/sec/sq m) of framed door opening at 0.10 inch w.g. (24.9 Pa) pressure, when tested in accordance with UL 1784 at both ambient and elevated temperatures.
      b. Gasketing: Provide gasketing or edge sealing as necessary to achieve leakage limit.
      c. Label: Include the "S" label on fire-rating label of door.
   5. Frame Finish: Factory finished.

2.04 ACCESSORIES

A. Silencers: Resilient rubber, fitted into drilled hole; 3 on strike side of single door, 3 on center mullion of pairs, and 2 on head of pairs without center mullions.

B. Grout for Frames: Mortar grout complying with ASTM C476 with maximum slump of 4 inches (102 mm) as measured in accordance with ASTM C143/C143M for hand troweling in place; plaster grout and thinner pumpable grout are prohibited.

C. Temporary Frame Spreaders: Provide for factory- or shop-assembled frames.

2.05 FINISHES

A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.

B. Bituminous Coating: Asphalt emulsion or other high-build, water-resistant, resilient coating.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

C. Verify that finished walls are in plane to ensure proper door alignment.

3.02 PREPARATION

A. Coat inside of frames to be installed in masonry or to be grouted, with bituminous coating, prior to installation.

B. Coat inside of frames with bituminous coating to a thickness of 1/16 inch.

3.03 INSTALLATION

A. Install frames in accordance with manufacturer's instructions and related requirements of specified frame standards or custom guidelines indicated.

B. Install prefinished frames after painting and wall finishes are complete.

C. Install fire rated units in accordance with NFPA 80.

D. Coordinate frame anchor placement with wall construction.

E. Grout frames in masonry construction, using hand trowel methods; brace frames so that pressure of grout before setting will not deform frames.

F. Coordinate installation of hardware.

G. Coordinate installation of electrical connections to electrical hardware items.

H. Touch up damaged factory finishes.

3.04 TOLERANCES

A. Clearances Between Door and Frame: Comply with related requirements of specified frame standards or custom guidelines indicated.

B. Maximum Diagonal Distortion: 1/16 inch (1.6 mm) measured with straight edges, crossed corner to corner.

3.05 SCHEDULE

A. Refer to Door and Frame Schedule on the drawings.

END OF SECTION 081213

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Solid-core doors with wood-veneer faces.
   2. Factory finishing flush wood doors.
   3. Factory fitting flush wood doors to frames and factory machining for hardware.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of door. Include details of core and edge construction, louvers, and trim for openings. Include factory-finishing specifications.

B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; and the following:
   1. Dimensions and locations of blocking.
   2. Dimensions and locations of mortises and holes for hardware.
   3. Dimensions and locations of cutouts.
   4. Undercuts.
   5. Requirements for veneer matching.
   6. Doors to be factory finished and finish requirements.
   7. Fire-protection ratings for fire-rated doors.

C. Samples for Verification:
   1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches, for each material and finish.
   2. Louver blade and frame sections, 6 inches long, for each material and finish specified.
   3. Frames for light openings, 6 inches long, for each material, type, and finish required.

1.04 INFORMATIONAL SUBMITTALS

A. Sample Warranty: For special warranty.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body and is a certified participant in AWI's Quality Certification Program.

B. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification body.

C. Fire Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing at positive pressure according to NFPA 252 (neutral pressure at 40” above sill) or UL 10C.

1. Oversize Fire Rated Door Assemblies: For units exceeding sizes of tested assemblies provide manufacturer's construction label, indicating compliance to independent 3rd party certification agency's procedure, except for size.
2. Temperature Rise Limit: Where required and at vertical exit enclosures (stairwell openings) and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F (250 deg C) above ambient after 30 minutes of standard fire test exposure.

D. Smoke Control Door Assemblies: Comply with NFPA 105.
1. Smoke "S" Label: Doors to bear "S" label, and include smoke and draft control gasketing applied to frame and on meeting stiles of pair doors.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of referenced standard and manufacturer's written instructions.

B. Package doors individually in cardboard cartons and wrap bundles of doors in plastic sheeting.

C. Mark each door on top and bottom rail with opening number used on Shop Drawings.

1.07 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during remainder of construction period.

B. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity between 43 and 70 percent during remainder of construction period.

1.08 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.
1. Failures include, but are not limited to, the following:
a. Warping (bow, cup, or twist) more than 1/4 inch in a 42 by 84-inch section.
b. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3 inch span.
2. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
3. Warranty Period for Solid-Core Interior Doors: Life of installation.
4. Warranty Period for Hollow-Core Interior Doors: Two year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:
1. VT Industries, Inc.; Heritage Series
2. Masonite Architectural.

3. Or approved equal.

B. Source Limitations: Obtain flush wood doors indicated to be blueprint matched with paneling from single manufacturer.

2.02 FLUSH WOOD DOORS, GENERAL

A. Quality Standard: In addition to requirements specified, comply with AWI's, AWMAC's, and WI's "Architectural Woodwork Standards WDMA I.S. 1A, "Architectural Wood Flush Doors."
   1. Provide AWI Quality Certification Labels indicating that doors comply with requirements of grades specified.
   2. Contract Documents contain selections chosen from options in quality standard and additional requirements beyond those of quality standard. Comply with those selections and requirements in addition to quality standard.

B. ICC A117.1 - Accessible and Usable Buildings and Facilities.

C. WDMA I.S. 1A Performance Grade: Heavy Duty and Extra Heavy Duty as specified.

D. WDMA I.S. 1A Performance Grade:
   1. Heavy Duty unless otherwise indicated.
   2. Extra Heavy Duty: public toilets, janitor's closets and assembly spaces.
   3. Standard Duty: Closets (not including janitor's closets) .

E. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are 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.
   1. Temperature-Rise Limit: Where indicated, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F above ambient after 30 minutes of standard fire-test exposure.
   2. Cores: Provide stave lumber core or mineral core as needed to provide fire-protection and positive pressure rating indicated.
   3. Pairs: Provide fire-retardant stiles that are listed and labeled for applications indicated without formed-steel edges and astragals. Provide stiles with concealed intumescent seals. Comply with specified requirements for exposed edges.
   4. Electronic Barcode: “VTsmartdoor” barcode technology.
      a. Location: Fire label, hinge stile of doors.
      b. Provide fire-rated door assembly information required for Owner’s annual fire-door inspection in accordance with NFPA 820, Paragraph 5.2.1.

F. Mineral-Core Doors:
   1. Core: Noncombustible mineral product complying with requirements of referenced quality standard and testing and inspecting agency for fire-protection rating indicated.
   2. Blocking: Provide composite blocking with improved screw-holding capability approved for use in doors of fire-protection ratings indicated as needed to eliminate through-bolting hardware.
      a. 5-inch top-rail blocking (HB-1).
      b. 5-inch bottom-rail blocking, in doors indicated to have protection plates (HB-2).
      c. 5-inch midrail blocking, in doors indicated to have armor plates (HB-6).
      d. 5-inch midrail blocking, in doors indicated to have exit devices (HB-6).

3. Edge Construction: At hinge stiles, provide laminated-edge construction with improved screw-holding capability and split resistance. Comply with specified requirements for exposed edges (HB-7).
    a. Screw-Holding Capability: 550 lbf per WDMA TM-10.

2.03 VENEER-FACED DOORS FOR TRANSPARENT FINISH

A. Interior Solid-Core Doors:
1. Grade: Premium with Grade A faces.
2. Species: Select White Maple.
3. Cut: Rift Cut.
4. Match between Veneer Leaves: Slip match.
5. Assembly of Veneer Leaves on Door Faces: Center-balance match.
6. Pair and Set Match: Provide for doors hung in same opening.
7. Room Match: Provide door faces of compatible color and grain within each separate room or area of building.
8. Blueprint Match: Where indicated, provide doors with faces produced from same flitches as adjacent wood paneling and arranged to provide blueprint match with wood paneling. Comply with requirements in Section 064216 "Flush Wood Paneling."
9. Exposed Vertical and Top Edges: Same species as faces - edge Type A.
10. Core: Either glued wood stave lumber core or structural composite lumber.
11. Construction: Five or seven plies. Stiles and rails are bonded to core, then entire unit is abrasive planed before veneering. Faces are bonded to core using a hot press.
12. WDMA I.S. 1A Performance Grade: Extra Heavy Duty.

2.04 FABRICATION

A. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.
1. Comply with NFPA 80 requirements for fire-rated doors.

B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, BHMA A156.115W, and hardware templates.
1. Metal Astragals: Factory machine astragals and formed-steel edges for hardware for pairs of fire-rated doors.

C. Transom and Side Panels: Fabricate matching panels with same construction, exposed surfaces, and finish as specified for associated doors. Finish bottom edges of transoms and top edges of rabbeted doors same as door stiles.
1. Fabricate door and transom panels with full-width, solid-lumber, rabbeted, meeting rails. Provide factory-installed spring bolts for concealed attachment into jambs of metal door frames.

D. Openings: Factory cut and trim openings through doors.
1. Light Openings: Trim openings with moldings of material and profile indicated.
2. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Section 088000 - CONCRETE UNIT MASONRY.
3. Louvers: Factory install louvers in prepared openings.

2.05 FINISHES -WOOD VENEER DOORS

A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.
   1. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on top and bottom edges, edges of cutouts, and mortises.

B. Factory finish doors.

C. Factory finish doors that are indicated to receive transparent finish.

D. Factory finish doors where indicated in schedules or on Drawings as factory finished.

E. Transparent Finish:
   1. Grade: Premium.
   2. Finish: AWI's, AWMAC's, and WI's "Architectural Woodwork Standards" System 10. UV Curable, Water Based.
   3. Finish: WDMA TR-6/OP-6 (Extra Heavy-Duty) catalyzed polyurethane and TR-8, UV cured urethane (Premium Grade).
   4. Staining: As selected by Architect from manufacturer's full range.
   5. Sealer: minimum 3 coats.
   6. Sanding: Sand.
   7. Topcoat: 2 coats.
   8. Effect: Semi-filled finish, produced by applying an additional finish coat to partially fill the wood pores or as selected by the architect.
   9. Sheen: Semi-gloss.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine doors and installed door frames, with Installer present, before hanging doors.
   1. Verify that installed frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
   2. Reject doors with defects.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Hardware: See Section 087100 - PRE-APPLIED SHEET MEMBRANE WATERPROOFING.

B. Installation Instructions: Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.
   1. Install fire-rated doors according to NFPA 80.

C. Job-Fitted Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors. Machine doors for hardware. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.

1. Clearances: Provide 1/8 inch at heads, jambs, and between pairs of doors. Provide 1/8 inch from bottom of door to top of decorative floor finish or covering unless otherwise indicated. Where threshold is shown or scheduled, provide1/4 inch from bottom of door to top of threshold unless otherwise indicated.

D. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

E. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.03 ADJUSTING

A. Operation: Rehang or replace doors that do not swing or operate freely.

B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if Work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION 081416

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Access doors and frames for walls and ceilings.
   2. Fire-resistive rated access door and frame units for wall and ceilings.

1.03 REFERENCES

A. ASTM E 152 - Standard Methods of Fire Tests of Door Assemblies

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.

C. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

D. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2018.

E. NFPA 288 - Standard Methods of Fire Tests of Floor Fire Door Assemblies Installed Horizontally in Fire Resistence-Rated Floor Systems; 2017.

F. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2019.

G. UL 10B - Standard for Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. Section 013300 - SUBMITTALS: Procedure for submittals.

B. Shop drawings: Fully describe and locate all items being furnished and include large scale details of principal construction features and internal reinforcement. Indicate dimensions, elevations, hardware, reinforcement, anchor types and spacing, and finishes.

C. Product Data: Indicate door and frame configuration and finishes with manufacturer's standard details and catalog data demonstrating compliance with referenced standards

D. Samples: For each door face material, at least 3 by 5 inches (75 by 125 mm) in size, in specified finish.

E. Product Schedule: Provide complete access door and frame schedule, including types, locations, sizes, latching or locking provisions, and other data pertinent to installation.

1.05 QUALITY ASSURANCE

A. Manufacturer: Minimum five years documented experience producing products specified in this section.

B. Installer: Minimum five years documented experience installing products specified in this section.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Fire-Rated Access Doors and Frames: Units complying with NFPA 80 that are identical to access door and frame assemblies tested for fire-test-response characteristics according to the following test method and that are listed and labeled by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
   1. NFPA 252 or UL 10B for fire-rated access door assemblies installed vertically.
   2. NFPA 288 for fire-rated access door assemblies installed horizontally.

2.02 ACCESS DOORS AND FRAMES FOR WALLS AND CEILINGS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated or comparable product by one of the following:
   1. Acudor Products, Inc.
   2. J. L. Industries, Inc.; Div. of Activar Construction Products Group.
   3. Karp Associates, Inc.
   4. Milcor Inc.
   5. Nystrom, Inc.

B. Source Limitations: Obtain each type of access door and frame from single source from single manufacturer.

C. Flush Access Doors with Exposed Flanges:
   1. Assembly Description: Fabricate door to fit flush to frame. Provide manufacturer's standard-width exposed flange, proportional to door size.
   2. Locations: Wall and ceiling.
   3. Metallic-Coated Steel Sheet for Door: 0.070 inch, 14 gauge steel sheet thickness for Fire-rated access doors and 20 gauge (0.0359 inch) single thickness steel sheet for non-fire rated access doors.
      a. Finish: Factory prime
   4. Hinges: 175 degree stainless steel piano hinge concealed constant force closure spring type.
   5. Hardware: Self latching, key operated.

D. Flush Access Doors with Concealed Flanges:
   1. Assembly Description: Fabricate door to fit flush to frame. Provide frame with gypsum board beads for concealed flange installation.
   2. Locations: Wall and ceiling .
   3. Uncoated Steel Sheet for Door: Nominal 0.060 inch (1.52 mm), 16 gage
      a. Finish: Factory prime.

E. Fire-Rated, Flush Access Doors with Concealed Flanges
   1. Assembly Description: Fabricate door to fit flush to frame, with a core of mineral-fiber insulation enclosed in sheet metal. Provide self-latching door with automatic closer and interior latch release. Provide frame with gypsum board beads for concealed flange installation.

2. Locations: Wall and ceiling.
3. Fire-Resistance Rating: Not less than that of adjacent construction.
4. Metallic-Coated Steel Sheet for Door: Nominal 0.040 inch (1.02 mm), 20 gage.
   a. Finish: Factory prime.

F. Hardware:
1. Latch: Self-latching bolt operated by flush key with interior release.

G. Locks:
1. Cylinder locks keyed alike for each door panel. Provide 2 keys per access panel. Coordinate locks and keying with the Owner's requirements and existing keying system(s) where applicable.

2.03 MATERIALS

A. Steel Plates, Shapes, and Bars: ASTM A36/A36M.

B. Stainless Steel: Type 304, brushed #4 finish.

C. Frame Anchors: Same type as door face.

D. Inserts, Bolts, and Anchor Fasteners: Hot-dip galvanized steel according to ASTM A153/A153M or ASTM F 2329. At stainless steel doors, provide stainless steel fasteners.

2.04 FABRICATION

A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.

B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access doors to types of supports indicated.
1. For concealed flanges with drywall bead, provide edge trim for gypsum board securely attached to perimeter of frames.
2. Provide mounting holes in frames for attachment of units to metal or wood framing.
3. Provide mounting holes in frame for attachment of masonry anchors.

2.05 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

D. Steel and Metallic-Coated-Steel Finishes:
   1. Factory Prime: Apply manufacturer's standard, fast-curing, lead- and chromate-free, universal primer immediately after surface preparation and pretreatment.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Comply with manufacturer's written instructions for installing access doors and frames.

B. Verify that field measurements, surfaces, substrates and project conditions are as required and suitable for installation. Verify that rough openings for door and frame are correctly sized and located. Do not proceed with installation until unsatisfactory conditions have been corrected.

C. Install doors flush with adjacent finish surfaces or recessed to receive finish material.

D. Secure rigidly in place.

E. Position unit to provide convenient access to concealed work requiring access.

3.03 ADJUSTING

A. Adjust doors and hardware, after installation, for proper operation.

B. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

END OF SECTION 083113

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 and electrified door hardware for:

   a. Swinging doors.
   b. Sliding doors.

2. Electronic access control system components, including:

   a. Electronic access control locksets

3. Field verification, preparation and modification of existing doors and frames to receive new door hardware.

B. Exclusions: Unless specifically listed in hardware sets, hardware is not specified in this section for:

1. Windows
2. Cabinets (casework), including locks in cabinets
3. Signage
4. Toilet accessories
5. Overhead doors

C. Related Sections:

1. General Conditions.
2. Division 01.
3. Division 07 Section “Joint Sealants” for sealant requirements applicable to threshold installation specified in this section.
4. Division 08.
5. Division 09 sections for touchup finishing or refinishing of existing openings modified by this section.
6. Division 26 sections for connections to electrical power system and for low-voltage wiring.
7. Division 28 sections for coordination with other components of electronic access control system.

1.3 REFERENCES

A. Fire/Life Safety

1. NFPA - National Fire Protection Association

a. NFPA 70 – National Electric Code
b. NFPA 80 - Standard for Fire Doors and Fire Windows
c. NFPA 101 - Life Safety Code
d. NFPA 105 - Smoke and Draft Control Door Assemblies

2. State Fire Safety Code.

B. UL - Underwriters Laboratories

1. UL 10B - Fire Test of Door Assemblies
2. UL 10C - Positive Pressure Test of Fire Door Assemblies
3. UL 1784 - Air Leakage Tests of Door Assemblies
4. UL 305 - Panic Hardware

C. Accessibility

1. ADA - Americans with Disabilities Act.
2. ANSI A117.1 - Accessible and Usable Buildings and Facilities.

D. DHI - Door and Hardware Institute

1. Sequence and Format for the Hardware Schedule
2. Recommended Locations for Builders Hardware
3. Key Systems and Nomenclature

E. ANSI - American National Standards Institute

1. ANSI/BHMA A156.1 - A156.29, and ANSI A156.31 - Standards for Hardware and Specialties

1.4 SUBMITTALS

A. General:

1. Submit in accordance with Conditions of Contract and Division 01 requirements.
2. Highlight, encircle, or otherwise specifically identify on submittals deviations from Contract Documents, issues of incompatibility or other issues which may detrimentally affect the Work.
3. Prior to forwarding submittal, comply with procedures for verifying existing door and frame compatibility for new hardware, as specified in PART 3, “EXAMINATION” article, herein.

B. Action Submittals:

1. Product Data: Product data including manufacturers’ technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.
2. Riser and Wiring Diagrams: After final approval of hardware schedule, submit details of electrified door hardware, indicating:

a. Wiring Diagrams: For power, signal, and control wiring and including:
1) Details of interface of electrified door hardware and building safety and security systems.
2) Schematic diagram of systems that interface with electrified door hardware.
3) Point-to-point wiring.
4) Risers.

3. Samples for Verification: If requested by Architect, submit production sample or sample installations of each type of exposed hardware unit in finish indicated, and tagged with full description for coordination with schedule.

    a. Samples will be returned to supplier in like-new condition. Units that are acceptable to Architect may, after final check of operations, be incorporated into Work, within limitations of key coordination requirements.

4. Door Hardware Schedule: Submit schedule with hardware sets in vertical format as illustrated by Sequence of Format for the Hardware Schedule as published by the Door and Hardware Institute. Indicate complete designations of each item required for each door or opening, include:

    a. Door Index; include door number, heading number, and Architects hardware set number.
    b. Opening Lock Function Spreadsheet: List locking device and function for each opening.
    c. Type, style, function, size, and finish of each hardware item.
    d. Name and manufacturer of each item.
    e. Fastenings and other pertinent information.
    f. Location of each hardware set cross-referenced to indications on Drawings.
    g. Explanation of all abbreviations, symbols, and codes contained in schedule.
    h. Mounting locations for hardware.
    i. Door and frame sizes and materials.
    j. Name and phone number for local manufacturer's representative for each product.
    k. Operational Description of openings with any electrified hardware (locks, exits, electromagnetic locks, electric strikes, automatic operators, door position switches, magnetic holders or closer/holder units, and access control components). Operational description should include how door will operate on egress, ingress, and fire and smoke alarm connection.
        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 fabrication of other work that is critical in Project construction schedule.

5. Key Schedule:

    a. After Keying Conference, provide keying schedule listing levels of keying as well as explanation of key system's function, key symbols used and door numbers controlled.
    b. Use ANSI A156.28 “Recommended Practices for Keying Systems” as guideline for nomenclature, definitions, and approach for selecting optimal keying system.
    c. Provide 3 copies of keying schedule for review prepared and detailed in accordance with referenced DHI publication. Include schematic keying diagram and index each key to unique door designations.
    d. Index keying schedule by door number, keyset, hardware heading number, cross keying instructions, and special key stamping instructions.
    e. Provide one complete bitting list of key cuts and one key system schematic illustrating system usage and expansion.
        1) Forward bitting list, key cuts and key system schematic directly to Owner, by means as directed by Owner.

    f. Prepare key schedule by or under supervision of supplier, detailing Owner’s final keying instructions for locks.

6. Templates: After final approval of hardware schedule, provide templates for doors, frames and other work specified to be factory prepared for door hardware installation.

C. Informational Submittals:

1. Qualification Data: For Supplier, Installer and Architectural Hardware Consultant.
2. Product Certificates for electrified door hardware, signed by manufacturer:

    a. Certify that door hardware approved for use on types and sizes of labeled fire-rated doors complies with listed fire-rated door assemblies.

3. Certificates of Compliance:

    a. Certificates of compliance for fire-rated hardware and installation instructions if requested by Architect or Authority Having Jurisdiction.
    b. Installer Training Meeting Certification: Letter of compliance, signed by Contractor, attesting to completion of installer training meeting specified in “QUALITY ASSURANCE” article, herein.
    c. Electrified Hardware Coordination Conference Certification: Letter of compliance, signed by Contractor, attesting to completion of electrified hardware coordination conference, specified in “QUALITY ASSURANCE” article, herein.

4. Product Test Reports: For compliance with accessibility requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by qualified testing agency, for door hardware on doors located in accessible routes.
5. Warranty: Special warranty specified in this Section.

D. Closeout Submittals:

1. Operations and Maintenance Data : Provide in accordance with Division 01 and include:

    a. Complete information on care, maintenance, and adjustment; data on repair and replacement parts, and information on preservation of finishes.
    b. Catalog pages for each product.
    c. Name, address, and phone number of local representative for each manufacturer.
    d. Parts list for each product.
    e. Final approved hardware schedule, edited to reflect conditions as-installed.
    f. Final keying schedule
    g. Copies of floor plans with keying nomenclature
    h. As-installed wiring diagrams for each opening connected to power, both low voltage and 110 volts.
    i. Copy of warranties including appropriate reference numbers for manufacturers to identify project.

1.5 QUALITY ASSURANCE

A. Product Substitutions: Comply with product requirements stated in Division 01 and as specified herein.

1. Where specific manufacturer’s product is named and accompanied by “No Substitute,” including make or model number or other designation, provide product specified. (Note: Certain products have been selected for their unique characteristics and particular project suitability.)
2. Where products indicate “acceptable substitute” or “acceptable manufacturer”, provide product from specified manufacturers, subject to compliance with specified requirements and “Single Source Responsibility” requirements stated herein.

B. Supplier Qualifications and Responsibilities: Recognized architectural hardware supplier with record of successful in-service performance for supplying door hardware similar in quantity,

type, and quality to that indicated for this Project and that provides certified Architectural Hardware Consultant (AHC) available to Owner, Architect, and Contractor, at reasonable times during the Work for consultation.

1. Warehousing Facilities: In Project's vicinity.
2. Scheduling Responsibility: Preparation of door hardware and keying schedules.
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.
4. Coordination Responsibility: Coordinate installation of electronic security hardware with Architect and electrical engineers and provide installation and technical data to Architect and other related subcontractors.

    a. Upon completion of electronic security hardware installation, inspect and verify that all components are working properly.

C. Installer Qualifications: Qualified tradesmen, skilled in application of commercial grade hardware with record of successful in-service performance for installing door hardware similar in quantity, type, and quality to that indicated for this Project.

D. Architectural Hardware Consultant Qualifications: Person who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project and meets these requirements:

1. For door hardware, DHI-certified, Architectural Hardware Consultant (AHC).
2. Can provide installation and technical data to Architect and other related subcontractors.
3. Can inspect and verify components are in working order upon completion of installation.
4. Capable of producing wiring diagrams.
5. Capable of coordinating installation of electrified hardware with Architect and electrical engineers.

E. Single Source Responsibility: Obtain each type of door hardware from single manufacturer.

1. Provide electrified door hardware from same manufacturer as mechanical door hardware, unless otherwise indicated.
2. Manufacturers that perform electrical modifications and that are listed by testing and inspecting agency acceptable to authorities having jurisdiction are acceptable.

F. Fire-Rated Door Openings: Provide door hardware for fire-rated openings that complies with NFPA 80 and requirements of authorities having jurisdiction. Provide only items of door hardware that are listed and are identical to products tested by Underwriters Laboratories, Intertek Testing Services, or other testing and inspecting organizations acceptable to authorities having jurisdiction for use on types and sizes of doors indicated, based on testing at positive pressure and according to NFPA 252 or UL 10C and in compliance with requirements of fire-rated door and door frame labels.

G. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.

1. Air Leakage Rate: Maximum air leakage of 0.3 cfm/sq. ft. (3 cu. m per minute/sq. m) at tested pressure differential of 0.3-inch wg (75 Pa) of water.

H. Electrified Door Hardware: Listed and labeled as defined in NFPA 70, Article 100, by testing agency acceptable to authorities having jurisdiction.

I. Means of Egress Doors: Latches do not require more than 15 lbf (67 N) to release latch. Locks do not require use of key, tool, or special knowledge for operation.

J. Accessibility Requirements: For door hardware on doors in an accessible route, comply with governing accessibility regulations cited in “REFERENCES” article, herein.

1. Provide operating devices that do not require tight grasping, pinching, or twisting of wrist and that operate with force of not more than 5 lbf (22.2 N).
2. Maximum opening-force requirements:

    a. Interior, Non-Fire-Rated Hinged Doors: 5 lbf (22.2 N) applied perpendicular to door.
    b. Sliding or Folding Doors: 5 lbf (22.2 N) applied parallel to door at latch.
    c. Fire Doors: Minimum opening force allowable by authorities having jurisdiction.

3. Bevel raised thresholds with slope of not more than 1:2. Provide thresholds not more than 1/2 inch (13 mm) high.
4. Adjust door closer sweep periods so that, from open position of 70 degrees, door will take at least 3 seconds to move to 3 inches (75 mm) from latch, measured to leading edge of door.

K. Keying Conference: Conduct conference at Project site to comply with requirements in Division 01.

1. Attendees: Owner, Contractor, Architect, Installer, and Supplier’s Architectural Hardware Consultant.
2. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including:

    a. Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
    b. Preliminary key system schematic diagram.
    c. Requirements for key control system.
    d. Requirements for access control.
    e. Address for delivery of keys.

L. Pre-installation 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. Inspect and discuss preparatory work performed by other trades.
3. Inspect and discuss electrical roughing-in for electrified door hardware.
4. Review sequence of operation for each type of electrified door hardware.
5. Review required testing, inspecting, and certifying procedures.

M. Coordination Conferences:

1. Installation Coordination Conference: Prior to hardware installation, schedule and hold meeting to review questions or concerns related to proper installation and adjustment of door hardware.

    a. Attendees: Door hardware supplier, door hardware installer, Contractor.
    b. After meeting, provide letter of compliance to Architect, indicating when meeting was held and who was in attendance.

2. Electrified Hardware Coordination Conference: Prior to ordering electrified hardware, schedule and hold meeting to coordinate door hardware with security, electrical, doors and frames, and other related suppliers.

a. Attendees: electrified door hardware supplier, doors and frames supplier, electrified door hardware installer, electrical subcontractor, Owner, Architect and Contractor.
b. After meeting, provide letter of compliance to Architect, indicating when coordination conference was held and who was in attendance.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up for hardware delivered to Project site.

B. Tag each item or package separately with identification coordinated with final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package.

1. Deliver each article of hardware in manufacturer's original packaging.

C. Project Conditions:

1. Maintain manufacturer-recommended environmental conditions throughout storage and installation periods.
2. Provide secure lock-up for door hardware delivered to Project, but not yet installed. Control handling and installation of hardware items so that completion of Work will not be delayed by hardware losses both before and after installation.

D. Protection and Damage:

1. Promptly replace products damaged during shipping.
2. Handle hardware in manner to avoid damage, marring, or scratching. Correct, replace or repair products damaged during Work.
3. Protect products against malfunction due to paint, solvent, cleanser, or any chemical agent.

E. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.

F. Deliver keys to Owner by registered mail or overnight package service.

1.7 COORDINATION

A. Coordinate layout and installation of floor-recessed door hardware with floor construction. Cast anchoring inserts into concrete. Concrete, reinforcement, and formwork requirements are specified in Division 03.

B. 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.

C. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.

D. Electrical System Roughing-In: Coordinate layout and installation of electrified door hardware with connections to power supplies and building safety and security systems.

E. 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.

F. Direct shipments not permitted, unless approved by Contractor.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Years from date of Substantial Completion, for durations indicated.

a. Closers:
1) Mechanical: 10 years.
2) Electrified: 2 years.

b. Exit Devices:
1) Mechanical: 3 years.
2) Electrified: 1 year.

c. Locksets:
1) Mechanical: 3 years.
2) Electrified: 1 year.

d. Continuous Hinges: Lifetime warranty
e. Key Blanks: Lifetime

2. Warranty does not cover damage or faulty operation due to improper installation, improper use or abuse.

1.9 MAINTENANCE

A. Extra Materials:

1. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

a. Door Hardware: 10% of total for each hardware item
b. Electrical Parts: 10% of total for each hardware item

B. Maintenance Tools:

1. Furnish complete set of special tools required for maintenance and adjustment of hardware, including changing of cylinders.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. The Owner requires use of certain products for their unique characteristics and particular project suitability to insure continuity of existing and future performance and maintenance

standards. After investigating available product offerings Awarding Authority has elected to prepare proprietary specifications. These products are specified with the notation: “No Substitute.”

1. Where “No Substitute” is noted, submittals and substitution requests for other products will not be considered.

B. Approval of manufacturers other than those listed shall be in accordance with QUALITY ASSURANCE article, herein.

C. Hand of Door: Drawings show direction of slide, swing, or hand of each door leaf. Furnish each item of hardware for proper installation and operation of door movement as shown.

D. Where specified hardware is not adaptable to finished shape or size of members requiring hardware, furnish suitable types having same operation and quality as type specified, subject to Architect's approval.

2.2 EXISTING MATERIALS

A. Where existing door hardware is indicated to be removed and reinstalled:

1. Carefully remove door hardware and components.
2. Clean, protect and store existing door hardware in accordance with storage and handling requirements specified herein.
3. Reinstall in accordance with installation requirements for new door hardware.

2.3 MATERIALS

A. Fasteners

1. Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation.
2. Furnish screws for installation with each hardware item. Finish exposed (exposed under any condition) screws to match hardware finish, or, if exposed in surfaces of other work, to match finish of this other work including prepared for paint surfaces to receive painted finish.
3. Provide concealed fasteners for hardware units exposed when door is closed except when no standard units of type specified are available with concealed fasteners. Do not use thru-bolts for installation where bolt head or nut on opposite face is exposed in other work unless thru-bolts are required to fasten hardware securely. Review door specification and advise Architect if thru-bolts are required.
4. Install hardware with fasteners provided by hardware manufacturer.

B. Modification and Preparation of Existing Doors: Provide necessary fillers, Dutchmen, reinforcements, and fasteners, compatible with existing materials, as required for mounting new opening hardware and to cover existing door and frame preparations.

1. Use materials which match materials of adjacent modified areas.
2. When modifying existing fire-rated openings, provide materials permitted by NFPA 80 as required to maintain fire-rating.

C. Provide screws, bolts, expansion shields, drop plates and other devices necessary for hardware installation.

1. Where fasteners are exposed to view: Finish to match adjacent door hardware material.

2.4 HINGES

A. Provide five-knuckle, ball bearing hinges.

1. Manufacturers and Products:

a. Scheduled Manufacturer and Product: Ives 5BB series.

B. Requirements:

1. 1-3/4 inch (44 mm) thick doors, up to and including 36 inches (914 mm) wide:

a. Interior: Heavy weight, steel, 4-1/2 inches (114 mm) high

2. 1-3/4 inch (44 mm) thick doors over 36 inches (914 mm) wide:

a. Interior: Heavy weight, steel, 5 inches (127 mm) high

3. Provide three hinges per door leaf for doors 90 inches (2286 mm) or less in height, and one additional hinge for each 30 inches (762 mm) of additional door height.
4. Where new hinges are specified for existing doors or existing frames, provide new hinges of identical size to hinge preparation present in existing door or existing frame.
5. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:

a. Steel Hinges: Steel pins
b. Non-Ferrous Hinges: Stainless steel pins
c. Out-Swinging Interior Lockable Doors: Non-removable pins
d. Interior Non-lockable Doors: Non-rising pins

6. Width of hinges: 4-1/2 inches (114 mm) at 1-3/4 inch (44 mm) thick doors, and 5 inches (127 mm) at 2 inches (51 mm) or thicker doors. Adjust hinge width as required for door, frame, and wall conditions to allow proper degree of opening.
7. Doors 36 inches (914 mm) wide or less furnish hinges 4-1/2 inches (114 mm) high; doors greater than 36 inches (914 mm) wide furnish hinges 5 inches (127 mm) high, heavy weight or standard weight as specified.
8. Provide spring hinges where specified. Provide two spring hinges and one bearing hinge per door leaf for doors 90 inches (2286 mm) or less in height. Provide one additional bearing hinge for each 30 inches (762 mm) of additional door height.

2.5 CONTINUOUS HINGES

A. Aluminum Geared

1. Manufacturers:

a. Scheduled Manufacturer: Ives.

2. Requirements:

a. Provide aluminum geared continuous hinges conforming to ANSI A156.25, Grade 2.
b. Provide aluminum geared continuous hinges, where specified in the hardware sets, fabricated from 6063-T6 aluminum, with 0.25-inch (6 mm) diameter Teflon coated stainless steel hinge pin.

c. Provide split nylon bearings at each hinge knuckle for quiet, smooth, self-lubricating operation.
d. Provide hinges capable of supporting door weights up to 450 pounds, and successfully tested for 1,500,000 cycles.
e. On fire-rated doors, provide aluminum geared continuous hinges that are classified for use on rated doors by testing agency acceptable to authority having jurisdiction.
f. Provide aluminum geared continuous hinges with electrified option where specified. Provide with sufficient number and gage of concealed wires to accommodate electric function of specified hardware.
g. Install hinges with fasteners supplied by manufacturer.
h. Provide hinges with symmetrical hole pattern.

2.6 FLUSH BOLTS

A. Manufacturers:

1. Scheduled Manufacturer: Ives

B. Requirements:

1. Provide automatic, constant latching, and manual flush bolts with forged bronze or stainless steel face plates, extruded brass levers, and with wrought brass guides and strikes. Provide 12 inch (305 mm) steel or brass rods at doors up to 90 inches (2286 mm) in height. For doors over 90 inches (2286 mm) in height increase top rods by 6 inches (152 mm) for each additional 6 inches (152 mm) of door height. Provide dust-proof strikes at each bottom flush bolt.

2.7 COORDINATORS

A. Manufacturers:

1. Scheduled Manufacturer: Ives

B. Requirements:

1. Where pairs of doors are equipped with automatic flush bolts, an astragal, or other hardware that requires synchronized closing of the doors, provide bar-type coordinating device, surface applied to underside of stop at frame head.
2. Provide filler bar of correct length for unit to span entire width of opening, and appropriate brackets for parallel arm door closers and surface vertical rod exit device strikes. Factory-prep coordinators for vertical rod devices if required.

2.8 MORTISE LOCKS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product: Schlage L9000 series

B. Requirements:

1. Provide mortise locks certified as ANSI A156.13, Grade 1 Operational, Grade 1 Security, and manufactured from heavy gauge steel, containing components of steel with a zinc dichromate plating for corrosion resistance. Provide lock case that is multi-function and

field reversible for handing without opening case. Cylinders: Refer to “KEYING” article, herein.
2. Provide mortise locks with classroom security function with an inside escutcheon measuring 7-7/8 inch x 2-1/2 inch x 7/16 inch with a visual security indicator window measuring a minimum 1-5/8 inch x 7/16 inch that identifies the trims locked/unlocked status of the door from the inside of the room. Indicator in unlocked state has a white background with black text and icon. Indicator in the locked state has a red background with white text and icon.
3. Provide locks with standard 2-3/4 inches (70 mm) backset with full 3/4 inch (19 mm) throw stainless steel mechanical anti-friction latchbolt. Provide deadbolt with full 1 inch (25 mm) throw, constructed of stainless steel.
4. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
5. Lever Trim: Solid brass, bronze, or stainless steel, cast or forged in design specified, with wrought roses and external lever spring cages. Provide thru-bolted levers with 2-piece spindles.

    a. Lever Design: Schlage 06A.

2.9 CYLINDRICAL LOCKS – GRADE 1

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product: Schlage ND Series

B. Requirements:

1. Provide cylindrical locks conforming to ANSI A156.2 Series 4000, Grade 1. Cylinders: Refer to “KEYING” article, herein.
2. Provide cylindrical locks with classroom security function with an inside indicator that provides clear direction for users to safely and quickly secure the room.
3. Provide locksets able to withstand 1500 inch pounds of torque applied to locked outside lever without gaining access per ANSI A156.2 Abusive Locked Lever Torque Test and cycle tested to 3 million cycles per ANSI A156.2 Cycle Test.
4. Provide solid steel rotational stops to control excessive rotation of lever.
5. Provide completely refunctionable lockset that allows lock function to be changed to over twenty other common functions by swapping easily accessible parts.
6. Provide locks with standard 2-3/4 inches (70 mm) backset, unless noted otherwise, with 1/2 inch latch throw. Provide proper latch throw for UL listing at pairs.
7. Provide locksets with separate anti-rotation thru-bolts, and no exposed screws.
8. Provide independently operating levers with two external return spring cassettes mounted under roses to prevent lever sag.
9. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
10. Provide electrical options as scheduled.
11. Lever Trim: Solid cast levers without plastic inserts, and wrought roses on both sides.

    a. Lever Design: Schlage Rhodes.

2.10 AUXILIARY LOCKS

A. Deadlocks:

1. Manufacturers and Products:

    a. Scheduled Manufacturer and Product: Schlage L400 series

2. Requirements:

    a. Provide mortise deadlock series conforming to ANSI A156 and function as specified. Cylinders: Refer to “KEYING” article, herein.
    b. Provide deadlocks with standard 2-3/4 inches (70 mm) backset. Provide deadbolt with full 1 inch (25 mm) throw, constructed of stainless steel.
    c. Provide manufacturer’s standard strike.

2.11 EXIT DEVICES

A. Manufacturer and Product: Von Duprin 98 series

B. Requirements:

1. Provide exit devices tested to ANSI/BHMA A156.3 Grade 1, and UL listed for Panic Exit or Fire Exit Hardware. Cylinders: Refer to “KEYING” article, herein.
2. Provide touchpad type exit devices, fabricated of brass, bronze, stainless steel, or aluminum, plated to standard architectural finishes to match balance of door hardware.
3. Quiet Operation: Incorporate fluid damper or other device that eliminates noise of exit device operation.
4. Touchpad: Extend minimum of one half of door width, but not the full length of exit device rail. Provide end-cap with two-point attachment to door. Match exit device finish, stainless steel for US26, US26D, US28, US32, and US32D finishes; and for all other finishes, provide compatible finish to exit device. Provide compression springs in devices, latches, and outside trims or controls; tension springs prohibited.
5. Provide rim devices with a dual cylinder or inside thumb turn cylinder option with a visual security indicator that identifies the trims locked/unlocked status of the door from the inside of the room. Indicator in unlocked state presents a 1/2 inch x 1/2 inch white metal flag with black icon at top of device head. Indicator in locked state has no flag present. Provide rim devices without the dual cylinder or inside thumb turn cylinder option capable of being retrofitted with the visual security indicator.
6. Provide exit devices with deadlatching feature for security and for future addition of alarm kits and/or other electrical requirements.
7. Provide exit devices with manufacturer’s approved strikes.
8. Provide exit devices cut to door width and height. Locate exit devices at height recommended by exit device manufacturer, allowable by governing building codes, and approved by Architect.
9. Mount mechanism case flush on face of doors, or provide spacers to fill gaps behind devices. Where glass trim or molding projects off face of door, provide glass bead kits.
10. Provide cylinder dogging at non-fire-rated exit devices, unless specified less dogging.
11. Removable Mullions: 2 inches (51 mm) x 3 inches (76 mm) steel tube. Where scheduled as keyed removable mullion that is removed by use of a keyed cylinder, which is self-locking when re-installed.
12. Where lever handles are specified as outside trim for exit devices, provide heavy-duty lever trims with forged or cast escutcheon plates. Provide vandal-resistant levers that will travel to 90-degree down position when more than 35 pounds of torque are applied, and which can easily be re-set.

    a. Lever Style: Match lever style of locksets.

13. Provide UL labeled fire exit hardware for fire rated openings.
14. Provide factory drilled weep holes for exit devices used in full exterior application, highly corrosive areas, and where noted in hardware sets.
15. Provide electrical options as scheduled.

2.12 ELECTRIC STRIKES

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product: Von Duprin 6000 series

B. Requirements:

1. Provide electric strikes designed for use with type of locks shown at each opening.
2. Provide electric strikes UL Listed as burglary-resistant.
3. Where required, provide electric strikes UL Listed for fire doors and frames.
4. Provide fail-secure type electric strikes, unless specified otherwise.
5. Coordinate voltage and provide transformers and rectifiers for each strike as required.

2.13 CYLINDERS

A. Manufacturer and Product:

1. Scheduled Manufacturer and Product: Schlage Everest 29, No Substitute

B. Requirements: Provide cylinders/cores complying with the following requirements.

1. Cylinders/cores compliant with ANSI/BHMA A156.5; latest revision, Section 12, Grade 1; permanent cylinders; cylinder face finished to match lockset, manufacturer's series as indicated.

C. Full-sized cylinders in the below-listed configuration(s), distributed throughout the Project as indicated.

1. Conventional Everest S cylinder with interchangeable core with open keyway.

D. Patent Protection: Cylinders/cores requiring use of restricted, patented keys, patent-protected until the year, 2029.

E. Primus Cylinders: Where indicated, provide "Primus" cylinders/cores with "dual-locking mechanism" with interlocking finger pin(s) to check for patented features on keys.

F. Nickel silver bottom pins.

1. Identification:

G. Mark permanent cylinders/cores and keys with applicable blind code per DHI publication "Keying Systems and Nomenclature" for identification. Blind code marks shall not include actual key cuts.

H. Identification stamping provisions must be approved by the Architect and Owner.

I. Failure to comply with stamping requirements shall be cause for replacement of cylinders/cores involved at no additional cost to Owner.

1. Forward cylinders/cores to Owner, separately from keys, by means as directed by Owner.

J. Replaceable Construction Cores.

1. Provide temporary construction cores replaceable by permanent cores, furnished in accordance with the following requirements.

K. 12 construction change (day) keys.

1. Owner or Owner's Representative will replace temporary construction cores with permanent cores.

2.14 KEYING

A. Keying System: Factory registered, complying with guidelines in ANSI/BHMA A156.28, incorporating decisions made at keying conference.

B. Keying Requirements – General

1. Provide keying system capable of multiplex master keying
2. Permanent cylinders/cores keyed by the manufacturer according to the following key system.

C. Keying system as directed by the Owner.

D. Key Features: Provide keys with the following features.

1. Patent Protection: Keys and blanks protected by one or more utility patent(s) until the year, 2029.

E. Keys

1. Material: Nickel silver; minimum thickness of .107-inch (2.3mm)
2. Identification:

F. Coordinate with cylinder/core and key identification requirements above.

G. Stamp keys with Owner's unique key system facility code as established by the manufacturer; key symbol and embossed or stamped with "DO NOT DUPLICATE" along with the "PATENTED" or patent number to enforce the patent protection.

H. Failure to comply with stamping requirements shall be cause for replacement of keys involved at no additional cost to Owner.

1. Quantity: Furnish in the following quantities.

a. Change (Day) Keys: 3 per cylinder/core.
b. Permanent Control Keys: 3.
c. Master Keys: 6.
d. Unused balance of key blanks shall be furnished to Owner with the cut keys.

e. Extra Keys:
1) 12 Construction Keys

I. Keying System Accessories: Furnish the following accessories to Owner in indicated quantities

1. 1 - Key Bitting Punch Cutter: Schlage Everest 29 S 40-075

2. 1 - Full Keying Kit with tools necessary to allow servicing of normal cylinder pinning: Schlage 40-119
3. 1 - Cylindrical Lock Maintenance Kit Schlage 40-097
4. 1 - Mortise Lock Maintenance Kit Schlage 40-054

2.15 KEY CONTROL SYSTEM

A. Key Control System Manufacturers:

1. Scheduled Manufacturer: Telkee

B. Requirements:

1. Provide key control system, including envelopes, labels, tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet, all as recommended by system manufacturer, with capacity for 150% of number of locks required for Project.

   a. Provide complete cross index system set up by hardware supplier, and place keys on markers and hooks in cabinet as determined by final key schedule.
   b. Provide hinged-panel type cabinet for wall mounting.

C. Key Management Software Manufacturers and Products:

1. Scheduled Manufacturer and Product: Schlage SITEMASTER 200

D. Key Management Software Requirements:

1. Software: Provide tracking, issuing, collecting and transferring information regarding keys. Provide customized query, reporting, searching capability, comprehensive location hardware listings, display key holder photos and signature for verification, and provide automatic reminders for maintenance, back-ups and overdue keys.
2. Provide training for Owner's personnel on proper operation and application of key management software.

2.16 DOOR CLOSERS

A. Manufacturer and Product: LCN 4011/4111/4040XP series.

B. Requirements:

1. Provide door closers certified to ANSI/BHMA A156.4 Grade 1 requirements by BHMA certified independent testing laboratory. Certify surface mounted mechanical closers to exceed ten million (10,000,000) full load cycles ISO 9000 certify closers. Stamp units with date of manufacture code.
2. Provide door closers with fully hydraulic, full rack and pinion action with high strength cast iron cylinder, and full complement bearings at shaft.
3. Cylinder Body: 1-1/2 inch (38 mm) diameter with 11/16 inch (17 mm) diameter double heat-treated pinion journal.
4. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
5. Spring Power: Continuously adjustable over full range of closer sizes, and providing reduced opening force as required by accessibility codes and standards.

6. Hydraulic Regulation: By tamper-proof, non-critical valves, with separate adjustment for latch speed, general speed, and backcheck.
7. Provide closers with solid forged steel main arms and factory assembled heavy-duty forged forearms for parallel arm closers. When closers are parallel arm mounted, provide closers which mount within 6-inch (152 mm) top rail without use of mounting plate so that closer is not visible through vision panel from pull side.
8. Pressure Relief Valve (PRV) Technology: Not permitted.
9. Finish for Closer Cylinders, Arms, Adapter Plates, and Metal Covers: Powder coating finish which has been certified to exceed 100 hours salt spray testing as described in ANSI Standard A156.4 and ASTM B117, or has special rust inhibitor (SRI).
10. Provide special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other door hardware items interfering with closer mounting.

2.17 ELECTRO-MECHANICAL CLOSER/HOLDERS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product: LCN 4040SE/4310ME/4410ME.

B. Requirements:

1. Provide single-point or multi-point hold-open electro-mechanical closer/holders as specified. Coordinate voltage requirements and provide transformer if necessary.
2. Provide multi-point electro-mechanical closer/holders with swing free arms.
3. Provide closer/holders that function as full rack and pinion door closer when current is interrupted or continuous hold-open is not engaged.
4. Provide door closers with fully hydraulic, full rack and pinion action with high strength cylinder and full complement bearings at shaft.
5. Cylinder Body: 1-1/2 inch (38 mm) diameter with 11/16 inch (17 mm) diameter double heat-treated pinion journal.
6. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
7. Spring Power: Continuously adjustable over full range of closer sizes, and providing reduced opening force as required by accessibility codes and standards.
8. Hydraulic Regulation: By tamper-proof, non-critical valves, with separate adjustment for latch speed, general speed, and backcheck.
9. Pressure Relief Valve (PRV) Technology: Not permitted.
10. Provide special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other door hardware items interfering with closer mounting.

2.18 DOOR TRIM

A. Manufacturers:

1. Scheduled Manufacturer: Ives.

B. Requirements:

1. Provide push plates 4 inches (102 mm) wide by 16 inches (406 mm) high by 0.050 inch (1 mm) thick and beveled 4 edges. Where width of door stile prevents use of 4 inches (102 mm) wide plate, adjust width to fit.

2. Provide push bars of solid bar stock, diameter and length as scheduled. Provide push bars of sufficient length to span from center to center of each stile. Where required, mount back to back with pull.
3. Provide offset pulls of solid bar stock, diameter and length as scheduled. Where required, mount back to back with push bar.
4. Provide flush pulls as specified. Where required, provide back-to-back mounted model.
5. Provide pulls of solid bar stock, diameter and length as scheduled. Where required, mount back to back with push bar.
6. Provide pull plates 4 inches (102 mm) wide by 16 inches (406 mm) high by 0.050 inch (1 mm) thick, beveled 4 edges, and prepped for pull. Where width of door stile prevents use of 4 inches (102 mm) wide plate, adjust width to fit.
7. Provide wire pulls of solid bar stock, diameter and length as scheduled.

2.19 PROTECTION PLATES

A. Manufacturers:

1. Scheduled Manufacturer: Ives.

B. Requirements:

1. Provide kick plates, mop plates, and armor plates minimum of 0.050 inch (1 mm) thick as scheduled. Furnish with sheet metal or wood screws, finished to match plates.
2. Sizes of plates:

   a. Kick Plates: 10 inches (254 mm) high by 2 inches (51 mm) less width of door on single doors, 1 inch (25 mm) less width of door on pairs
   b. Mop Plates: 4 inches (102 mm) high by 2 inches (51 mm) less width of door on single doors, 1 inch (25 mm) less width of door on pairs
   c. Armor Plates: 36 inches (914 mm) high by 2 inches (51 mm) less width of door on single doors, 1 inch (25 mm) less width of door on pairs

2.20 OVERHEAD STOPS AND OVERHEAD STOP/HOLDERS

A. Manufacturers:

1. Scheduled Manufacturers: Glynn-Johnson

B. Requirements:

1. Provide heavy duty concealed mounted overhead stop or holder as specified for exterior and interior vestibule single acting doors.
2. Provide heavy duty concealed mounted overhead stop or holder as specified for double acting doors.
3. Provide heavy or medium duty and concealed or surface mounted overhead stop or holder for interior doors as specified. Provide medium duty surface mounted overhead stop for interior doors and at any door that swings more than 140 degrees before striking wall, open against equipment, casework, sidelights, and where conditions do not allow wall stop or floor stop presents tripping hazard.
4. Where overhead holders are specified provide friction type at doors without closer and positive type at doors with closer.

2.21 DOOR STOPS AND HOLDERS

A. Manufacturers:

1. Scheduled Manufacturer: Ives.

B. Provide door stops at each door leaf:

1. Provide wall stops wherever possible. Provide convex type where mortise type locks are used and concave type where cylindrical type locks are used.
2. Where a wall stop cannot be used, provide universal floor stops for low or high rise options.
3. Where wall or floor stop cannot be used, provide medium duty surface mounted overhead stop.

2.22 THRESHOLDS, SEALS, DOOR SWEEPS, AUTOMATIC DOOR BOTTOMS, AND GASKETING

A. Manufacturers:

1. Scheduled Manufacturer: Zero, Pemko

B. Requirements:

1. Provide thresholds, weatherstripping (including door sweeps, seals, astragals) and gasketing systems (including smoke, sound, and light) as specified and per architectural details. Match finish of other items.
2. Size of thresholds::

   a. Saddle Thresholds: Per description in hardware set

3. Provide door sweeps, seals, astragals, and auto door bottoms only of type where resilient or flexible seal strip is easily replaceable and readily available.

2.23 SILENCERS

A. Manufacturers:

1. Scheduled Manufacturer: Ives.

B. Requirements:

1. Provide "push-in" type silencers for hollow metal or wood frames.
2. Provide one silencer per 30 inches (762 mm) of height on each single frame, and two for each pair frame.
3. Omit where gasketing is specified.

2.24 MAGNETIC HOLDERS

A. Manufacturers:

1. Scheduled Manufacturer: LCN.

B. Requirements:

1. Provide wall or floor mounted electromagnetic door release as specified with minimum of 25 pounds of holding force. Coordination projection of holder and armature with other hardware and wall conditions to ensure that door sits parallel to wall when fully open. Wire magnetic holders on fire-rated doors into the fire control panel for fail-safe operation.

2.25 FINSHES

A. Finish: BHMA 606

PART 3 - EXECUTION

3.1 EXAMINATION

A. Prior to installation of hardware, examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance.

B. Existing Door and Frame Compatibility: Field verify existing doors and frames receiving new hardware and existing conditions receiving new openings. Verify that new hardware is compatible with existing door and frame preparation and existing conditions.

C. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Where on-site modification of doors and frames is required:

1. Remove existing hardware being replaced, tag, and store according to contract documents.
2. Field modify and prepare existing door and frame for new hardware being installed.
3. When modifications are exposed to view, use concealed fasteners, when possible.
4. Prepare hardware locations in accordance with:

    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: DHI WDHS.5 "Recommended Hardware Reinforcement Locations for Mineral Core Wood Flush Doors."
    c. Doors in rated assemblies: NFPA 80 for restrictions on on-site door hardware preparation.

3.3 INSTALLATION

A. Mounting Heights: Mount door hardware units at heights to comply with the following, unless otherwise indicated or required to comply with governing regulations.

1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
2. Custom Steel Doors and Frames: HMMA 831.

3. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."

B. Install each hardware item in compliance with manufacturer's instructions and recommendations, using only fasteners provided by manufacturer.

C. Do not install surface mounted items until finishes have been completed on substrate. Protect all installed hardware during painting.

D. Set units level, plumb and true to line and location. Adjust and reinforce attachment substrate as necessary for proper installation and operation.

E. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.

F. Install operating parts so they move freely and smoothly without binding, sticking, or excessive clearance.

G. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than quantity recommended by manufacturer for application indicated or one hinge for every 30 inches (750 mm) of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.

H. Lock Cylinders: Install construction cores to secure building and areas during construction period.

1. Replace construction cores with permanent cores as indicated in keying section.

I. Key Control System: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.

J. Door Closers: Mount closers on room side of corridor doors, inside of exterior doors, and stair side of stairway doors from corridors. Closers shall not be visible in corridors, lobbies and other public spaces unless approved by Architect.

K. Closer/Holders: Mount closer/holders on room side of corridor doors, inside of exterior doors, and stair side of stairway doors.

L. Power Supplies: Locate power supplies as indicated or, if not indicated, above accessible ceilings or in equipment room, or alternate location as directed by Architect.

M. Thresholds: Set thresholds in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants."

N. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they may impede traffic or present tripping hazard.

O. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.

P. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.

Q. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.

3.4 FIELD QUALITY CONTROL

A. Architectural Hardware Consultant: Engage qualified independent Architectural Hardware Consultant to perform inspections and to prepare inspection reports.

1. 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. Spring Hinges: Adjust to achieve positive latching when door is allowed to close freely from an open position of 30 degrees.
2. Electric Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.
3. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.

B. Occupancy Adjustment: Approximately three months after date of Substantial Completion, Installer's Architectural Hardware Consultant shall examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors, door hardware, and electrified door hardware.

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 door hardware is without damage or deterioration at time of Substantial Completion.

3.7 DEMONSTRATION

A. Provide training for Owner's maintenance personnel to adjust, operate, and maintain door hardware and door hardware finishes. Refer to Division 01 Section "Demonstration and Training."

3.8 DOOR HARDWARE SCHEDULE

A. Locksets, exit devices, and other hardware items are referenced in the following hardware sets for series, type and function. Refer to the above-specifications for special features, options, cylinders/keying, and other requirements.

B. Hardware Sets:

Hardware Group No. 01 – SINGLE SWING DOOR WITH PANIC HARDWARE
NEW DOOR X NEW FRAMES

HARDWARE GROUP NO. 01
Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HW HINGE	5BB1HW 4.5 X 4.5	606	IVE
1	EA	PANIC HARDWARE	QM98-L-F-996-07/299F-SLM-WD	606	VON
1	EA	RIM CYLINDER	20-057 ICX	606	SCH
1	EA	FSIC CORE	23-030 CKC EV29 T	606	SCH
1	EA	SURFACE CLOSER	4021-3077-MC	696	LCN
1	EA	BLADE STOP SPACER	4110-61 SRI	696	LCN
1	EA	MOPPLATE	8402 6″ X 2″ LDW	606	IVE
1	EA	KICKPLATE	8402 10″ X 2″ LDW	606	IVE
1	SET	SEALS	HSS2000xS88	D	PEM

NOTE:
1. NEW DOORS X NEW FRAMES
2. THE 4020-18 MOUNTING PLATE MUST BE USED TO AVOID A CONFLICT WITH THE 4011 CLOSER WHEN THRU BOLTING THE GLYNN JOHNSON OVERHEAD STOP. THE GC IS RESPONSIBLE FOR DRILLING OUT THE MOUNTING PLATE TO ACCOMMODATE THE THRU BOLT HEAD.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
1. Non-load-bearing steel framing systems for interior gypsum board assemblies.
2. Suspension systems for interior gypsum ceilings, soffits, and grid systems.
3. Adjustable Aluminum Mullion/Partition Closures.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.04 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For firestop tracks, from ICC-ES.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated, according to ASTM E119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated, according to ASTM E90 and classified according to ASTM E413 by an independent testing agency.

2.02 FRAMING SYSTEMS

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Framing Members, General: Comply with ASTM C754 for conditions indicated.
1. Steel Sheet Components: Comply with ASTM C645 requirements for metal unless otherwise indicated.
2. See "Corrosion Protection of Steel Framing" Article in the Evaluations for a discussion of corrosion-resistant coatings on components.
3. Protective Coating: ASTM A653/A653M, G60 (Z180), hot-dip galvanized unless otherwise indicated.

C. Studs and Runners: ASTM C645. Use either steel studs and runners or dimpled steel studs and runners.
1. Steel Studs and Runners:
a. Minimum Base-Metal Thickness: 18 gauge (0.043 inch).
b. Depth: 4 inches, 3-5/8 inches, 2-1/2 inches, 1-5/8 inches as indicated on the drawings.

2. Dimpled Steel Studs and Runners:
   a. Minimum Base-Metal Thickness: 20 gauge (0.033 inch)0.025 inch.

D. Slip-Type Head Joints: Where indicated, provide one of the following:
   1. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.
      a. Products: Subject to compliance with requirements, provide one of the following:
         1) Dietrich Metal Framing; SLP-TRK Slotted Deflection Track.
         2) Steel Network Inc. (The); VertiTrack VTD Series.

E. 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.

F. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
   1. Minimum Base-Metal Thickness: As indicated on Drawings or a minimum of 0.033 inch.

G. Cold-Rolled Channel Bridging: Steel, 0.053-inch minimum base-metal thickness, with minimum 1/2-inch wide flanges.
   1. Depth: 1-1/2 inches.
   2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches, 0.068-inch thick, galvanized steel.

H. Hat-Shaped, Rigid Furring Channels: ASTM C645.
   1. Minimum Base-Metal Thickness: 18 gauge (0.043 inch)0.033 inch.
   2. Depth: 7/8 inch, 1-1/2 inches as indicated on the drawings.

I. Resilient Furring Channels: 1/2-inch deep, steel sheet members designed to reduce sound transmission.
   1. Configuration: Asymmetrical.

J. Z-Shaped Furring: With slotted or non-slotted web, face flange of 1-1/4 inches, wall attachment flange of 7/8 inch, minimum uncoated-metal thickness of 16 gauge (0.057 inch) gauge, and depth required to fit insulation thickness indicated.

K. Column Flange Grip Clips: Pre-manufactured Column/Beam connectors for rapid installation of board type materials to Steel Column and Beam Flanges. ASTM A1003/A1003M Structural Grade 33 (230) Type H, ST33H (ST230H): 33ksi (230MPa) minimum yield strength, 45ksi (310MPa) minimum tensile strength, 27mil minimum thickness (22 gauge, 0.0283” design thickness) with ASTM A653/A653M G60 (Z180) hot dipped galvanized coating. Manufacturer: The steel Network, Inc. Unit connection box measures 1 inch deep, 2 inches wide and 2 1/2 inches long with a spring clip depth of 2.375 inches and a curved clip spring clearance of .2 inches.
   1. Install as indicated on the drawings. Maximum spacing 24" on center.

2.03 SUSPENSION SYSTEMS

A. Wire Hangers: ASTM A641/A641M, Class 1 zinc coating, soft temper, 0.16 inch in diameter.

B. Flat Hangers: Steel sheet, 1 by 3/16 inch by length indicated.

C. Carrying Channels: Cold-rolled, commercial-steel sheet with a base-metal thickness of 0.053 inch and minimum 1/2-inch wide flanges.
   1. Depth: As indicated on Drawings.

D. Furring Channels (Furring Members):
   1. Cold-Rolled Channels: 16 gauge (0.057 inch) uncoated-steel thickness, with minimum 1/2-inch wide flanges, 3/4 inch deep.
   2. Dimpled Steel Studs and Runners: ASTM C645.
      a. Minimum Base-Metal Thickness: As indicated on Drawings or 18 gauge (0.043 inch).
      b. Depth: As indicated on Drawings.
   3. Hat-Shaped, Rigid Furring Channels: ASTM C645, 7/8 inch deep.

2.04 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards.
   1. Fasteners for Metal Framing: Type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

B. Isolation Strip at Exterior Walls: Provide one of the following:
   1. Asphalt-Saturated Organic Felt: ASTM D226/D226M, Type I (No. 15 asphalt felt), non-perforated.
   2. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit steel stud size.

C. Adjustable Aluminum Mullion/Partition Closures: MULLION MATE – SERIES 40 PLUS extruded aluminum partition closure shall be manufactured by Gordon Interior Specialties Division, Gordon, Inc., 5023 Hazel Jones Road, Bossier City, LA 71111, (800) 747-8954, Fax (800) 877-8746, sales@gordoninteriors.com or approved equal.
   1. Aluminum extrusions: 6063-T5 temper, tensile strength 31 KSI, ASTM B221.
      a. Size(s): Mullion Mate 3: 2 7/8 inch through 3 15/16 inch, Mullion Mate 4: 4 inch through 4 15/16 inch, Mullion Mate 5: 5 inch through 6 15/16 inch, Mullion Mate 7: 7 inch through 9 3/4 inch, and Mullion Mate 9: 9 inch through 13 3/4 inch or as required by the field conditions.
      b. Length: 10 foot or as required by field conditions.
      c. Finish: Acrylic-Polyester hybrid powder-coat paint finish in color as selected by the Architect from the manufacturer's full color offering.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building

structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.

1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.

B. Coordination with Sprayed Fire-Resistive Materials:
   1. Before sprayed fire-resistive materials are applied, attach offset anchor plates or ceiling runners (tracks) to surfaces indicated to receive sprayed fire-resistive materials. Where offset anchor plates are required, provide continuous plates fastened to building structure not more than 24 inches o.c.
   2. After sprayed fire-resistive materials are applied, remove them only to extent necessary for installation of non-load-bearing steel framing. Do not reduce thickness of fire-resistive materials below that required for fire-resistance ratings indicated. Protect adjacent fire-resistive materials from damage.

3.03 INSTALLATION, GENERAL

A. Installation Standard: ASTM C754.
   1. Gypsum Board Assemblies: Also comply with requirements in ASTM C840 that apply to framing installation.

B. Install supplementary framing, and blocking to support fixtures, equipment, services, heavy trim, grab bars, toilet accessories, and furnishings or similar construction.

C. Install bracing at terminations in assemblies.

D. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.04 INSTALLING FRAMED ASSEMBLIES

A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
   1. Single-Layer Application: 16 inches o.c. unless otherwise indicated.
   2. Multilayer Application: 16 inches o.c. unless otherwise indicated.
   3. Tile Backing Panels: 16 inches o.c. unless otherwise indicated.

B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

C. Install studs so flanges within framing system point in same direction.

D. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.
   1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
   2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
      a. Install two studs at each jamb unless otherwise indicated.
      b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint in finished assembly.

c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.

3. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.
   a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.
4. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.
5. Curved Partitions:
   a. Bend track to uniform curve and locate straight lengths so they are tangent to arcs.
   b. Begin and end each arc with a stud, and space intermediate studs equally along arcs. On straight lengths of no fewer than two studs at ends of arcs, place studs 6 inches o.c.
   c. Products such as Curv-Trak and Flex-C Trac may be submitted for approval to accomplish radius wall applications.

E. Direct Furring:
1. Screw to wood framing where applicable.
2. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.

F. Z-Furring Members:
1. Erect insulation, specified in Section 072100 - ASPHALT SHINGLES, vertically and hold in place with Z-furring members spaced 24 inches o.c.
2. Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.
3. At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw-attach short flange of furring channel to web of attached channel. At interior corners, space second member no more than 12 inches from corner and cut insulation to fit.

G. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

3.05 INSTALLING SUSPENSION SYSTEMS

A. Install suspension system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types as indicated.
1. Hangers: 48 inches o.c.
2. Carrying Channels (Main Runners): 48 inches o.c.
3. Furring Channels (Furring Members): 16 inches o.c.

B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.

C. Suspend hangers from building structure as follows:
1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
   a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.

2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.
   a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.
3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
4. Flat Hangers: Secure to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.
5. Do not attach hangers to steel roof deck.
6. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
7. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
8. Do not connect or suspend steel framing from ducts, pipes, or conduit.

D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.

E. Seismic Bracing: Sway-brace suspension systems with hangers used for support.

F. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

G. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

END OF SECTION 092216

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Interior gypsum board.
   2. Fire resistive Type X Gypsum Board.
   3. Abuse-Resistant Gypsum Board
   4. Moisture and Mold-Resistant gypsum board.
   5. Fire ResistiveType C Gypsum Board
   6. Glass-Mat Interior Gypsum Board.
   7. Acoustical Gypsum Board.
   8. Cementitious Tile Backer Board.
   9. Water-Resistant Gypsum Tile backing panels.
   10. Trim and Accessories.
   11. Joint treatment, tapes, compounds and finishing.
   12. Miscellaneous metal framing, furring, and fasteners.
   13. Sound attenuation insulation and acoustical sealants.
   14. All related items necessary to complete the work of this section.

1.03 SUBMITTALS

A. Product Data: For each type of product.

B. Submit manufacturers' product information, specifications, and installation instructions for the specified products including joint compounds, fasteners, trim, control joints, joint reinforcing, metal furring members, metal studs, tracks, runners, resilient clips, steel grounds, and all related accessories.
   1. Trim Accessories: Full-size Sample in 12-inch (300-mm-) long length for each trim accessory indicated.

C. Mockups: Before beginning gypsum board installation, install mockups of at least 100 sq. ft. (9 sq. m) in surface area to demonstrate aesthetic effects and set quality standards for materials and execution.

1.04 DELIVERY, STORAGE AND HANDLING

A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.05 FIELD CONDITIONS

A. Environmental Limitations: Comply with ASTM C840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.

B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.

C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.
   1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.

PART 2 - PRODUCTS

2.01 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: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E90 and classified according to ASTM E413 by an independent testing agency.

2.02 GYPSUM BOARD, GENERAL

A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.03 INTERIOR GYPSUM BOARD

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. National Gypsum Company.
   2. USG Corporation.
   3. Or approved equal.

B. Gypsum Wallboard: ASTM C1396/C1396M.
   1. Thickness: 5/8 inch (15.9 mm) and 1/2 inch (12.7 mm).
   2. Long Edges: Tapered and featured (rounded or beveled) for Pre-filling.

C. Gypsum Board, Type X: ASTM C1396/C1396M.
   1. Thickness: 5/8 inch (15.9 mm) and 1 inch (25.4 mm).

D. Abuse-Resistant Gypsum Board: ASTM C1629/C1629M, Level 3.
   1. Long Edges: Tapered.
   2. Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D 3274.
   3. Weight: 2.8 lbs. per sf.
   4. Flame spread rating: ASTM E84, 15.
   5. Water Absorption: ASTM C473, Less than 5%.

E. Moisture- and Mold-Resistant Gypsum Board: ASTM C1396/C1396M. With moisture- and mold-resistant core and paper surfaces.
   1. Core: 5/8 inch (15.9 mm), regular type; 5/8 inch Type X.
   2. Long Edges: Tapered.
   3. Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D 3274.

2.04 SPECIALTY GYPSUM BOARD

A. Gypsum Board, Type C: ASTM C1396/C1396M. Manufactured to have increased fire-resistive capability.
   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. USG Corporation; Firecode C Core.
      b. Or approved equal.
   2. Thickness: 5/8 inch minimum or as required by fire-resistance-rated assembly indicated on Drawings.
   3. Long Edges: Tapered.

B. Glass-Mat Interior Gypsum Board: ASTM C 1658/C 1658M with fiberglass mat laminated to both sides. Specifically designed for interior use.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Georgia-Pacific Gypsum LLC; DensArmour Plus.
      b. Approved equal
   2. Core: 5/8 inch (15.9 mm), regular type; Long Edges: Tapered.
   3. Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D 3274.
      a. CertainTeed Corp.; GlasRoc Sheathing.

C. Acoustical Gypsum Board with sound-absorbing viscoelastic polymer core:
   1. Basis of Design: Quiet Rock 527, manufactured by Serious Materials or approved equal.
   2. Thickness: 5/8 inch, tapered edges.
   3. Weight: 3.0 lbs/sq. ft.
   4. Materials: Paper faced gypsum, sound-absorbing viscoelastic polymer core, magnesium oxide wallboard, cement.
   5. STC Rating: 55-65 (ASTM E90).
   6. Fire-rated: 1 hour (ASTM E119).
   7. Surface flame: Class A (ASTM E84).

2.05 TILE BACKING PANELS

A. Cementitious Backer Units: ANSI A118.9 and ASTM C1288 or ASTM C1325, with manufacturer's standard edges.
   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. USG Corporation; DUROCK Cement Board.
      b. Or approved equal.
   2. Thickness: 1/2 inch
   3. Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D 3274.
   4. Tape: 2 inch wide, coated glass fiber tape for joints and corners;

B. Water-Resistant Gypsum Backing Board: ASTM C1396/C1396M, with manufacturer's standard edges.
   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. USG Corporation.
      b. Or approved equal.

2. Core: As indicated on Drawings 5/8 inch (15.9 mm), Type X.

2.06 TRIM ACCESSORIES

A. Interior Trim: ASTM C1047.
   1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
   2. Shapes:
      a. Cornerbead.
      b. L-Bead: L-shaped; exposed long flange receives joint compound.
      c. Expansion (control) joint.

B. PVC Rip Bead L-Trim (VLZL) with tear-away strip to be removed after drywall finishing and painting to form a crisp, clean edge. 0.028 PVC material with 5/8 inch Tear away flange, 10 foot lengths with perforated flanges. Manufacturer: ClarkDietrich or approved equal.

C. Aluminum Trim: Extruded accessories of profiles and dimensions indicated.
   1. Manufacturers: Subject to compliance with requirements, provide products by the following:
      a. Fry Reglet Corp.
      b. Gordon, Inc.
      c. Pittcon Industries.
   2. Finish: Corrosion-resistant primer compatible with joint compound and finish materials specified or finish as specified on the drawings..

2.07 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C475/C475M.

B. Joint Tape:
   1. Interior Gypsum Board: Paper.
   2. Glass-Mat Gypsum Sheathing Board: 10-by-10 glass mesh.
   3. Tile Backing Panels: As recommended by panel manufacturer.

C. Joint Compound for Interior Gypsum Board: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
   1. Pre-filling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
   2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
      a. Use setting-type compound for installing paper-faced metal trim accessories.
   3. Fill Coat: For second coat, use setting-type, sandable topping compound.
   4. Finish Coat: For third coat, use setting-type, sandable topping compound.

2.08 MATERIALS

A. Metal Framing: Protective coating of framing shall conform to ASTM A653/A653M - G40 minimum, or shall be a protective coating with equal or better corrosion resistance.
   1. Runners: In compliance with ASTM C645, provide 1-1/2” galvanized steel runners to match applicable assembly specified, to match wall framing members, unless indicated otherwise.
   2. Furring members: In compliance with ASTM C645, provide galvanized cold rolled steel, 0.0296" minimum thickness of base metal or 20 gage min., screw type hat shaped

channels; 7/8" depth, width approx. 2¾", hemmed edges. Where furring channels are used in conjunction with resilient clips, width of channel shall be coordinated with clip configuration to ensure proper fit.

3. Vertical Supports: 1" x 1/8" steel flat bars installed a maximum 4'-0" on center, slotted for 3/8" diameter bolts at each end. 3" x 3" x 3/16" steel angle, slotted to receive 3/8" diameter bolt and faster to truss above with a safe working load of 300 pounds minimum.
4. Fasteners for Metal Framing: Provide fasteners of type, size, style, grade, holding power, class, and other properties required for secure installation of framing and furring. Galvanize all fasteners and accessories. All devices, other than bolts, used to interconnect ceiling members are required to be certified and listed by an Approved Agency.

B. Fasteners: Fasteners for securing board to metal furring or wood shall be Phillips Head, black oxidized screws made for fastening gypsum wall board, size and length as recommended by the drywall manufacturer for the applications shown.

C. Joint Compound for Tile Backing Panels:
1. Cementitious Backer Units: As recommended by backer unit manufacturer.
2. Water-Resistant Gypsum Backing Board: Use setting-type taping compound and setting-type, sandable topping compound.

2.09 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.

B. Steel Drill Screws: ASTM C1002, unless otherwise indicated.
1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick.
2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

C. Sound Attenuation Blankets: ASTM C665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.

D. Acoustical Joint Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E90.
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. Accumetric LLC; BOSS 824 Acoustical Sound Sealant.
b. Grabber Construction Products; Acoustical Sealant GSC.
c. Pecora Corporation; AC-20 FTR AIS-919.
d. USG Corporation; SHEETROCK Acoustical Sealant.
e. Approved Equal.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine areas and substrates including welded hollow-metal frames and framing, with Installer present, for compliance with requirements and other conditions affecting performance.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 APPLYING AND FINISHING PANELS, GENERAL

A. Comply with ASTM C840.

B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch (1.5 mm) of open space between panels. Do not force into place.

D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

E. Form control and expansion joints with space between edges of adjoining gypsum panels.

F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
   1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. (0.7 sq. m) in area.
   2. Fit gypsum panels around ducts, pipes, and conduits.
   3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch (6.4- to 9.5-mm-) wide joints to install sealant.

G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4 to 1/2-inch (6.4 to 12.7-mm) wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

I. Wood Framing: Install gypsum panels over wood framing, with floating internal corner construction. Do not attach gypsum panels across the flat grain of wide-dimension lumber, including floor joists and headers. Float gypsum panels over these members or provide control joints to counteract wood shrinkage.

J. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C919 and with manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.

K. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

3.03 APPLYING INTERIOR GYPSUM BOARD

A. Install interior gypsum board in the following locations:
   1. Wallboard Type: As indicated on Drawings.
   2. Type X: As indicated on Drawings.
   3. Ceiling Type: As indicated on Drawings.
   4. Abuse-Resistant Type: As indicated on Drawings.
   5. Moisture- and Mold-Resistant Type: As indicated on Drawings.
   6. Glass-Mat Interior Type: As indicated on Drawings.

B. Single-Layer Application:
   1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
   2. On partitions/walls, apply gypsum panels horizontally (perpendicular to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
      a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
      b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.
   3. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

C. Multilayer Application:
   1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints one framing member, 16 inches (400 mm) minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.
   2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
   3. Fastening Methods: Fasten base layers and face layers separately to supports with screws.

3.04 CONSTRUCTION TOLERANCES

A. Do not exceed 1/8" in 8'-0" variation from plumb or level in any exposed line or surface, except at joints between units do not exceed 1/16" variation between planes of abutting edges or ends. Shim as required to comply with specified tolerances. Variations shall not be visible in finished surfaces.

B. For soffits and ceilings verify that direct suspension system has been installed properly, that main runners are spaced evenly and have been leveled to a tolerance of 1/8" in 12 feet measured both lengthwise on each runner and transversely between parallel runners so that furring member installation may proceed accurately.

C. Cementitious Backer Units: ANSI A108.11, at showers and locations indicated to receive tile.

D. Water-Resistant Backing Board: Install where indicated with 1/4 inch (6.4 mm) gap where panels abut other construction or penetrations.

3.05 INSTALLING TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

B. Control Joints: Install control joints according to ASTM C840 and in specific locations approved by Architect for visual effect.

C. Interior Trim: Install in the following locations:
   1. Exposed Edges: Where an exposed edge of gypsum drywall abuts dissimilar materials use Gold Bond #C250 casing bead or equal. Casing beads to be finished with joint compound. Same casing bead and joint treatment is to be used on exposed wallboard edges.

D. Trim: 1/16 inch thick extruded aluminum 6063-T5 mill finish manufactured by Gorden Inc. or approved equal:
   1. J-Trim: Model JD-58
   2. Control Joint: Model RD-5810
   3. Corner Joint: Model FD-5810
   4. ‘F’ Reveal: Model 412-5/8
   5. Reveal Trim: Series 900, Model 904 RT-12
   6. Trim Reveal: Series 300, Model 312-5/8.

E. Neatly cut all openings so that they may be covered by plates and escutcheons.

F. Place control joints consistent with lines of building spaces as directed.
   1. Gypsum Panel surfaces should be isolated with control joints or other means where:
      a. Partition, furring or column fireproofing abuts a structural element (except floor) or dissimilar wall or ceiling;
      b. Ceiling abuts a structural element, dissimilar wall or partition or other vertical penetration; construction changes or ceiling;
      c. Construction changes within the plane of the partition or ceiling;
      d. Partition or furring run exceeds 30 feet;
      e. Ceiling dimensions exceed 50 feet in either direction;
      f. The area within separate ceiling sections exceeds 2,500 sq. ft.;
      g. Wings of "L", "U", and "T" shaped ceiling areas are joined;
   2. Penetrations of the gypsum panel diaphragm, such as door frames, borrowed-light openings, vents, grilles, access panels and light troffers, require additional reinforcement at the corners to distribute concentrated stresses if a control joint is not used.
   3. Place edge trim where gypsum board abuts dissimilar materials. Use longest practical length.
   4. Provide additional framing and blocking as required to support gypsum board at openings and cutouts, and to support built-in anchorage and attachment devices for other work.
   5. Coordinate installation of joint sealers specified in Section 079200 at penetrations and where abutting different materials.
   6. Cornerbead: Use at outside corners unless otherwise indicated.
   7. LC-Bead: Use where indicated.

8. L-Bead: Use where indicated.

3.06 FINISHING GYPSUM BOARD

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

B. Pre-fill open joints, rounded or beveled edges, and damaged surface areas.

C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C840:
   1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
   2. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated. All joints and interior angles shall have tape embedded in joint compound and two separate coats of joint compound applied over all flat joints and one separate coat of joint compound applied over interior angles. Fastener heads and accessories shall be covered with three separate coats of joint compound. All joint compound shall be smooth and free of tool marks and ridges. Prepared surface shall be coated with a drywall primer/sealer prior to the application of finish paint.
      a. Primer and its application to surfaces are specified in Section 099113 - Exterior Painting and 099123 - Interior Painting.
   3. Level 5: Where indicated on Drawings.
      a. Primer and its application to surfaces are specified in Section 099113 - Exterior Painting and 099123 - Interior Painting.

E. Glass-Mat Faced Panels: Finish according to manufacturer's written instructions.

F. Cementitious Backer Units: Finish according to manufacturer's written instructions.

3.07 PROTECTION

A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.

B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

C. Remove and replace panels that are wet, moisture damaged, and mold damaged.
   1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
   2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 092900

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Resilient Tile (Vinyl Enhanced Tile) Flooring.

B. Related Sections:

1.03 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Initial Selection: For each type of product indicated.

C. Samples for Verification: For each type of product indicated, in manufacturer's standard-size samples of each resilient product color, texture, and pattern required.

D. Product Schedule: For resilient products. Use same designations indicated on Drawings.

1.04 QUALITY ASSURANCE

A. Mockups: Provide resilient products with mockups specified in other Sections.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by Johnsonite, but not less than 55 deg F or more than 85 deg F.

1.06 PROJECT CONDITIONS

A. Install resilient products after other finishing operations, including painting, have been completed.

B. Maintain ambient temperatures within range recommended by Johnsonite, but not less than 65 deg F or more than 85 deg F in spaces to receive resilient products during the following time periods:
   1. 48 hours before installation
   2. During installation
   3. 48 hours after installation

C. Maintain the ambient relative humidity between 40% and 60% during installation.

D. Until Substantial Completion, maintain ambient temperatures within range recommended by the manufacturer, but not less than 55 deg F or more than 85 deg F.

1.07 WARRANTY

A. Warranty: 10 year Manufacturer's Warranty

PART 2 -PRODUCTS

2.01 PRODUCTS

A. Products and Product Data meeting the requirements of this specification may be submitted by one of the following manufacturers for review by the Architect for this project:
   1. Johnsonite: A Tarkett Company:: Color Essence and Color Essence Slip Resistant - Basis of Design
   2. Armstrong World Industries, Inc.
   3. TOLI International
   4. Or approved Equal

2.02 MATERIALS

A. Resilient Vinyl Enhanced Tile Flooring
   1. Color Essence and Color Essence Slip Resistant – Resilient Vinyl Enhanced Tile Flooring with the following physical characteristics:
      a. Complies with requirements for ASTM F 1066, Class 3 (Surface Pattern) Standard Specification for Vinyl Composition Floor Tile
      b. Wear layer/Overall thickness: 1/8" (3.2 mm)
      c. Tile size: 12" x 12" (30.5 x 30.5 cm)
      d. ASTM E648, Standard Test method for Critical Radiant Flux of 0.45 watts/cm2 or greater, Class I
      e. Smoke Density: ASTM E662: <450
      f. Slip Resistance: ADA Compliant
      g. Polyurethane Reinforced wear surface with Tritonite Finish
      h. ASTM F970, Standard Test Method for Static Load Limit – 400 PSI (modified for higher load)
      i. Color Essence slip resistant tile shall be provided as indicated on the drawings.
      j. Color Essence shall be installed with Tarkett 800 Pressure Sensitive Adhesive in accordance with the manufacturers requirements.
      k. Vinyl Enhanced Tiles contain 23% pre-consumer and 6% post-consumer recycled content
      l. Phthalate-free
      m. 100% Recyclable
      n. SCS FloorScore® Certified and meets California Specifications Section 01350
      o. Johnsonite facilities shall be ISO 9001 and ISO 14001 Certified
      p. Color/Pattern: As selected by architect from manufacturer’s full line of Color Essence and Color Essence Slip Resistant tile.

2.03 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, Portland cement based or blended hydraulic-cement-based formulation.

B. Adhesives: As recommended by the manufacturer to meet site conditions.
   1. Vinyl Enhanced Tile:

a. Tarkett 800 Pressure Sensitive Adhesive

PART 3 -EXECUTION

3.01 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the work.

B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Prepare substrates according to Johnsonite written instructions to ensure adhesion of Resilient Tile Flooring.
   1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
   2. Remove substrate paint, coatings and other substances that are incompatible with adhesives or contain soap, wax, oil, solvents, or silicone, using mechanical methods recommended by the manufacturer. Do not use solvents.
   3. Mechanically remove contamination on the substrate that may cause damage to the resilient flooring material. Permanent and non-permanent markers, pens, crayons, paint, etc., must not be used to write on the back of the flooring material or used to mark the substrate as they could bleed through and stain the flooring material.
   4. Prepare Substrates according to ASTM F 710 including the following:
      a. Moisture Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
         1) Perform anhydrous calcium chloride test, ASTM F 1869. Results must not exceed 5 lbs. Moisture Vapor Emission Rate per 1,000 sq. ft. in 24 hours.
         – or –
         2) Perform relative humidity test using in situ probes, ASTM F 2170. Results must not exceed 80%.
      b. A pH test for alkalinity shall be conducted. Results shall range between 7 and 9. If the test results are not within the acceptable range of 7 to 9, the installation must not proceed until the problem has been corrected.
      c. Alkalinity and Adhesion Testing: Perform tests as recommended by the manufacturer.

B. Fill cracks, holes, depressions and irregularities in the substrate with good quality Portland cement based underlayment leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.

C. Floor covering shall not be installed over expansion joints. Expansion Joints shall be honored and shall carry through floor covering installation(s) as indicated on the drawings

D. Do not install resilient products until they maintain the same temperature (acclimate) as the space where they are to be installed.
   1. Store resilient products and installation materials into the spaces where they will be installed at least 48 hours in advance of installation. Verify that the materials have acclimated to the spaces prior to commencing installation.

E. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

3.03 INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient tile flooring.

B. Vinyl Enhanced Tile Flooring:
   1. Install with manufacturers approved adhesive specified for the material and site conditions and follow adhesive label for proper use.
   2. Follow manufacturers - Johnsonite - recommendation for Quarter Turn tiles.
   3. Open enough cartons of floor tiles to cover each area, and mix tile to ensure shade variations do not occur within any one area.
   4. Roll the flooring in both directions using a 100 pound three-section roller.

3.04 CLEANING AND PROTECTING

A. Comply with manufacturer's written instructions for cleaning and protection of resilient products.

B. Perform the following operations immediately after completing resilient product installation:
   1. Remove adhesive and other blemishes from exposed surfaces.
   2. Sweep and vacuum surfaces thoroughly.
   3. Damp-mop surfaces to remove marks and soil.

C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. No traffic shall be permitted on the installed material for 24 hours after installation.

E. No heavy traffic, rolling loads, or furniture placement shall be permitted for 72 hours after installation.

F. Wait 72 hours after installation before performing initial cleaning.

G. A regular maintenance program must be started after the initial cleaning.

END OF SECTION 096519.11

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section includes surface preparation and the application of paint systems on interior substrates.
   1. Concrete.
   2. Concrete Masonry Units.
   3. Steel.
   4. Galvanized metal.
   5. Gypsum board.
   6. Wood.
   7. Aluminum.
   8. Clay Masonry

1.03 DEFINITIONS

A. Flat: Gloss Level 1: Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D523.

B. Matte: Gloss Level 2: Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D523.

C. Eggshell: Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D523.

D. Satin: Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D523.

E. Semi-Gloss: Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D523.

F. Gloss: Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D523.

G. High Gloss: Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D523.

1.04 ACTION SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions.

B. Samples for Initial Selection: For each type of topcoat product.
   1. Product List: For each product indicated, include the following:
   2. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
   3. Printout of current "MPI Approved Products List" for each product category specified in Part 2, with the proposed product highlighted.
   4. VOC content.

1.05 CLOSEOUT SUBMITTALS

A. Coating Maintenance manual: Manual: Upon conclusion of the project, the Contractor or paint manufacturer/supplier shall furnish a coating maintenance manual, such as Sherwin-Williams “Custodian Project Color and Product Information report or equal. Manual shall include an Area Summary with finish schedule, Area Detail designating where each product/color/finish was used, product data pages, Material Safety Data Sheets, care and cleaning instructions, touch-up procedures, and color samples of each color and finish used.

1.06 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Paint: 5 percent, but not less than 1 gal. of each material and color applied.

B. Coating Maintenance Manual: Upon conclusion of the project, the Contractor or paint manufacturer/supplier shall furnish a coating maintenance manual, such as Sherwin-Williams “Custodian Project Color and Product Information report or equal. Manual shall include an Area Summary with finish schedule, Area Detail designating where each product/color/finish was used, product data pages, Material Safety Data Sheets, care and cleaning instructions, touch-up procedures, and color samples of each color and finish used.

1.07 QUALITY ASSURANCE

A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
   1. Architect will select one surface to represent surfaces and conditions for application of each paint system specified in Part 3.
      a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft..
      b. Other Items: Architect will designate items or areas required.
   2. Final approval of color selections will be based on mockups.
      a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.
   3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
   4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
   1. Maintain containers in clean condition, free of foreign materials and residue.
   2. Remove rags and waste from storage areas daily.

B. Delivery and Handling: Deliver products to Project site in an undamaged condition in manufacturer's original sealed containers, complete with labels and instructions for handling, storing, unpacking, protecting, and installing. Packaging shall bear the manufacturer’s label with the following information:
   1. Product name and type (description).

2. Batch date.
3. Color number.
4. VOC content.
5. Environmental handling requirements.
6. Surface preparation requirements.
7. Application instructions.

1.09 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.

B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

C. Lead Paint: It is not expected that lead paint will be encountered in the Work.

PART 2 - PRODUCTS

2.01 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. Benjamin Moore & Co.
2. PPG Architectural Finishes, Inc.
3. Sherwin-Williams Company.

2.02 PAINT, GENERAL

A. MPI Standards: Provide products that comply with MPI standards indicated and that are listed in its "MPI Approved Products List."

B. Material Compatibility:
1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

C. VOC Content: Products shall comply with VOC limits of authorities having jurisdiction and, for interior paints and coatings applied at Project site, the following VOC limits, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

1.	Flat Paints and Coatings:	50 g/L.
2.	Nonflat Paints and Coatings:	150 g/L.
3.	Dry-Fog Coatings:	400 g/L.
4.	Primers, Sealers, and Undercoaters:	200 g/L.
5.	Anti-corrosive and Antirust Paints Applied to Ferrous Metals:	250 g/L.
6.	Zinc-Rich Industrial Maintenance Primers:	340 g/L.
7.	Pretreatment Wash Primers:	420 g/L.
8.	Floor Coatings:	100 g/L.
9.	Shellacs, Clear:	730 g/L.

10. Shellacs, Pigmented: `550 g/L.

D. Colors: As selected by Architect from manufacturer's full range.
   1. 30 percent of surface area will be painted with deep tones.

2.03 BLOCK FILLERS

A. Block Filler, Latex, Interior/Exterior: MPI #4.
   1. Benjamin Moore - Super Spec - Int/Ext High-Build Block Filler - 206/K206 (75-100 sq. ft. / gal - 4.2 mdf per coat), VOC 55 g/l, CHPS (E3)
   2. Sherwin-Williams - PrepRite Int/Ext Block Filler, B25W25, at 75-125 sq. ft. per gal. (E3)
   3. Or approved equal.

2.04 PRIMERS/SEALERS

A. Primer Sealer, Latex, Interior: MPI #50.
   1. Benjamin Moore - Ultra Spec 500 Latex Primer N534 (0 g/l), 50 X-Green (E3)
   2. Sherwin-Williams - Pro Mar 200 Zero - Interior Latex Primer - B28W02600/B28WQ2600 (E3)
   3. PPG - Speedhide Interior Latex - Quick-Drying #6-2 (E3)

B. Primer Sealer MPI #60.
   1. Benjamin-Moore - (E3) Insul-X Tough Shield Floor and Patio TS-3 (<200 g/l)
   2. Sherwin-Williams - Protective & Marine - Armorseal Tread-Plex - B90W111 (E3)
   3. Or approved equal.

C. Primer Sealer, Interior, Institutional Low Odor/VOC: MPI #149.
   1. Benjamin Moore - Ultra Spec 500 Latex Primer N534 +(0 g/l), MPI 149 X-Green (E3)
   2. Sherwin-Williams - ProMar 200 Zero - Interior Latex Primer - B28W02600/B28WQ2600 (E3)
   3. PPG - Speehide Zero Interior Zero VOC - #6-4900XI -(E3)

D. Primer, Latex, for Interior Wood: MPI #39.
   1. Benjamin Moore - Fresh Start N023 Primer, CHPS Certified (E3)
   2. Sherwin-Williams - PrepRite ProBlock Primer Sealer - B51-620 Series, at 4.0 mils wet, 1.4 mils dry. (E3)
   3. Or approved equal.

E. Primer, Alkyd, Anti-Corrosive, for Metal: MPI #79.
   1. Benjamin Moore - Super Spec Alkyd Metal Primer P06, 1.9 mdf, VOC - 313 (E2)
   2. Sherwin-Williams - Protective & Marine - Kem Bond HS - B50WZ4 (E2)
   3. Rustoleum - High Performance - 7400 System - #2082402 (E2)
   4. Or approved equal

F. Primer, Alkyd, Quick Dry, for Metal: MPI #76.
   1. Benjamin Moore -Corotech Universal Metal Primer V131, 2.1 mdf, 333 g/l.
   2. Sherwin-Williams - Protective & Marine - Kem Bond HS Universal Alkyd Primer - B50WZ0004 (E3)
   3. Or approved equal.

G. Primer, Galvanized, Water Based: MPI #134.
   1. Benjamin Moore Super Spec HP Acrylic Metal Primer P04/KP04.

2. Sherwin Williams - Pro Industrial - Pro-Cryl Universal Primer - B66W310 (E2)
3. Or approved equal.

2.05 WATER-BASED PAINTS

A. Latex, Interior, Flat, (Gloss Level 1): MPI #53.
   1. Benjamin Moore - Eco Spec WB Interior Latex Flat Finish N373/F373 (E3)
   2. Sherwin-Williams - Solo - Interior/Exterior 100% Acrylic Flat - A74W00051 (E3)
   3. PPG - Speedhide - Interior Flat Latex - #6-70 (E3).
   4. Or approved equal.

B. Latex, Interior, (Gloss Level 4): MPI #43 (Pearl / Satin / Low Lustre)
   1. Benjamin Moore - Ultra Spec 500 Latex Semi Gloss N539 (0 g/l), 43 X-Green (E3).
   2. Sherwin-Williams - ProMar 200 Zero VOC - Interior Latex Semi-Gloss, B31-2600 Series - (E3).
   3. Or approved equal.

C. Latex, Interior, Institutional Low Odor/VOC, Flat (Gloss Level 1): MPI #143.
   1. Benjamin Moore - Ultra Spec 500 Latex Eggshell N538 (0 g/l), MPI #143 X-Green, CHPS Certified (E3).
   2. Sherwin-Williams - Harmony - Interior Acrylic Latex Flat - B05W01051 (E3)
   3. Or approved Equal.

D. Latex, Interior, Institutional Low Odor/VOC, (Gloss Level 3): MPI #145
   1. Benjamin Moore - Ultra Spec500 Latex Eggshell N538 (0 g/l), MPI # 145 X-Green, CHPS Certified (E3).
   2. Sherwin Williams Promar 200 Zero VOC - Interior Latex Flat - #B30WO2651/B30WQ2651 (E3).
   3. PPG Speedhide Zero - Interior Zero VOC Latex Flat - #6-4110XI (E3).

E. Latex, Interior, High Performance Architectural, (Gloss Level 2): MPI #138.
   1. Benjamin Moore Regal Select Waterborne Interior Paint - Eggshell Finish 549, 1.5 mdf, (0 g/l), MPI #138 X-Green, CHPS Certified.
   2. Sherwin-Williams - SuperPaint - Interior Latex Satin - A87W001151/A87WQ1151 (E3)
   3. Or approved equal.

2.06 SOLVENT-BASED PAINTS

A. Epoxy Primer MPI #212
   1. Sherwin-Williams - Protective & Marine - ArmorSeal 33 Epoxy Primer - B58AQ33/B60VQ33 (E3)
   2. Or approved Equal

B. Alkyd, Quick Dry, Semi-Gloss (Gloss Level 5): MPI #81.
   1. Corotech Alkyd Enamel Semi-Gloss V231, 2.0 - 2.5 mdf, 389 g/l.
   2. Or approved equal.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers. Where acceptability of substrate conditions is in question, apply samples and perform in-situ testing to verify compatibility, adhesion, and film integrity of new paint application.
   1. Report in writing conditions that may affect application, appearance, or performance of paint.

B. Substrate Conditions:
   1. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
      a. Concrete: 12 percent.
      b. Masonry (Clay and CMU): 12 percent.
      c. Wood: 15 percent.
      d. Gypsum Board: 12 percent.
   2. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.

C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

D. Proceed with coating application only after unsatisfactory conditions have been corrected.
   1. Application of coating indicates acceptance of surfaces and conditions.

3.02 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Manual" applicable to substrates indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
   1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
   1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.
   1. Concrete Floors: Remove oil, dust, grease, dirt and other foreign materials. Comply with SSPC-SP-13/NACE 6 or ICRI 03732.

E. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceed that permitted in manufacturer's written instructions.

1. SSPC-SP 3, "Power Tool Cleaning."

F. Steel Substrates: Remove rust, loose mill scale, and shop primer, if any. Clean using methods recommended in writing by paint manufacturer but not less than the following:
   1. SSPC-SP 2, "Hand Tool Cleaning."
   2. SSPC-SP 3, "Power Tool Cleaning."
   3. SSPC-SP 7/NACE No. 4, "Brush-off Blast Cleaning."
   4. SSPC-SP 11, "Power Tool Cleaning to Bare Metal."

G. Shop-Primed Steel Substrates: Clean field welds, bolted connections and abraded areas of shop paint and paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop primed surfaces.

H. Galvanized Metal Surfaces: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

I. Aluminum Substrates: Remove loose surface oxidation.

J. Wood Substrates:
   1. Scrape and clean knots and apply coat of knot sealer before applying primer.
   2. Sand surfaces that will be exposed to view and dust off.
   3. Prime edges, ends, faces, undersides and backsides of wood.
   4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

K. Cotton or Canvas Insulation Covering Substrates: Remove dust, dirt and other foreign material that might impair the bond of paints to substrates.

3.03 APPLICATION

A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."
   1. Use applicators and techniques suited for paint and substrate indicated.
   2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
   3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
   4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
   5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

E. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:
   1. Unless otherwise specified or noted, paint all “unfinished” conduits, piping, hangers, ductwork and other mechanical and electrical equipment with color and texture to match adjacent surfaces, in the following areas:
      a. where exposed-to-view in all exterior and interior areas.
      b. in all interior high humidity interior areas.
      c. in all boiler room, mechanical and electrical rooms.
   2. In unfinished areas leave exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment in original finish and touch up scratches and marks.
   3. Touch up scratches and marks on factory painted finishes and equipment with paint as supplied by manufacturer of equipment.
   4. Do not paint over nameplates.
   5. Paint the inside of all ductwork where visible behind louvers, grilles and diffusers for a minimum of 460 mm (18”) or beyond sight line, whichever is greater, with primer and one coat of matt black (non-reflecting) paint.
   6. Paint the inside of light valances gloss white.
   7. Paint disconnect switches for fire alarm system and exit light systems in red enamel.
   8. Paint red or band all fire protection piping and sprinkler lines in accordance with mechanical specification requirements and the AHJ. Keep sprinkler heads free of paint.
   9. Paint yellow or band all natural gas piping in accordance with mechanical specification requirements and the AHJ.
   10. Backprime and paint face and edges of plywood service panels for telephone and electrical equipment before installation to match adjacent wall surface. Leave equipment in original finish except for touch-up as required, and paint conduits, mounting accessories and other unfinished items.
      a. Uninsulated plastic piping.
      b. Pipe hangers and supports.
      c. Metal conduit.
      d. Plastic conduit.
      e. Tanks that do not have factory-applied final finishes.
      f. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material. Coordinate the installation of required piping labels with the installing contractor in order to schedule painting prior to application of labels.
   11. Paint the following work where exposed in occupied spaces:
      a. Equipment, including panelboards.
      b. Uninsulated metal piping.
      c. Uninsulated plastic piping.
      d. Pipe hangers and supports.
      e. Metal conduit.
      f. Plastic conduit.
      g. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
      h. Other items as directed by Architect.
   12. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces.

3.04 FIELD QUALITY CONTROL

A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.
   1. Contractor shall touch up and restore painted surfaces damaged by testing.
   2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.05 PROTECTION

A. Protect all exterior surfaces and areas, including landscaping, walks, drives, all adjacent building surfaces (including glass, aluminum surfaces, etc.) and equipment and any labels and signage from painting operations and damage by drop cloths, shields, masking, templates, or other suitable protective means and make good any damage caused by failure to provide such protection.

B. Protect all interior surfaces and areas, including glass, aluminum surfaces, etc. and equipment and any labels and signage from painting operations and damage by drop cloths, shields, masking, templates, or other suitable protective means and make good any damage caused by failure to provide such protection.

C. Erect barriers or screens and post signs to warn of or limit or direct traffic away or around work area as required.

3.06 CLEANING

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site. Keep work area free from an unnecessary accumulation of tools, equipment, surplus materials and debris.

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. Remove combustible rubbish materials and empty paint cans each day and safely dispose of same in accordance with requirements of authorities having jurisdiction.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.07 INTERIOR PAINTING SCHEDULE

A. Glazed Brick Masonry:
   1. Latex Systems
      a. Semi-Gloss Finish
         1) First Coat: Benjamin Moore, Fresh Start High Hiding All-purpose Primer 0046, 1.2 mils DFT.
         2) Second Coat: Coronado, Rust Scat Acrylic WB Int/Ext Enamel Semi-Gloss C90, 1.4 - 1.7 mils DFT.
         3) Third Coat: Coronado, Rust Scat Acrylic WB Int/Ext Enamel Semi-Gloss C90, 1.4 - 1.7 mils DFT.

B. Concrete Block Masonry (CMU)
   1. Latex System:
      a. Semi Gloss Finish:
         1) First Coat: Benjamin Moore, Corotech Acrylic Block Filler V114, 8 - 16 mils DFT.
         2) Second Coat: Coronado, Rust Scat Acrylic WB Int/Ext Enamel Semi-Gloss C90, 1.4 - 1.7 mils DFT.
         3) Third Coat: Coronado, Rust Scat Acrylic WB Int/Ext Enamel Semi-Gloss C90, 1.4 - 1.7 mils DFT.
   2. Two Component Epoxy System (Water Base)
      a. Gloss Finish:
         1) First Coat: Benjamin Moore, Corotech Acrylic Block Filler V114, 8 - 16 mils DFT.
         2) Second Coat: Benjamin Moore, Corotech Waterborne Amine Epoxy V440, 1`.5 - 1.9 mils DFT.
         3) Third Coat: Benjamin Moore, Corotech Waterborne Amine Epoxy V440, 1.5 - 1.9 DFT.

C. Concrete Substrates, Traffic Surfaces:
   1. Latex Floor Enamel System: (MPI INT 3.2A)
      a. Prime Coat: Floor paint, latex, slip-resistant, matching topcoat.
      b. Topcoat: Floor paint, latex slip-resistant, low gloss (maximum Gloss Level 3), MPI #60: Benjamin Moore - Insl-X Tough Shield Floor and Patio TS-3 (<200 g/l).
   2. Concrete Stain System (Water-based): (MPI INT 3.2E)
      a. First Coat: Benjamin Moore - Insl-X Tuffcrete Waterborne Acrylic Concrete Stain CST-2xxx, 450-500 sq. ft. / gal., 153 g/l, MPI #58.
      b. Second coat: Benjamin Moore - Insl-X Tuffcrete Waterborne Acrylic Concrete Stain CST-2xxx, 450-500 sq. ft. / gal., 153 g/l, MPI #58.

D. Metal Substrates:
   1. Latex System:
      a. Gloss Finish:
         1) First Coat: First Coat: Coronado, Rust Scat Int/Ext WB Acrylic Metal Primer 36, 1.5-1.9 mils .
         2) Second Coat: Coronado, Rust Scat Acrylic WB Int/Ext Enamel Semi-Gloss C90, 1.4-1.7 DFT.
         3) Third Coat: Coronado, Rust Scat Acrylic WB Int/Ext Enamel Semi-Gloss C90, 1.4-1.7 DFT.
   2. Acrylic System (Solvent Base Finish):
      a. Gloss Finish Silicone Modified:
         1) First Coat: First Coat: Coronado Rust Scat Polyurethane Int-Ext Alkyd Metal Primer 35, 1.8-2.2 mils DFT .
         2) Second Coat: Coronado, Rust Scat Silicone Alkyd Enamel Gloss 39 , 2.0-2.5 mils DFT.
         3) Third Coat: Coronado, Rust Scat Silicone Alkyd Enamel Gloss 39 , 2.0-2.5 mils DFT.

E. Metal (Steel Joists, Trusses)
   1. Latex Systems:
      a. Gloss Finish:
         1) First Coat: First Coat: Coronado, Rust Scat Int/Ext WB Acrylic Metal Primer 36, 1.5-1.9 mils DFT.

2) Second Coat: Coronado, Rust Scat Acrylic WB Int/Ext Enamel Semi-Gloss C90, 1.4-1.7 DFT.
3) Third Coat: Coronado, Rust Scat Acrylic WB Int/Ext Enamel Semi-Gloss C90, 1.4-1.7 DFT.

2. Alkyd System (Solvent Base Finish):
   a. Gloss Finish Silicone Modified:
      1) First Coat: First Coat: Coronado Rust Scat Polyurethane Int-Ext Alkyd Metal Primer 35, 1.8-2.2 mils DFT.
      2) Second Coat: Coronado, Rust Scat Silicone Alkyd Enamel Gloss 39 , 2.0-2.5 mils DFT.
      3) Third Coat: Coronado, Rust Scat Silicone Alkyd Enamel Gloss 39 , 2.0-2.5 mils DFT.

F. Galvanized-Metal and Aluminum Substrates:
   1. Pigmented Polyurethane System: (MPI INT 5.4C)
      a. Prime Coat, MPI #105: Benjamin Moore - Corotech Acrylic Metal Primer V110, 1.5 - 2.0 mdf, (VOC ,<200)
      b. Intermediate Coat: Polyurethane, two-component, pigmented, matching topcoat.
      c. Topcoat: Polyurethane, two-component, pigmented, gloss, MPI #105: Benjamin Moore - Corotech Urethane Waterborne Urethane Gloss, V540, 470-530 sq. ft. / gal., 1.6-1.8 mdf, (19 g/l).
   2. Latex System
      a. Gloss Finish:
         1) First Coat: Coronado, Rust Scat Int/Ext WB Acrylic Metal Primer 36, 1.5-1.9 mils DFT.
         2) Second Coat: Coronado Rust Scat Acrylic WB Int/Ext Enamel Semi-Gloss C90, 1.4-1.7 mils DFT.
         3) Third Coat: Coronado, Rust Scat Acrylic WB Int/Ext Enamel Semi-Gloss C90, 1.4-1.7 mils DFT.
   3. Alkyd System (Waterbased)
      a. Gloss Finish:
         1) First Coat: Coronado, Rust Scat Int/Ext WB Acrylic Metal Primer 36, 1.5 - 1.9 mils DFT.
         2) Second Coat: Coronado, Super Kote 5000 Waterborne Acrylic Alkyd Semi-Gloss Finish 204, 1.4 - 1.6 mils DFT.
         3) Third Coat: Coronado, Super Kote 5000 Waterborne Acrylic Alkyd Semi-Gloss Finish 204, 1.4 - 1.6 mils DFT.

G. Wood Substrates:
   1. Latex System:
      a. Semi-Gloss Finish:
         1) First Coat: Benjamin Moore, Fresh Start Latex Primer 023 1.2 DFT.
         2) Second Coat: Coronado, Rust Scat Acrylic WB Int/Ext Enamel Semi-Gloss C90, 1.4-1.7 DFT.
         3) Third Coat: Coronado, Rust Scat Acrylic WB Int/Ext Enamel Semi-Gloss C90, 1.4-1.7 DFT.
   2. Stain and Varnish System:
      a. Gloss Finish:
         1) First Coat: Lenmar Waterborne Interior Wiping Stain 1WB.1300.
         2) Second Coat: Lenmar Waterborne Aqua-Plastic Urethane Gloss 1WB.1400 .
         3) Third Coat: Lenmar Waterborne Aqua-Plastic Urethane Gloss 1WB.1400.

H. Gypsum Board Substrates:
   1. Latex System:
      a. Semi-Gloss Finish:
         1) First Coat: Benjamin Moore, Ultra Spec 500 Interior Latex Primer N534.
         2) Second Coat: Coronado, Rust Scat Acrylic WB Int/Ext Enamel Semi-Gloss C90, 1.4-1.7 DFT .
         3) Third Coat: Coronado, Rust Scat Acrylic WB Int/Ext Enamel Semi-Gloss C90, 1.4-1.7 DFT.
   2. Institutional Low-Odor/VOC Latex System: (MPI INT 9.2M)
      a. Prime Coat: Primer sealer, interior, institutional low odor/VOC, MPI #149 X- Green. Benjamin Moore - Ultra Spec 500 Latex Primer, N534, (0 g/l).
      b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
      c. Topcoat: Latex, interior, institutional low odor/VOC, flat (Gloss Level 1), MPI #143: Benjamin Moore - Ultra-Spec 500 Latex Flat, N536, (0 g/l), CHPS Certified.
   3. High-Performance Architectural Latex System: (INT 9.2B)
      a. Prime Coat: Primer sealer, latex, interior, MPI #50 X-Green. Benjamin Moore - Ultra Spec 500 Latex Primer, N534, (0 g/l),
      b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
      c. Topcoat: Latex, interior, high performance architectural, (Gloss Level 3), MPI #139: Benjamin Moore Ultra spec 500 Latex Eggshell, N538, (0 g/l), CHPS certified.
   4. Water-Based Light Industrial Coating System:
      a. Prime Coat: Primer sealer, latex, interior, MPI #50 X-Green: Benjamin Moore - Ultra Spec 500 Latex Primer, N534, (0 g/l).
      b. Intermediate Coat: Light industrial coating, interior, water based, matching topcoat.
      c. Topcoat: Light industrial coating, interior, water based, eggshell, (Gloss Level 3), MPI #151: Benjamin Moore - Corotech Pre-Catalyzed Waterborne Epoxy Eggshell, v342, 1.5- 2.0 mdf, (VOC-72).
      d. Topcoat: Light industrial coating, interior, water based, semi-gloss, (Gloss Level 5), MPI #153 X-Green: S Benjamin Moore Ultra Spec HP DTM Acrylic Enamel Semi-Gloss HP29, 2.3 mdf, (VOC-45).
   5. Epoxy-Modified Latex System: (MPI INT 9.2F)
      a. Prime Coat: Primer sealer, latex, interior, MPI #50 X-Green:Benjamin Moore - Ultra Spec 500 Latex Primer, N534, (0 g/l).
      b. Intermediate Coat: Epoxy-modified latex, interior, matching topcoat.
      c. Topcoat: Epoxy-modified latex, interior, eggshell, (Gloss Level 3), MPI #115: Benjamin Moore - Corotech Pre-Catalyzed Waterborne Epoxy Eggshell, V342, 1.5 - 2.0 mdf, (VOC-72).
      d. Topcoat: Epoxy-modified latex, interior, gloss, (Gloss Level 6), MPI #115: . Benjamin Moore - Corotech, Acrylic Epoxy Gloss, V450/V450-90, 1.5 - 2.0 mdf, (168 g/l).

END OF SECTION 099123

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. This section describes the general requirements for all mechanical items and systems required by the Contract Documents.

B. Comply with all Contract Requirements, General Conditions, Supplementary Conditions and Division 1 Sections applying to or affecting the Work of Division 23.

C. Unless specifically dimensioned, the Work shown on the Drawings is in diagrammatic form only to show general arrangement.

D. Include, in the Work, all accessories and appurtenances, necessary and integral, for the intended operation of any system, component or device, as such systems, components and devices are specified.

E. Do not install pipe or conduit through ductwork.

F. If the pipe or duct size shown on the Drawings does not match the connection size of the equipment that it is connected to, provide the necessary transition pieces at the piece of equipment.

G. Do not use or allow to be used asbestos or asbestos-containing materials on this project. Be rigorous in assuring that all materials, equipment, systems and components thereof do not contain asbestos. Any deviations from this requirement shall be remedied at the Contractor's expense without regard to prior submittal approvals.

1.02 RELATED DOCUMENTS

A. The General Conditions and General Requirements Division 1 apply to the Work of this Section.

1.03 REFERENCE STANDARDS

A. Compliance with the following codes and standards shall be required:

1.	Codes, Rules and Regulations of the State of New York	
2.	USAS	USA Standards Institute (Formerly ASA)
3.	AMCA	Air Moving and Conditioning Association
4.	ADC	Air Diffusion Council
5.	NEMA	National Electrical Manufacturers Association
6.	FM	Factory Mutual
7.	NFPA	National Fire Protection Association
8.	ASTM	American Society for Testing Materials
9.	UL	Underwriters Laboratories, Inc.
10.	NEC	National Electrical Code
11.	ASME	American Society of Mechanical Engineers
12.	ANSI	American National Standards Institute
13.	OSHA	Occupational Safety and Health Act
14.	BSA	Board of Standards and Appeals
15.	MEA	Materials and Equipment Acceptance
16.	DEC	New York State Department of Environmental Conservation - 6 NYCRR Part 613 Handling and Storage of Petroleum

17.	ASHRAE	American Society of Heating, Refrigeration and Air Conditioning Engineers.
18.	AWWA	American Water Works Association
19.	MSS	Manufacturer's Standardization Society of the Valve and Fitting Industry
20.	ARI	American Refrigeration Institute
21.	SMACNA	Sheet Metal and Air Conditioning Contractor's Nation-al Association
22.	TEMA	Tubular Exchanger Manufacturers Association
23.	F.S. or FED	Spec. Federal Specification
24.	ASA	Acoustical Society of America
25.	NACE	National Association or Corrosion Engineers
26.	AGA	American Gas Association
27.	AABC	American Air Balance Council
28.	NEBB	National Environmental Balancing Bureau
29.	AWS	American Welding Society

1.04 DEFINITIONS

A. "Provide" means furnish and install, complete the specified material, equipment or other items and perform all required labor to make a finished installation.

B. "Furnish and install" has the same meaning as given above for "Provide."

C. Refer to General Conditions for other definitions.

1.05 ABBREVIATIONS

A. Reference by abbreviation may be made in the Specifications and the Drawings in accordance with the following list:

1.	HVAC	Heating, Ventilating and Air Conditioning
2.	CM	Construction Manager
3.	AC	Air Conditioning
4.	H & V	Heating and Ventilating
5.	AWG	American Wire Gauge
6.	BWG	Birmingham Wire Gauge
7.	USS	United States Standard
8.	B & S	Brown & Sharpe
9.	OS & Y	Outside Screw and Yoke
10.	IBBM	Iron Body Brass Mounted
11.	WSP	Working Steam Pressure
12.	PSIG	Pounds per Square Inch Gauge
13.	PRV	Pressure Reducing Valve
14.	GPM	Gallons per Minute
15.	MBH	Thousand BTU per hour
16.	BTU	British Thermal Units
17.	WG	Water Gage
18.	LB	Pound (Also shown as: #)
19.	ASME	American Society of Mechanical Engineers
20.	ASTM	American Society for Testing Materials
21.	ABMA	American Boiler Manufacturers Association
22.	ASA	American Standards Associates
23.	MER	Mechanical Equipment Room

See Drawings for additional abbreviations

1.06 REVIEW OF CONTRACT DOCUMENTS AND SITE

A. Give written notice with the submission of bid to the Architect/Engineer of any materials or apparatus believed inadequate or unsuitable, in violation of laws, ordinances, rules or regulations of Authorities having jurisdiction, and any necessary items of work omitted. In the absence of such written notice it is mutually agreed that the Contractor has included the cost of all required items in his proposal for a complete project.

B. Contractors shall acknowledge that they have examined the Plans, Specifications and Site, and that from his own investigations he has satisfied himself as to the nature and location of the Work; the general and local conditions, particularly those bearing upon transportation, disposal, handling and storage of materials; availability of labor, utilities, roads and uncertainties of weather; the composition and condition of the ground; the characters quality and quantity of subsurface materials to be encountered; the character of equipment and facilities needed preliminary to and during the execution of the Work; all federal, state, county, township and municipal laws, ordinances and regulations particularly those relating to employment of labor, rates of wages, and construction methods; and all other matters which can in any way affect the Work or the cost thereof under this Contract. Any failure by the Contractor to acquaint himself with the available information concerning these conditions will not relieve him from the responsibility for successfully performing the Work.

C. Owner assumes no responsibility for any understanding or representation made during or prior to the negotiation and execution of this Contract unless such understanding or representations are expressly stated in the Contract and the Contract expressly provides that the responsibility, therefore, is assumed by the Owner.

1.07 MEASUREMENTS

A. Base all measurements, both horizontal and vertical from established bench marks. Make all Work agree with these established lines and levels. Verify all measurements at site; and check the correctness of same as related to the Work.

1.08 LABOR AND MATERIALS

A. Provide all materials and apparatus required for the Work of new and first-class quality. Furnish, deliver, arrange, erect, connect and finish all materials and equipment in every detail, so selected and arranged as to fit properly into the building spaces.

B. Remove all materials delivered, or work erected, which does not comply with Drawings or Specifications, and replace with proper materials, or correct such work as directed, at no additional cost to the Owner.

1.09 COVERING OF WORK

A. Do not cover up or hide from view any duct, piping, fitting, or other work of any kind before it has been examined or approved by the Architect/Engineer and/or other authority having jurisdiction over the same. Remove and correct immediately any unacceptable or imperfect work or unauthorized or disapproved materials discovered immediately after being disapproved.

1.10 PROTECTION

A. Protect the Work and material of all trades from damage and replace all damaged material with new.

B. Protect work and equipment until the Work is finally inspected, tested, and accepted; protect the Work against theft, injury or damage; and carefully store material and equipment received on site which is not immediately installed; close open ends of work with temporary covers or plugs during construction to prevent entry of foreign material.

C. Preserve all public and private property, along and adjacent to the Work, and use every precaution necessary to prevent damage or injury thereto. Use suitable precautions to prevent damage to pipes, conduits and other underground structures or utilities, and carefully protect from disturbance or damage all property marks until an authorized agent has witnessed or otherwise referenced their location, and do not remove them until directed.

1.11 CUTTING AND PATCHING

A. Provide all cutting and rough patching required for the Work. Perform all finish patching.

B. Furnish and locate all sleeves and inserts required before the floors and walls are built, pay the cost of cutting and patching required for pipes where sleeves and inserts were not installed in time, or where incorrectly located. Provide all drilling required for the installation of hangers.

C. Punch or drill all holes cut through concrete slabs or arches from the underside. Do not cut structural members without the approval of the Architect/Engineer. Perform all cutting in a manner directed by the Architect/Engineer.

D. Do not do any cutting that may impair strength of building construction. Do no drill any holes, except for small screws, in beams or other structural members without obtaining prior approval. All Work shall be done in a neat manner by mechanics skilled in their trades and as approved.

1.12 SUBMITTALS

A. Submit for review, shop drawings for all materials and equipment furnished and installed under this Contract. Submissions shall include but not be limited to:
   1. Ductwork layout drawings, air devices and accessories
   2. Breeching layout drawings
   3. Piping and equipment layout drawings.
   4. Piping materials, valves, hangers, supports and accessories
   5. Automatic temperature control equipment, diagrams and control sequences
   6. Equipment, fixtures, and appurtenances
   7. Insulation
   8. Rigging Plan - Include the name of the rigging company; a layout drawing that details the crane with its outriggers extended outward. Provide dimensions showing how rigging operations will affect the road and parking lines being used, the type of crane and its specification including crane arm height, lift capacity, crane reach.

B. Reports
   1. Compliance with listings and approvals for equipment and for fire ratings.
   2. Acceptance certificates from inspecting agencies.
   3. Complete printed and illustrated operating instructions in report format.

4. Manufacturer's performance tests of equipment.
5. Field pipe and duct testing reports.
6. Field operating test results for equipment.
7. Performance report on the balancing of air and water systems.
8. Performance reports for vibration isolation equipment.
9. Manufacturer's reports on motorized equipment alignment and installation.

C. Specific references to any article, device, product or material, fixture or item of equipment by name, make or catalog number shall be interpreted as establishing a basis of cost and a standard of quality. All devices shall be of the make and type listed by Special Agencies, such as the Underwriters' Laboratories, and where required, approved by the Fire Department.

1.13 SPACE ALLOTMENTS AND SUBSTITUTIONS

A. The space allotments and equipment layouts on the Drawings are based on the manufacturer's model indicated or scheduled as the "Basis of Design". Ensure that any equipment that is submitted other than the "Basis of Design" will fit in the space allotment and will provide the necessary maintenance clearances as recommended by the manufacturer. If maintenance clearances are not met, pay for any changes such that maintenance clearances will be met.

B. Bear all costs associated with re-layout of the equipment, changes to piping/ductwork, and other changes as required if approved equipment other than the "Basis of Design" equipment is purchased. This shall also include any structural steel modifications and structural steel design changes. Submit, at no cost to the Owner, a steel design stamped by a structural engineer licensed in the state in which the Work is to be performed for structural modifications that must be made resulting from the use of equipment other than the "Basis of Design" or not specified.

1.14 PAINTING

A. Prime paint all bare supplemental steel, supports and hangers required for the installation of Division 23 Work in accordance with "Painting" Specification Section. Touch up welds of galvanized surfaces with galvanizing primer.

1.15 MATERIAL SAFETY DATA SHEETS

A. Submit material safety data sheets (MSDS) for all chemicals, hydraulic fluids, seal oils, lubricating oils, glycols and any other hazardous materials used in the performance of the Work, in accordance with the US Department of Labor, Occupational Safety and Health Administration (OSHA) hazard communication and right-to-know requirements stipulated in 29 CFR 1910.1200 (g).

1.16 MOTORS AND STARTERS

A. Provide new NEMA Standard electric motors, sized and designed to operate at full load and full speed continuously without causing noise, vibration, and temperature rise in excess of their rating. Provide motors with a service factor of at least 1.15.

B. Equip motors for belt driven equipment with rails with adjusting screws for belt tension adjustment. Weather protect motors exposed to the weather.

C. Install high efficiency electric motors for air handling units, relief fans, and exhaust fans.

D. Provide all motors for use with Variable Frequency Drives with “high efficiency inverter duty” insulation class “F” with class “B” temperature rise and that conform to or exceed the International Energy Conservation Code or the Federal EP Act of 1992 requirements for efficiency.

E. Provide stainless steel nameplates, permanently attached to the motor, and having the following information as a minimum:
   1. Manufacturer
   2. Type
   3. Model
   4. Horsepower
   5. Service Factor
   6. RPM
   7. Voltage/Phase/Frequency
   8. Enclosure Type
   9. Frame Size
   10. Full-Load Current
   11. UL Label (where applicable)
   12. Lead Connection Diagram
   13. Bearing Data
   14. Efficiency at Full Load.

F. Provide motors whose sound power levels do not exceed that recommended in NEMA MG 1-12.49.

G. Provide motors with drive shafts long enough to extend completely through belt sheaves when sheaves are properly aligned and balanced.

H. Protect motor starters on equipment located outdoors in weatherproof NEMA 4X enclosures.

I. Provide weatherproof NEMA 4X disconnect switches when located outdoors.

J. Motor Characteristics:
   1. 120V/1/60 Hz, 208V/1/60 Hz or 240V/1/60 Hz: Capacitor start, open drip-proof type, ball bearing, rated 40 C. continuous rise.
   2. 208V/3/60 Hz, 240V/3/60 Hz or 460/3/60 Hz: NEMA B, normal starting torque, single speed, squirrel-cage type, open drip-proof, rated 40 C continuous rise, with ball bearings rated for B-10 life of 100,000 hours and fitted with grease fittings and relief ports. Provide motors with aluminum end brackets with steel inserts in bearing cavities.

1.17 ACOUSTICAL PERFORMANCE OF EQUIPMENT AND SYSTEMS

A. Install the Work in such a manner that noise levels from operation of motor driven equipment, whether airborne or structure-borne, and noise levels created by or within air handling equipment and air distribution and control media, do not to exceed sound pressure levels determined by the noise criteria curves published in the ASHRAE guide.

B. Acoustical Tests
   1. Owner may direct the Contractor to conduct sound tests for those areas he deems too noisy.

2. If NC level exceeds the requirements of the Contract Documents due to improper installation or operation of mechanical systems, make changes or repairs to bring noise levels to within required levels.
3. Retest until specified criteria have been met.

1.18 OPERATING AND MAINTENANCE INSTRUCTIONS

A. Instructions and Demonstration for Owner's Personnel
1. Provide operating and maintenance instruction to the Owner when project is completed and all HVAC equipment serving the building is ready to be turned over to the Owner.
2. Turn over the HVAC equipment to the Owner only after the final testing and proper balancing of HVAC systems.
3. Instruct the Owner's personnel in the use, operation and maintenance of all equipment of each system.
4. The above instruction requirements are in addition to that specified for specific equipment or systems. Conform to specified requirements if more stringent or longer instruction is specified for specific equipment or systems.

1.19 CODES, RULES, PERMITS & FEES

A. Give all necessary notices, obtain all permits and pay all government sales taxes, fees, and other costs, in connection with the Work. Unless indicated otherwise, fees for all utility connections, extensions, and tap fees for water, storm, sewer, gas, telephone, and electricity will be paid directly to utility companies and/or agencies by the Owner. File all necessary plans, prepare all documents and obtain all necessary approvals of all governmental departments having jurisdiction; obtain all required certificates of inspection for the Work and deliver same to the Owner's Representative before request for acceptance and final payment for the Work.

B. Conform to the requirements of the NFPA, NEC, FM, UL and any other local or State codes which may govern.

1.20 RECORD DRAWINGS

A. During the progress of the Work, make a record set of drawings of all changes by which the actual installation differs from the Drawings.

B. Create all record drawings in AutoCAD version 2002 or later in .dwg format. Upon completion of the Work, submit to the Architect/Engineer for approval three complete sets of hard copies of the record drawings, of the same size as the Drawings for approval. Upon approval by the Architect/Engineer furnish the Owner a CD copy of the record drawings along with one hard copy for his records.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.01 CLEANING AND ADJUSTING

A. Cleaning
1. Blow out, clean and flush each system of piping and equipment, to thoroughly clean the systems.

2. Clean all materials and equipment; leave in condition ready to operate and ready to receive final finishes where required.
3. Clean the operating equipment and systems to be dust free inside and out.
4. Clean concealed and unoccupied areas such as plenums, pipe and duct spaces and equipment rooms to be free of rubbish and dust.

B. Adjusting
1. Adjust and align equipment interconnected with couplings or belts.
2. Adjust valves of all types and operating equipment of all types to provide proper operation.
3. Clean all strainers after system cleaning and flushing and again before system startup.

C. Lubrication
1. Lubricate equipment as recommended by the manufacturer, during temporary construction use.
2. Provide complete lubrication just prior to acceptance.

D. Permanent Equipment Operating During Construction
1. Use only in same service as the permanent applications.
2. Use disposable filters during temporary operation.
3. Replace expendable media, including belts used for temporary operation and similar materials just prior to acceptance of the Work.
4. Repack packing in equipment operated during construction just prior to system acceptance, using materials and methods specified by the equipment manufacturer.

E. Retouch or repaint equipment furnished with factory finish as required to provide same appearance as new.

F. Tools
1. Provide one set of specialized or non-standard maintenance tools and devices required for servicing the installed equipment.

3.02 EQUIPMENT BASES, PLATFORMS AND SUPPORTS

A. Provide supporting platforms, steel supports, anchor bolts, inserts, etc., for all equipment and apparatus provided.

B. Obtain prior approval for installation method of structural steel required to frame into building structural members for the proper support of equipment, conduit, etc. Welding will be permitted only when approved by the Architect/Engineer.

C. Submit shop drawings of supports to the Architect/Engineer for approval before fabricating or constructing.

D. Provide leveling channels, anchor bolts, complete with nuts and washers, for all apparatus and equipment secured to concrete pads and further supply exact information and dimensions for the location of these leveling channels, anchor bolts, inserts, concrete bases and pads.

E. Where supports are on concrete construction, take care not to weaken concrete or penetrate waterproofing.

3.03 ACCESSIBILITY

A. Install valves, dampers and other items requiring access conveniently and accessibly located with reference to the finished building.

3.04 USE OF EQUIPMENT

A. The use of any equipment, or any part thereof, even with the Owner's consent, is not an indication of acceptance of the Work on the part of the Owner, nor shall it be construed to obligate the Owner in any way to accept improper work or defective materials.

3.05 MODIFICATIONS OF EXISTING WORK

A. Coordinate the Work with all other contractors and provide necessary dimensions for all openings. Provide all cuts and openings which are necessary for the Work for passage of piping and ductwork

B. Upon completion, remove all temporary piping and equipment, shoring, scaffolds, etc., and leave all areas clean and free from material and debris resulting from the Work performed under this Section. Provide rough patching in areas required.

3.06 EQUIPMENT INSTALLATION

A. Locate and set equipment anchor bolts, dowels and aligning devices for equipment requiring them.

B. Level and shim the equipment; coordinate and oversee the grouting work.

C. Perform field assembly, installation and alignment of equipment under direct supervision provided by the manufacturer or with inspections, adjustments and approval by the manufacturer.

D. Alignment and Lubrication Certification for Motor Driven Apparatus
   1. After permanent installation has been made and connections have been completed, but before the equipment is continuously operated, have a qualified representative of the equipment manufacturer inspect the installation and report in writing on the manufacturer's letterhead on the following:
      a. Whether shaft, bearing, seal, coupling, and belt drive alignment and doweling is within the manufacturer’s required tolerances so that the equipment will remain aligned in the normal service intended by the Contract Documents and that no strain or distortion will occur in normal service.
      b. That all parts of the apparatus are properly lubricated for operation.
      c. That the installation is in accordance with manufacturer's instructions.
      d. That suitable maintenance and operating instructions have been provided for the Owner's use.
      e. Make any corrections to items that are required or recommended based on the manufacturer’s inspection and have the equipment re-inspected.

E. Belt Drives
   1. V-belt drives - a driving and driven sheave grooved for belts of trapezoidal cross-section. Construct belts of fabric and rubber so designed so as not to touch the bottom of the grooves, the power being transmitted by the contact between the belts and V-shaped

groove sides. Design drives for a minimum of 150 percent of motor horsepower. Provide companion type driven sheaves.

2. Select drives to provide for 12-1/2 percent variation in speed, plus or minus, from specified speed. Provide all motors with adjustable sheaves except where indicated otherwise in the Specifications or on the Drawings.
3. Install all fans with adjustable pitch sheaves on their drive motors. Select sheaves to provide air quantities under specified conditions. Put air systems into operation, and determine as a result of the completed air balance the actual size of sheaves required to produce specified air quantities on installed systems. The adjustable pitch sheaves shall then be replaced with the proper size fixed sheaves. Remove adjustable pitch sheaves from premises. Provide fixed motor sheaves manufactured by Wood's.
4. Where indicated on the Drawings or specified, provide spare motor, bearings, and belts.

F. Machinery Guards
1. Protect motor drives by guards furnished by the equipment manufacturer or in accordance with the Sheet Metal and Air Conditioning Contractors National Association's Low Pressure Duct Manual. Provide guards of all types approved as acceptable under OSHA Standards.

G. Equipment Start-up
1. Require each equipment manufacturer to provide qualified personnel to inspect and approve equipment and installation and to supervise the start-up of the equipment and to supervise the operating tests of the equipment.
2. If a minimum number of hours for start-up and instruction are not stated with the equipment specifications, these shall be 2 full 8-hour working days as a minimum.
3. Advise Owner of start-up at least 72 hours in advance.

3.07 CLOSEOUT PROCEDURES

A. General Operating and Maintenance Instructions: Arrange for each installer of operating equipment and other work that requires regular or continuing maintenance, to meet at the site with the Owner's personnel to provide necessary basic instructions in the proper operation and maintenance of the entire Work. Where installers are not expert in the required procedures, include instruction by the manufacturer's representatives.

B. Where applicable, provide instruction and training, including application of special coatings systems, at manufacturer's recommendation.

C. Provide a detailed review of the following items:
1. Maintenance manuals
2. Record documents and catalog cuts for each piece of equipment.
3. Spare parts and materials
4. Tools
5. Lubricants
6. Fuels
7. Identification systems
8. Control sequences
9. Hazards
10. Cleaning

D. Warranties, bonds, maintenance agreements, and similar continuing commitments.

E. Demonstrate the following procedures:

1. Start-up
2. Shut-down
3. Emergency operations
4. Noise and vibration adjustments
5. Safety procedures
6. Economy and efficiency adjustments
7. Effective energy utilization.

F. Prepare instruction periods to consist of approximately 50% classroom instruction and 50% "hands-on" instruction. Provide minimum instruction periods as follows:

Systems or Equipment	Training Time (Hours)
DOAS	8 hrs.
Air Handlers	8 hrs.
DDC Control System	24 hrs.h
All other equipment	4 hrs. (each)

Note: Consult individual equipment specification sections for additional training requirements.

G. Prepare a written agenda for each session and submit for review and approval. Include date, location, purpose, specific scope, proposed attendance and session duration.

H. Record training sessions in digital format, format as selected by the Owner. Turn over digital files to the Owner after training has been completed.

END OF SECTION

H2M

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. This Section describes the draining, disconnecting, dismantling, demolition, removal, relocation, rerouting and reconnection of existing mechanical facilities, in a neat and workmanlike manner, of mechanical systems, materials and accessories as required, as shown on the Drawings and specified herein, to accomplish alteration, restoration and to accommodate the Work.

1.02 RELATED WORK

A. General Mechanical Requirements - Section 230010

1.03 REFERENCES

A. NFPA Fire Code

B. ANSI A10.6 - Safety Requirements for Demolition

C. National Association of Demolition Contractors (NADC) - Demolition Safety Manual

D. NFPA 51B - Cutting and Welding Processes

E. NFPA 70 - National Electrical Code

F. NFPA 241 - Safeguarding Building Construction and Demolition Operations

G. OSHA 29 CRF 1910 - Occupational Safety and Health Standards

H. US EPA - Clean Air Act Amendment of 1990.

1.04 SUBMITTALS

A. Demolition Schedule

B. Fire Watch Procedures

C. Inspection Report of Underground Piping Systems

D. Welding/Burning Permit - Obtain a welding/burning permit from the local Fire Official prior to the start of any welding or burning in accordance with the local Fire Code or as required by the Owner.

1.05 QUALITY ASSURANCE

A. Only employ workers skilled in the specific trades involved for cutting, patching and removal.

B. Job Conditions: Prior to start of the Work, make an inspection accompanied by the Architect/Engineer to determine physical condition of adjacent construction that is to remain.

1.06 SPECIAL PRECAUTIONS

A. Do not torch cut ductwork.

B. Torch cutting of other mechanical equipment will be permitted only with the specific written approval of the Architect/Engineer.

C. Include “Fire Watch” procedures as required by the Fire Code and/or Owner’s Fire Insurance Carrier for any cutting work that may produce sparks. Submit fire watch procedures for approval.

D. Perform draining operations so that damage to existing building components does not occur.

PART 2 - PRODUCTS

2.01 GENERAL

A. Adequately sized rubbish containers for the proper and safe disposal of all debris.

PART 3 - EXECUTION

3.01 PREPARATION

A. Construct temporary partitions enclosing respective work prior to any demolition work. Erect temporary fencing and signage around demolished materials.

B. Protect existing materials and equipment which are not to be demolished.

C. Prevent movement of structure; provide required bracing and shoring.

D. Do not begin the work until the time schedules and manner of operations have been approved by the Architect/Engineer and Owner. Include all interruptions of existing services in schedules submitted for approval by the Architect/Engineer and Owner.

3.02 GENERAL

A. Provide alteration and demolition of mechanical facilities as required by the Drawings and Specifications. The Drawings are diagrammatic and do not show the exact location of all existing mechanical work. Where existing equipment is to remain in service during construction, provide rerouting and reconnection of mechanical services as required to maintain continuous service.

B. Review all equipment with the Architect/Engineer and Owner prior to disposal. Completely remove existing ductwork, piping, conduit and similar items to be abandoned that are not embedded in walls or floor slabs unless otherwise shown on the Drawings. Cap open ends at all walls and floors.

C. Remove, store and protect all equipment or materials designated to be turned over to the Owner. Coordinate exact location of storage with the Owner.

D. Temporarily cap ends of ductwork, piping and sanitary vent piping to avoid entry of dirt, debris, or discharge of foul odors and gases.

E. Where existing louvers or ductwork penetrations are to remain, blank-off the opening on the inside with galvanized sheet metal on both sides of 2-inch thick, 6 pcf density rigid fiberglass board insulation. Paint side attached to the opening with weather resistant flat black paint.

F. Do not close or obstruct egress width to exits.

G. Do not disable or disrupt building fire or life safety systems without five (5) days prior written notice to the Architect/Engineer and Owner.

H. Conform to procedures applicable when discovering hazardous or contaminated materials.

I. Conduct demolition to minimize interference with adjacent building structures or Owner's operations.

J. Cease operations immediately if structure appears to be in danger or hazardous materials are encountered. Notify Architect/Engineer. Do not resume operations until directed.

K. Demolish in an orderly and careful manner. Do not cut or remove more than is necessary to accommodate the new construction or alteration.

L. Remove demolished materials from site daily. Do not burn or bury materials on site. Dispose of all material at an approved disposal facility.

M. Protect finished surfaces at all times and repair or replace, if damaged, to match existing construction to the satisfaction of the Architect/Engineer.

3.03 PIPING REMOVAL

A. Cut off all welded piping square at the locations indicated on the Drawings. No cutting is required where the demolition ends at a flanged valve or equipment. Close off all openings of any remaining valves, piping or fittings with weld caps or blind flanges to prevent debris from entering the existing system.

B. Disconnect all threaded piping at the location indicated on the Drawings. Close off all openings of remaining valves, piping, fittings and equipment with pipe plugs or pipe caps as required to prevent debris from entering the existing systems.

C. Remove all pipe hangers, supports, miscellaneous steel and anchors with the piping.

3.04 PROTECTION FROM FREEZING

A. It is intended that the building remain protected from damage due to freezing temperatures. To that end, keep in place and in operation existing equipment and systems used for heating until scheduling permits shutdown.

B. Where the removal of equipment, etc. will leave an area unprotected from freezing, notify the Owner and Architect/Engineer at least 72 hours in advance prior to removal so appropriate steps can be taken by the Owner to protect the area. Provide temporary heating equipment sufficient to prevent freezing.

C. It is the Contractor’s responsibility to ensure that piping systems that are being worked on are completely drained from water prior to the start of demolition. If water is not drained and the water freezes it is the Contractor’s responsibility to replace piping and repair all damages caused by water leakage at his own expense.

3.05 DISCONNECTION AND INTERRUPTION OF MECHANICAL SERVICES

A. When portions of an existing piping system or ductwork system are removed, and this removal causes loss of operation to another piece of equipment due to open or disconnected piping or ductwork, cap piping or ductwork or provide temporary piping or ductwork system to retain operation of the system.

3.06 MECHANICAL EQUIPMENT REMOVAL

A. Remove all mechanical equipment as shown on the Drawings. Remove all electrical work, including wiring between equipment, and wiring to power source or point of origin.

B. Where equipment is supported by steel and/or structural supports, remove these supports.

3.07 REFRIGERANT REMOVAL

A. Recover and dispose of all existing refrigerant charges in accordance with EPA regulations. Comply with all regulations applicable to the release of chlorofluorocarbon refrigerants to the atmosphere.

3.08 DUCTWORK REMOVAL

A. Disconnect all ductwork which must be removed, at the closest joint and support the remaining ductwork.

B. Prepare all remaining ductwork joints at the point of disconnection to receive new ducts or blank-off panels.

C. Remove all ductwork supports and miscellaneous steel with ductwork to be demolished.

3.09 INSULATION REMOVAL

A. Remove insulation, together with all piping, fittings, valves and equipment designated for demolition.

3.10 CONTROL WIRING REMOVAL

A. Disconnect and remove all control wiring and tubing, including conduit, for the Automatic Temperature Control (ATC) System associated with equipment and systems to be removed.

END OF SECTION

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. This section describes the tools, procedures and performance required for cleaning of the existing HVAC system.

B. NADCA Standards: The HVAC system cleaning contractor shall perform the services specified here in accordance with the current published standards of the National Air Duct Cleaners Association (NADCA).
   1. All terms in this specification shall have their meaning defined as stated in the NADCA Standards.
   2. NADCA Standards shall be followed with no modifications or deviations being allowed.

C. Scope: This section defines the minimum requirements necessary to render HVAC components clean, and to verify the cleanliness through inspection and/or testing in accordance with items specified herein and applicable NADCA Standards.

D. The Contractor shall be responsible for the removal of visible surface contaminants and deposits from within the HVAC system in strict accordance with these specifications.

E. The HVAC system includes any interior surface of the facility's air distribution system for conditioned spaces and/or occupied zones. This includes the entire heating, air-conditioning and ventilation system from the points where the air enters the system to the points where the air is discharged from the system. The return air grilles, return air ducts, and outdoor air ducts, to the air handling unit (AHU), the interior surfaces of the AHU, mixing box, coil compartment, condensate drain pans, humidifiers and dehumidifiers, supply air ducts, fans, fan housing, fan blades, air wash systems, spray eliminators, turning vanes, filters, filter housings, reheat coils, and supply diffusers are all considered part of the HVAC system. The HVAC system may also include other components such as dedicated exhaust and ventilation components and make-up air systems.

1.02 QUALITY ASSURANCE

A. Contractors' personnel shall have OSHA Certification for OSHA 40-hour HAZWOPER, OSHA Lockout Tagout Procedures and OSHA Permit required, Confined Space Entry. Certifications shall be included with bid, in order for the bid to be considered.

B. Contractor shall have at least two (2) years experience in air duct cleaning. Three (3) commercial references, including contract name and telephone number shall be submitted with bid, in order for the bid to be considered.

C. Membership: The HVAC system cleaning contractor shall be a certified member of the National Air Duct Cleaners Association (NADCA), or shall maintain membership in a nationally recognized non-profit industry organization dedicated to the cleaning of HVAC systems.

D. Certification: The HVAC system cleaning contractor shall have a minimum of one (1) Air System Cleaning Specialist (ASCS) certified by NADCA on a full time basis, or shall have staff certified by a nationally recognized certification program and organization dedicated to the cleaning of HVAC systems.

E. Supervisor Qualifications: A person certified as an ASCS by NADCA, or maintaining an equivalent certification by a nationally recognized program and organization, shall be responsible for the total work herein specified.

F. Experience: The HVAC system cleaning contractor shall submit records of experience in the field of HVAC system cleaning as requested by the Owner. Bids shall only be considered from firms which are regularly engaged in HVAC system maintenance with an emphasis on HVAC system cleaning and decontamination.

G. Equipment, Materials and Labor: The HVAC system cleaning contractor shall possess and furnish all necessary equipment, materials and labor to adequately perform the specified services.
   1. The contractor shall assure that its employees have received safety equipment training, medical surveillance programs, individual health protection measures, and manufacturer's product and material safety data sheets (MSDS) as required for the work by the U.S. Occupational Safety and Health Administration, and as described by this specification. For work performed in countries outside of the U.S.A., contractors shall comply with applicable national safety codes and standards.
   2. The contractor shall maintain a copy of all current MSDS documentation and safety certifications at the site at all times, as well as comply with all other site documentation requirements of applicable OSHA programs and this specification.
   3. Contractor shall submit to the Owner and Engineer/ Architect, all Material Safety Data Sheets (MSDS) for all chemical products proposed to be used in the cleaning process.

H. Licensing: The HVAC system cleaning contractor shall provide proof of maintaining the proper license(s), if any, as required to do work in this state. Contractor shall comply with all Federal, state and local rules, regulations, and licensing requirements.

1.03 REFERENCES

A. National Air Duct Cleaners Association (NADCA): "Assessment, Cleaning & Restoration of HVAC Systems (ACR 2005)," 2004.

B. National Air Duct Cleaners Association (NADCA): "Understanding Microbial Contamination in HVAC Systems," 1996.

C. National Air Duct Cleaners Association (NADCA): "Introduction to HVAC System Cleaning Services," 2004.

D. National Air Duct Cleaners Association (NADCA): Standard 05 "Requirements for the Installation of Service Openings in HVAC Systems," 2004.

E. Underwriters' Laboratories (UL): UL Standard 181.

F. American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE): Standard 62-89, "Ventilation for Acceptable Indoor Air Quality".

G. Environmental Protection Agency (EPA): "Building Air Quality," December 1991.

H. Sheet Metal and Air Conditioning Contractors' National Association (SMACNA): "HVAC Duct Construction Standards - Metal and Flexible," 1985.

I. North American Insulation Manufacturers Association (NAIMA): "Cleaning Fibrous Glass Insulated Air Duct Systems," 1993.

1.04 LABORATORY SERVICES

A. Contractor shall provide testing and analysis of contaminants such as Legionella, asbestos, microbials or any other hazardous airborne particulates using the (Air Conveyance System) as a pollutant pathway should such testing be deemed necessary. Swipe samples of the ACS shall be used to determine what contaminates are present. Laboratory results shall be included as part of the prepared Mechanical Hygiene Report.

1.05 SCOPE OF WORK - EXISTING AIR CONVEYANCE SYSTEM CLEANING

A. The entire air distribution system in the building shall be cleaned as per this specification this shall include all supply, return and exhaust ductwork, reheat coils and all air outlets and inlets.

B. Existing Air Duct Cleaning
   1. Access points shall be strategically placed throughout the supply and return duct systems, as required. SMACNA approved insulated access doors shall be used upon closure to prevent heat loss/gain, and to facilitate inspection.
   2. Interior surfaces of the ductwork, dampers, turning vanes, shall be cleaned by using HEPA filtered vacuums, rotary brush and air whip dislodging systems, and contact cleaning as required.

C. Sanitizing Existing Ductwork:
   1. Upon completion of cleaning, sanitizing shall be performed throughout the entire air conveyance system. This process shall eliminate mold, bacteria, odors and viruses, plus retard their growth.

1.06 NOTIFICATION

A. The Contractor shall notify the Owner that prior to commencing of the cleaning work, the Owner shall remove the smoke detectors and other safety devices from the ductwork.

1.07 HEALTH AND SAFETY REQUIREMENTS

A. Safety Standards: Cleaning contractors shall comply with applicable federal, state, and local requirements for protecting the safety of the contractor’s employees, building occupants, and the environment. In particular, all applicable standards of the Occupational Safety and Health Administration (OSHA) shall be followed when working in accordance with this specification.

B. Occupant Safety: No processes or materials shall be employed in such a manner that they will introduce additional hazards into occupied spaces.

C. Disposal of Debris: All Debris removed from the HVAC System shall be disposed of in accordance with applicable federal, state and local requirements.

PART 2 - PRODUCTS

2.01 GENERAL

A. Contractor shall provide all necessary material and tools to provide access doors in the ductwork to reach the areas around dampers and turning vanes, bends, coils, smoke detectors, etc.

2.02 ACCESS DOORS

A. Sandwich access door shall be as manufactured by:
   1. DUCTMATE INDUSTRIES, INC.
   2. Approved Equal.

B. Composition and material
   1. The sandwich access door shall consist of three layers of precision stamped hot-dipped galvanized steel.
   2. The inside door shall combine two layers of metal which be shall spot welded together along the rim, encapsulating high density fiberglass insulation - UL classified FHC25/50.
   3. The inside surface of the access door shall be smooth to minimize friction.
   4. Gasket: Closed cell neoprene gasket shall be UL94HF1 listed with a service temperature range of (ASTM D746) -20ºF to 200ºF. The gasket shall be permanently bonded to the inside of the door to eliminate leakage.
   5. Springs: Zinc plated conical springs shall be installed over the bolts, between the inner and outer door, to facilitate opening.
   6. Knobs: Knobs shall have threaded metal inserts to eliminate thread stripping. Knobs shall be easily turned by hand without wrenches. UL94HB listed.
   7. Bolts: Zinc plated carriage bolts shall be clinched and sealed to the inner door.
   8. Template: Self-adhesive cut-around template shall be provided for the exact size of cut opening required.
   9. Technical Data: Each door shall be tested to 20” WG with no leakage noted.
   10. Guarantees: The Sandwich Access Door shall be guaranteed against defective material.

2.03 TOOLS AND EQUIPMENT

A. Contractor, shall utilize HEPA filters and vacuums meeting the following minimum requirements:
   1. Vacuum: CFM minimum - 6,000
   2. HEPA filter: 99.97% collection efficiency for particulates 0.3 microns or greater

2.04 SANITIZING

A. Upon completion of cleaning, sanitizing will be performed throughout the entire air conveyance system. Sanitizer will be fogged into ACS using a portable fogging system. Envirocon or other EPA Registered sanitizer will be used.

PART 3 - EXECUTION

3.01 INSPECTION/PREPARATION

A. HVAC System Component Inspections: Prior to the commencement of any cleaning work, the HVAC system cleaning contractor shall perform a visual inspection of the HVAC system to determine appropriate methods, tools, and equipment required to satisfactorily complete this

project. The cleanliness inspection should include air handling units and representative areas of the HVAC system components and ductwork. In HVAC systems that include multiple air handling units, a representative sample of the units should be inspected.

B. The cleanliness inspection shall be conducted without negatively impacting the indoor environment through excessive disruption of settled dust, microbial amplification or other debris. In cases where contamination is suspected, and/or in sensitive environments where even small amounts of contaminant may be of concern, implement environmental engineering control measures.

C. Damaged system components found during the inspection shall be documented and brought to the attention of the Owner.

D. Site Evaluation and Preparations: Contractor shall conduct a site evaluation, and establish a specific, coordinated plan which details how each area of the building will be protected during the various phases of the project.

E. Protect all furniture and flooring in the work area using clean protective coverings. Perform cleanup of these areas by use of HEPA filtered vacuums, to avoid recontamination of occupied space.

F. Contractor prior to his work shall check if the smoke detectors were removed from the ductwork.

G. Insulation: Identify areas of internally lined air conveyance systems that are deteriorated and negatively impacting air quality. Notify the Owner of these conditions so that he may correct them.

H. Inspector Qualifications: Qualified personnel should perform the HVAC cleanliness inspection to determine the need for cleaning. At a minimum, such personnel should have an understanding of HVAC system design, and experience in utilizing accepted indoor environmental sampling practices, current industry HVAC cleaning procedures, and applicable industry standards.

3.02 GENERAL DUCT CLEANING REQUIREMENTS

A. Install filter material over all terminal diffusers to protect surrounding areas during cleaning operation. Remove all filter material from diffusers after cleaning is complete.

B. Wherever grilles and/or diffusers are removable, they shall be removed, vacuum cleaned, washed, dried, and then replaced. Welded or fixed grilles shall be cleaned in place.

C. Interior surfaces of the ductwork, dampers, turning vanes, VAV boxes, and reheat coils shall be cleaned by using HEPA filtered vacuums, rotary brush and air whip dislodging systems, and contact cleaning as required. All removable diffusers shall be removed for cleaning, while others shall be done in place.

D. All internally lined ductwork and flex duct shall be cleaned using soft nylon brushes for dislodging, to avoid damage to fibrous insulation.

E. Containment: Debris removed during cleaning shall be collected and precautions shall be taken to ensure that debris is not otherwise dispersed outside the HVAC system during the cleaning process.

F. Particulate Collection: Where the Particulate Collection Equipment is exhausting inside the building, HEPA filtration with 99.97% collection efficiency for 0.3-micron size (or greater) particles shall be used. When the Particulate Collection Equipment is exhausting outside the building, Mechanical Cleaning operations shall be undertaken only with Particulate Collection Equipment in place, including adequate filtration to contain debris removed from the HVAC system. When the Particulate Collection Equipment is exhausting outside the building, precautions shall be taken to locate the equipment down wind and away from all air intakes and other points of entry into the building.

G. Controlling Odors: Measures shall be employed to control odors and/or mist vapors during the cleaning process.

H. Component Cleaning: Cleaning methods shall be employed such that all HVAC system components must be Visibly Clean as defined in applicable standards (see NADCA Standards). Upon completion, all components must be returned to those settings recorded just prior to cleaning operations.

I. Air-Volume Control Devices: Dampers and any air-directional mechanical devices inside the HVAC system shall have their position marked prior to cleaning and, upon completion, must be restored to their marked position.

J. Service Openings: The contractor shall utilize service openings, as required for proper cleaning, at various points of the HVAC system for physical and mechanical entry, and inspection.
   1. Contractor shall utilize the existing service openings already installed in the HVAC system where possible.
   2. Other openings shall be created where needed and they shall be created so they can be sealed in accordance with industry codes and standards.
   3. Closures shall not significantly hinder, restrict, or alter the airflow within the system.

K. Closures shall be properly insulated to prevent heat loss/gain or condensation on surfaces within the system.
   1. Openings shall not compromise the structural integrity of the system.
   2. Construction techniques used in the creation of openings shall conform to requirements of applicable building and fire codes, and applicable NFPA, SMACNA and NADCA Standards.
   3. Cutting service openings into flexible duct is not permitted. Flexible duct shall be disconnected at the ends as needed for proper cleaning and inspection.
   4. Rigid fiber glass duct systems shall be resealed in accordance with NAIMA recommended practices. Only closure techniques that comply with UL Standard 181 or UL Standard 181a are suitable for fiber glass duct system closures.
   5. All service openings capable of being re-opened for future inspection or remediation shall be clearly marked and shall have their location reported to the Owner in project report documents.

L. Ceiling sections (tile): The contractor may remove and reinstall ceiling sections to gain access to HVAC systems during the cleaning process.

M. Air distribution devices (registers, grilles & diffusers): The contractor shall clean all air distribution devices.

N. Air handling units, terminal units (VAV, Dual duct boxes, etc.), blowers and exhaust fans: The contractor shall insure that supply, return, and exhaust fans and blowers are thoroughly cleaned. Areas to be cleaned include blowers, fan housings, plenums (except ceiling supply and return plenums), scrolls, blades, or vanes, shafts, baffles, dampers and drive assemblies. All visible surface contamination deposits shall be removed in accordance with NADCA Standards. Contractor shall:
   1. Clean all air handling units (AHU) internal surfaces, components and condensate collectors and drains.
   2. Assure that a suitable operative drainage system is in place prior to beginning wash down procedures.
   3. Clean all coils and related components, including evaporator fins.

O. Duct Systems. Contractor shall:
   1. Create service openings in the system as necessary in order to accommodate cleaning of otherwise inaccessible areas.
   2. Mechanically clean all duct systems to remove all visible contaminants, such that the systems are capable of passing Cleaning Verification Tests (see NADCA Standards).

3.03 DUCT CLEANING METHODOLOGY

A. Source Removal Cleaning Methods: The HVAC system shall be cleaned using Source Removal mechanical cleaning methods designed to extract contaminants from within the HVAC system and safely remove contaminants from the facility. It is the contractor's responsibility to select Source Removal methods that will render the HVAC system Visibly Clean and capable of passing cleaning verification methods (See applicable NADCA Standards) and other specified tests, in accordance with all general requirements. No cleaning method, or combination of methods, shall be used which could potentially damage components of the HVAC system or negatively alter the integrity of the system.
   1. All methods used shall incorporate the use of vacuum collection devices that are operated continuously during cleaning. A vacuum device shall be connected to the downstream end of the section being cleaned through a predetermined opening. The vacuum collection device shall be of sufficient power to render all areas being cleaned under negative pressure, such that containment of debris and the protection of the indoor environment are assured.
   2. All vacuum devices exhausting air inside the building shall be equipped with HEPA filters (minimum efficiency), including hand-held vacuums and wet-vacuums.
   3. All vacuum devices exhausting air outside the facility shall be equipped with Particulate Collection including adequate filtration to contain Debris removed from the HVAC system. Such devices shall exhaust in a manner that will not allow contaminants to re-enter the facility. Release of debris outdoors must not violate any outdoor environmental standards, codes or regulations.
   4. All methods require mechanical agitation devices to dislodge debris adhered to interior HVAC system surfaces, such that debris may be safely conveyed to vacuum collection devices. Acceptable methods will include those, which will not potentially damage the integrity of the ductwork, nor damage porous surface materials such as liners inside the ductwork or system components.

B. Methods of Cleaning Fibrous Glass Insulated Components
   1. Fibrous glass thermal or acoustical insulation elements present in any equipment or ductwork shall be thoroughly cleaned with HEPA vacuuming equipment, while the HVAC system is under constant negative pressure, and not permitted to get wet in accordance with applicable NADCA and NAIMA standards and recommendations.

2. Cleaning methods used shall not cause damage to fibrous glass components and will render the system capable of passing Cleaning Verification Tests (see NADCA Standards).

C. Damaged Fibrous Glass Material
1. Evidence of damage: If there is any evidence of damage, deterioration, delaminating, friable material, mold or fungus growth, or moisture such that fibrous glass materials cannot be restored by cleaning or resurfacing with an acceptable insulation repair coating, they shall be identified for replacement.
2. Replacement: When requested or specified, Contractor must be capable of remediating exposed damaged insulation in air handlers and/or ductwork requiring replacement.
3. Replacement material: In the event fiber glass materials must be replaced, all materials shall conform to applicable industry codes and standards, including those of UL and SMACNA.

D. Cleaning of coils
1. Any cleaning method may be used which will render the Coil Visibly Clean and capable of passing Coil Cleaning Verification (see applicable NADCA Standards). Coil drain pans shall be subject to Non-Porous Surfaces Cleaning Verification. The drain for the condensate drain pan shall be operational. Cleaning methods shall not cause any appreciable damage to, displacement of, inhibit heat transfer, or erosion of the coil surface or fins, and shall conform to coil manufacturer recommendations when available. Coils shall be thoroughly rinsed with clean water to remove any latent residues.

E. Antimicrobial Agents and Coatings
1. Antimicrobial agents shall only be applied if active fungal growth is reasonably suspected, or where unacceptable levels of fungal contamination have been verified through testing.
2. Application of any antimicrobial agents used to control the growth of fungal or bacteriological contaminants shall be performed after the removal of surface deposits and debris.
3. When used, antimicrobial treatments and coatings shall be applied in strict accordance with the manufacturer’s written recommendations and EPA registration listing.
4. Antimicrobial coatings shall be applied according to the manufacturer’s written instructions. Coatings shall be sprayed directly onto interior ductwork surfaces, rather than “fogged” downstream onto surfaces.

3.04 CLEANLINESS VERIFICATION

A. General: Verification of HVAC System cleanliness will be determined after mechanical cleaning and before the application of any treatment or introduction of any treatment-related substance to the HVAC system, including biocidal agents and coatings.

B. Visual Inspection: The HVAC system shall be inspected visually to ensure that no visible contaminants are present.
1. If no contaminants are evident through visual inspection, the HVAC system shall be considered clean; however, the Owner reserves the right to further verify system cleanliness through Surface Comparison Testing or the NADCA vacuum test specified in the NADCA standards.
2. If visible contaminants are evident through visual inspection, those portions of the system where contaminants are visible shall be re-cleaned and subjected to re-inspection for cleanliness.
3. NADCA vacuum test analysis shall be performed by a qualified third party experienced in testing of this nature.

C. Verification of Coil Cleaning
   1. Cleaning shall restore the coil pressure drop to within 10 percent of the pressure drop measured when the coil was first installed. If the original pressure drop is not known, the coil will be considered clean only if the coil is free of foreign matter and chemical residue, based on a thorough visual inspection (see NADCA Standards).

3.05 HVAC SYSTEM REPORT

A. At the conclusion of the project, the Contractor shall provide a bound report to the Owner indicating the following:

B. Success of the cleaning project, as verified through visual inspection (before and after photographs) and gravimetric analysis.

C. Areas of the system found to be damaged and/or in need of repair

3.06 PROTECTION/ CLEANUP OF PROPERTY

A. Protect all furniture, wood flooring, and equipment in the work area using clean protective coverings. Cleanup of these areas shall be performed by use of the HEPA filtered vacuums, to avoid recontamination of occupied space. The contractor shall perform clean up and remove the protective coverings on a daily basis.

3.07 REPAIRING OF DAMAGED DUCTWORK, ACCESSORIES AND THERMAL INSULATION

A. Contractor shall repair all damages resulted by his work to the ductwork, thermal insulation and vapor barrier.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. National Electrical Manufacturers Association (NEMA):
   1. MG 1 - Motors and Generators
   2. MG 2 - Safety Standard for Construction and Guide for Selection, Installation and Use of Electric Motors and Generators

B. National Fire Protection Association (NFPA)
   1. 70-208 - National Electric Code (NEC)

C. Institute of Electrical and Electronics Engineers (IEEE)
   1. 112-04 - Standard Test Procedure for Polyphase Induction Motors and Generators

D. American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE)
   1. 90.1 - Energy Standard for Buildings Except Low-Rise Residential Buildings.

PART 2 - PRODUCTS

2.01 MOTORS AND STARTERS

A. Provide new NEMA Standard electric motors, sized and designed to operate at full load and full speed continuously without causing noise, vibration, and temperature rise in excess of their rating. Provide motors with a service factor of at least 1.15.

B. Equip motors for belt driven equipment with rails with adjusting screws for belt tension adjustment. Weather protect motors exposed to the weather.

C. Install high efficiency electric motors for air handling units, relief fans, and exhaust fans.

D. Provide all motors for use with Variable Frequency Drives with “high efficiency inverter duty” insulation class “F” with class “B” temperature rise and that conform to or exceed NYSECC or the Federal EP Act of 1992 requirements for efficiency.

E. Provide stainless steel nameplates, permanently attached to the motor, and having the following information as a minimum:
   1. Manufacturer
   2. Type
   3. Model
   4. Horsepower
   5. Service Factor
   6. RPM
   7. Voltage/Phase/Frequency
   8. Enclosure Type
   9. Frame Size
   10. Full-Load Current
   11. UL Label (where applicable)
   12. Lead Connection Diagram
   13. Bearing Data
   14. Efficiency at Full Load.

F. Provide motors whose sound power levels do not exceed that recommended in NEMA MG 1-12.49.

G. Provide motors with drive shafts long enough to extend completely through belt sheaves when sheaves are properly aligned and balanced.

H. Protect motor starters on equipment located outdoors in weatherproof NEMA 4X enclosures.

I. Provide weatherproof NEMA 4X disconnect switches when located outdoors.

J. Motor Characteristics:
   1. 120V/1/60 Hz, 208V/1/60 Hz or 240V/1/60 Hz: Capacitor start, open drip-proof type, ball bearing, rated 40 C. continuous rise.
   2. 208V/3/60 Hz, 240V/3/60 Hz or 460/3/60 Hz: NEMA B, normal starting torque, single speed, squirrel-cage type, open drip-proof, rated 40 C continuous rise, with ball bearings rated for B-10 life of 100,000 hours and fitted with grease fittings and relief ports. Provide motors with aluminum end brackets with steel inserts in bearing cavities.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install motors in accordance with manufacturer's recommendations, the NEC, NEMA, as shown on the drawings and/or as required by other sections of these specifications.

3.02 FIELD TESTS

A. Perform an electric insulation resistance test using a megohmmeter on all motors after installation, before start-up. All shall test free from grounds.

B. Perform Load test in accordance with ANSI/IEEE 112, Test Method B, to determine freedom from electrical or mechanical defects and compliance with performance data.

C. Insulation Resistance: Not less than one-half meg-ohm between conductors and frame, to be determined at the time of final inspection.

D. All test data shall be compiled into a report form for each motor and provided to the contracting officer or their representative.

END OF SECTION

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. The Work covered under this Section consists of the furnishing of all necessary labor, supervision, materials, equipment, and services to completely execute the pipe hanger and supports as described in this Specification. Size hangers and supports to fit the outside diameter of the

1.02 REFERENCES

A. ASTM B633 - Specification for Electrodeposited Coatings of Zinc on Iron and Steel

B. ASTM A123 - Specification for Zinc (Hot-Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars, and Strip

C. ASTM A653 - Specification for Steel Sheet, Zinc-Coated by the Hot-Dip Process

D. ASTM A1011 - Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability (Formerly ASTM A570)

E. MSS SP58 - Manufacturers Standardization Society: Pipe Hangers and Supports- Materials, Design, and Manufacture

F. MSS SP89 - Pipe Hangers and Supports - Fabrication and Installation Practices

1.03 QUALITY ASSURANCE

A. Provide hangers and supports used in fire protection piping systems listed and labeled by Underwriters Laboratories.

B. Steel pipe hangers and supports shall have the manufacturer’s name, part number, and applicable size stamped in the part itself for identification.

C. Design and manufacture hangers and supports in conformance with MSS SP 58.

1.04 SUBMITTALS

A. Submit product data on all hanger and support devices, including shields and attachment methods. Include as a minimum as part of product data materials, finishes, approvals, load ratings, and dimensional information.

B. Submit Pipe Hanger and Support Application Schedule.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Manufacturer: Subject to compliance with these specifications, provide pipe hanger and support systems manufactured by:
   1. Cooper B-Line, Inc.
   2. Carpenter and Patterson

3. Grinnell

2.02 PIPE HANGERS AND SUPPORTS

A. Hangers
   1. Insulated pipe- Hot or steam piping:
      a. 2 inch and smaller pipes: use adjustable steel clevis with galvanized sheet metal shield. B-Line B3100 with B3151 series.
      b. 2-1/2 inch and larger pipes
         1) Adjustable steel yoke pipe roll with pipe covering protection saddle. B-Line B3110 with B3160-B3165 series.
         2) Pipe roll with sockets with pipe covering protection saddle, B-Line B3114 with B3160-B3165 series.

B. Pipe Clamps
   1. When flexibility in the hanger assembly is required due to horizontal movement, use pipe clamps with weldless eye nuts, B-Line B3140 or B3142 with B3200. For insulated lines use double bolted pipe clamps, B-Line B3144 or B3146 with B3200.

C. Multiple or Trapeze Hanger
   1. Construct trapeze hangers from 12 gauge roll formed ASTM A1011 SS Grade 33 structural steel channel, 1-5/8 inch by 1-5/8 inch minimum, B-Line B22 strut or stronger as required.
   2. Mount pipes to trapeze with 2 piece pipe straps sized for outside diameter of pipe, B-Line B2000 Series.
   3. For pipes subjected to axial movement:
      a. Strut mounted roller support, B-Line B3126. Use pipe protection shield or saddles on insulated lines.
      b. Strut mounted pipe guide, B-Line B2417.

D. Wall Supports
   1. Pipes 4 inch and smaller:
      a. Carbon steel hook, B-Line B3191.
      b. Carbon steel J-hanger, B-Line B3690.
   2. Pipes larger than 4 inch:
      a. Welded strut bracket and pipe straps, B-Line B3064 and B2000 series.
      b. Welded steel brackets, B-Line B3066 or B3067, with roller chair or adjustable steel yoke pipe roll. B-Line B3120 or B3110. Use pipe protection shield or saddles on insulated lines.

E. Vertical Supports
   1. Steel riser clamp sized to fit outside diameter of pipe, B-Line B3373.
   2. Copper Tubing Supports
      a. Size hangers to fit copper tubing outside diameters.
         1) Adjustable steel swivel ring (band type) hanger, B-Line B3170CT.
         2) Malleable iron ring hanger, B-Line B3198RCT or hinged ring hanger B3198HCT.
         3) Malleable iron split-ring hanger with eye socket, B-Line B3173CT with B3222.
         4) Adjustable steel clevis hanger, B-Line B3104CT.
      b. For supporting vertical runs use epoxy painted or plastic coated riser clamps, B-Line B3373CT or B3373CTC.

c. For supporting copper tube to strut use epoxy painted pipe straps sized for copper tubing, B-Line B2000 series, or plastic inserted vibration isolation clamps, B-Line BVT series.

F. Pipe Supports Between Anchors and Pipe Expansion Loops
1. Provide supports between pipe anchors designed to cause minimal resistance to piping movement. Provide roller hanger supports or slide plates between anchors.
2. Provide supports near the L bends of pipe thermal expansion loops. No more than 12 inches from either side of the horizontal elbow.

2.03 SPRING HANGERS

A. For critical high temperature piping, at hanger locations where the vertical movement of the piping is ¾ inch or more, or where it is necessary to avoid the transfer of load to adjacent hangers or connected equipment, provide approved constant support hangers. However, where the piping movement occurs at a hanger supporting a portion of piping riser on which a rigid support is also located, variable spring hangers may be used for any amount of expansion up to the full recommended working range of the spring, provided the change in supporting effect of the variable spring is added to the design load of the rigid support.

B. Where transfer of load to adjacent hangers or equipment is not critical, and where the vertical movement of the piping is less than ¾ inch, variable spring hangers may be used, provided the variation in supporting effect does not exceed 25 percent of the calculated piping load through its total vertical travel.

C. The total travel for constant support hangers shall be equal to actual travel plus 20 percent. In no case shall the difference between actual and total travel be less than one inch.

D. Furnish constant support hangers with travel stops, which shall prevent upward and downward movement of the hanger. The travel stops shall be factory installed so that the hanger level is at the “cold” position. Design the travel stops to permit future reengagement, even in the event the lever is at a position other than “cold”, without having to make hanger adjustments.

E. For low temperature systems where vertical movements are anticipated, use approved precompressed variable spring hangers.

2.04 UPPER ATTACHMENTS

A. Beam Clamps
1. Use beam clamps where piping is to be suspended from building steel. Select clamp type on the basis of load to be supported, and load configuration.
2. Use center loaded beam clamps where specified. For steel clamps provide B-Line B3050, or B3055. For malleable iron or forged steel beam clamps with cross bolt provide B-Line B3054 or B3291-B3297 Series as required to fit beams.

B. Concrete Inserts
1. Use cast in place spot concrete inserts where applicable; either steel or malleable iron body, B-Line B2500 or B3014. Select spot inserts to allow for lateral adjustment and to have means for attachment to forms. Select inserts to suit threaded hanger rod sizes, B-Line N2500 or B3014N series.
2. Use continuous concrete inserts where applicable. Provide 12 gauge channels, ASTM A1011 SS Grade 33 structural quality carbon steel, complete with Styrofoam inserts and end caps with nail holes for attachment to forms. Provide continuous concrete inserts with

a load rating of 2,000 lbs/ft. in concrete, B-Line B22I, 32I, or 52I. Select channel nuts suitable for strut and rod sizes.

3. Provide Drop-In, shell type anchors with an internally threaded, all-steel shell with expansion cone insert and flush embedment lip. Manufacture anchors from plated carbon steel, 18-8 stainless steel and 316 stainless steel. Install anchors with carbide tipped hammer drill bits made in accordance to ANSI B212.15-1994 specifications. Test anchors to ASTM E488 criteria and listed by ICC (formerly ICBO) and SBCCI. Provide anchors listed by the following agencies as required by the local building code: UL, FM. Select inserts to suit threaded hanger rod sizes, Redhead Multi-Set.

2.05 ACCESSORIES

A. Hanger Rods shall be threaded both ends or continuous threaded rods of circular cross section. Use adjusting locknuts at upper attachments and hangers. No wire, chain, or perforated straps are allowed.

B. Provide shields that are 180 degree galvanized sheet metal, 12 inch minimum length, 18 gauge minimum thickness, designed to match outside diameter of the insulated pipe, B-Line B3151.

C. Pipe protection saddles shall be formed from carbon steel, 1/8 inch minimum thickness, sized for insulation thickness. Saddles for pipe sizes greater than 12 inch shall have a center support rib.

2.06 FINISHES

A. Indoor Finishes
   1. Coat hangers and clamps for support of bare copper piping with copper colored epoxy paint, B-Line Dura-Copper®. Use additional PVC coating of the epoxy painted hanger where necessary.
   2. Zinc plate hangers for other than bare copper pipe in accordance with ASTM B633 OR provide an electro-deposited green epoxy finish, B-Line Dura-Green®.
   3. Provide pre-galvanized strut channels in accordance with ASTM A653 SS Grade 33 G90 or provide an electro-deposited green epoxy finish, B-Line Dura-Green®.

B. Outdoor and Corrosive Area Finishes
   1. Hot dip galvanize hangers and struts located outdoors after fabrication in accordance with ASTM A123. Provide all hanger hardware as hot dip galvanized or stainless steel. Zinc plated hardware is not acceptable for outdoor or corrosive use.
   2. Provide hangers and strut manufactured of type 304 stainless steel with stainless steel hardware where located in corrosive areas.

PART 3 - EXECUTION

3.01 PIPE HANGERS AND SUPPORTS

A. Adequately support pipe by pipe hanger and supports specified in PART 2 PRODUCTS. Allow for forces imposed by expansion joints, satisfy structural requirements and maintain proper clearances with respect to adjacent piping, equipment and structures. Size hangers for insulated pipes sized to accommodate insulation thickness.

B. Keep the different types of hangers to a minimum and provide hangers that are neat, without complicated bolting and with the number of parts of each hanger and its anchor kept to a minimum.

C. Make accurate weight balance calculations to determine the required supporting forces at each hanger or support location and the pipe weight load at each equipment connection.

D. Provide pipe hangers capable of supporting the pipe in all conditions of operation selected to allow free expansion and contraction of the piping, and prevent excessive stress resulting from transferred weight being induced into the pipe or connected equipment.

E. Painted or shop prime all hangers and supports that are not galvanized.

F. Support horizontal steel piping in accordance with MSS SP-69 Tables 3 and 4, excerpts of which follow below:

NOMINAL PIPE SIZE (INCHES)	ROD DIAMETER (INCHES)	MAXIMUM SPACING (FEET)
1/2 to 1-1/4	3/8	6
1-1/2	3/8	9
2	3/8	10
2-1/2	1/2	11
3	1/2	12
3-1/2	1/2	13
4	5/8	14
5	5/8	16
6	3/4	17
8	3/4	19
10	7/8	22
12	7/8	23
14	1	25
16	1	27

G. Support horizontal copper tubing in accordance with MSS SP-69 Tables 3 and 4, excerpts of which follow below:

NOMINAL PIPE SIZE (INCHES)	ROD DIAMETER (INCHES)	MAXIMUM SPACING (FEET)
1/2 to 3/4	3/8	5
1	3/8	6
1-1/4	3/8	6
1-1/2	3/8	8
2	3/8	8
2-1/2	1/2	9
3	1/2	10
3-1/2	1/2	11
4	1/2	12
5	1/2	13
6	5/8	14
8	3/4	16

H. For grooved end steel pipe:

NOMINAL PIPE SIZE (INCHES)	MAXIMUM SPACING (FEET)
1-1/2 and under	7
2 through 4	10
5 and over	12

Do not leave any pipe length unsupported between any two coupling joints.

I. Provide means of preventing dissimilar metal contact such as plastic coated hangers, copper colored epoxy paint, or non adhesive isolation tape- B-Line Iso-pipe. Galvanized felt isolators sized for copper tubing may also be used, B-Line B3195CT.

J. Install hangers to provide a minimum of 1/2 inch space between finished covering and adjacent work.

K. Place a hanger within 12 inches of each horizontal elbow.

L. Support vertical piping independently of connected horizontal piping. Support vertical pipes at every floor. Wherever possible, locate riser clamps directly below pipe couplings or shear lugs.

M. Where several pipes can be installed in parallel and at the same elevation, provide trapeze hangers as specified in section 2.02 C. Space trapeze hangers according to the smallest pipe size, or install intermediate supports according to schedules in this Section.

N. Do not support piping from other pipes, ductwork or other equipment that is not building structure.

O. Where horizontal piping movements are greater than ½ inch, or where the hanger rod angularity from the vertical is greater than four degrees from the cold to hot position of the pipe, offset the hanger pipe and structural attachments in such a manner that the rod is vertical in the hot position.

P. In any part of the building which is steel-framed, attach hangers to the building structural steel beams. Where hangers do not correspond with the building structural steel beams, provide supplemental steel members continuously welded or bolted to the building structural steel beams. Provide two (2) coats of primer on the supplemental steel. In any parts of the building which is a concrete structure, attach hangers to the concrete structure by installing anchors into the concrete.

3.02 CONCRETE INSERTS

A. Secure pipe hangers attached to concrete structure and slabs with embedded inserts, anchor bolts or concrete fasteners. Use a safety factor of 5 in selection of all inserts and expansion bolts unless there are seismic requirements (See “Seismic Restraint” specification if applicable). In which case, the larger of the two loadings shall govern the design.

B. Provide inserts for placement in formwork before concrete is poured.

C. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.

D. Where concrete slabs form finished ceilings, provide inserts to be flush with slab surface.

E. E. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inch.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

A. Backfilling and Subbase for Concrete Pads: Section 312317.

1.02 REFERENCES

A. Except as shown or specified otherwise, the Work of this Section shall conform to the requirements of Specifications for Structural Concrete for Buildings ACI 301-99 of the American Concrete Institute.

1.03 SUBMITTALS

A. Submittals Package: Submit product data for design mix and materials for concrete specified below at the same time as a package.

B. Shop Drawings: Placing drawings for bar reinforcement.

C. Product Data:
1. Concrete design mix with name and location of batching plant.
2. Portland Cement: Brand and manufacturer's name.
3. Fly Ash: Name and location of source, and DOT test numbers.
4. Air-Entraining Admixture: Brand and manufacturer's name.
5. Aggregates: Name and location of source, and NYS test numbers.
6. Bonding Agent (Adhesive): Brand and manufacturer's name, and preparation and application instructions.

D. Samples:
1. Fabric Reinforcement: 8 inches square.
2. Bar Supports: Full size.

E. Quality Control Submittals:
1. Certificates: Bar reinforcement manufacturer's certification that bar material conforms with ASTM A 615 and specified grade.

1.04 STORAGE

A. Store materials as required to insure the preservation of their quality and fitness for the Work.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Anchor Bolts: Standard bolts, ASTM A 307, with lock washers and nuts.

B. Steel Plates: ASTM A 36.

C. Sleeves: Steel Pipe, Schedule 40, black, ASTM A 53.

D. Steel Shims and Fillers: ASTM A 569.

E. Reinforcement: Furnish the following unless otherwise indicated on the Drawings:
1. Fabric Reinforcement: ASTM A 185 welded wire fabric, 6 x 6 - W2.9 x W2.9 fabricated into flat sheets unless otherwise indicated.
2. Bar Reinforcement: ASTM A 615, Grade 60, deformed.

3. Metal Bar Supports: Galvanized or AISI Type 430 stainless steel, and without plastic tips.
4. Tie Wire: Black annealed wire, 16 gage minimum.

F. Fly Ash: ASTM C 618, including Table 1A (except for footnote A), Class F except that loss on ignition shall not exceed 4.0 percent.

G. Bonding Agent (Adhesive): Epoxy-resin-base bonding system, Type II, complying with ASTM C 881. Grade and class as required by conditions of use.

H. Cement Grout: Portland cement and clean natural sand mixed at a ratio of 1.0 part cement to 3.0 parts sand, with only the minimum amount of water required for placement and hydration.

I. Dowels: ASTM A 36 steel bars 1/2 inch in diameter by 5 inches long, unless otherwise indicated on the Drawings.

2.02 PROPORTIONING OF CONCRETE MIXES

A. Compressive Strength: Minimum 4000 psi.

B. Weight: Normal.

C. Durability: Concrete shall be air-entrained. Design air content shall be 6 percent by volume, with an allowable tolerance of plus or minus 1.5 percent for total air content. Entrained air shall be provided by use of an approved air-entraining admixture. Air-entrained cement shall not be used.

D. Slump: Between 2 inches and 4 inches.

E. Admixtures: Do not use admixtures in concrete unless specified or approved in writing by the Director.

F. Selection of Proportions: Concrete proportions shall be established on the basis of previous field experience or laboratory trial batches, unless otherwise approved in writing by the Director. Proportion mix with a minimum cement content of 611 pounds per cubic yard for 4000 psi concrete.
1. Optional Material: Fly ash may be substituted for (Portland) cement in normal weight concrete up to a maximum of 15 percent by weight of the required minimum (Portland) cement. If fly ash is incorporated in a concrete design mix, make necessary adjustments to the design mix to compensate for the use of fly ash as a partial replacement for (Portland) cement.
2. Adjustments shall include the required increase in air-entraining admixture to provide the specified air content.

2.03 FABRICATION OF ANCHOR BOLT ASSEMBLIES

A. Bolts: Diameter 1/8 inch less than the bolt holes in the equipment supports and length equal to the depth of the pad minus 1 inch plus the additional length required to provide full thread through nuts after shims, equipment, and washers are in place.

B. Sleeves: Diameter 1/2 inch larger than the bolt diameter and length as required to extend from the head of the bolt to the top of the pad.

C. Plates: 3 x 3 x 1/4 inch steel plate.

D. Weld a plate to the head end of a bolt. Center the bolt in a sleeve and tack-weld the sleeve to the plate.

PART 3 - EXECUTION

3.01 EXAMINATION AND PREPARATION

A. Concrete materials, reinforcement, forms, and earth which will be in contact with fresh concrete shall be free from frost at the time of concrete placement.

3.02 BONDING TO EXISTING CONCRETE SLABS

A. Where more than one pad is required for a single piece of equipment, install 2 dowels in existing slab for each pad. Drill existing slab as required to install dowels 3 inches into the existing concrete. Grout dowels in the drilled holes.

B. Prior to placing concrete, thoroughly roughen and clean existing concrete slab. Saturate existing concrete surface with clean water. Immediately prior to depositing concrete for pad, apply a coat of cement grout over the existing damp concrete or allow existing concrete to dry and apply bonding agent (adhesive) over the existing concrete in accordance with manufacturer's printed instructions.

3.03 INSTALLING ANCHOR BOLTS AND SLEEVES

A. Install anchor bolts (with sleeves) for all bolt holes in equipment supports.

B. Accurately position and securely support anchor bolts and sleeves prior to placing concrete. Support head of bolt 1 inch above bottom of pad. Temporarily close open end of sleeves to prevent entry of concrete.

C. Grout anchor bolts in sleeves with cement grout or approved shrink-resistant grout after final positioning.

3.04 REINFORCING

A. Except where other reinforcement is shown on the Drawings, install welded wire fabric at mid-depth of each pad, extending to 1 inch from perimeter of pad.

3.05 FINISHES

A. Formed Surfaces: Provide a smooth rubbed finish, with rounded or chamfered external corners, on all concrete surfaces exposed to view.

B. Unformed Surfaces: Provide a troweled finish on top surface of pads.

C. Unless noted otherwise on drawings, paint pad safety yellow using two part epoxy paint prior to installation of new equipment.

END OF SECTION

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. This Section describes the marking and identification materials for identifying mechanical equipment, ductwork and piping systems.

B. Mark and identify all mechanical equipment, ductwork and piping systems described herein, and as shown and specified in the Contract Documents.

1.02 REFERENCES

A. ANSI A13.1 - Scheme for the Identification of Piping Systems.

B. Z53.1 - Safety Color Code for Marking Physical Hazards.

C. OSHA 29 CFR 1910 - Subpart J, General Environmental Controls

1.03 SUBMITTALS

A. Identification Scheme - Submit scheme of identification codes.

B. Steam Trap Schedule - Submit steam trap schedules listing proposed steam trap number, location, type, sizes and service.

C. Valve Schedules - Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.

D. Samples - Submit samples of tags, attachments, labeled and identified.

E. Equipment Schedules - Submit mechanical equipment schedules, listing proposed equipment numbers, and their location and function.

F. Product Data: Provide manufacturers catalog literature for each product required.

PART 2 - PRODUCTS

2.01 APPROVED MANUFACTURERS

A. Seton

B. Bunting

C. W.H. Brady Company

2.02 VALVE TAGS

A. Provide valve tags for all valves installed for this project. Valve tags shall be constructed of brass with stamped letters and service designation tag size minimum 1-1/2 inches (38 mm) diameter with smooth edges, brass S hook.

B. Valve tags shall be permanently stamped and marked with a service designation, normal valve position, and an identifying number as large as possible. Each valve shall have a separate and

distinct number coordinated with the service designations shown on the Drawings and the Owners existing valve numbering system. Coordinate with the Architect/Engineer and Owner before finalizing the valve tag numbering system.

2.03 STEAM TRAP TAGS

A. Provide steam trap tags for all steam traps installed for this project. Steam trap tags shall be constructed of brass with stamped letters and service designation tag size minimum 1-1/2 inches (38 mm) diameter with smooth edges, brass S hook.

B. Each steam trap tag shall be permanently stamped and marked with a service designation and a unique identifying number as large as possible.

C. Each trap shall have a separate and distinct number coordinated with the service designations shown on the Drawings and the Owners existing trap numbering system. Coordinate with the Architect/Engineer and Owner before finalizing the trap tag numbering system.

2.04 PIPE MARKERS

A. All accessible piping installed indoors for this project, insulated and uninsulated shall be identified with wraparound pipe markers. Pipe markers shall be factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering. “Accessible” piping shall include exposed piping, and piping located above lay-in ceilings. Markers shall include system name, flow arrow, and color code and pipe diameter.

B. All piping installed outdoors for this project, insulated and uninsulated, shall be identified with wraparound pipe markers. Pipe markers shall be factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering. The marker shall be printed with weather-resistant ink.

C. Where pipes are too small or not readily accessible for application of pipe markers, a brass identification tag at least 1 ½ inches in diameter, with depressed ½ inch high black letters and numerals, shall be securely fastened at locations specified for pipe markers.

D. See pipe marker schedule for size requirements of pipe markers.

2.05 MECHANICAL EQUIPMENT MARKERS

A. Identify all mechanical equipment, bare or insulated, installed in the rooms or on the roof, by means of lettered and numbered nameplate (not stenciled) identifying the equipment and service. Refer to the Drawings for equipment identifications. Nameplates shall be aluminum with permanent 1 ½ inch high white letters on a black background, mechanically affixed and installed in a readily visible location on the equipment. Coordinate the final equipment designation with the Owner.

B. In addition to markers, all mechanical equipment shall be furnished with the manufacturer’s identification plate showing the name of equipment, manufacturer’s name and address, date of purchase, model number and performance data.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Apply piping system markers and valve tags in the following locations:
   1. Adjacent to each valve and fitting.
   2. At each branch location and riser take-off
   3. At each side of a pipe passage through floors, walls, ceiling and partitions.
   4. At each pipe passage to and from underground areas.
   5. Every 20 feet on all horizontal and vertical pipe runs.

B. Provide arrow markers showing direction of flow incorporated into or adjacent to each piping system marker. Use double-headed arrows if flow is in both directions.

C. Apply all piping system markers where view is unobstructed; markers and legends shall be clearly visible from operating positions.

D. Apply all tags and piping system markers in accordance with the manufacturer's instructions. Do not attach tags to valve handle such that the normal or emergency operation of the valve will be hindered.

3.02 VALVE CHART

A. Provide valve and steam trap chart identifying each valve's and steam trap's number, size of valve and service.

B. Frame the chart and locate the schedule in the Mechanical Equipment Room. (Aluminum Frame with plastic window).

C. Provide a compact disc that has the valve and steam trap chart schedule in a spreadsheet format. The spreadsheet software to be used for the schedule shall be identified by the Owner.

3.03 LAY IN CEILING TILES AND ACCESS DOORS

A. Provide a lettered and numbered nameplate for each access door indicating the mechanical equipment that the door provides access too.

B. Where VAV boxes, hot water reheat coils, or other mechanical devices are installed above a lay-in ceiling tile system, provide and install color coded thumb tabs to mark the location of the equipment above the ceiling.

3.04 SCHEDULES

A. Pipe Marker Letter Size Schedule:

Outside diameter of insulation or pipe Inches	**Letter height Inches**	**Color field Inches**
3/4 to 1-1/4	1/2	8
1-1/2 to 2	3/4	8
2-1/2 to 6	1 - 1/4	12
8 to 10	2 - 1/2	24

Over 10	3 - 1/2	24

END OF SECTION

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. This section specifies requirements for testing, adjusting, and balancing of all air and hydronic fluid distribution systems, including the equipment and devices associated with each system.

B. The work includes setting speed and flow, adjusting equipment and devices installed for systems, recording data, conducting tests, preparing and submitting reports, and recommending modifications to the mechanical installations specified in other Sections of the Specifications.

1.02 RELATED WORK

A. Drawings and general provisions of the Contract, including General Conditions, any Supplemental Conditions and Division 1 Specification Sections, govern the work of this section.

1.03 SUBMITTALS

A. Submit proof that the testing, adjusting and balancing agency meets the requirements of Section 1.04 “Quality Assurance”, and all other specified requirements.

B. Prior to performing the work, submit sample blank forms of the test reports that will be submitted by the entity performing work of this Section, indicating all data and parameters included.

C. Submit certified test reports, signed by the authorized representative of the testing and balancing agency. Certify the reports to be proof that the systems have been tested, adjusted and balanced in accordance with the selected reference standards (NEBB or AABC); are an accurate representation of how the systems have been installed; are a true representation of how the systems are operating at completion of the testing, adjusting and balancing procedures; and are an accurate record of all final quantities measured, to establish normal operating values of the systems. Submittal of test report shall be in the following format:
   1. Draft Report: Upon completion of testing, adjusting and balancing procedures, prepare draft reports on the approved forms. Draft report may be handwritten, but must be complete, factual, accurate and legible. Organize and format draft reports in the same manner specified herein for the final reports. Submit two complete sets of draft reports. Only one complete set of draft reports will be returned.
   2. Final Report: Upon verification and approval of draft reports, prepare final reports, type written and organized and formatted as described herein. Submit two complete sets of final reports.
      a. Report Format: Submit reports using the standard forms prepared by the referenced standard for each respective item and system to be tested, adjusted and balanced. Include schematic systems diagrams. Enclose the report contents in a 3-ring binder. Divide the contents into the below listed divisions, separating them by divider tabs with titles descriptive of the contents:
         1) General Information and Summary.
         2) Air Systems.
         3) Hydronic Systems.
      b. Report Contents: Provide the following minimum information, forms and data:
         1) General Information and Summary: Identify the testing, adjusting and balancing Agency, Contractor, Owner, Architect/Engineer, and Project on the inside cover sheet. Include addresses, and contact names and telephone numbers. Include

a certification sheet containing the seal and name, address, telephone number and signature of the Agency's responsible certified Test and Balance Engineer. Include in this division a listing of the instrumentation used for the procedures, along with the proof of calibrations.

2) Include in the remainder of the reports the appropriate forms containing, as a minimum, the information indicated on the standard report forms prepared by AABC or NEBB, for each item of equipment and system. Prepare a schematic diagram for each item of equipment and system, to accompany each respective report form.

c. Calibration Reports: Submit proof that all required instrumentation has been calibrated to tolerances specified in the referenced standards within a period not exceeding six months prior to conducting the test procedures.

d. Existing Systems: Where existing systems are to be added to or modified include in the report results of operational tests taken prior to modifications including but not limited to existing fan and pump curves, pressure readings and flow measurements. Include in the report copies of the equipment and motor nameplate data along with equipment performance curves indicating operating points prior to any modifications and, where existing equipment is retained, operating points after system balance. Where terminals are adjusted or modified include terminal performance curves/data and final readings.

1.04 QUALITY ASSURANCE

A. Test, adjust and balance systems and equipment by using competent mechanics regularly employed by a testing, adjusting and balancing Subcontractor whose primary business is the testing, adjusting and balancing of building mechanical systems. The testing, adjusting and balancing Subcontractor shall be a business established for a minimum of 10 years.

B. The testing, adjusting, and balancing Subcontractor shall be certified by the Associated Air Balance Council (AABC) or the National Environmental Balancing Bureau (NEBB).

C. Instrumentation type, quantity, and accuracy shall be as described in AABC's "National Standards for Field Measurement and Instrumentation, or Total System Balance, or NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems."

D. All instrumentation shall be calibrated at least every 6 months or more frequently if required by the instrument manufacturer.

1.05 PERFORMANCE REQUIREMENTS

A. Comply with all applicable Federal, State and Local laws, ordinances, regulations and codes, and the latest industry standards including, but not limited to the entities listed below for procedures, measurements, instruments and test reports for testing, adjusting and balancing work:
   1. American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE)
   2. Sheet Metal and Air Conditioning Contractors National Association (SMACNA)
   3. National Environmental Balancing Bureau (NEBB)
   4. Associated Air Balance Council (AABC)

B. Set the air delivery or intake of each diffuser, grille and register to be as designed or within five percent of the air flow rates shown on the Drawings.

C. Set the fan air flow rate and static pressure rise across the fan to be within 10 percent above the design value at design speed.

1.06 JOB CONDITIONS

A. Require the testing and balancing specialist to review his work with the respective manufacturers of the equipment and devices involved, and coordinate and schedule all work.

B. Furnish and install balancing dampers, pressure taps, gauges, valves, and other components as required for a properly balanced system, whether or not specified herein or shown on the Drawings, all at no additional cost to the Owner. Make all adjustment or replacement parts recommended by the testing and balancing specialist in strict accordance with the respective equipment manufacturer's recommendations.

C. Coordinate with the control manufacturer's representative to set the adjustment of the automatically operated dampers and control valves to operate as required.

1.07 GENERAL

A. The Owner will occupy the building during the entire testing, adjusting, and balancing period. Cooperate with the Owner during testing, adjusting, and balancing operations to minimize conflicts with the Owner's operations.

B. Complete all tests specified herein to the satisfaction of the Architect/Engineer before final acceptance.

C. The Architect/Engineer, or his representative, is the sole judge of the acceptability of the tests. The Architect/Engineer may direct the performance of any such additional tests, as he deems necessary in order to determine the acceptability of the systems, equipment, material and workmanship. No additional payment will be made for any test required by the Architect/Engineer.

PART 2 - PRODUCTS

NOT USED.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Obtain design drawings and specifications and become thoroughly acquainted with the design intent.

B. Obtain copies of approved shop drawings of all air handling and hydronic equipment, air outlets (supply, return and exhaust), manual valves, automatic valves and the temperature control diagrams, including intended sequence of operations.

C. Existing Systems: Where existing systems are to be added to or modified perform operational tests prior to modifications including but not limited to existing fans and pumps curves, pressure readings and flow measurements.

1. Obtain copies of the equipment and motor nameplate data along with equipment performance curves indicating operating points prior to any modifications. Where terminal units are to be adjusted or modified obtain performance data for these units.

D. Examine installed work and conditions under which testing is to be done to ensure that work has been completed, cleaned, and is operable. Do not proceed with testing, adjusting and balancing until unsatisfactory conditions have been corrected in a manner approved by the testing and balancing specialist.

E. Examine the air systems to see that they are free from obstructions. Determine that all dampers and registers are open, moving equipment is lubricated, clean filters are installed, and automatic controls are functioning; and perform other inspections and maintenance activities necessary for proper operation of the systems.

F. Examine the hydronic systems to see that they are free from abnormal obstructions, and that all piping, valves and equipment have been properly made fully operational. Determine that all equipment and control systems are performing correctly by functional testing.

G. Where existing systems are to be modified or added to ensure that all strainers and filters are clean and any operational problems that will prevent system balance have been brought to the attention of the Owner and repaired.

3.02 TESTING, ADJUSTING AND BALANCING

A. Notify the Owner 48 hours in advance of starting any tests. Do not perform any tests until acknowledgment of notification and approval has been received from the Owner.

B. Provide all necessary instruments and personnel for the tests. If, in the opinion of the Architect/Engineer, the results of such tests show that the Work has not complied with the requirements of the Contract Documents, make all additions or changes necessary to put the system in proper working condition and pay all expenses for all subsequent tests which are necessary to determine whether the Work is satisfactory. Any additional work or subsequent tests shall be carried out at the convenience of the Architect/Engineer.

C. Test all packaged equipment in strict accordance with the equipment manufacturer’s requirements.

D. Perform any and all other tests that may be required by the local municipality or other governing body, board or agency having jurisdiction.

E. Perform testing, adjusting, and balancing after leakage and pressure tests on air and water distribution systems have been satisfactorily completed.

F. Actuate all safety devices in a manner that clearly demonstrates their workability and operation.

G. Cut insulation, ductwork and piping for installation of test probes to the minimum extent necessary to allow adequate performance of test procedure.

H. Perform tests and compile test data for all air systems and hydronic systems.

I. Include a schematic diagram locating the air inlets, outlets, fans, equipment, dampers and regulating devices for air systems, and a schematic diagram for location of balancing valves, flow indicators, equipment, and devices for hydronic systems.

J. All instruments used shall be provided by the entity performing the Work of this Section, and shall be accurately calibrated and maintained in good working order.

K. Air Systems

Perform the testing, adjusting and balancing of air systems in accordance with the detailed procedures outlined in the referenced standards; including but not be limited to the following:

1. Test, record and adjust fan rpm to design requirements.
2. Test and record motor full load amperes.
3. Make a pitot tube traverse of main supply ducts and obtain design flow rate at fans.
4. Test and record system static pressure, velocity pressure and total pressure.
5. Test and adjust system for design supply, transfer and return air flow rate.
6. Test and adjust system for minimum and maximum design flow rates of outside air.
7. Test and record return air temperatures.
8. Test and record coil and fan leaving air temperatures.
9. Adjust all main supply, return, relief, and exhaust air ducts to proper design flow rate.
10. Adjust all zones to proper design flow rate for supply, return, transfer, relief and exhaust air.
11. Test and adjust each diffuser, grille and register.
12. Identify each grille, diffuser and register as to location and area on the schematic diagram.
13. Identify and list in the final report size, type and manufacturer of diffusers, grilles and registers and all tested equipment. Use manufacturer's data on all equipment to make required calculations for testing, adjusting and balancing. Include design required velocity and test resultant velocity, required flow rate and test resultant flow rate after adjustment as part of readings and tests of diffusers, grilles and registers.
14. Adjust all diffusers, grilles and registers to minimize drafts in all areas.
15. Permanently mark all dampers after air balance is complete so that they can be restored to their correct position, if disturbed later.
16. Seal openings in ductwork for pitot tube insertion with snap-in plugs after air balance is complete.

L. Hydronic Systems

1. Perform the testing, adjusting and balancing of hydronic systems in accordance with the detailed procedures outlined in the referenced standards; and including but not limited to the following:
    a. Preliminary procedure prior to balancing:
        1) Examine water in system and determine if water has been treated and cleaned.
        2) Check expansion tank to determine that it is not air bound and the system is completely full of water.
        3) Purge all air vents of water systems, check automatic air vents and determine if they are operating properly. Repair or replace any air vents that are not operating properly.
        4) Coordinate with control manufacturer for required cooling and heating temperature controls and corresponding, automatic valve operation settings.
        5) Open all normally open valves to full open position. Set automatic valves to full coil flow.
        6) Complete air balance before final water balance begins.
        7) Check water pumps for pump rotation and for proper flow rate delivery against manufacturer's pump curves.
        8) Set all balancing valves for required flow delivery at mains and branch mains to cooling and heating elements.

9) Upon completion of flow readings and adjustments of balancing valves, mark all settings and record data, so that they can be restored to their correct “balanced” position, if disturbed later.

b. Include the following as part of the final balancing:
   1) After required cooling and heating temperature controls and automatic valve operation settings are made, recheck pump flow requirements and readjust system as required.
   2) Record pressure drop through coil at set flow rate of coil for full cooling and for full heating. Set pressure drop across bypass valve to match coil pressure drop.
   3) Record and check the following items at each cooling and heating element:
   4) Inlet water temperatures and static pressure at connections.
   5) Leaving water temperatures and pressure drop of each coil.
   6) Flow rate through coil with control valve stroked manually wide open.
   7) Record operating suction and discharge pressures of each pump and final total dynamic head and rated amperage versus actual amperage of pump motors.
   8) Record entering and leaving water temperatures and flow through all equipment and devices.
   9) Check and record all flow rates at all locations in the piping system with flow meters.
   10) Upon completion of air and hydronic systems testing, patch insulation, ductwork and housings, using materials identical to those removed.
   11) Perform final testing, adjusting and balancing during summer season for air conditioning systems and during winter season for heating systems, including operation when outside conditions are within 5 degrees F wet bulb temperature of maximum summer design condition, and within 10 degrees F dry bulb temperature of minimum winter design condition.
   12) Retest, adjust, and balance systems subsequent to system modifications. Resubmit test results.

END OF SECTION

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. This section specifies requirements for testing, adjusting, and balancing of all air distribution systems, including the equipment and devices associated with each system.

B. The work includes setting speed and flow, adjusting equipment and devices installed for systems, recording data, conducting tests, preparing and submitting reports, and recommending modifications to the mechanical installations specified in other Sections of the Specifications.

1.02 RELATED WORK

A. Drawings and general provisions of the Contract, including General Conditions, any Supplemental Conditions and Division 1 Specification Sections, govern the work of this section.

1.03 SUBMITTALS

A. Submit proof that the testing, adjusting and balancing agency meets the requirements of Section 1.04 “Quality Assurance”, and all other specified requirements.

B. Prior to performing the work, submit sample blank forms of the test reports that will be submitted by the entity performing work of this Section, indicating all data and parameters included.

C. Submit certified test reports, signed by the authorized representative of the testing and balancing agency. Certify the reports to be proof that the systems have been tested, adjusted and balanced in accordance with the selected reference standards (NEBB or AABC); are an accurate representation of how the systems have been installed; are a true representation of how the systems are operating at completion of the testing, adjusting and balancing procedures; and are an accurate record of all final quantities measured, to establish normal operating values of the systems. Submittal of test report shall be in the following format:
   1. Draft Report: Upon completion of testing, adjusting and balancing procedures, prepare draft reports on the approved forms. Draft report may be handwritten, but must be complete, factual, accurate and legible. Organize and format draft reports in the same manner specified herein for the final reports. Submit two complete sets of draft reports. Only one complete set of draft reports will be returned.
   2. Final Report: Upon verification and approval of draft reports, prepare final reports, type written and organized and formatted as described herein. Submit two complete sets of final reports.
      a. Report Format: Submit reports using the standard forms prepared by the referenced standard for each respective item and system to be tested, adjusted and balanced. Include schematic systems diagrams. Enclose the report contents in a 3-ring binder. Divide the contents into the below listed divisions, separating them by divider tabs with titles descriptive of the contents:
         1) General Information and Summary.
         2) Air Systems.
      b. Report Contents: Provide the following minimum information, forms and data:
         1) General Information and Summary: Identify the testing, adjusting and balancing Agency, Contractor, Owner, Architect/Engineer, and Project on the inside cover sheet. Include addresses, and contact names and telephone numbers. Include a certification sheet containing the seal and name, address, telephone number

and signature of the Agency's responsible certified Test and Balance Engineer. Include in this division a listing of the instrumentation used for the procedures, along with the proof of calibrations.

2) Include in the remainder of the reports the appropriate forms containing, as a minimum, the information indicated on the standard report forms prepared by AABC or NEBB, for each item of equipment and system. Prepare a schematic diagram for each item of equipment and system, to accompany each respective report form.

c. Calibration Reports: Submit proof that all required instrumentation has been calibrated to tolerances specified in the referenced standards within a period not exceeding six months prior to conducting the test procedures.

d. Existing Systems: Where existing systems are to be added to or modified include in the report results of operational tests taken prior to modifications including but not limited to existing fan curves, pressure readings and flow measurements. Include in the report copies of the equipment and motor nameplate data along with equipment performance curves indicating operating points prior to any modifications and, where existing equipment is retained, operating points after system balance. Where terminals are adjusted or modified include terminal performance curves/data and final readings.

1.04 QUALITY ASSURANCE

A. Test, adjust and balance systems and equipment by using competent mechanics regularly employed by a testing, adjusting and balancing Subcontractor whose primary business is the testing, adjusting and balancing of building mechanical systems. The testing, adjusting and balancing Subcontractor shall be a business established for a minimum of 10 years.

B. The testing, adjusting, and balancing Subcontractor shall be certified by the Associated Air Balance Council (AABC) or the National Environmental Balancing Bureau (NEBB).

C. Instrumentation type, quantity, and accuracy shall be as described in AABC's "National Standards for Field Measurement and Instrumentation, or Total System Balance, or NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems."

D. All instrumentation shall be calibrated at least every 6 months or more frequently if required by the instrument manufacturer.

1.05 PERFORMANCE REQUIREMENTS

A. Comply with all applicable Federal, State and Local laws, ordinances, regulations and codes, and the latest industry standards including, but not limited to the entities listed below for procedures, measurements, instruments and test reports for testing, adjusting and balancing work:
   1. American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE)
   2. Sheet Metal and Air Conditioning Contractors National Association (SMACNA)
   3. National Environmental Balancing Bureau (NEBB)
   4. Associated Air Balance Council (AABC)

B. Set the air delivery or intake of each diffuser, grille and register to be as designed or within five percent of the air flow rates shown on the Drawings.

C. Set the fan air flow rate and static pressure rise across the fan to be within 10 percent above the design value at design speed.

1.06 JOB CONDITIONS

A. Require the testing and balancing specialist to review his work with the respective manufacturers of the equipment and devices involved, and coordinate and schedule all work.

B. Furnish and install balancing dampers, pressure taps, gauges, and other components as required for a properly balanced system, whether or not specified herein or shown on the Drawings, all at no additional cost to the Owner. Make all adjustment or replacement parts recommended by the testing and balancing specialist in strict accordance with the respective equipment manufacturer's recommendations.

C. Coordinate with the control manufacturer's representative to set the adjustment of the automatically operated dampers to operate as required.

1.07 GENERAL

A. The Owner will occupy the building during the entire testing, adjusting, and balancing period. Cooperate with the Owner during testing, adjusting, and balancing operations to minimize conflicts with the Owner's operations.

B. Complete all tests specified herein to the satisfaction of the Architect/Engineer before final acceptance.

C. The Architect/Engineer, or his representative, is the sole judge of the acceptability of the tests. The Architect/Engineer may direct the performance of any such additional tests, as he deems necessary in order to determine the acceptability of the systems, equipment, material and workmanship. No additional payment will be made for any test required by the Architect/Engineer.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.01 EXAMINATION

A. Obtain design drawings and specifications and become thoroughly acquainted with the design intent.

B. Obtain copies of approved shop drawings of all air handling equipment, air outlets (supply, return and exhaust), and the temperature control diagrams, including intended sequence of operations.

C. Existing Systems: Where existing systems are to be added to or modified perform operational tests prior to modifications including but not limited to existing fan curves, pressure readings and flow measurements.
   1. Obtain copies of the equipment and motor nameplate data along with equipment performance curves indicating operating points prior to any modifications. Where terminal units are to be adjusted or modified obtain performance data for these units.

D. Examine installed work and conditions under which testing is to be done to ensure that work has been completed, cleaned, and is operable. Do not proceed with testing, adjusting and balancing until unsatisfactory conditions have been corrected in a manner approved by the testing and balancing specialist.

E. Examine the air systems to see that they are free from obstructions. Determine that all dampers and registers are open, moving equipment is lubricated, clean filters are installed, and automatic controls are functioning; and perform other inspections and maintenance activities necessary for proper operation of the systems.

F. Where existing systems are to be modified or added to ensure that all filters are clean and any operational problems that will prevent system balance have been brought to the attention of the Owner and repaired.

3.02 TESTING, ADJUSTING AND BALANCING

A. Notify the Owner 48 hours in advance of starting any tests. Do not perform any tests until acknowledgment of notification and approval has been received from the Owner.

B. Provide all necessary instruments and personnel for the tests. If, in the opinion of the Architect/Engineer, the results of such tests show that the Work has not complied with the requirements of the Contract Documents, make all additions or changes necessary to put the system in proper working condition and pay all expenses for all subsequent tests which are necessary to determine whether the Work is satisfactory. Any additional work or subsequent tests shall be carried out at the convenience of the Architect/Engineer.

C. Test all packaged equipment in strict accordance with the equipment manufacturer’s requirements.

D. Perform any and all other tests that may be required by the local municipality or other governing body, board or agency having jurisdiction.

E. Perform testing, adjusting, and balancing after leakage and pressure tests on air distribution systems have been satisfactorily completed.

F. Actuate all safety devices in a manner that clearly demonstrates their workability and operation.

G. Cut insulation and ductwork for installation of test probes to the minimum extent necessary to allow adequate performance of test procedure.

H. Perform tests and compile test data for all air systems.

I. Include a schematic diagram locating the air inlets, outlets, fans, equipment, dampers and regulating devices for air systems.

J. All instruments used shall be provided by the entity performing the Work of this Section, and shall be accurately calibrated and maintained in good working order.

K. Air Systems

L. Perform the testing, adjusting and balancing of air systems in accordance with the detailed procedures outlined in the referenced standards; including but not be limited to the following:

1. Test, record and adjust fan rpm to design requirements.
2. Test and record motor full load amperes.
3. Make a pitot tube traverse of main supply ducts and obtain design flow rate at fans.
4. Test and record system static pressure, velocity pressure and total pressure.
5. Test and adjust system for design supply, transfer and return air flow rate.
6. Test and adjust system for minimum and maximum design flow rates of outside air.
7. Test and record return air temperatures.
8. Test and record coil and fan leaving air temperatures.
9. Adjust all main supply, return, relief, and exhaust air ducts to proper design flow rate.
10. Adjust all zones to proper design flow rate for supply, return, transfer, relief and exhaust air.
11. Test and adjust each diffuser, grille and register.
12. Identify each grille, diffuser and register as to location and area on the schematic diagram.
13. Identify and list in the final report size, type and manufacturer of diffusers, grilles and registers and all tested equipment. Use manufacturer's data on all equipment to make required calculations for testing, adjusting and balancing. Include design required velocity and test resultant velocity, required flow rate and test resultant flow rate after adjustment as part of readings and tests of diffusers, grilles and registers.
14. Adjust all diffusers, grilles and registers to minimize drafts in all areas.
15. Permanently mark all dampers after air balance is complete so that they can be restored to their correct position, if disturbed later.
16. Seal openings in ductwork for pitot tube insertion with snap-in plugs after air balance is complete.

END OF SECTION

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. This section describes the insulation, jackets and accessories for piping as scheduled in Part 3 of this Section and as shown on the Drawings.

1.02 RELATED REQUIREMENTS

A. Section 078400 - Firestopping

B. Section 078413 - Through Penetration Firestopping for HVAC Systems

C. Section 079201 - Non Fire Rated Sleeves and Seals

D. Section 232000 - Pipe, Valves, and Fittings

E. Section 232300 - Refrigerant Piping

1.03 REFERENCES

A. National Fire Protection Association (NFPA):
   1. NFPA 255 - Surface Burning Characteristics of Building Materials.

B. Greenguard

C. Underwriters Laboratories, Inc. (UL):
   1. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials.

D. American Society for Testing and Materials (ASTM):
   1. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
   2. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
   3. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus.
   4. ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement.
   5. ASTM C335 - Standard Test Method for Steady-State Heat Transfer Properties of Horizontal Pipe Insulation.
   6. ASTM C449 - Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement.
   7. ASTM C518 - Standard Test Method for Steady-State Heat Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
   8. ASTM C533 - Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation.
   9. ASTM C534 - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.
   10. ASTM C547 - Standard Specification for Mineral Fiber Preformed Pipe Insulation.
   11. ASTM C 552 - Standard Specification for Cellular Glass Thermal Insulation
   12. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
   13. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.
   14. ASTM C585 - Standard Practice for Inner and Outer Diameters of Rigid Thermal Insulation for Nominal Sizes of Pipe and Tubing.

15. ASTM C 591 - Standard Specification for Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation.
16. ASTM C 610 - Standard Specification for Molded Expanded Perlite Block and Pipe Thermal Insulation.
17. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.
18. ASTM C921 - Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.
19. ASTM C1136 - Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation
20. ASTM D1056 - Standard Specification for Flexible Cellular Materials - Sponge or Expanded Rubber.
21. ASTM D2842 - Standard Test Method for Water Absorption of Rigid Cellular Plastics.
22. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
23. ASTM E96 - Standard Test Method for Water Vapor Transmission of Materials.

1.04 DEFINITIONS

A. Greenguard: Greenguard Environmental Institute

B. IAQ: Indoor Air Quality

C. EPA: Environmental Protection AgencyA

D. WHO: World Health Organization

E. ASJ: All Service Jacket

F. SSL: Self-Sealing Lap

G. FSK: Foil-Scrim-Kraft; jacketing

H. PSK: Poly-Scrim-Kraft; jacketing

I. PVC: Polyvinyl Chloride

J. FRP: Fiberglass Reinforced Plastic

K. Cold Service Piping/ Surfaces: Pipes or surfaces where the normal operating temperature is 60 degrees F or lower.

L. Hot Service Piping/ Surfaces: Pipes or surfaces where the normal operating temperature is 105 degrees F or higher.

1.05 SUBMITTALS

A. Product data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

B. Manufacturer’s Instructions: Indicate installation procedures that ensure acceptable workmanship and installation standards will be achieved.

1.06 QUALITY ASSURANCE

A. Qualifications:
   1. Manufacturer: Company specializing in manufacturing products specified with minimum 3 years documented experience.
   2. Installer: Company specializing in performing the Work of this Section with minimum 3 years documented experience.

B. Materials:
   1. Flame spread/smoke developed rating of 25/50 or less in accordance with ASTM E84, NFPA 255 and UL 723.
   2. Insulation for duct, pipe and equipment for above grade exposed to weather outside building shall be certified as being self-extinguishing for 1" thickness in less than 53 seconds when tested in accordance with ASTM D1692.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site, labeled with manufacturer’s identification, product density, and thickness.

B. Follow manufacturer’s recommended storage and handling practices.

1.08 ENVIRONMENTAL REQUIREMENTS

A. Maintain ambient conditions required by manufacturers of each product (tapes, adhesives, mastics, cements, insulation, etc.).

B. Maintain temperature before, during, and after installation for a minimum of 24 hours.

C. Supply fiberglass products that assure excellent IAQ (Indoor Air Quality) performance through Greenguard Certification.

D. Mold: Carefully inspect any insulation that has been exposed to water. If it shows any sign of mold growth remove it from the Site. If the material is wet but shows no sign of mold, dry rapidly and thoroughly. If it shows signs of facing degradation from wetting remove it from the Site.

PART 2 - PRODUCTS

2.01 FIBER GLASS INSULATION

A. Approved Manufacturers:
   1. Knauf Insulation
   2. Johns Manville Corporation
   3. Owens Corning Corporation
   4. CertainTeed Corporation

B. Fiber glass insulation meeting ASTM C547, ASTM C585, and ASTM C795; rigid molded, noncombustible.

C. Factory applied vapor barrier jacket: ASJ/SSL conforming to ASTM C1136 Type I and ASTM E96, secured with self-sealing longitudinal laps and butt strips.

2.02 FIBER GLASS INSULATION JACKETS AND ACCESSORIES

A. Field-Applied Jackets and Fitting Covers
   1. PVC - 25/50 or Indoor/Outdoor, UV-resistant fittings, jacketing and accessories, white or colored. Fitting cover system consisting of pre-molded, high-impact PVC materials with fiber glass inserts. Approved Manufacturer: Proto Corporation.
      a. Thickness: 10 mil.
      b. Closures: stainless steel tacks, matching PVC tape, or PVC adhesive per manufacturer's recommendations.
   2. ASTM B209 formed aluminum, 0.016-inch thick in smooth, corrugated, or embossed finish with factory-applied moisture barrier. Approved Manufacturer: Childers.
      a. Overlap: 2-inch minimum.
      b. Fittings: 0.016-inch thick die-shaped with factory-applied moisture barrier.
      c. Metal jacket bands: 3/8-inch wide, 0.015-inch thick aluminum or 0.010-inch thick stainless steel.
   3. ASTM A666, Type <<302; 304; 316>> stainless Steel, 0.010-inch thick in smooth, corrugated, or embossed finish with factory-applied moisture barrier. Approved Manufacturer: Childers.
      a. Overlap: 2-inch minimum.
      b. Fittings: 0.016-inch thick die-shaped with factory-applied moisture barrier.
      c. Metal jacket bands: 3/8-inch wide, 0.010-inch thick stainless steel.
   4. Laminated Self-Adhesive Water and Weather Seals - Permanent acrylic self-adhesive System; weather resistant, high puncture and tear resistance; meeting or exceeding requirements of UL 723; applied in strict accordance with manufacturers' recommendations.

B. Fitting Insulation
   1. Pre-formed fiberglass, preformed perlite, mitered fiberglass, mitered perlite or calcium silicate in lieu of PVC systems. Protect fittings with field-applied fitting covers.

C. Tapes
   1. Vapor barrier type, self-sealing, non-corrosive, fire-retardant. Approved Manufacturer: Compac Corporation

2.03 ELASTOMERIC INSULATION

A. Approved Manufacturers:
   1. Armacell LLC
   2. K-Flex USA, Inc.

B. Flexible, tubular (Type 1) or sheet/roll form (Type 2) closed-cell elastomeric insulation complying with ASTM C534 <<Grade 1 - Standard (temperature range -297°F to 220°F); Grade 2 - High Temperature (to 350°F); Grade 3 - Contains no halogens>>; use molded tubular material wherever possible.

2.04 ELASTOMERIC INSULATION ACCESSORIES

A. Adhesives:
   1. Air dried, waterproof vapor barrier contact adhesive, compatible with insulation for joining of seams and butt joints.

B. Finishes:
   1. Provide a weather and UV resistant protective finish for outdoor applications in accordance with the manufacturer's recommendations.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that all piping is tested and approved prior to insulation installation.

B. Verify that all surfaces are clean, dry and without foreign material before applying insulation materials.

3.02 INSTALLATION (GENERAL)

A. Install all materials using skilled labor regularly engaged in this type of work. Install all materials in strict accordance with manufacturer's recommendations, building codes, and industry standards.

B. Locate insulation and cover seams in the least visible location. Extend all surface finishes in such a manner as to protect all raw edges, ends and surfaces of insulation.

C. On cold surfaces where a vapor retarder must be maintained, apply insulation with a continuous, unbroken moisture and vapor seal. Insulate and vapor seal all hangers, supports, anchors, or other projections secured to cold surfaces to prevent condensation.

D. Insulated pipes conveying fluids below ambient temperature; insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.

E. For hot piping conveying fluids <<140°F>> or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.

F. For hot piping conveying fluids over <<140°F>>, insulate flanges and unions at equipment.

G. Maintain continuous pipe insulation through walls, ceiling or floor openings, or sleeves except where firestop or firesafing materials are required.

H. Install insulation neatly, accurately and without voids, in accordance with manufacturer's instructions and NIAC National Commercial and Industrial Insulation Standards.

I. Insulate fittings, valves and flanges using premolded covers with precut insulation inserts.

J. Insulate piping using insulation of type and thickness scheduled in this Section.

K. Install metal shields between hangers or supports and the piping insulation. Install rigid insulation inserts as required between the pipe and the insulation shields. Fabricate inserts to be of equal thickness to the adjacent insulation and vapor seal as required. Insulation inserts shall be no less than the following lengths:

1½" to 2½" IPS	10" long
3" to 6" IPS	12" long

8" to 10" IPS	16" long
12" and over IPS	22" long

L. Pipe exposed in Mechanical Equipment Rooms or Finished Spaces (less than 10 feet above finished floor) to be finished with PVC jacket and fitting covers, aluminum jacket, or stainless steel jacket.

M. Buried Piping: Provide factory fabricated assembly with inner all-purpose service jacket with self-sealing lap, and asphalt impregnated open mesh glass fabric, with one mil thick aluminum foil sandwiched between three layers of bituminous compound; outer surface faced with polyester film.

N. Heat Traced Piping: Insulate fittings, joints, and valves with insulation of like material, thickness, and finish as adjoining pipe. Size large enough to enclose pipe and heat tracer. Cover with <<aluminum; stainless steel>> jacket with seams located on bottom side of horizontal piping. Coordinate insulation installation with heat-tracing installation and testing. Insulate piping after tracing or heat distribution tape has been installed and tested for continuity.

3.03 INSTALLATION (FIBER GLASS)

A. Provide a continuous vapor retarder on piping operating below ambient temperatures. Seal all joints, seams and fittings.

B. Firmly butt and secure ends with appropriate butt-strip material. On high-temperature piping, double layering with staggered joints when recommended by the insulation manufacturer. When double layering, the inner layer should not be jacketed.

C. Insulated pipes conveying fluids below ambient temperature:
   1. Provide vapor barrier jackets, factory-applied or field-applied; secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.
   2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.

D. Insulated pipes conveying fluids above ambient temperature:
   1. Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples.
   2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.

E. Exterior Applications:
   1. Jacket piping and fittings exposed to the elements using aluminum or stainless steel jackets with a factory applied moisture barrier. Hold firmly in place with a friction type Z lock or a minimum 2” overlap joint. Seal all joints completely along the longitudinal seam and install so as to shed water. Seal all circumferential joints by use of preformed butt strips; minimum 2" wide or a minimum 2" overlap. Overlap butt strips to the adjacent jacketing a minimum ½-inch and completely weather seal. Install a 6" to 10" unsealed slide joint every 25 to 30 lineal feet to allow for the thermal expansion of the pipe and jacketing. In addition, apply a thin bead of silicone grease in the overlap to prevent water migration while allowing the joint to slide. Install an unsealed slide joint where distance between fittings exceeds 8 lineal feet.

2. Provide vapor barrier jacket. Insulate fittings, joints, and valves with insulation of like material and thickness ad adjoining pipe, and finish with glass mesh reinforced vapor barrier cement. Cover with <<aluminum; stainless steel>> jacket with seams located on bottom side of horizontal piping.

F. Cold Piping Insulation:
1. On below freezing applications and in high abuse areas protect the ASJ jacket with a PVC vapor retarding outer jacket. Seal exposed ends of the insulation with a vapor retarder mastic installed per the manufacturer's recommendations. Apply vapor seals at butt joints at every fourth pipe section joint and at each fitting to isolate any water incursion.
2. On chilled water systems operating in conditions of: RH of 90% and above, follow the same guidelines as described above for below freezing applications.

3.04 INSTALLATION (ELASTOMERIC)

A. Piping:
1. Install pipe insulation by slitting tubular sections and applying onto piping or tubing. Alternately, slide unslit sections over the open ends of piping or tubing. Adhere and seal all seams and butt joints using adhesive.
2. Push insulation onto the pipe, never pull. Stretching of insulation may result in open seams and joints.
3. Tape the ends of the tubing before slipping the insulation over the new pipes to prevent dust from entering the pipe.
4. Clean cut all edges. Do not leave rough or jagged edges of the insulation. Use proper tools such as sharp non-serrated knives.
5. On cold piping, adhere insulation directly to the piping at the high end of the run using a two-inch strip of adhesive on the inner diameter of the insulation and on the pipe. Coat all exposed end cuts of the insulation with adhesive. Adhere all penetrations through the insulation and termination to the substrate to prevent condensation migration.
6. Use sheet insulation on all pipes larger than 6-inch diameter. Do not stretch insulation around the pipe. On pipes larger than 12-inch diameter, adhere insulation directly to the pipe on the lower 1/3 of the pipe. On pipes greater than 24-inch diameter, completely adhere insulation.
7. Stagger seams when applying multiple layers of insulation.

B. Valves, Flanges and Fittings:
1. Insulate all fittings with the same insulation thickness as the adjacent piping. Adhere all seams and mitered joints with adhesive. Sleeve screwed fittings and adhere with a minimum 1" overlap onto the adjacent insulation.
2. Insulate valves, flanges, strainers, and Victaulic couplings using donuts covered with sheet or oversized tubular insulation.

C. Hangers:
1. Support piping system using high density inserts with sufficient compressive strength. Apply elastomeric foam insulation with the same or greater thickness than the pipe insulation to pipe supports. Seal all joints with adhesive.
2. Standard and split hangers - Insulate piping supported by ring hangers with the same insulation thickness as the adjacent pipe. Seal all seams and butt joints with adhesive. Sleeve ring hangers using oversized tubular insulation. On cold piping, extend insulation up the hanger rod a distance equal to four times the insulation thickness. Insulation tape may be used to a thickness equal to the adjacent insulation thickness.
3. Clevis hangers or other pipe support systems - Install saddles under all insulated lines at unistrut clamps, clevis hangers, or locations where insulation may be compressed due to

the weight of the pipe. Insert and adhere wooden dowels or blocks of a thickness equal to the insulation to the insulation between the pipe and the saddle.

4. Pre-insulated pipe hangers can be used to prevent compression of insulation at standard split, clevis hangers or other pipe support systems. Adhere a pair of non-skid pads to the clamps to minimize the movement. In addition, to prevent loosening of the clamps, use an antivibratory fastener, such as a nylon-locking nut.

D. Exterior Applications:
   1. Paint all outdoor exposed piping with two coats of UV resistant finish. Prior to applying the finish, wipe the insulation with denatured alcohol. Do not tint the finish.
   2. Locate seams for all outdoor exposed piping on the lower half of the pipe.

3.05 PIPING INSULATION MATERIAL SCHEDULE

SYSTEM OR SERVICE	LOCATION	INSULATION TYPE	JACKET
CONDENSATE DRAINS	INSIDE	ELASTOMERIC	
HVAC REFRIGERANT LINES	INSIDE	ELASTOMERIC	
HVAC REFRIGERANT LINES	OUTSIDE	ELASTOMERIC	EXTERIOR COATING
STEAM (LPS) TO 15 PSIG.	INSIDE	FIBER GLASS	ALL SERVICE JACKET
STEAM CONDENSATE	INSIDE	FIBER GLASS	ALL SERVICE JACKET

3.06 MINIMUM PIPING INSULATION THICKNESS (IN.)

FLUID OPERATING TEMP RANGE (°F)	SYSTEMS IN TEMP RANGE	INSUALATION CONDUCTIVITY		NOMINAL PIPE OR TUBE SIZE (IN.)				
		CONDUCTIVITY BTU*IN./(H*SQ. FT.*°F)	MEAN RATING TEMP (°F)	<1	1 TO < 1-1/2	1-1/2 TO < 4	4 TO < 8	=8
> 350		0.32-0.34	250	4.5	5.0	5.0	5.0	5.0
251-350		0.29-0.32	200	3.0	4.0	4.5	4.5	4.5
201-250		0.27-0.30	150	2.5	2.5	2.5	3.0	3.0
141-200		0.25-0.29	125	1.5	1.5	2.0	2.0	2.0
105-140		0.21-0.28	100	1.0	1.0	1.5	1.5	1.5
40-60		0.21-0.27	75	0.5	0.5	1.0	1.0	1.0
< 40		0.20-0.26	50	0.5	1.0	1.0	1.0	1.5

END OF SECTION

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. This section describes the insulation, jackets and insulating accessories for sheet metal ductwork as scheduled in Part 3 of this Section and as shown on the Drawings.

1.02 REFERENCES

A. National Fire Protection Association (NFPA):
   1. NFPA 255 - Surface Burning Characteristics of Building Materials.

B. Greenguard

C. Sheet Metal and Air Conditioning Contractors National Association (SMACNA):

D. SMACNA - HVAC Duct Construction Standards - Metal and Flexible.

E. Underwriters Laboratories, Inc. (UL):
   1. UL 723 - Surface Burning Characteristics of Building Materials.

F. American Society for Testing and Materials (ASTM):
   1. ASTM B209 - Aluminum and Aluminum-Alloy Sheet and Plate.
   2. ASTM C177 - Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus.
   3. ASTM C518 - Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
   4. ASTM C553 - Mineral Fiber Blanket and Felt Insulation.
   5. ASTM C612 - Specification for Mineral Fiber Block and Board Thermal Insulation.
   6. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel
   7. ASTM C921 - Properties of Jacketing Materials for Thermal Insulation.
   8. ASTM C1136 - Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation
   9. ASTM D1056 - Flexible Cellular Materials - Sponge or Expanded Rubber.
   10. ASTM E84 - Surface Burning Characteristics of Building Materials.
   11. ASTM E96 - Water Vapor Transmission of Materials.

1.03 DEFINITIONS

A. Greenguard: Greenguard Environmental Institute

B. IAQ: Indoor Air Quality

C. EPA: Environmental Protection Agency

D. WHO: World Health Organization

E. ASJ: All Service Jacket

F. SSL: Self-Sealing Lap

G. FSK: Foil-Scrim-Kraft; jacketing

H. PSK: Poly-Scrim-Kraft; jacketing

I. PVC: Polyvinyl Chloride

J. FRP: Fiberglass Reinforced Plastic

K. Cold Piping/Ductwork/Surfaces: Pipes or surfaces where the normal operating temperature is 60 degrees F or lower.

1.04 SUBMITTALS

A. Product data: To include product description, manufacturer's installation instructions, types and recommended thicknesses for each application, and location of materials.

B. Provide samples and mock-ups of systems as required.

1.05 ENVIRONMENTAL REQUIREMENTS

A. Maintain ambient conditions required by manufacturers of tapes, adhesives, mastics, cements, and insulation materials.

B. Follow manufacturer’s recommended handling practices.

C. Supply fiberglass products that assure excellent IAQ (Indoor Air Quality) performance through Greenguard Certification.

D. Mold: Carefully inspect any insulation that has been exposed to water. If it shows any sign of mold growth remove it from the Site. If the material is wet but shows no sign of mold, dry rapidly and thoroughly. If it shows signs of facing degradation from wetting remove it from the Site. Discard air handling insulation used in the air stream if exposed to water.

1.06 QUALITY ASSURANCE

A. Qualifications:
   1. Manufacturer: Company specializing in manufacturing Products specified with minimum 3 years documented experience.
   2. Installer: Company specializing in performing the Work of this Section with minimum 3 years documented experience.

B. Materials:
   1. Flame spread/smoke developed rating of 25/50 or less in accordance with ASTM E84, NFPA 255 and UL 723.
   2. Certify insulation for duct, pipe and equipment for above grade exposed to weather outside building as being self-extinguishing for 1" thickness in less than 53 seconds when tested in accordance with ASTM D1692.

PART 2 - PRODUCTS

2.01 FIBERGLASS DUCT WRAP

A. Flexible Fiber Glass Blanket meeting ASTM C 553 Types I, II and III, and ASTM C 1290; Greenguard compliant.

B. Factory Applied Vapor Retarder Jacket: FSK or PSK conforming to ASTM C 1136 Type II.

C. Maximum service temperature of 250º F (Faced) or 350° F (Unfaced).

D. Density:
   1. Concealed areas: Minimum 0.75 PCF.
   2. Exposed areas: Minimum 1.0 PCF.

E. Approved Products:
   1. Friendly Feel Duct Wrap by Knauf

2.02 FIBERGLASS RIGID BOARD

A. Rigid Fiber Glass Board insulation meeting ASTM C 612 Type IA and IB.

B. Mean temperature by ASTM C 177 and a maximum service temperature of 450º F.

C. Factory Applied Vapor Retarder Jacket: ASJ conforming to ASTM C 1136 Type I, or FSK or PSK conforming to ASTM C 1136 Type II.

D. Density:
   1. Concealed areas: Minimum 3 PCF
   2. Exposed areas: Minimum 6 PCF

E. Approved Products:
   1. Insulation Board by Knauf

2.03 INTERNAL DUCT LINING

A. Conforming to ASTM C 1071 Type 1 and NFPA 90A & 90B.

B. Noise Reduction Coefficient (NRC): ASTM C 423 Type A Mounting, 0.40 or higher for ½" product, 0.60 or higher for 1" product.

C. Rated for a maximum air velocity of 6000 Feet per minute.

D. Approved Products:
   1. Textile Duct Liner with HydroshieldÔ Technology by Knauf.

2.04 FIBERGLASS INSULATION ACCESSORIES

A. Aluminum Jacket - 0.016-inch (0.406 mm) thick in smooth, corrugated, or embossed finish with factory applied moisture barrier. Overlap 2-inch (50 mm) minimum.

B. Laminated Self-Adhesive Water and Weather Seals - apply per manufacturers' recommendations.

C. Tapes - Vapor barrier type, self-sealing, non-corrosive, fire-retardant. Approved Manufacturer: Compac Corporation

D. Adhesives - Approved Manufacturer: Foster

E. Mastic - Approved Manufacturer: Foster

F. Vapor Barrier Coating - Approved Manufacturer: Foster

2.05 SHEET WATERPROOFING MEMBRANE

A. Prefabricated, self-adhering, sheet-type waterproofing membrane shall be FlexClad-400 by MFM Building Products Corp. or approved equal.

B. Description:
   1. Top Layer: Stucco-embossed, UV-resistant aluminum weathering surface.
   2. Middle Layer: Multiple layers of high-density cross-linked polymer film.
   3. Bottom Layer: Uniform layer of rubberized asphalt adhesive, protected by disposable silicone release paper.

C. Color: As selected by Architect/Engineer.

D. Material Thickness: ASTM D 1970, 40 Mils Nominal

E. Flexibility: ASTM D 1970, Pass.

F. Vapor Permeance: ASTM E 96, 0 perms.

G. Nail Sealability: ASTM D 1970, Pass.

H. Heat Aging: ASTM D 794, Pass.

I. Tear Resistance: ASTM D 1424, Average: 660 grams.

J. Ultimate Elongation MD: ASTM D 412, 434 percent.

K. Ultimate Elongation CMD: ASTM D 412, 246 percent.

L. Low Temperature Flexibility: 1,000,000 Cycles at -10 Degrees F, 1,200 Cycles at -20 Degrees F, No cracking.

M. Flame Spread Index: ASTM E 84, 0.

N. Smoke Density Index: ASTM E 84, 5.

O. Wind-Driven Rain: SFBC TAS-110-95, 100 mph, No leakage or failure.

P. UV Stability: Excellent.

Q. Accessories: MFM Spray Adhesive

2.06 LOUVER BLANK OFF PANELS

A. Facing: 0.032 inch thick aluminum on both sides.

B. Perimeter Frame: 0.050 inch thick-formed aluminum channels.

C. Core: Expanded polystyrene (EPS), R value of 8

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that all ductwork is tested and approved prior to insulation installation.

B. Verify that all surfaces are clean, dry and without foreign material before applying insulation materials.

3.02 DUCTWORK REQUIRING INSULATION

A. Insulate Ductwork as specified in the DUCTWORK INSULATION SCHEDULE.
   1. Insulate any additional ductwork or plenums indicated to be insulated on the Drawings.

3.03 INSTALLATION (GENERAL)

A. Install all materials using skilled labor regularly engaged in this type of work. Install all materials in strict accordance with manufacturer's recommendations, building codes, and industry standards.

B. Locate insulation and cover seams in the least visible location. Extend all surface finishes in such a manner as to protect all raw edges, ends and surfaces of insulation.

C. On cold surfaces where a vapor retarder must be maintained, apply insulation with a continuous, unbroken moisture and vapor seal. Insulate and vapor seal all hangers, supports, anchors, or other projections secured to cold surfaces to prevent condensation.

D. Install insulation neatly, accurately and without voids, in accordance with manufacturer's instructions and NIAC National Commercial and Industrial Insulation Standards.

E. Install ductwork hanger supports on the outside of the insulation. Where vertical ducts are supported to the building structure, insulate the ductwork supports to prevent condensation.

F. Insulate ductwork using insulation of the type and thickness scheduled at the end of this Section.

G. If specified insulation board thickness does not cover ductwork standing seams and reinforcing angles, insulate them by adhering a grooved strip of fiberglass board with a thickness at least 1 ½ inches greater than the height of the seam or angle covered over the standing seam or angle.

3.04 FIBERGLASS INTERNAL DUCT LINING

A. Apply Duct Lining in strict accordance with the latest edition of SMACNA's "HVAC Duct Construction Standard Metal & Flexible" and NAIMA's "Fibrous Glass Duct Liner Standard".

B. Select length of mechanical fasteners in accordance with the manufacturer's recommendation as listed on each product. Install mechanical fasteners perpendicular to the duct surface, and such that the pin does not compress the liner more than relative to the nominal thickness of the insulation.

C. Adhesive shall conform to ASTM C 916. Apply adhesive to the sheet metal with a 90% minimum coverage. Coat all exposed edges of the duct liner with the same adhesive. Repair all rips and tears using an adhesive that conforms to ASTM C 916.

D. Cover all internal duct areas with duct liner. Firmly butt transverse joints with no gaps and coat with adhesive. Overlap and compress longitudinal corner joints.

E. When air velocities are 4000 to 6000 FPM, apply metal nosing to all upstream transverse edges to additionally secure the insulation.

3.05 FIBERGLASS WRAP INSULATION

A. Apply external duct wrap per insulation schedule even where internally lined.

B. Install Duct Wrap to obtain specified R-value using a maximum compression of 25%.

C. Firmly butt all joints.

D. Overlap the longitudinal seam of the vapor retarder a minimum of 2 inches.

E. Where vapor retarder performance is required, repair all penetrations and damage to the facing using pressure-sensitive foil tape or mastic prior to system startup.

F. Use pressure-sensitive foil tapes a minimum 3 inches wide and apply by moving pressure using a squeegee or other appropriate sealing tool.

G. Additionally secure Duct Wrap to the bottom of rectangular ductwork over 24 inches wide using mechanical fasteners on 18-inch centers. Do not over-compress insulation during installation.

H. Overlap unfaced Duct Wrap a minimum of 2 inches and fasten using 4-inch to 6-inch nails or skewers spaced 4 inches apart, or secured with a wire/banding system. Do not damage the Duct Wrap.

3.06 FIBERGLASS BOARD INSULATION

A. Fit insulation by scoring, cutting and mitering to fit the contour of the ductwork.

B. Attach insulation to ductwork in thickness scheduled by brushing adhesive uniformly on all sides of ductwork covering 100 percent of ductwork surface. Press insulation into place, making complete contact with adhesive. Butt edges of insulation board tightly together without gaps.

C. Additionally, hold insulation in place by impaling on pins welded to all four sides of the ductwork. Locate and weld pins a minimum 12 inch on center with a minimum of 2 rows per side of duct and no less than 3 inches from the edges of the ductwork. Secure insulation to pins with 1 inch diameter hold-down washers. As an alternate to welded pins, provide “Gripnail” mechanical surface fasteners by Gripnail Corporation using pneumatic hammer designed for this work.

D. Seal all joints, seams, breaks, and punctures in facing with adhesive and cover with 3 inch wide sealing tape. Flash supports with vapor barrier coating.

E. For rectangular ducts and plenums exposed to weather, pitch ductwork or insulation board minimum ¼ inch per foot to prevent rainwater from accumulating on top of duct or plenum. Cover insulation board with Sheet Waterproofing Membrane.

3.07 SHEET WATERPROOFING MEMBRANE

A. Surface Preparation:
1. Prepare surfaces in accordance with manufacturer's instructions.
2. Ensure tops of ducts have sufficient slope to eliminate ponding water.
3. Ensure bottoms of ducts have foil-faced rigid insulation boards installed.
4. Ensure surfaces are clean and dry.
5. Remove dirt, dust, oil, grease, hand oils, processing lubricants, moisture, frost, and other contaminants that could adversely affect adhesion of waterproofing membrane.
6. Prime metal, concrete, and masonry surfaces with primers approved by waterproofing membrane manufacturer.

B. Application:
1. Apply waterproofing membrane in accordance with manufacturer's instructions on all exterior insulated ductwork and at locations indicated on the Drawings.
2. Apply membrane to clean, dry, primed metal ductwork and foil-faced rigid insulation boards. Do not apply over wet or non-rigid insulation.
3. Apply membrane in accordance with manufacturer's air, material, and surface temperature requirements.
4. Apply firm, uniform pressure with hand roller to entire membrane to ensure proper adhesion. Concentrate pressure at seams and on underside of ductwork.
5. Apply membrane to ducts in accordance with manufacturer's instructions.
6. Apply membrane shingle fashion to shed water over, not against laps.
7. Do not terminate membrane on bottom of duct.
8. Apply minimum 3-inch laps and minimum 6-inch end laps for ductwork applications.
9. Embed membrane to bottom of ducts over 24 inches wide in light continuous layer of adhesive applied to insulation face.
10. Apply membrane to bottom of insulated ducts over 36 inches wide using mechanical attachment, in addition to adhesive, in accordance with manufacturer's instructions. Install pints on 12-inch centers with rows staggered.
11. Apply adhesive to areas where special adhesion requirements exist, including duct bottoms, flashings, transitions, joints, elbows, valves, tees, and other fittings.

C. Protection:
1. Protect applied waterproofing membrane and fabric flexible duct connections from damage during construction.

3.08 DUCTWORK INSULATION SCHEDULE

A. Fiber Glass Insulation Schedule:

Ductwork System	Type	Minimum R-Value
Supply Ducts and Plenums, Concealed	Fiberglass Duct Wrap	6
Return Ducts and Plenums, Concealed	Fiberglass Duct Wrap	6
Supply and Return Ducts and Plenums, Exposed in the Space Served	Uninsulated	NA

Supply and Return Ducts and Plenums, Exposed Other Than in the Space Served	Fiberglass Rigid Board	6
Outdoor Air Intake Ducts, Indoors	Fiberglass Rigid Board	6
Ducts Located Outdoors	Fiberglass Rigid Board	8
Unused Portions of Louvers	Louver Blank Off Panels	As Specified
Ductwork 20 Feet Upstream and Downstream of Air Handling Units and Supply and Return Fans, Located Indoors	Fiberglass Internal Duct Lining	Note 1
Ductwork 20 Feet Upstream and Downstream of Air Handling Units and Supply and Return Fans, Located Outdoors	Fiberglass Internal Duct Lining	Note 1
General Exhaust Ducts Except as Noted	Uninsulated	NA

NOTE 1 - Ductwork to be provided with 1-inch internal lining in addition to externally applied insulation in accordance with the table above.

END OF SECTION

PART 1 - GENERAL

1.01 DESCRIPTION

A. General provisions and other mechanical systems are specified in other Sections of Division 23.

B. Commision all new building mechanical systems in accordance with the requirements of the 2020 New York State (NYS) Energy Conservation Code(ECC) section C408. Commissioning shall be performed by an approved third party commissioning afency hired by the owner. Refer to specification section 230800 - commissioning of mechanical systems for more information.

C. Provide drawings, operation & maitnence (O&M) manuels, and system balancing reports to building owner or owner's authorized agent within 90 days of the date of receipt of the certifcate of occupancy or letter of completion in accordance with the 2020 NYS ECC section C408.2.5.

D. Provide final commissioning report to the building owner or owner's authorized agent within 90 days of the receipt of the certificate of occupancy or letter of completion in accordance with the requirments of the 2020 NYS ECC section C408.2.5.4.

E. Commissioning is an ongoing process and shall be performed throughout construction. Commissioning requires the participation of Division 23 to ensure that all systems are operating in a manner consistent with the Contract Documents. Division 23 shall be familiar with the commissioning plan issued by the Commissioning Authority (CA) as it applies to the work of Division 23 and shall execute all commissioning responsibilities assigned to them in the Contract Documents.

F. Commissioning shall conclude with the completion of all required deferred testing, training and system documentation as specified and required to ensure the proper operation of the mechanical equipment and systems provided by this Division.

G. This Section covers mechanical systems commissioning, as required to demonstrate that the equipment and systems of Division 23 are ready for safe and satisfactory operation, as defined by project documents. Commissioning shall include, but shall not be limited to, identification of piping and equipment, cleaning, lubrication, start-up, check-out, and testing, adjusting, and balancing of systems, preparation of equipment and systems documentation and of maintenance and operation manuals, Owner training, and preparation of record drawings.

1.02 QUALITY ASSURANCE

A. The mechanical contractor shall identify a mechanical commissioning supervisor. The mechanical commissioning supervisor should have a minimum of ten years experience in mechanical contracting. The mechanical commissioning supervisor shall become familiar with the design intent and the requirements of the commissioning process as defined in this Section. The mechanical commissioning supervisor shall attend all commissioning meetings and coordinate the commissioning schedule as outlined by the CA. The mechanical commissioning supervisor shall assist the CA in coordinating and executing the required commissioning activities.

1.03 MECHANICAL, PLUMBING, AND FIRE PROTECTION CONTRACTOR RESPONSIBILITIES

A. Include and itemize the cost of commissioning in the contract price with an estimated breakdown of hours for meeting and functional testing requirements.

B. The mechanical commissioning supervisor shall be responsible for scheduling, supervising, and coordinating the startup, testing and commissioning activities as specified herein with the CA. Specific requirements of the mechanical contractor and associated subcontractors are identified in this Section and in other Sections of this Division.

C. The CA shall conduct independent verification of installation, pre-functional, start-up and functional testing.

D. Mechanical commissioning shall take place in three phases. Commissioning requirements for each phase are as follows:
   1. Construction Phase
      a. The Contractor shall attend a Commissioning Scoping meeting and additional commissioning meetings as required throughout the commissioning process. These commissioning meetings will be monthly during early construction and may increase in frequency to weekly during the start-up, pre-functional and functional testing phases. The Contractor shall assure that all subcontractors who have commissioning responsibilities attend the Commissioning Scoping meeting and other commissioning meetings, as appropriate, during the construction process.
      b. The Contractor shall report, in writing, to the CA at least as often as commissioning meetings are scheduled concerning the status of his activities as they affect the commissioning process, the status of each discrepancy identified, the pre-functional and functional testing process, explanations of any disagreements with the identified deficiencies, and proposed resolution and schedule.
      c. The Contractor shall provide the CA with normal cut sheets and shop drawing submittals of equipment that is to be commissioned.
      d. The Contractor shall provide documentation to the CA for development of pre-functional and functional performance testing procedures, prior to normal O&M manual submittals. This documentation shall include detailed manufacturer installation, start-up, operating, troubleshooting and maintenance procedures; full details of any owner-contracted tests; fan and pump curves; full factory testing reports, if any; and full warranty information, including all responsibilities of the Owner to keep the warranty in force clearly identified. In addition, the installation, start-up and checkout materials that are actually shipped inside the equipment and the actual field checkout sheet forms to be used by the factory or field technicians shall be submitted to the CA. The CA may request further documentation necessary for the development of functional performance testing and the commissioning process. This data request may be made prior to normal submittals.
      e. The Contractor shall develop and submit to CA, for review prior to equipment or system startup, a complete startup and initial checkout plan using manufacturer's start-up procedures.
      f. The Contractor shall review and complete the CA's pre-functional check-sheets and sign-off on the appropriate areas when the Contractor and sub-contractors are complete. The pre-functional test sheets will be developed by the CA. The CA may conduct their own pre-functional testing check in parallel with the Contractors or verify the contractors completed pre-functional forms after submission.
      g. The Contractor shall provide a copy of the O&M manuals and submittals of commissioned equipment, through normal channels, to the CA for review.
      h. The Contractor shall assist in clarifying the proposed operation and control of commissioned equipment in areas where the specifications, control drawings or equipment documentation is not sufficient for writing detailed testing procedures.
      i. The CA shall prepare the specific functional test procedures as specified herein. The Contractors shall review the CA's proposed functional performance test procedures to

ensure feasibility, safety and equipment protection and provide necessary written alarm limits to be used during the tests.

j. Contractor shall prepare a preliminary schedule for Division 23 commissioning activities, to include pipe and duct system testing, flushing and cleaning, equipment start-up, and TAB start and completion, for use by the CA and shall update the schedule as appropriate. CA will assist in providing expected time durations for Cx activities.

k. The Contractor shall update the commissioning activities and notify any delays in the progress meetings. Contractor shall notify the CA during the commissioning meetings when commissioning activities not yet performed or not yet scheduled will delay construction. Mechanical equipment start-up shall not be initiated until the complete sign-off of the pre-functional check-sheets as developed by the CA as specified in other Sections of Division 23.

l. The Contractor shall provide startup testing for all HVAC equipment, including the building automation control system and shall execute the mechanical-related portions of the pre-functional checklists for all commissioned equipment during the startup and initial checkout process. The CA shall conduct an independent start-up once the Contractor is complete with their requirements.

m. The Contractor shall perform and clearly document all completed start-up and system operational checkout procedures, providing a copy to the CA.

n. The Contractor shall correct current A/E punch list and CA deficiency items before functional performance testing can begin. Air and water TAB shall be completed with discrepancies and problems remedied before functional testing of the respective air or water related systems.

o. The CA shall generate the functional testing procedure and record to the mechanical contractor. The mechanical contractor shall review and provide support to the functional testing process. Contractor shall operate boilers, pumps, etc., and systems in accordance with the CA requirements, open and close disconnects and switch normal and emergency power requirements as directed by the CA and the functional testing procedures.

p. The Contractor shall report in writing to the CA at least as often as commissioning meetings are being scheduled concerning the status of each outstanding discrepancy identified during commissioning, pre-functional and functional performance testing. Report shall include description of the identified discrepancy, explanations of any disagreements, and proposals and schedule for correction of the discrepancy.

    1) Acceptance Phase. The Contractor shall assist and cooperate with the CA in the commissioning process by:
        (a) Putting all HVAC equipment and systems into operation and continuing the operation during each working day of the test and balance and commissioning effort, as required.
        (b) For a given area, have all required pre-functional checklists, calibrations, startup and selected functional tests of the mechanical system and associated controls completed and approved by the CA prior to beginning the test and balance process.
        (c) Provide a qualified technician to operate the controls as required to assist the TAB contractor in performing TAB, or provide sufficient training for TAB to operate the system without assistance.
        (d) Provide a TAB representative to assist the CA on conducting a random 10% check of the air and water distribution requirements.
        (e) Including cost of sheaves and belts that may be required to obtain required equipment performance, as measured by the test and balance effort.
        (f) Providing test holes in ducts and plenums where directed by TAB to allow air measurements and air balancing. Providing an approved plug.

(g) Providing temperature and pressure taps according to the Construction Documents for TAB and commissioning testing.
(h) Installing a P/T plug at each water sensor that is an input point to the Control System.
(i) Providing skilled technicians to execute starting and operation of equipment.
(j) The CA will conduct functional performance testing. The Contractor may be required to have a skilled technician present during functional testing, although it is suggested that one be available to make adjustments or assist in problem-solving.
(k) The CA will require full and part load performance verifications as well as seasonal and simulated testing requirements. The Contractor shall be prepared to operate different components of various systems (example, DX and hot water systems to generate loading strategies) during the functional testing.
(l) Correct deficiencies (differences between specified and observed performance) as interpreted by the CA and A/E.
(m) Prepare O&M manuals according to the Contractor Documents, including clarifying and updating the original sequence of operation to as-built conditions.
(n) Maintain on site redline as built drawings and produce final “As-built” drawings for all project drawings and contractor-generated coordination drawings. List and clearly identify on the as-built drawings the locations of all airflow stations and sensor installations that are not equipment mounted.
(o) Provide specified training of the Owner’s operating personnel in accordance with the CA’s overview and outline.
(p) Coordinate with equipment manufacturers to determine specific requirements to maintain the validity of the warranty.
(q) Provide updated diagrammatical logic for all TAB adjustments to the system.

2) Warranty Period. During the warranty period, the Contractor shall:
(a) Be available during seasonal or deferred functional performance testing conducted by the CA, according to the specifications.
(b) Correct deficiencies and make necessary adjustments to O&M manuals and as-built drawings for applicable issues identified in any seasonal testing.

1.04 TAB CONTRACTOR RESPONSIBILITIES

A. Six weeks prior to the starting of the T&B, submit to the CA, the qualifications of the site technician(s) for the project, including three (3) names of contractors and facility managers of recent projects on which the personnel were in charge. The Owner and CA will approve the site technician for this job.

B. Three months prior to the start of the TAB, submit a TAB plan and approach for each system. The plan shall be reviewed by the TAB and the CA for review and approval. The submitted plan shall include:
1. Certification that the TAB contractor has reviewed the construction documents and the systems with the design engineers and Contractors to sufficiently understand the design intent for each system.
2. An explanation of the intended use of the building control system.
3. All field check-out sheets and logs to be used that lists each piece of equipment to be tested adjusted and balanced with the data cells to be gathered for each.
4. Final test report forms to be used during this process:

a. Detailed step by step procedures for TAB work for each system and issue: terminal flow calibration; diffuser proportioning; branch and submain proportioning; total flow calculations; and rechecking diversity issues.
b. List all air flow, water flow, sound level, system capacity and efficiency measurements to be performed and a description of each of the test procedures, parameters and formulas to be used.
c. Details of how total flow will be determined (Air: sum of terminal flows via BMS calibrated readings or via hood, pitot tube or flow stations). Details of how total water flow will be determined (Water: pump curves, circuit setters, flow station, ultrasonic, etc.).
d. The identification and types of measurement instruments to be used and their most recent calibration date.
e. Specific procedures that will ensure that both air and watersides will be operating at there lowest possible pressure at the point where the system will operate.
f. Confirmation that the TAB contractor understands the outside air ventilation criteria under all conditions and how this will be measured during normal, economizer and unoccupied conditions.
g. Details of how building static, room static and exhaust fan capacity will be checked.
h. Proposed selection points for traverse measurement locations on the as-built documents. Review the placement of the HVAC measurement devices for proper straight runs and accuracy.
i. Submit a plan for testing and checking the fume hood system exhaust requirements.
j. Plan for formal progress reports including scope and frequency.
k. Plan for formal deficiency reports including scope and frequency.
    1) TAB contractor shall attend commissioning meetings as directed by the CA and the general contractor.
    2) TAB contractor shall communicate in writing to the controls contractor and the CA all setpoint and parameter changes made or problems and discrepancies identified during the TAB process that would affect the control loop system set-up and operation.
    3) Submit written report of discrepancies, deficit or uncompleted work by others, contract interpretation requests and list of completed tests to the CA at least once per week.
    4) After the TAB plan is accepted and two-weeks prior to TAB work, the contractor shall conduct a pre-balancing conference. Prior to the pre-balancing conference, the TAB contractor shall inspect the system readiness for testing and balancing. The TAB contractor shall prepare a list of deficiencies and uncompleted work that will affect the TAB process. This list shall be submitted to the CA and the general contractor.
    5) The TAB contractor shall review the projected schedule and provide, in writing, to the CA and CM any delays in the schedule and what items will require completion prior to the TAB work.
    6) The CA agent shall conduct independent verification of 10% of air and water end-devices for acceptance after the TAB contractor states in writing that they are complete with Testing & Balancing. The TAB contractor shall provide a mechanic to assist the CA in this verification and shall include this in the scope and price of the Work.
    7) The TAB agent shall submit the TAB report to the CA for his review and comment. All data contained shall be re-verified in the field by the CA. A minimum of ten percent of the airflow readings shall be verified by the CA using his own equipment. All selection points shall be random. Total airflow shall be verified on all mains in the supply and the exhaust ducts.

1.05 CONTROL CONTRACTOR RESPONSIBILITIES

A. Include and itemize the cost of commissioning in the contract price with an estimated breakdown of hours for meeting and functional testing requirements.

B. The controls commissioning supervisor shall be responsible for scheduling, supervising, and coordinating the startup, testing and commissioning activities as specified herein with the CA. Specific requirements of the controls contractor and associated subcontractors are identified in this Section and in other Sections of this Division.

C. The CA shall conduct independent verification of installation, pre-functional, start-up and functional testing.

D. Controls commissioning shall take place in three phases. Commissioning requirements for each phase are as follows:
   1. Construction Phase
      a. Contractor shall attend a Commissioning Scope meeting and additional commissioning meetings as required throughout the commissioning process. These commissioning meetings will be monthly during early construction and increase in frequency to weekly during the start-up, pre-functional and functional testing phases. Contractor shall assure that all subcontractors who have commissioning responsibilities attend the Commissioning Scope meeting and other commissioning meetings, as appropriate, during the construction process.
      b. Contractor shall report, in writing, to the CA at least as often as commissioning meetings are scheduled concerning the status of his activities as they affect the commissioning process, the status of each discrepancy identified, the pre-functional and functional testing process, explanations of any disagreements with the identified deficiencies, and proposed resolution and schedule.
      c. Contractor shall provide the CA with normal cut sheets and shop drawing submittals of equipment that is to be commissioned.
      d. Contractor shall provide documentation to the CA for development of pre-functional and functional performance testing procedures, prior to normal O&M manual submittals. This documentation shall include detailed manufacturer installation, start-up, operating, troubleshooting and maintenance procedures; full details of any owner-contracted tests; points listing; full factory testing reports, if any; and full warranty information, including all responsibilities of the Owner to keep the warranty in force clearly identified. In addition, the installation, start-up and checkout materials that are actually shipped inside the equipment and the actual field checkout sheet forms to be used by the factory or field technicians shall be submitted to the CA. The CA may request further documentation necessary for the development of functional performance testing and the commissioning process. This data request may be made prior to normal submittals.
      e. The Contractor shall develop and submit to CA, for review prior to equipment or system startup, a complete startup and initial checkout plan using manufacturer's start-up procedures.
      f. The Contractor shall review and complete the CA's pre-functional check-sheets and sign-off on the appropriate areas when the Contractor and sub-contractors are complete. The pre-functional test sheets will be developed by the CA. The CA may conduct their own pre-functional testing check in parallel with the Contractors or verify the contractors completed pre-functional forms after submission.
      g. Contractor shall provide a copy of the O&M manuals and submittals of commissioned equipment, through normal channels, to the CA for review.

h. Contractor shall assist in clarifying the proposed operation and control of commissioned equipment in areas where the specifications, control drawings or equipment documentation is not sufficient for writing detailed testing procedures.
i. CA shall prepare for the specific functional test procedures as specified herein. The Contractors shall review the CA's proposed functional performance test procedures to ensure feasibility, safety and equipment protection and provide necessary written alarm limits to be used during the tests.
j. Controls contractor shall prepare a preliminary schedule for their commissioning activities, to include wiring, instrument installation, calibration, point-to-point verification, sequence of operation testing and emergency operating procedural testing for use by the CA and shall update the schedule as appropriate. The Contractor shall update the commissioning activities and notify any delays in the progress meetings. Contractor shall notify the CA during the commissioning meetings when commissioning activities not yet performed or not yet scheduled will delay construction.
k. Controls instrument and equipment start-up shall not be initiated until the complete sign-off of the pre-functional check-sheets as developed by the CA as specified in other Sections of Division 23.
l. Contractor shall provide startup testing for all HVAC equipment, including the building automation control system and shall execute the mechanical/controls-related portions of the pre-functional checklists for all commissioned equipment during the startup and initial checkout process. The CA shall conduct an independent start-up once the Contractor is complete with their requirements.
m. Contractor shall perform and clearly document all completed startup and system operational checkout procedures, providing a copy to the CA.
n. Contractor shall correct current A/E punch list and CA deficiency items before functional performance testing can begin. Point-to-point verification shall be completed with discrepancies and problems remedied before functional testing of the respective controls related systems.
o. The CA shall generate the functional testing procedure and record to the controls contractor. The controls contractor shall review and provide support to the functional testing process. Contractor shall aid in operating boilers, pumps, etc., and systems in accordance with the CA requirements, turn on and off normal and emergency power requirements as directed by the CA and the functional testing procedures.
p. Contractor shall report, in writing, to the CA at least as often as commissioning meetings are being scheduled concerning the status of each outstanding discrepancy identified during commissioning, pre-functional and functional performance testing. Report shall include description of the identified discrepancy, explanations of any disagreements, and proposals and schedule for correction of the discrepancy.
    1) Acceptance Phase. Contractor shall assist and cooperate with the CA in the commissioning process by:
        (a) Putting all HVAC equipment and systems into operation and continuing the operation during each working day of the test and balance and commissioning effort, as required.
        (b) For a given area, have all required, pre-functional checklists, calibrations, startup and selected functional tests of the mechanical system and associated controls completed and approved by the CA prior to beginning the test and balance process.
        (c) Provide a qualified technician to operate the controls as required to assist the TAB contractor in performing TAB, or provide sufficient training for TAB to operate the system without assistance.
        (d) Provide a controls representative to assist the CA on conducting a random 10% check of the air and water distribution requirements.

(e) Providing skilled technicians to execute starting and operation of equipment.
(f) The CA will conduct functional performance testing. The Contractor may be required to have a skilled technician present during functional testing, although it is suggested that one be available to make adjustments or assist in problem-solving.
(g) The CA will require full and part load performance verifications as well as seasonal and simulated testing requirements. The Contractor shall be prepared to operate different components of various systems (example, chilled water and hot water systems to generate loading strategies) during the functional testing.
(h) Correct deficiencies (differences between specified and observed performance) as interpreted by the CA and A/E.
(i) Prepare O&M manuals according to the Contractor Documents, including clarifying and updating the original sequence of operation to as-built conditions.
(j) Maintain on site redline as built drawings and produce final “As-built” drawings for all project drawings and contractor-generated coordination drawings. List and clearly identify on the as-built drawings the locations of all airflow stations and sensor installations that are not equipment mounted.
(k) Provide specified training of the Owner’s operating personnel in accordance with the CA’s overview and outline.
(l) Coordinate with equipment manufacturers to determine specific requirements to maintain the validity of the warranty.
(m) Provide a detailed marked up drawings of all the instruments and their installed location (P&ID) for instruments and components.

2) Warranty Period. During the warranty period, the Contractor shall:
(a) Be available during seasonal or deferred functional performance testing conducted by the CA, according to the specifications.
(b) Correct deficiencies and make necessary adjustments to O&M manuals and as-built drawings for applicable issues identified in any seasonal testing.

PART 2 - PRODUCTS

2.01 SYSTEMS TO BE COMMISSIONED

A. The following are systems to be commissioned:
1. DOAS units
2. Unit Ventilators
3. Toilet Exhausts
4. ERV unit
5. Ceiling Cassette units
6. Branch Control boxes
7. Condensing units
8. Condensate pumps

2.02 2.2. TEST EQUIPMENT

A. All standard testing equipment required to the mechanical portion startup, initial checkout shall be provided by the Contractor responsible for the equipment or system being tested. This includes TAB and controls verification.

B. The CA shall perform their own system verification and performance check-out. The CA shall provide their own calibrated equipment as required for this testing.

C. All testing equipment associated with functional performance verification and point-to-point required by the CA shall be the responsibility of the CA. All testing equipment associated with the control's contractor point-to-point verification shall be the responsibility of the control's contractor.

D. Special equipment, tools and instruments (only available from vendor or specific to a piece of equipment) required for the functional testing of that equipment, according to the requirements of the contract documents and the functional test procedures shall be provided to the CA by the installing contractor and shall become the property of the Owner at project completion as indicated in the specification.

E. Proprietary test equipment and software required by any manufacturer for programming and/or start-up, whether specified or not, shall be provided by the manufacturer of the equipment. Manufacturer shall provide test equipment, demonstrate its use and assist in the commissioning process as needed. Proprietary test equipment (and software) shall become the property of the Owner upon successful completion of the commissioning process as required in the specifications.

PART 3 - EXECUTION

3.01 SUBMITTALS

A. Division 23 shall provide submittal documentation relative to commissioning as required in this Section Part 1.

3.02 3.2 STARTUP PLAN AND PREFUNCTIONAL TESTING

A. The mechanical contractor and associated subcontractors shall be responsible for the installation of complete systems and sub-systems, fully functional, meeting the design objectives of the Contract Documents. Contractor shall follow the approved start-up, initial checkout, and pre-functional testing procedures. The commissioning procedures and functional testing do not relieve or lessen this responsibility or shift that responsibility to the CA or Owner.

B. Pre-functional testing as directed and performed by the contractor shall be required for each piece of equipment to ensure that the equipment and systems are properly installed and ready for operation, so that functional performance testing to may proceed without delays. Sampling strategies shall not be used for pre-functional testing. The pre-functional testing for all equipment and subsystems of a given system shall be successfully completed and documented prior to functional performance testing of the system. The mechanical contractor and sub-contractors shall sign off on the CA's pre-functional test sheets that they are complete and the system is ready. The CA will verify and conduct their own independent verification and start-up in parallel to the Contractor's verification. Any deficiencies identified during this process shall be noted and reviewed by the Contractors. Start-up and functional testing shall not proceed until all the deficiencies are corrected and verified by the CA.

C. The following procedures shall apply to all equipment and systems to be commissioned.
   1. Start-up and Initial Checkout Plan. The contractor shall develop the detailed start-up and pre-functional testing plans for all equipment to be reviewed by the CA. The primary role of the CA in this process shall be to review the installation for construction completeness

and ensure that all components have been installed as per the design documents. Only when pre-functional testing is complete and signed off by all Contractors, shall the Contractor start-up the equipment. Equipment and systems to be commissioned are identified in this Section Part 2.

2. The start-up and initial checkout plan shall consist of the following as a minimum:
   a. The manufacturer's standard written start-up and checkout procedures copied from the installation manuals and manufacturer's normally used field checkout sheets. The plan shall include checklists and procedures with specific boxes or lines for recording and documenting the checking and inspections of each procedure and a summary statement with a signature block at the end of the plan.
   b. First-run checklist for equipment, to include:
      1) Equipment properly set.
      2) Alignment of shafts and couplings.
      3) Adjustment of vibration isolators.
      4) Piping and equipment properly connected.
      5) Completion of initial lubrication procedures.
      6) Clean filters in place, as appropriate.
      7) Wiring properly connected.
      8) Electrical overload relays appropriate for load.
      9) Electrical accessories properly installed and adjusted.
      10) Controls, safeties, and time switches properly calibrated and set-up.
      11) Verification of direction of motor rotation after final electrical connections by jogging motor.
      12) Measurements of ampere draw of electric motors and comparison with nameplate rating and with overload heater ratings.
      13) The Contractor shall submit the start-up reports to the CA for review.

D. The CA shall review and approve the procedures and the format for documenting them, noting any procedures that need to be added.

E. Two weeks prior or startup, the Contractor shall schedule start-up and checkout with the Owner and CA. The execution of the start-up and checkout shall be directed and performed by the Contractor, in accordance with manufacturer's published procedures and with the approved procedures. The CA may be present for the Contractor's required startup and checkout of all systems and equipment to be commissioned.

F. Sensor Calibration. Calibration of all sensors shall be included as part of the pre-functional testing and listed on the appropriate test checklists and reports, according to the specified procedures and accuracies for the devices and systems being tested.

G. All contractor responsible start-up, checkout forms shall be completed and submitted to the CA for review.

3.03 FUNCTIONAL PERFORMANCE TESTS

A. Functional Performance Verification (FPV) is the dynamic testing of systems (rather than just individual components) under full, part and seasonal requirements. Systems are tested under various loads and control sequences, such as low cooling and heating loads, component failures, unoccupied modes, fire alarm, etc. The systems are run through all the control sequences of operation and components are verified to be responding as the design intent and documents. FPV shall include; testing all sequences of operations, verification of system capacity, generating simulated signals to simulate sensor values, conducting simulated conditions to tests all loads and verify system performance during all conditions of operation and

verifying design intent. In addition, each system shall be tested through all modes of operation (seasonal, occupied, unoccupied, warm-up, cool-down, part and full load). Proper responses such as power failures, freeze conditions, low-oil pressures, equipment failures, etc. shall also be tested. The CA develops the functional test sheets and procedures in sequential written form, coordinates the testing, conducts the testing and documents the testing. Each contractor is required is supply personnel to assist during the functional performance testing where applicable.

B. No system, equipment or component thereof shall be tested until the Contractor and the CM has certified, in writing, that the system, equipment and / or components are complete, have been tested, adjusted and balanced and are ready for validating and performance testing. FPV is scheduled by the CA after the pre-functional testing requirements are complete and signed-off by the CM and the CA. FPV will not be conducted until a written notice of completion by the CM confirming that the system is ready for FPV. The air balancing and water balancing must be complete and the controls must be debugged prior to the performance verification.

C. Functional testing shall be conducted by the CA. Functional testing may not proceed until the systems have been properly installed, started-up and all deficiencies have been corrected.

D. Functional testing is intended to begin upon completion of a system. Functional testing may proceed prior to the completion of systems or sub-systems at the discretion of the CA and CM. Beginning system testing before full completion shall not relieve the Contractor from fully completing the system, including all pre-functional checklists.

E. The Contractor shall provide personnel to operate the systems while functional performance testing is commencing. This shall include but not be limited to; starting and stopping of systems, opening and closing valves to create false loads on the system (with the capabilities of the existing system) and allowing the CA to manipulate the building automation systems to modulate the system requirements.

F. The Contractor shall review the commissioning functional performance testing procedure supplied by the CA. After functional testing commences, the Contractor and the CA shall sign the functional test record and provide the owner and the CM a copy to review. All deficiencies either corrected in the field or outstanding shall be documented on the functional test forms for review by all parties.

G. All functional testing must be completed and approved by the CA and the owner before the project will be considered substantially complete.

3.04 DEFERRED TESTING

A. Deferred Testing. The Contractor shall be available to assist in seasonal testing (Summer, Winter and Intermediate), tests delayed until weather or other conditions until building construction is completed, required building occupancy or loading, or other conditions are suitable for the demonstration of equipment or system’s performance, as specified. These deferred tests shall be conducted in the same manner as the seasonal tests as soon as possible. Deferred testing shall be executed, documented and deficiencies corrected as specified herein for functional performance testing. Any adjustments or corrections to the O&M manuals and “As built” documents required by the results of the testing shall be made before the seasonal testing process is considered complete.

3.05 TESTING DOCUMENTATION, NON-CONFORMANCE AND APPROVALS

A. The CA shall clearly list any outstanding items of the initial start-up and pre-functional procedures that were not completed successfully. The testing form and any outstanding deficiencies shall be provided to the CM/Owner within two days of test completion. The CA shall review the Contractor's startup testing reports and shall submit either a non-compliance report or an approval form to the Contractor. The CA shall work with the Contractor and others as necessary, to correct and retest deficiencies or uncompleted items. The Contractor shall correct all areas that are deficient or incomplete in the checklists and tests in a timely manner, and shall notify the CA as soon as outstanding items have been corrected and resubmit an updated start-up report with a Statement of Correction on the original non-compliance report. When all requirements are satisfactorily completed, the CA shall recommend approval of the startup and pre-functional testing of each system and schedule the functional testing of the equipment or system.

B. As functional performance testing progresses and a deficiency is identified, the CA shall discuss the issue with the executing contractor and the commissioning team.
   1. When there is no dispute of the deficiency and the Contractor accepts responsibility for correcting it, the CA shall document the deficiency and the Contractor's response and intentions and the testing shall proceed, if possible. Corrections of minor deficiencies identified may be made by the Contractor during the functional performance testing, at the discretion of the CA. Every effort shall be made or expedite the testing process and minimize unnecessary delays, while not compromising the integrity of the commissioning effort.
   2. When the identified deficiency is corrected, the Contractor shall sign the statement of correction at the bottom of the non-compliance form, certifying that the equipment is ready to be retested, and return the form to the CA. The CA shall schedule the retest of the equipment or system involved.
   3. If there is a dispute about an identified deficiency, the CA shall document the deficiency and the Contractor's response, and provide a copy to the Contractor. Every attempt shall be made to resolve the dispute at the lowest management level possible. When the dispute resolution has been decided, the appropriate party corrects the deficiency, signs the statement of correction on the non-compliance form and returns the form to the CA. The CA shall schedule the retest of the equipment or system involved. Final interpretive authority shall be the A/E. Final acceptance authority shall be the Owner.

C. During the functional performance testing of multiple units of similar equipment, the CA will test all of the installed equipment and components identified. If, under such a testing procedure, three or more identical pieces of equipment (size along does not constitute difference) fail to perform to the requirements of the Contract Documents (mechanically or substantively) due to manufacturing or installation defects not allowing it to meet its submitted performance spec, all identical units may be considered unacceptable by the CA. In such a case, the Contractor shall provide the CA with the following:
   1. 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 CA within two weeks of the original notice.
   2. Within two weeks of the original notification, the Contractor shall provide the CA and the A/E a signed and dated, written explanation of the problem, cause of failures, etc., and proposed solution, including full equipment submittals for corrective or replacement equipment, if appropriate. The proposed solution shall not be for less than the specification requirements of the original installation.

3. When approved, two examples of the proposed solution shall be installed by the Contractor and the CA shall schedule and conduct functional testing of the proposed solution. Upon completion of the functional testing of the proposed solution, the CA shall recommend the acceptance or disapproval of the proposed solution to the Owner.
4. Upon acceptance of the proposed solution by the Owner, the Contractor shall replace or repair all identical items, at their expenses 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 of approval of the proposed solution.
5. Cost of Retesting
    a. The cost for CA and/or Owner personnel to conduct the retesting of a functional performance testing requirements necessitated because a specific pre-functional or start-up test item, reported to have been successfully completed, but found to be incomplete or faulty, shall be the responsibility of the Contractor.
    b. For a deficiency identified during the functional testing, not related to any pre-functional checklist or start-up fault, the CA and Owner shall direct the retesting of the equipment once at “no charge” for their time. However, all costs for any subsequent retesting shall be the responsibility of the Contractor.
    c. Items left incomplete, which later cause deficiencies or delays during functional testing may result in back-charges to the responsible party.

3.06 OPERATION AND MAINTENANCE (O&M) MANUALS

A. The following O&M manual requirements do not replace O&M manual documentation requirements elsewhere in these specifications.

B. Division 23 shall compile and prepare documentation for all equipment and systems covered in Division 23 and deliver this documentation to the CM for inclusion in the O&M manuals, according to this section, prior to the training of owner personnel.

C. The CA shall receive a copy of the O&M manuals for review.

D. Operation and maintenance documentation, in hardback 3-ring loose-leaf binders except full size drawings and diskettes, shall cover all mechanical systems. Documentation shall include the following: operations and maintenance documentation directory; emergency information; operating manual; emergency information; maintenance manual; test reports; and construction documents.

E. The operation and maintenance documentation package shall be submitted as one comprehensive package to the Owner and CA before systems start-up and commissioning, and shall be updated, revised and completed during, and at completion of, commissioning.

3.07 TRAINING OF OWNER PERSONNEL

A. The mechanical commissioning supervisor shall be responsible for training coordination and scheduling of required training and for ensuring that all required training is completed. The CA shall oversee the content and adequacy of the training of Owner personnel.

B. Prepare and submit a syllabus describing an overview of the program, describing how the program will be conducted, when and where meetings are to be held, names and company affiliations of lecturers, description of contents and outline for each lecture, and recommended reference material and outside reading. Obtain direction from the Owner on which operating personnel shall be instructed in each system. Proposed training schedules, materials, and

lesson plans shall be submitted to the CA for review of the content and adequacy of the training of Owner personnel for commissioned equipment or systems.

C. Mechanical Contractor. The mechanical contractor shall have the following training responsibilities:
   1. Provide the CA with training plan one week before the planned training.
   2. Provide designated Owner personnel with comprehensive orientation and training in the understanding of the systems and the operation and maintenance of each piece of equipment.
   3. Training shall normally start with classroom sessions followed by hands-on training on each piece of equipment.
   4. During any demonstration, should the system fail to perform in accordance with the requirements of the O&M manual or sequence of operations, the system will be repaired or adjusted as necessary and the demonstration repeated.
   5. The appropriate trade or manufacturer's representative shall provide the instructions on each major piece of equipment. This person may be the start-up technician for the piece of equipment, the installing contractor or manufacturer's representative. Practical building operating expertise, as well as in-depth knowledge of all modes of operation of the specific piece of equipment, is required. More than one party may be required to execute the training.
   6. The controls contractor shall attend sessions other than the controls training, for each type of equipment controlled by the BAS, to discuss the interaction of the BAS as it relates to the equipment being discussed.
   7. The training sessions shall follow the outline in the Table of Contents of the operation and maintenance manual and illustrate whenever possible the use of the O&M manuals for reference.

3.08 WRITTEN WORK PRODUCTS

A. Written work products of Contractors shall consist of the start-up and initial checkout plan and the filled out start-up, initial checkout and pre-functional checklists.

END OF SECTION

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. The work specified as part of this Section consists of the integration of equipment controls supplied as part of manufactured items, materials and equipment required by the Drawings and under Divisions 23 and 26 to achieve operational and coordinated Sequences of Operation as Specified. Work shall include management of the system start up and operational check out, coordination of functions of controllers supplied as part of equipment packages, sizing of control valves and damper operators for dampers, interconnection of systems, provision and installation of all accessory devices required for complete system operation including dampers, control valves and actuators not provided as part of equipment, coordination of start up and testing and demonstration of the operation of Sequences of Operation to the Owner and his representatives.

1.02 RELATED SECTIONS

A. The General Conditions of the Contract, Supplementary Conditions, and General Requirements are a part of these Specifications and shall be used in conjunction with this Section as a part of the Contract Documents. Consult them for further instructions pertaining to this work. The Contractor is bound by the provisions of Division 00 and Division 01.

B. The following Sections constitute related work:
   1. Section 230010 - General Mechanical Requirements
   2. Equipment and Systems specified under Division 23
   3. Division 26

1.03 QUALITY ASSURANCE

A. System Installer Qualifications
   1. The Integrator shall have a minimum of five years experience in the integration of systems of a similar nature to those of this Project.
   2. The Integrator shall have an office within 50 miles of the project site and provide 24-hour response in the event of a customer call.

B. Codes and Standards: Meet requirements of all applicable standards and codes, except when more detailed or stringent requirements are indicated by the Contract Documents, including requirements of this Section.
   1. Underwriters Laboratories: Products shall be UL-916-PAZX listed.
   2. National Electrical Code - NFPA 70.

C. All products used in this installation shall be new, currently under manufacture, and shall have been applied in similar installations for a minimum of 2 years. This installation shall not be used as a test site for any new products unless explicitly approved by the Owner's representative in writing prior to bid date. Spare parts shall be available for at least 5 years after completion of this Contract.

1.04 SUBMITTALS

A. Submit at the time of bid the name and qualifications of the firm that will be responsible for the Integration function along with the qualifications of the specific personnel proposed. The Owner and Architect/Engineer may choose to interview the personnel proposed for the project.

B. Contractor shall provide shop drawings and manufacturer's standard specification data sheets on all materials and hardware to be provided. No work may begin on any segment of this project until the Architect/Engineer and Owner have reviewed submittals for conformity with the Drawings and Specifications. All shop drawings shall be provided to the Owner electronically as .dwg or .dxf file formats.

C. Submit a written sequence of operation for each system indicating which functions are to be controlled by controls provided as part of manufactured equipment and which functions will be under control of devices provided as part of this Section.

D. Submit interconnecting wiring diagrams for all systems. These diagrams may rely on diagrams for controls of manufactured equipment provided that the interface points are clearly identified and copies of the manufactured item's control diagrams are submitted for information as part of the submittal package.

E. Submit any additional information or data which is deemed necessary to determine compliance with these specifications or which is deemed valuable in documenting the system to be installed.

F. Submit the following within 30 days of contract award:
   1. A work plan and schedule for the start up and check out of all systems including time requirements and resources required from all Sub-Contractors involved.
   2. A complete list of equipment to be used indicating quantity, manufacturer and model number.
   3. A schedule of all control valves including the valve size, model number (including pattern and connections), flow, CV, pressure rating, and location.
   4. A schedule of all control dampers. This shall include the damper size, pressure drop, manufacturer and model number.
   5. Provide manufacturers cut sheets for major system components. When manufacturer's cut sheets apply to a product series rather than a specific product, the data specifically applicable to the project shall be highlighted or clearly indicated by other means. Each submitted piece of literature and drawings shall clearly reference the specification and/or drawing that the submittal is being submitted to cover.
   6. The submittals required under this Section shall be considered as For Information Only. Review by the Architect/Engineer shall not relieve the Contractor from the responsibility of providing fully operational systems.

1.05 WARRANTY

A. Warrant all work as follows:
   1. Labor & materials for control system specified shall be warranted free from defects for a period of twelve (12) months after final completion acceptance by the Owner. Control System failures during the warranty period shall be adjusted, repaired, or replaced at no charge or reduction in service to the Owner. The Contractor shall respond to the Owner's request for warranty service within 24 hours during customary business hours.
   2. At the end of the final start-up/testing, if equipment and systems are operating in a manner satisfactory to the Owner and Architect/Engineer, the Owner shall sign certificates certifying that the control system's operation has been tested and accepted in accordance with the terms of this Specification. The date of Owner's acceptance shall be the start of warranty.

PART 2 - PRODUCTS

2.01 STANDARD OF QUALITY AND PERFORMANCE

A. Products specified are not intended to form a complete scope of supply. They are intended to set a level of quality for items that the Contractor may need to supply to implement a complete Sequence of Operation. Products of a comparable quality and performance may be submitted for approval by the Architect/Engineer.

2.02 MOTORIZED DAMPERS

A. Dampers shall be modulating double-acting opposed blade or parallel blade dampers as required, designed and tested in accordance with AMCA 500. Obtain and verify the location, size and pressure rating of each damper prior to fabrication and delivery. Verify the layout of equipment and ductwork before dampers are fabricated. Pressure drop shall not exceed 0.03 inches water gauge static pressure at 1000 fpm in the fully-open position, and shall be rated for at least 2000 fpm average velocity. Damper shut-off pressure rating shall exceed the fan maximum total head-pressure.

B. Dampers shall be constructed of extruded aluminum or at least No. 16 gauge galvanized steel, with each blade being not more than 8 inches; wide damper frame channel shall be at least 5 inches deep. Each blade end shall have a 3/8 inch stainless steel or plated steel shaft rotating in self-lubricating bearings mounted in a damper channel frame. Blades mounted vertically shall be supported by thrust bearings. Control shaft shall be at least ½ inch diameter.

C. Flat-steel damper blades shall be made rigid by folding the edges. Blades shall have interlocking edges and shall be provided with EPDM or neoprene compressible seals at point of contact. Foam seals are not acceptable. Provide compression-type stainless steel jamb seals continuously along blade edges.

D. Each damper shall be assembled in the manufacturer’s shop as a complete unit. Dampers, when closed, shall be guaranteed by the manufacturer not to leak in excess of 20 cfm per square foot at 4 inches w.g. static pressure. Provide dampers with operators having sufficient power to limit leakage to the rate specified.

E. Damper seals shall be suitable for an operating range of minus 20 degrees F (or 20 degrees F below the heating outside design temperature, whichever is lower) at the lower end to 200 degrees F at the upper end.

F. A complete damper assembly shall have blades no longer than 48 inches and no higher than 48 inches. Where greater length or height is required, the assembly shall be made of a combination of sections. Dampers shall be sized for the required air velocity and pressure classification.

G. Approved Manufacturers Arrow Damper & Louver or approved equal.

2.03 ELECTRONIC DAMPER/VALVE ACTUATORS

A. The actuator shall have electronic overload or digital rotation sensing circuitry to prevent damage to the actuator throughout the rotation of the actuator.

B. For power-failure/safety applications, an internal mechanical, spring return mechanism shall be built into the actuator housing.
   1. Damper actuators shall fail normally open or closed as described on the Drawings or as follows:
      a. Outdoor Air Intake - normally closed.
      b. Air Exhaust - normally closed.
      c. Hot water control valves - normally open.
      d. Other applications - as as required by the Sequence of Operation.

C. All rotary spring return actuators shall be capable of both clockwise and counter clockwise spring return operation.

D. Proportional actuators shall accept a 0-10 VDC or 0-20 ma control signal and provide a 2-10 VDC or 4-20 ma operating range.

E. All 24 VAC/DC actuators shall operate on Class 2 wiring and shall not require more than 10 VA for AC or more than 8 W for DC applications. Actuators operating on 120 VAC or 230 VAC shall not required more than 11 VA.

F. All non-spring return actuators shall have an external manual gear release to allow manual positioning of the damper when the actuator is not powered. Spring return actuators with more than 60 in-lb. torque capacity shall have a manual crank for this purpose.

G. Actuators shall be provided with a conduit fitting and a minimum 1 meter electrical cable and shall be pre-wired to eliminate the necessity of opening the actuator housing to make electrical connections.

H. All modulating actuators shall have an external, built-in switch to allow the reversing of direction of rotation

I. Actuators shall be Underwriters Laboratories Standard 873 listed.

J. Actuators shall be designed for a minimum of 60,000 full stroke cycles at the actuator's rated torque.

K. Provide a single damper actuator when dampers are less than 4 feet in width. Otherwise provide two damper actuators (one on each side of the ductwork).

2.04 CONTROL VALVES

A. Control valves shall be two-way or three-way type for two-position or modulating service as required.

B. Close-off (differential) Pressure Rating: Valve actuator and trim shall be furnished to provide the following minimum close-off pressure ratings:
   1. Water Valves:
      a. Two-way: 150% of total system (pump) head.
      b. Three-way: 300% of pressure differential between ports A and B at design flow or 100% of total system (pump) head.

C. Valve Failure Position:

1. Valves shall fail normally open or closed as indicated on the Drawings or as follows:
   a. Hot water control valves - normally open.
   b. Other applications - as scheduled or as required by Sequence of Operation.
2. Zone valves shall be sized to meet the control application and they shall maintain their last position in the event of a power failure.

D. Water Valves:
1. Body and trim materials shall be as specified in “Pipe, Valve & Fittings” specification. Equal percentage ports for modulating service.
2. Sizing Criteria:
   a. Three-way Modulating Service: Pressure drop equal to twice the pressure drop through the coil exchanger (load), [5] psi maximum.
   b. Contractor shall verify sizing criteria with manufacturer.

2.05 TEMPERATURE SENSORS

A. Temperature sensors shall be Resistance Temperature Device (RTD) or Thermistor.

B. Duct sensors shall be rigid or averaging as required. Averaging sensors shall be a minimum of 5 feet in length.

C. Immersion sensors shall be provided with a separable stainless steel well. Pressure rating of well is to be consistent with the system pressure in which it is to be installed.

D. Space sensors shall be equipped with set-point adjustment, override switch, display, and communication port.

E. Provide matched temperature sensors for differential temperature measurement. Differential accuracy shall be within 0.2 degrees F.

F. The space temperature, setpoint, and override confirmation shall be annunciated by a digital display for each zone sensor. The setpoint shall be selectable utilizing buttons.

2.06 HUMIDITY SENSORS

A. Room Humidity sensors shall have an accuracy of ±1% 25°C from 10% to 80% RH with One-point adjustment calibration. The operating temperature range shall be -10° to 150°F max.

B. Duct sensors shall have a sensing range of 20% to 80% with accuracy of ±1% R.H. Duct sensors shall be provided with a sampling chamber.

C. Outdoor air humidity sensors shall have a sensing range of 20% to 95% R.H. and shall be suitable for ambient conditions of -40 degrees F to 170 degrees F.

D. Humidity sensor's drift shall not exceed 1% of full scale per year.

2.07 LOW LIMIT THERMOSTATS

A. Safety low limit thermostats shall be vapor pressure type with an element 20 ft minimum length. Element shall respond to the lowest temperature sensed by any one foot section.

2.08 RELAYS

A. Control relays shall be UL listed plug-in type with dust cover. Contact rating, configuration, and coil voltage suitable for application.

B. Time delay relays shall be UL listed solid-state plug-in type with adjustable time delay. Delay shall be adjustable plus or minus 200% (minimum) from set-point shown on plans. Contact rating, configuration, and coil voltage suitable for application. Provide NEMA 1 Type enclosure when not installed in local control panel.

2.09 TRANSFORMERS AND POWER SUPPLIES

A. Control transformers shall be UL listed, Class 2 current-limiting type, or shall be furnished with over-current protection in both primary and secondary circuits for Class 2 service.

B. Unit output shall match the required output current and voltage requirements. Current output shall allow for a 50% safety factor. Output ripple shall be 3.0 mV maximum Peak-to-Peak. Regulation shall be 0.10% line and load combined, with 50 microsecond response time for 50% load changes. Unit shall have built-in over-voltage protection.

C. Unit shall operate between 0 degrees C and 50 degrees C.

D. Unit shall be UL recognized.

2.10 CURRENT SWITCHES

A. Current-operated switches shall be self-powered, solid state with adjustable trip current. The switches shall be selected to match the current of the application and output requirements of the control system.

2.11 LOCAL CONTROL PANELS

A. All indoor control cabinets shall be fully enclosed NEMA 1 or NEMA 4 rating as required. Provide cabinet with hinged door, key-lock latch, and removable sub-panels. A single key shall be common to all field panels and sub-panels.

B. Interconnections between internal and face-mounted devices pre-wired with color-coded stranded conductors neatly installed in plastic troughs and/or tie-wrapped. Terminals for field connections shall be UL listed for 600-volt service, individually identified per control/interlock drawings, with adequate clearance for field wiring. Control terminations for field connection shall be individually identified per control drawings.

C. Provide on/off power switch with over-current protection and main air gauge for control power sources to each local panel.

PART 3 - EXECUTION

3.01 GENERAL WORKMANSHIP

A. Install equipment, piping, wiring/conduit parallel to building lines (i.e. horizontal, vertical, and parallel to walls) wherever possible.

B. Provide sufficient slack and flexible connections to allow for vibration of piping and equipment.

C. Install all equipment in readily accessible location as defined by Chapter 1 Article 100 part A of the NEC. Control panels shall be attached to structural walls unless mounted in equipment enclosure specifically designed for that purpose. Panels shall be mounted to allow for unobstructed access for service.

D. Verify integrity of all wiring to ensure continuity and freedom from shorts and grounds.

E. All equipment, installation, and wiring shall comply with acceptable industry specifications and standards for performance, reliability, and compatibility and be executed in strict adherence to local codes and standard practices.

3.02 WIRING

A. All control and interlock wiring shall comply with the national and local electrical codes and Division 26 of these Specifications. Where the requirements of this Section differ with those in Division 26, the requirements of this Section shall take precedence.

B. Do not install Class 2 wiring in conduit containing Class 1 wiring. Do not use boxes and panels containing high voltage for low voltage wiring except for the purpose of interfacing the two (e.g. relays and transformers).

C. Control wiring located in a plenum space that is not installed in a conduit shall be plenum rated.

D. All wire-to-device connections shall be made at a terminal block or terminal strip. All wire-to wire connections shall be at a terminal blocks, or with a crimped connector. All wiring within enclosures shall be neatly bundled and anchored to permit access and prevent restriction to devices and terminals.

E. Maximum allowable voltage for control wiring shall be 120V. Provide and install step down transformers.

F. All wiring shall be installed as continuous lengths, where possible. Any required splices shall be made only within an approved junction box or other approved protective device.

G. Maintain fire rating at all penetrations in accordance with other Sections of this Specification and local codes.

H. Size of conduit and size and type of wire shall be the design responsibility of the Contractor, in keeping with the manufacturer's recommendations and the NEC.

I. Locate control and status relays in designated enclosures only. These relays may also be located within packaged equipment control panel enclosures. These relays shall not be located within Class 1 starter enclosures.

J. Follow manufacturer's installation recommendations for all communication and network cabling. Network or communication cabling shall be run separately from other wiring.

K. Adhere to Division 26 requirements for installation of raceway.

L. Maintain an updated (as-built) wiring diagram with terminations identified at the job site.

M. Flexible metal conduits and liquid-tight, flexible metal conduits shall not exceed 3feet in length and shall be supported at each end. Flexible metal conduit less than 1/2" electrical trade size shall not be used. In areas exposed to moisture liquid tight, flexible metal conduits shall be used.

3.03 INSTALLATION OF SENSORS

A. Install sensors in accordance with the manufacturer's recommendations.

B. Mount sensors rigidly and adequate for the environment within which the sensor operates.

C. Room temperature sensors shall be installed on concealed junction boxes properly supported by the wall framing.

D. All wires attached to sensors shall be air sealed in their conduits or in the wall to stop air transmitted from other areas affecting sensor readings.

E. Install duct static pressure tap with tube end facing directly down-stream of air flow.

F. Sensors used in mixing plenums, and hot and cold decks shall be of the averaging type. Averaging sensors shall be installed in a serpentine manner horizontally across duct. Each bend shall be supported with a capillary clip.

G. All pipe mounted temperature sensors shall be installed in wells. Install all liquid temperature sensors with heat conducting fluid in thermal wells.

H. Wiring for space sensors shall be concealed in building walls. EMT conduit is acceptable within mechanical and service rooms.

I. Install outdoor air temperature sensors on north wall complete with sun shield at designated location.

3.04 FLOW SWITCH INSTALLATION

A. Install using a thread-o-let in steel pipe. In copper pipe use C x C x F Tee, no pipe extensions or substitutions allowed.

B. Mount a minimum of 5 pipe diameters upstream and 5 pipe diameters downstream or 2 feet which ever is greater, from fittings and other obstructions.

C. Install in accordance with manufacturers' instructions.

D. Assure correct flow direction and alignment.

E. Mount in horizontal piping - flow switch on top of the pipe.

3.05 ACTUATOR INSTALLATION

A. Mount and link control damper actuators per manufacturer's instructions.

B. To compress seals when spring return actuators are used on normally closed dampers, power actuator to approximately 5 degrees open position, manually close the damper, and then tighten the linkage.

C. Check operation of damper/actuator combination to confirm that actuator modulates damper smoothly throughout stroke to both open and closed positions.

D. Valves - Actuators shall be mounted on valves with adapters approved by the actuator manufacturer. Actuators and adapters shall be mounted following manufacturer's recommendations.

3.06 WARNING LABELS

A. Affix plastic labels on each starter and equipment automatically controlled. Label shall indicate the following:

C A U T I O N This equipment is operating under automatic control and may start at any time without warning.

3.07 IDENTIFICATION OF HARDWARE AND WIRING

A. All wiring and cabling, including that within factory-fabricated panels, shall be labeled at each end within 2 inches of termination with a cable identifier and other descriptive information.

B. Permanently label or code each point of field terminal strips to show the instrument or item served.

C. Identify control panels with minimum 1-cm letters on laminated plastic nameplates.

D. Identify all other control components with permanent labels. Identifiers shall match record documents. All plug-in components shall be labeled such that removal of the component does not remove the label.

3.08 CLEANING

A. The Contractor shall clean up all debris resulting from his or her activities daily. The contractor shall remove all cartons, containers, crates, etc. under his control as soon as their contents have been removed. Waste shall be collected and placed in a location designated by the Construction Manager or General Contractor.

B. At the completion of work in any area, the Contractor shall clean all of his/her work, equipment, etc., making it free from dust, dirt and debris, etc.

C. At the completion of work, all equipment furnished under this Section shall be checked for paint damage, and any factory finished paint that has been damaged shall be repaired to match the

adjacent areas. Any metal cabinet or enclosure that has been deformed shall be replaced with new material and repainted to match the adjacent areas.

3.09 PROTECTION

A. The Contractor shall protect all work and material from damage by his/her work or workers, and shall be liable for all damage thus caused.

B. The Contractor shall be responsible for his/her work and equipment until finally inspected, tested, and accepted. The Contractor shall protect his/her work against theft or damage, and shall carefully store material and equipment received on site that is not immediately installed. The Contractor shall close all open ends of work with temporary covers or plugs during storage and construction to prevent entry of foreign objects.

3.10 FIELD QUALITY CONTROL

A. All work, materials and equipment shall comply with the rules and regulations of applicable local, state, and federal codes and ordinances as identified in Part 1 of this Section.

B. Contractor shall continually monitor the field installation for code compliance and quality of workmanship. All visible piping and or wiring runs shall be installed parallel to building lines and properly supported.

C. Contractor shall arrange for field inspections by local and/or state authorities having jurisdiction over the work.

3.11 ACCEPTANCE

A. The control systems will not be accepted as meeting the requirements of completion until all tests described in this Specification have been performed to the satisfaction of both the Engineer and Owner.

B. The full range of operation for all Sequences of Operation shall be demonstrated. Where sequences are dependent on season or outside conditions these conditions may be simulated for the purpose of demonstration if approved by both the Architect/Engineer and the Owner. If simulations cannot be acceptably created the Contractor shall perform the demonstration during the proper period.

C. Any tests that cannot be performed due to circumstances beyond the control of the Contractor may be exempt from the Completion requirements if stated as such in writing by the Owner's representative. Such tests shall then be performed as part of the warranty.

END OF SECTION

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. The Work specified as part of this Section consists of the work required to achieve operational and coordinated Sequences of Operation as described. Work includes coordination of functions of controllers supplied as part of equipment packages, sizing of control valves, interconnection of systems, provision and installation of all accessory devices required for complete system operation including devices not provided as part of equipment, coordination of start up and testing and demonstration of the operation of Sequences of Operation to the Owner and his representatives.

B. The control system operation of all equipment shall be subject to the operational modes, conditions and logic described in this Section and the controlled equipment manufacturer's recommendations.

C. Training of the Owner's personnel in the operation, trouble shooting, adjustment and repair of all system controls.

1.02 RELATED SECTIONS AND WORK

A. Division 26

B. Owner's Building Management System (BMS)

C. Owner's Fire Alarm System (FAS)

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.01 GENERAL

A. General
1. Conform to the requirements of the Owner's standards for all electrical work and devices.
2. System and system components shall be BACNet compatible.
3. All set points and operating points shall be able to be transmitted to and set from the BMS system. Specific points to be enabled shall be at the discretion of the Owner.
4. All systems shall be capable of operating independently of the BMS system based on set points and limits either input from the BMS system or manually.
5. Coordinate all work with the requirements and characteristics of the BMS system and the equipment provided for the project under this phase or earlier phases.
6. All space sensors and thermostats shall have an lcd display indicating their set point, the condition sensed and the mode of operation they are responding to.
7. All equipment to be integrated with the BMS shall be fully integrated with new or existing facility controls and devices including interlocks, icons, graphics, read-outs and reports."

3.02 SEQUENCE OF OPERATION - TOILET EXHAUST FANS

A. General:
1. The exhaust fan shall run continuously 24 hours a day, 7 days a week.

3.03 SEQUENCE OF OPERATION - SPLIT SYSTEM DEDICATED OUTDOOR AIR UNIT

A. Run Conditions - Scheduled:
   1. The unit shall run according to a user definable time schedule.

B. Outside Air Damper:
   1. The outside air damper shall open anytime the unit runs and shall close anytime the unit stops. The supply fan shall start only after the damper status has proven the damper is open.
   2. The outside air damper shall close 4sec (adj.) after the supply fan stops.
   3. Alarms shall be provided as follows:
      a. Outside Air Damper Failure: Commanded open, but the status is closed.
      b. Outside Air Damper in Hand: Commanded closed, but the status is open.

C. Supply Fan:
   1. The supply fan shall run anytime the unit is commanded to run. To prevent short cycling, the supply fan shall have a user definable (adj.) minimum runtime, unless shutdown on safeties.
   2. Alarms shall be provided as follows:
      a. Supply Fan Failure: Commanded on, but the status is off.

D. Zone Temperature Control:
   1. The controller shall monitor the supply air temperature and shall maintain a supply air temperature of 70 degrees.

E. Hot Gas Reheat Mode:
   1. When the supply fan is running and the unit is in Cooling mode the system monitors the leaving air temperature.
   2. The leaving air temperature will typically be within approximately ± 0.5 degree F of the leaving air temperature set point.
   3. If the leaving air temperature is greater than 72 degree F, then the hot gas reheat mode will be disabled.

F. Dehumidification:
   1. If the leaving air temperature set point is achieved, the controller will check leaving air humidity.
   2. If the leaving air humidity is 3% above the leaving air humidity set point, 60% RH, the digital compressor will ramp up in capacity as necessary to satisfy the leaving air humidity set point.
   3. If the leaving air temperature goes below the set point, modulating hot gas reheat will be enabled to maintain the leaving air temperature. The controlled will balance the capacity of the compressor and the use of hot gas reheat to first satisfy leaving air temperature and then, if necessary dehumidify.

G. Prefilter Status:
   1. The controller shall monitor the prefilter status.
   2. Alarms shall be provided as follows:
      a. Prefilter Change Required: Prefilter differential pressure exceeds a user definable limit (adj.).

H. Supply Air Temperature:

1. The controller shall monitor the supply air temperature.
2. Alarms shall be provided as follows:
   a. High Supply Air Temp: If the supply air temperature is greater than 120 degree F (adj.).
   b. Low Supply Air Temp: If the supply air temperature is less than 45 degree F (adj.).

I. System Points

	Hardware Points				Software Points						
Point Name	AI	AO	BI	BO	AV	BV	Loop	Sched	Trend	Alarm	Show On Graphic
Supply Air Temp	x								x		x
Modulating Gas Heat		x							x		x
Outside Air Damper Status			x						x		x
Supply Fan Status			x						x		x
Prefilter Status			x						x		
Outside Air Damper				x					x		x
Supply Fan Start/Stop				x					x		x
Cooling Stage 1				x					x		x
Cooling Stage 2				x					x		x
Supply Air Temp Set Point					x				x		x
Outside Air Damper Failure										x	
Supply Fan Failure										x	
High Supply Air Temp										x	
Low Supply Air Temp										x	
Totals	**1**	**1**	**3**	**4**	**1**	**0**	**0**	**0**	**10**	**4**	9

Total Hardware (12) **Total Software (18)**

3.04 SEQUENCE OF OPERATION - VARIABLE REFRIGERANT FLOW (VRF) UNITS

A. Cooling Operation:
   1. The unitary controller will call for cooling when measured room temperature is 1.8FDB above setpoint and adjust refrigerant flow and capacity based on differential from setpoint. The unit will remain in an active call for cooling until the measured room temperature is 1.8FDB below setpoint.
   2. The indoor fan will operate based on user selected fan speed setting at the unitary controller and will allow for High, Medium, and Low selection. The fan speed will remain constant in the cooling mode regardless of the cooling cycle being called for.
   3. (User fan speed control should be disabled in applications where OA is ducted into the terminal unit)

B. Heating Operation
   1. The unitary controller will call for heating when measured room temperature is 1.8FDB below setpoint and adjust refrigerant flow and capacity based on differential from setpoint.

The unit will remain in an active call for heating until the measured room temperature is 1.8FDB above setpoint.

2. The indoor fan will operate based on user selected fan speed setting at the unitary controller and will allow for High, Medium, and Low selection. The fan speed will remain constant during heating/and or cooling operation.

3.05 SEQUENCE OF OPERATION - ENERGY RECOVERY VENTILATOR UNIT

A. The ERV shall be configured via the factory provided controller to start operation when an indoor unit in the same room is turned on and will stop operation when the indoor units in its room is set to off. The ERV will be in economizer bypass between 59 and 66 degrees F outdoor air temperature.

3.06 SEQUENCE OF OPERATION - UNIT VENTILATORS

A. New Unit Ventilators - Hot Water Heat (Face/Bypass Control):
   1. The following additional control devices shall be provided, installed and wired to the PCG controller for each new unit ventilator: (1) TE-6314P-1 wall-mounted temperature sensor, (1) TE-6315P-1 discharge air sensor (8' averaging capillary), (1) current relay wired to monitor the unit ventilator supply fan, (1) fail-safe, normally closed outside air damper actuator, (1) modulating face/bypass damper actuator.
   2. The unit ventilators will be provided with a factory-installed freeze-stat. This is to be left in place to shut the fan off when a freezing condition occurs. Whenever the fan is off, the outside air damper will be closed. As an added feature, the DDC controller will use the discharge air sensor to detect a potential freezing condition. The set point will be 5° higher than the set point of the factory freeze-stat. If such a condition occurs, an alarm will be displayed on the front-end PC and an email will be sent from the DDC front-end system to those recipients designated by the District. The alarm and email messages will indicate which unit vent caused the alarm and be stamped with the date and time that the alarm occurred. Whenever the unit vent fan is off, the outside air damper shall be fully closed.
   3. All setpoints will be adjustable from the BMS front-end.
   4. Occupied Mode: During the occupied period, the unit vent fan will run continuously. Once the fan has been proven running by a current relay wired as a binary input to the DDC controller, the outside air damper shall open to its minimum position (adjustable from the BMS front-end). The face/bypass damper will modulate to maintain the space heating setpoint. As the space temperature rises above the room set point, the face/bypass damper will modulate towards the bypass position and the outside air damper will be modulated open beyond the minimum position. The discharge low limit program in the FX controller shall modulate the face/bypass damper command and outside air damper command in sequence, without overlap, to maintain a discharge air temperature of 60°F (adjustable from the BMS front-end).
   5. Occupied Mode – Mechanical Cooling: For units with chilled water cooling, if the BMS front-end determines there is chilled water available, on a call for cooling the outside air damper will move to its minimum open position and the DDC controller will modulate the face/bypass damper towards the cooling coil to maintain the space occupied cooling setpoint.
   6. Occupied Mode - DX Mechanical Cooling: For units with DX cooling, on a call for the cooling the outside air damper will move to its minimum open position and the DDC controller will modulate the face/bypass damper towards the cooling coil to maintain the space occupied cooling setpoint.
   7. Fan Control: The Unit Ventilator will be provided with an ECM motor for the supply fan, with a factory ECM control board. The ATC contractor will interface with the factory ECM board to provide a 0-100% speed signal to the ECM board. The fan speed setting will be

adjustable from the BMS front-end. The factory ECM board will be programmed by the UV manufacturer with minimum speed settings.

8. Unoccupied Mode: During unoccupied periods the FX controller will cycle unit ventilator's supply fan to maintain a lower, unoccupied space set point (adjustable). The face/bypass damper will fully face the coil. The outside air damper shall be fully closed during unoccupied mode.
9. All outside air dampers shall fail in the closed position.

B. New Unit Ventilators - Steam Heat (Valve Control):
1. The following additional control devices shall be provided, installed and wired to the PCG controller for each new unit ventilator: (1) TE-6314P-1 wall-mounted temperature sensor, (1) TE-6315P-1 discharge air sensor (8' averaging capillary), (1) current relay wired to monitor the unit ventilator supply fan, (1) fail-safe, normally closed outside air damper actuator, (1) fail-safe, normally open, modulating control valve.
2. The unit ventilators will be provided with a factory-installed freeze-stat. This is to be left in place to shut the fan off when a freezing condition occurs. Whenever the fan is off, the outside air damper will be closed. As an added feature, the DDC controller will use the discharge air sensor to detect a potential freezing condition. The set point will be 5° higher than the set point of the factory freeze-stat. If such a condition occurs, an alarm will be displayed on the front-end PC and an email will be sent from the DDC front-end system to those recipients designated by the District. The alarm and email messages will indicate which unit vent caused the alarm and be stamped with the date and time that the alarm occurred. Whenever the unit vent fan is off, the outside air damper shall be fully closed.
3. All setpoints will be adjustable from the BMS front-end.
4. Occupied Mode: During the occupied period, the unit vent fan will run continuously. Once the fan has been proven running by a current relay wired as a binary input to the DDC controller, the outside air damper shall open to its minimum position (adjustable from the BMS front-end). The heating control valve will modulate to maintain the space heating setpoint. As the space temperature rises above the room set point, the heating command will be off, and the outside air damper will be modulated open beyond the minimum position. The discharge low limit program in the controller shall modulate the heating command and outside air damper in sequence, without overlap, to maintain a discharge air temperature of 60°F (adjustable from the BMS front-end).
5. Occupied Mode - DX Mechanical Cooling: For units with DX cooling, on a call for the cooling the outside air damper will move to its minimum open position and the DDC controller will modulate the DX cooling to maintain the space occupied cooling setpoint.
6. Fan Control: The Unit Ventilator will be provided with an ECM motor for the supply fan, with a factory ECM control board. The ATC contractor will interface with the factory ECM board to provide a 0-100% speed signal to the ECM board. The fan speed setting will be adjustable from the BMS front-end. The factory ECM board will be programmed by the UV manufacturer with minimum speed settings.
7. Unoccupied Mode: During unoccupied periods the PCG controller will cycle unit ventilator's supply fan to maintain a lower, unoccupied space set point (adjustable). The heating valve will be modulated to maintain the night heating setpoint. The outside air damper shall be fully closed during unoccupied mode.
8. All outside air dampers shall fail in the closed position.

3.07 SEQUENCE OF OPERATION - HEATING AND COOLING UNIT VENTILATORS

A. Modes of Operation:
1. The unit controller shall operate using pre-programmed modes and set points using the new wall mounted controller with occupied/unoccupied signal from central timeclock. Heating and cooling modes shall be determined by the controller.

2. When the BAS is installed, the BAS shall be capable of sending the controller occupancy modes, heating/cooling modes, and space temperature set points. If a BAS is not present, or communication is lost with the BAS, the controller shall operate using default modes and set points.

B. Occupied Mode:
   1. The supply fan shall run continuously and the outdoor air damper shall open to the minimum position during the occupied heating and cooling mode.
      a. The existing building exhaust fans serving the associated rooms shall be engaged when the unit ventilators are in the “occupied” mode and the outside air dampers are open.
      b. Warm-up Mode:
         1) During warm-up mode the outdoor air damper shall be closed and the heating hot water valve shall be fully open. The outdoor air damper shall remain closed until the room temperature approaches within 3 deg. F of the desired heating set point (70 deg. F adjustable).
      c. Heating Mode:
         1) As the room temperature rises into the operating range of the set point, the outdoor air damper shall open to provide minimum ventilation. The unit ventilator shall modulate the heating hot water control valve to maintain the set point temperature.
      d. Cooling Mode:
         1) When the room temperature rises above the cooling set point (75 deg. F adjustable), the controller shall modulate the heat supply so that cool air flows into the room. The controller shall gradually shut off the heat and open the outside air damper to provide 100% outdoor air as necessary (free cooling). During this natural cooling stage the heating hot water control valve shall be fully closed.
         2) Mechanical cooling shall be utilized if the cooling set point temperature cannot be maintained via the natural cooling mode. The unit ventilator shall cycle the condensing unit to maintain the set point temperature. During mechanical cooling the outdoor air damper shall return to the minimum outdoor air position.

C. Unoccupied Mode
   1. The supply fan shall cycle as necessary to maintain the room temperature within set-point limits. The outdoor air damper shall be fully closed during the unoccupied mode.
      a. The existing building exhaust fans serving the associated rooms and corridor shall be shut down when the unit ventilators are in the “un-occupied” mode.
      b. Heating Mode:
         1) The heating hot water control valve shall be fully open during the unoccupied heating mode. The unit ventilator shall cycle the fan operation in order to maintain the unoccupied set point temperature (60 deg. F adjustable).
      c. Cooling Mode:
         1) The condensing unit shall cycle on during the unoccupied cooling mode. The unit ventilator shall cycle the fan operation in order to maintain the unoccupied set point temperature (85 deg. F adjustable).

D. Freeze Condition:
   1. In the event the Freeze-Stat (located in the return air stream) is activated (set at 40 deg. F (adjustable), the following shall occur:
      a. The outside air damper shall fully close.
         1) The heating hot water valve shall fully open.

2) The supply air fan shall turn on.
3) An alarm shall be generated at the BAS.

END OF SECTION

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. This Section describes the pipe, valves, fittings, and joining materials for use with the piping systems described in this Section and as shown on the Drawings.

1.02 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. Section 079201 - Non-Fire Rated Sleeves and Seals

C. Section 230529 - Pipe Hangers and Supports

D. Section 230555 - Mechanical System Identification

E. Section 230700 - Pipe Insulation

F. Section 232007 - Piping Specialties

1.03 ABBREVIATIONS

A. The following are standard abbreviations:
1. CWP: Cold working pressure.
2. EPDM: Ethylene-propylene-diene-terpolymer rubber.
3. NRS: Nonrising stem.
4. OS&Y: Outside screw and yoke.
5. PTFE: Polytetrafluoroethylene plastic.
6. SWP: Steam working pressure.
7. TFE: Tetrafluoroethylene plastic.
8. NPS: Nominal Pipe Size

1.04 SUBMITTALS

A. Product Data: For each type of valve indicated: Include body, seating, and trim materials; valve design; pressure and temperature classifications; end connections; arrangement; dimensions; and required clearances. Include list indicating valve and its application. Include rated capacities; shipping, installed, and operating weights; furnished specialties; and accessories.

B. Product data on pipe, fittings, gaskets, and bolts. Include dimensions, specifications, and manufacturer. Provide pipe and valve application schedule.

C. Provide product data, including but not be limited to dimensions, specifications, manufacturer, installation and operation instructions, temperature and pressure ratings, end connections, and required clearances on piping specialties included in this Specification.

D. Welder Certifications - Furnish the names of pipe welders and welding operators employed by the Contractor to perform the Work who have been qualified to use the welding procedures which have been qualified in accordance with the specified pressure piping codes or AWS or NFPA standards.

E. Shop Drawings
   1. Where deviations from the Drawings and Specifications are proposed for any reason, submit shop drawings identifying proposed deviations showing layout of all piping, fittings, materials, dimensions, and fabrication and installation details. Submit a comparison table of the specified features and ratings of the specified item and those of the proposed deviation to allow a direct comparison.
   2. The review of deviations will be for pressure drop only. The review will not address clearances or accessibility. No dimensional or coordination check will be made.
   3. The Contractor has the sole responsibility to review the Drawings, coordinate piping fabrication, and provide clearances and access for installation, maintenance and balancing of this Work, and Work of other trades. Unless specifically dimensioned, Drawings indicate approximate locations only. The Contractor has the sole responsibility to locate and route the piping.
   4. Submit all layout shop drawings on not less than ¼ inch equals 1 foot scale drawings.

1.05 REFERENCES

A. Division 1 - Quality Control: Requirements for references and standards.

B. AGA Z21.22 - Relief Valves and Automatic Gas Shutoff Devices for Hot Water Supply Systems.

C. ANSI C111 - Rubber-Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings

D. ASME B16.3 - Malleable Iron Threaded Fittings.

E. ASME B16.5 - Steel Pipe Flanges and Flanged Fittings

F. ASME B16.9 - Factory-Made Wrought Steel Buttwelding Fittings

G. ASME B16.15 - Cast Bronze Threaded Fittings

H. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings.

I. ASME B16.22 - Wrought Copper and Bronze Solder Joint Pressure Fittings.

J. ASME B16.23 - Cast Copper Alloy Solder Joint Drainage Fittings - DWV.

K. ASME B16.24 - Cast Copper Alloy Pipe Flanges and Flanged Fittings.

L. ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV.

M. ASME B16.39 - Pipe Unions, Malleable Iron Threaded

N. ASME-B31.1 - Power Piping.

O. ASME B31.2 - Fuel Gas Piping.

P. ASME B31.5 - Refrigeration Piping.

Q. ASME B31.9 - Building Service Piping.

R. ASME B36.10M - Welded and Seamless Wrought Steel Pipe

S. ASME SEC IV - Construction of Heating Boilers.

T. ASME SEC IX - Welding and Brazing Qualifications.

U. ASTM A47 - Ferritic Malleable Iron Castings

V. ASTM A53 - Pipe, Steel, Black and Hot-Dipped Zinc Coated, Welded and Seamless.

W. ASTM A74 - Cast Iron Soil Pipe and Fittings.

X. ASTM A105 - Forgings, Carbon Steel, for piping components.

Y. ASTM A126 - Gray Iron Castings for Valves, Flanges, and Pipe Fittings

Z. ASTM A181 - Forgings, Carbon Steel, for General Purpose Piping

AA. ASTM A197 -Cupola Malleable Iron

AB. ASTM A234/A234M - Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures.

AC. ASTM A307 - Carbon Steel Bolts and Studs, 60,000 psi Tensile

AD. ASTM B32 - Solder Metal.

AE. ASTM B42 - Seamless Copper Pipe.

AF. ASTM B62 - Composition Bronze or Ounce Metal Castings

AG. ASTM B75 - Seamless Copper Tube

AH. ASTM B88 - Seamless Copper Water Tube.

AI. ASTM B306 - Copper Drainage Tube (DWV).

AJ. ASTM B584 - Copper Alloy Sand Castings for General Applications

AK. ASTM C564 - Rubber Gaskets for Cast Iron Soil Pipe and Fittings.

AL. ASTM B828 - Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings.

AM. AWS A5.8 - Specification for Brazing Filler Material

AN. AWWA C651 - Disinfecting Water Mains.

AO. MSS SP-80 - Bronze Gate, Globe, Angle and Check Valves.

AP. NFPA 30 - Flammable and Combustible Liquids Code

AQ. NFPA 54 - National Fuel Gas Code.

AR. NSF 61 - Domestic Water Pipe, Valves, and Fittings.

AS. Mechanical Code of New York State-Latest Edition

AT. Plumbing Code of New York State-Latest Edition

AU. Fuel Gas Code of New York State-Latest Edition

AV. FM - Factory Mutual Compliance

AW. UL - Underwriter's Laboratory Compliance

1.06 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:
   1. Protect internal parts against rust and corrosion.
   2. Protect threads, flange faces, grooves, and weld ends.
   3. Set angle, gate, and globe valves closed to prevent rattling.
   4. Set ball and plug valves open to minimize exposure of functional surfaces.
   5. Set butterfly valves closed or slightly open.
   6. Block check valves in either closed or open position.

B. Use the following precautions during storage:
   1. Maintain valve end protection.
   2. Store valves indoors and maintain at higher than ambient dew-point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use hand wheels or stems as lifting or rigging points.

D. Protect all flange faces with wood, plastic or soft metal to prevent damage to parts.

E. Protect all pipe threads from damage with plastic plugs or caps.

F. Mark and identify all piping materials in accordance with the Reference Standards specified herein.

PART 2 - PRODUCTS

2.01 GENERAL

A. When two or more valves of the same type are used in the same service, furnish all valves of this type from the same manufacturer.

B. Specific manufacturer's model numbers are cited in the following Piping Material Schedules to establish the desired quality and performance for each type valve or material. Equivalent products by other approved manufacturers are also acceptable. Approval shall be subject to review by the Architect/Engineer.

2.02 LOW PRESSURE STEAM AND CONDENSATE (INCLUDING VENTS, RELIEF AND DRAIN LINES)

Item	Pipe Size	Description	Manufacturer/ Model No.
Piping	All sizes	Schedule 40, seamless steel, ASTM A 53 Grade B (all condensate and blowdown piping shall be schedule 80 seamless steel)	Wheatland
Joints	2 inches & smaller 2 ½ inches & larger	Threaded Connections Welded Connections	
Fittings	2 inches & smaller 2 ½ inches & larger	125#, cast iron, threaded, ASTM A126 Standard Weight, Seamless steel, butt welded, ASTM A234	Anvil Weldbend
Flanges	2 ½ inches & larger	150#, forged steel, weld neck, bore to match pipe ID, ASTM A181	Weldbend
Bolts	All Sizes	Alloy Steel, Hex Head Bolts and Nuts, ASTM A307 Grade B	
Unions	2 inches & smaller	150#, malleable iron, brass trim, threaded ends ASTM A197, ASME B16.3	Anvil
Gaskets	All Sizes	Spiral wound metallic gaskets	Flexitallic Style LS/LSI
Gate Valves	2 inches & smaller 2 ½ inches & larger	Class 125, threaded connections, rising stem, union bonnet, solid wedge, bronze body and wedge, non-asbestos packing and ductile iron hand wheel. MSS-SP80, ASTM B62 Class 125, flanged connections, OS & Y, cast-iron body and bonnet, bronze trim, solid-wedge disc, 200 psig CWP rating. ASTM A-126 Class B	Nibco T-124 Nibco F-617-O
Swing Check Valves	2 inches & smaller 2 ½ inches & larger	Class 125, Y-pattern swing type, threaded connections, bronze body with TFE seat disc. MSS-SP80, ASTM B 62 Class 125, swing-type, flanged connections, cast iron body with bronze trim, non asbestos gasket. MSS-SP71, ASTM A-126 Class B	Nibco T413-Y Nibco F918-B
Globe Valves	2 inches & smaller 2 ½ inches & larger	Class 150, threaded connections, bronze body, bonnet, and seat, TFE disc, copper-silicone bronze stem, union-ring bonnet, 300 psig CWP rating. ASTM B-62 Class 125, flanged connections, cast-iron body and bonnet with bronze trim, 200 psig CWP rating. ASTM A-126 Class B	Nibco T-235-Y Nibco F-718-B
Ball Valves	2 inches & smaller	Two-Piece, Full-Port, threaded connections, bronze body, type 316 stainless-steel vented ball and stem, reinforced TFE seats, 150 psig SWP and 600-psig CWP ratings. MSS SP-110, ASTM B 584 Alloy C84400, ASME B1.20.1	Nibco T-585-70-66

Item	Pipe Size	Description	Manufacturer/ Model No.
Butterfly Valves	2 ½ inches & larger	Single flange, full lug, 720 psig CWP and 50 psig SWP rating, permanently lubricated 300-series stainless-steel bushings with graphite and modified PTFE seats, graphite packing and gasket, one-piece duplex stainless-steel stem and stainless-steel disc. Valves NPS 6 and smaller shall have lever-lock operator; valves NPS 8 and larger shall have weatherproof gear operator. MSS SP-88, API 609, ANSI B 1634A, ANSI B16.5	Nibco LCS7822-3/5

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS

A. Unless otherwise shown, route piping in the most direct manner parallel to building lines in accordance with the Drawings. Group piping whenever practical at common elevations.

B. Accurately align, support and connect piping without forcing.

C. Locate piping so that access to and clearance around equipment, and minimum piping headroom of 7 feet is maintained, except where otherwise shown.

D. Space piping so that insulation and flanges, if any, have at least 1 inch clearance after maximum movement.

E. Where pipe elevations are not shown, pitch supply and return lines to positive drain points and/or coils.

F. Provide accessible flanges or union connections on the supply and return connections of terminal equipment and other items which must be disconnected for maintenance. Where unions are furnished as an integral part of the equipment, additional unions are not required unless required for access to or removal of components. Arrange equipment piping connections so that maintenance can be made without removing large sections of pipe or relocating the equipment.

G. In Domestic Water Systems, connect branch lines to the top of the line. For all other liquid systems, connect branch lines to the bottom or lower half of the line, preferably the bottom.

H. Connect branch lines in steam service and compressed air to the top or upper half of the line, preferably the top.

I. Use fittings for all changes of direction. Bending of steel pipe is not permissible.

J. Clean all piping materials before installation to remove grease, loose dirt, mill scale and other foreign matter.

K. Provide air vents at all high points of water piping, and valved drains at all low points of water piping for complete venting, draining and flushing of the piping system. Locate and provide air vents at multiple high points that are necessary to prevent air binding in the piping system.

Install additional air vents and drains if directed by the Architect/Engineer, at no cost to the Owner. As a minimum provide drains and air vents

1. In each section of piping separated by valves.
2. On all coils.
3. For each riser, where riser or runout to riser has a valve installed.
4. In low point of piping to each down fed convector or radiator.

L. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment. Provide loops, pipe offsets and anchors.

M. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.

N. Install gate or ball valves for shut-off and to isolate equipment, parts of systems, or vertical risers.

O. Sleeve pipes passing through partitions, walls and floors.

P. Identify piping under provisions of “Mechanical System Identification” Specification.

Q. Provide escutcheons at all locations where piping installed exposed to view penetrates wall, partitions, floors and ceilings.

R. Conceal all pipe installations in walls, pipe chases, utility spaces, above ceilings, below grade or floors, unless indicated to be exposed to view.

S. Install flexible connectors at inlet and discharge connections of pumps and other vibration producing equipment.

T. Install strainers on the supply side of each control valve, pressure regulating valve, solenoid valve, trap, and elsewhere as indicated.

U. For pressurized liquid piping systems installed horizontally make reductions in pipe sizes using eccentric reducer fitting installed with the level side up to allow air venting.

V. For all nipples up to and including six inches in length provide extra-heavy shoulder type. For all nipples over six inches in length provide corresponding material, quality and thickness as the pipe on which they are used. Do not use close nipples. Provide nipples with designation mark of the manufacturer conforming to the ASTM pipe specifications for system served.

W. Make connections to all cooling and heating units with single or multiple cooling or heating coils in accordance with the manufacturer’s instructions and labeling on equipment

X. For pressures over 15 psig, use nipples and caps instead of plugs for permanent closures. Plugs in equipment provided by equipment manufacturers are acceptable.

Y. Do not install piping above electrical panels. Route piping around panels.

3.02 THREADED CONNECTIONS

A. Ream pipe ends to remove burrs.

B. Use only standard ANSI taper threads. Threads shall be full, sharp, clean, and free of fins and burrs.

C. Apply joint sealing tape or paste to male threads only. Do not use paste on compressed air lines. When sealing fuel oil piping, use a thread-sealing compound suitable for oil when making up joints. When sealing natural gas piping, use a thread-sealing compound suitable for natural gas when making up joints.

D. Do not use close or short nipples of a size where the length of unthreaded pipe is less than the width of a pipe wrench.

E. Thredolets or similar code-approved fittings may be used for branch connections.

F. Provide unions at all threaded valve locations to facilitate the removal of the valve.

G. Joint Sealing Compound; Hercules, RectorSeal or approved equal.

3.03 WELDED CARBON STEEL CONNECTIONS

A. Perform welding using qualified welders and procedures following specified reference standards.

B. Do not use mitered welds for elbows.

C. Welded branch connections may be used in place of welding tees provided that requirements of the applicable ASME Code for pressure piping, B31.1 and/or B31.9 are met.

D. Weldolets or similar code-approved fittings may be used for branch connections.

E. Qualifications of welders, welding procedures, performance of welders and welding operators are required complying with the requirements of ASME B31.9 and ASME Boiler and Pressure Vessel Code, Section IX. Keep records and certifications required by code on file and available for inspection.

F. Whenever welding is done close to walls, floors or building structure, thoroughly clean the surfaces of weld splatter. Remove weld splatter from the surface of all welds, pipe and pipe supports.

G. Provide long radius pattern for welding elbows unless otherwise shown on the Drawings.

H. Examine and inspect welded pipe joints as follows:
   1. Visually examine all welded pipe joints for imperfections using qualified representatives. Submit qualifications to the Architect/Engineer.
   2. Make available to the Architect/Engineer records of visual examinations upon request.
   3. Remove weld defects by grinding or chipping and repair or replace joints in accordance with approved procedures.
   4. Make shop and field welded joints available to the Owner for nondestructive inspection and examination upon request.

3.04 FLANGED CONNECTIONS

A. Arrange flange bolt holes to straddle the pipe vertical and horizontal centerlines, and match the orientation of mating flanges.

B. Install piping to equipment without strain.

C. Provide gaskets at all flanged connections suitable for the design and temperature of the fluid contained, and in accordance with Part 2 of this Section.

D. Mate flat face flanges together and raised face flanges together.

3.05 COPPER TUBING CONNECTIONS

A. Provide soldered or brazed in accordance with Part 2 of this Section.

B. Make soldered and brazed connections in accordance with the procedures in the current edition of the Copper Tube Handbook of the Copper Development Association.

C. Qualifications of brazers, brazing procedures, and performance of brazers and brazing operators are required in compliance with the requirements of ASME B31.1, ASME B31.9, and the Boiler and Pressure Vessel Code, Section IX. Keep records and certifications required by the code on file and available for inspection.

D. Make solder joints on all copper water piping with 95/5 solder. Absolutely no lead-based solder will be accepted.

E. Clean joints thoroughly before soldering.

F. Remove excess solder and flux with a cloth or brush to leave a uniform clean fillet.

G. For refrigeration copper tubing connections, comply with ASME B31.5. Make brazed joints on all refrigeration piping.

3.06 CONNECTIONS OF DISSIMILAR METALLIC MATERIALS

A. Isolate connections between dissimilar metallic materials using dielectric connections. Use dielectric unions or flanges that provide a complete isolation of the two ends, including bolts for flanges, using materials suitable for the design pressure, temperature and fluid contained.

3.07 VALVES

A. Provide valves of the same size as the pipe in which they are installed, unless shown otherwise on the Drawings. At pumps, match valve size to pipe size and not pump connection size.

B. Install valves with the stem on or above the horizontal. Install valves with the stem horizontal if requirements of headroom, access or chain operation must be met.

C. Pack valves and adjust glands before final acceptance.

D. Install valve extension stems or chain operators where the center of valve hand wheels is more than 6 feet-6 inches above the floor and valve is 2 ½" and larger. Prove chain hooks where

required to prevent fouling of chains on equipment and to clear walkways. Terminate chains approximately 3 feet-6 inches above the floor. Provide worm gear operators or impact hand wheels for all valves 6 inches and larger.

E. Extended Stems: Where insulation is indicated or specified, provide extended stems arranged to receive insulation and a protective sleeve that allows operation of the valve without breaking the vapor seal or disturbing the insulation.

F. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

G. Locate valves for easy access and provide separate support where necessary.

H. Install check valves for proper direction of flow and as follows:
   1. Swing Check Valves: In horizontal position with hinge pin level.
   2. Lift Check Valves: With stem upright and plumb

I. Install butterfly valves with stems horizontal to allow support for the disc and the cleaning action of the disc.

J. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

K. Install balancing valves with lengths of straight pipe upstream and downstream of valve as per manufacturer's instructions such that calibrated accuracy is maintained As a minimum provide straight lengths as per the following table;

REQUIRED STRAIGHT LENGTHS

Valve Size	Upstream (In Pipe Diameters)	Downstream (In Pipe Diameters)
½"-3"	3	1
4"-12"	5	2

L. Chain wheel Actuators- Valve actuation assembly with sprocket rim, brackets, and chain.
   1. Sprocket rim with Chain guides: Ductile Iron (Aluminum for applications exposed to weather), of type and size required for valve.
   2. Brackets: Type, number, size, and fasteners required to securely mount actuator on valve.
   3. Chain: Stainless steel, of size required to fit sprocket rim.
   4. Manufacturers:
      a. Babbitt Steam Specialty Co.
      b. Roto Hammer Industries

3.08 CONTROL VALVE INSTALLATION

A. Install all control valves so that the stem position is not more than 60 degrees from the vertical up position.

B. Install valves in accordance with the manufacturer's recommendations.

C. Install control valves so that they are accessible and serviceable, and such that actuators may be serviced and removed without interference from structure or other pipes, ducts and/or equipment.

D. Install isolation valves at control valves such that control valve body may be serviced without draining the supply/return side piping system. Install unions at all connections to screwed type control valves.

3.09 PRESSURE TESTING, FLUSHING AND CLEANING

A. Pressure test piping systems in accordance with applicable codes and as described herein.

B. Pressure testing - Schedule pressure testing so that it may be witnessed by the Architect/Engineer, Owner, or their representative. Perform tests in accordance with the following procedures:
   1. Before testing, complete the installation of each pipe line, including final supports, hangers and anchors. Perform testing before insulation or paint is applied for examination during the test. Clean piping and equipment of metal cuttings and foreign matter as they are installed.
   2. Codes - Pressure test piping to assure integrity of material and workmanship in accordance with the applicable ASME Code for pressure piping (B31) and New York State Code.
   3. Protection of Equipment - Protect equipment, instruments and piping specialties which are not included in the test by either disconnecting from the piping and blanking off the end of the pipe with a blind flange, plug or cap, or isolating by insertion of a line blind or spool piece as required. Disconnect pneumatic control lines and close all openings.
   4. Provide temporary restraints for expansion joints that cannot sustain reactions due to test pressure. If temporary restraints are impractical, isolate expansion joints from testing.
   5. Piping may be tested in sections or circuits as required for the progress of the work.
   6. Provide all systems to be pressurized with the appropriate gauges, certified calibrated by the manufacturer, and pressure-relieving devices.
   7. Install relief valve set at a pressure no more than 1/3 higher than the test pressure, to protect against damage by expansion of liquid or other source of overpressure during the test. Do not allow test pressure to exceed maximum pressure for any vessel, pump, valve, or other component in system under test.
   8. Records - Provide records of all tests showing line designation, test pressure, ambient temperature, date of test, retests and signature of witness.

C. Pneumatic Test Procedures - Perform pneumatic testing in accordance with ASME B31.9
   1. Prior to application of full pneumatic test pressure, perform a preliminary test at 10 psig for a minimum of ten (10) minutes to reveal any major leaks.
   2. After the preliminary test, apply pressure gradually in stages until test pressure is reached.
   3. Test durations:
      a. For all systems the minimum test duration is that required to thoroughly examine the system for leaks.
      b. Natural gas piping; Maintain test pressure for a minimum of one hour but not less than ½ hour for each 500 cubic feet of pipe volume. After test, purge the entire system of test gas.
      c. For all other systems maintain test pressure for a minimum of ten (10) minutes without fluctuation.
   4. Check all joints, valves, etc. for leaks with a thick soap-water solution.
   5. Repair leaks as specified under “Repair of Line Leaks”.

6. Repeat pneumatic test until there are no leaks.
7. Ensure that adequate protection is provided to prevent injury to persons or property during leak testing.
8. Test systems to the pressure indicated under “Pressure Testing Schedule”

D. Hydrostatic Test Procedures - Perform hydrostatic testing in accordance with ASME B31.9.
1. Perform test using the pressure indicated under “Pressure Testing Schedule”
2. After hydrostatic test pressure has been applied for at least two hours, examine piping, joints, and connections for leakage while maintaining test pressure. Repeat hydrostatic test until there are no leaks.
3. Repair leaks as specified under “Repair of Line Leaks”

E. Service Testing - Perform service testing in accordance with ASME B31.9.
1. For gases and steam and condensate service not over 15 psig, and for nontoxic, noncombustible, nonflammable liquids at pressures not over 100 psig and temperatures not over 200 degrees F a system test with the service fluid is acceptable. This exemption does not apply to natural gas piping.
2. Bring the piping system up to operating pressure gradually with visual examination at a pressure between one-half and two-thirds of design pressure. Make a final examination at operating pressure.
3. Repair leaks as specified under “Repair of Line Leaks”
4. Repeat service test until there are no leaks.

F. Repair of Line Leaks - Comply with the following procedures for repair of leaks. In each case retest after repairs are made.
1. Soldered/Brazed Joints - Remove solder/brazing alloy and reapply with proper flux.
2. Flanged Joints - Check to determine flange end alignment and that all bolts are uniformly tightened with the required torque. If leak persists, depressurize the line, remove gasket, examine flange end face, and insert new gasket.
3. Threaded Joints - Tighten joint to a required torque. If leak does not stop, replace pipe and/or fittings. Do not use pipe dope, cement or seal weld to stop pipe leaks.
4. Gasketed Joints - Remove existing gasket and insert new gasket.
5. Welded Steel Joints - Repair pipe in accordance with applicable ASME B31 code.
6. Leaks in Material - Leaks located in pipe or fitting material require the replacement of that section of pipe or fitting and a repeat of the entire system using the complete procedure required for that system. Caulking, welding or epoxy is not permitted. Repair all damage caused by leaks.

G. Flushing - Complete pressure testing requirements prior to flushing. Performance of the flushing may be witnessed by the Architect/Engineer, Owner, or their representative, provide ample notification to all parties in advance of flushing any system. Perform system flushing in accordance with the following procedures:
1. Flush all main and branch steam and liquid piping systems after pressure testing is complete with new potable water while draining the system at all low points. Isolate all connected equipment and flush individually.
2. Flushing for piping and equipment will be considered complete when water samples taken at all low points indicate clear discharge-with no visible solids. If not clear, continue flushing and sampling until discharge is clear.

H. Cleaning - Complete flushing requirements prior to cleaning. Performance of the cleaning may be witnessed by the Architect/Engineer, Owner, or their representative, provide ample

notification to all parties in advance of cleaning any system. Perform system cleaning in accordance with the following procedures:

1. Clean all steam and condensate lines by blowing them out with live steam. Discharge steam and condensate from each main and branch safely to atmosphere for a minimum of five minutes.
2. Clean all compressed air, instrument air, and fuel oil lines with oil-free dry compressed air at design pressure through each section so that they are blown free of dirt and debris.
3. Clean domestic water lines by flushing with water until effluent is visibly as clean as the flushing medium.
4. Clean hot water/chilled water lines as described below:
   a. When flushing discharge is clear, fill piping systems with water and sufficient approved alkaline cleaning material to remove dirt, oil and grease. Include all connected equipment in the cleaning.
   b. Vent system and place in operation, with automatic controls operating at set point temperature or an operating temperature designated by the Architect/Engineer. Circulate the solution through the system for a minimum of 4 consecutive hours.
   c. After 4 hours, drain system and flush with clean water until the pH at the farthest drain matches the clean water input. Keep strainers unplugged during the cleaning operations. Refill system with clean water.
5. Clean temporary pump strainers and strainers at coils, etc. every 2 hours periodically during cleaning procedures. Do not remove temporary strainers until all cleaning steps are completed and the operation of the system indicates that the system is free of all foreign matter.
6. Blow out all piping and equipment after cleaning and final flushing is completed and the system is drained with clean dry instrument air for a minimum of 15 minutes or until all water is expelled from the system. Upon completion seal the system by closing all drains and vents.
7. Following the Architect/Engineers approval of the above flushing and cleaning procedures, immediately fill each system and chemically treat and monitor in accordance with the “Chemical Treatment Systems” specifications.

I. Pressure Testing Schedule:

Service	Test Type	Design Operating Pressure (psig)	Test Pressure (psig)
Condensate Piping	Hydrostatic		1.5 times maximum working pressure, but not less than 100 psi
Refrigerant Piping	Hydrostatic		1.5 times maximum working pressure, but not less than 100 psi
Heating Hot Water Supply & Return	Hydrostatic		1.5 times maximum working pressure, but not less than 100 psi

3.10 PAINTING

A. Upon completion of the installation, remove all protecting materials, thoroughly remove all scale and grease and leave in a clean condition for painting. Paint in accordance with the requirements of the “Painting” Specification Section.

3.11 PIPE FREEZING

A. Where pipe freezing is required because of the lack of isolation valves, completely freeze piping using a jacket of liquid nitrogen. Provide the services of a company specializing in pipe freezing to perform the Work. Submit to the Architect/Engineer evidence that the company has performed this work for at least 5 years.

B. Approved Manufacturer's:
   1. Freeze Tech, Inc.
   2. Pro Tapping, Inc.

3.12 HOT TAPPING

A. Provide a hot tapping tool for cutting holes in piping under pressure without interrupting system operation and without release or loss of fluid.

B. Provide hot taps to permit new tie-ins to existing piping systems, insertion of flow meters, and permanent or temporary bypasses.

C. Hot tap rating, ½ through 48 inch line size: 1500 psig maximum operating pressure at 100 degrees F and 750 degrees F maximum operating temperature at 700 psig.

D. Provide the following information on the line to be tapped to the hot tap vendor before starting the Work:
   1. Line size, wall thickness, and pipe material.
   2. Fluid in line, and operating pressure and temperature.
   3. Dimensional information and restrictions, if any.
   4. Tap size and orientation (if other than 90 degrees perpendicular to run of the pipe, give full details).

E. Provide the services of a company specializing in hot taps to perform the Work. Submit to the Architect/Engineer evidence that the company has performed this work for at least 5 years.

F. Approved Manufacturer's:
   1. Topaz, Inc.
   2. Pro Tapping, Inc.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Pipe, pipe fittings, valves, and connections for piping systems.

B. Condensate Drain.

1.02 RELATED SECTIONS

A. Section 230529 - Pipe Hangers and Supports

B. Section 230555 - Mechanical System Identification

C. Section 230700 - Piping Insulation.

1.03 REFERENCES

A. Section 014500 - Quality Control: Requirements for references and standards.

B. ASTM D 1784 - Rigid Vinyl Compounds.

C. ASTM D 1785 - PVC Plastic Pipe, Schedule 40

D. ASTM D 2466 - PVC Plastic Fittings, Schedule 40

E. ASTM D 2665 - PVC Drain, Waste, and Vent Pipe and Fittings

F. ASTM D 2564 - Solvent Cements for PVC Pipe and Fittings

G. ASTM D 2321 - Underground Installation of Thermoplastic Pipe (non-pressure applications)

H. ASTM F 1668 - Procedures for Buried Plastic Pipe

I. ASTM F 1866 - Fabricated PVC DWV Fittings

J. NSF Standard 14 - Plastic Piping Components and Related Materials.

K. NSF Standard 61 - Drinking Water System Components - Health Effects.

1.04 SUBMITTALS FOR REVIEW

A. Section 013300 - Submittals: Procedures for submittals.

B. Product Data: Provide data on pipe materials, pipe fittings, and accessories. Provide manufacturers catalog information.

1.05 QUALITY ASSURANCE

A. Perform Work in accordance with State of New York and Town code.

B. Identify pipe with marking including size, ASTM material classification and ASTM specification.

1.06 REGULATORY REQUIREMENTS

A. Perform Work in accordance with the State of New York and the Town code.

1.07 DELIVERY, STORAGE, AND PROTECTION

A. Section 016500 – Product Delivery, Storage, and Handling: Transport, handle, store, and protect products.

B. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

C. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

1.08 ENVIRONMENTAL REQUIREMENTS

A. Section 014536 – Environmental Quality Control: Moisture control affecting products on site.

PART 2 - PRODUCTS

2.01 CONDENSATE DRAIN PIPING (DIAMETER LESS THAN OR EQUAL TO 1”)

A. Copper Type L Pipe and Fitting System.

B. Pipe and fittings shall be manufactured from Type L Copper.

C. Pipe and fittings shall be manufactured as a system and be the product of one manufacturer.

D. Pipe and fittings shall conform to National Sanitation Foundation (NSF) Standard 61 or the health effects portion of NSF Standard 14.

E. Testing with or transport/storage of compressed air or gas in Copper pipe or fittings shall not be permitted.

F. The system is intended for pressure drainage applications where the temperature will not exceed 140°F.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Section 013100 - Project Management and Coordination: Verification of existing conditions before starting work.

3.02 PREPARATION

A. Ream pipe and tube ends. Remove burrs.

B. Remove scale and dirt, on inside and outside, before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions and the requirements of the Plumbing Code of New York State.

B. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls. Effect changes in size with reducing fittings.

C. Install piping to maintain headroom, conserve space, and not interfere with use of space.

D. Group piping whenever practical at common elevations.

E. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to fittings. Refer to Section 230700.

F. Provide access where valves and fittings are not exposed. Coordinate size and location of access doors with Section 083100 - Access Doors and Panels.

G. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.

H. Sleeve pipes passing through partitions, walls and floors.

I. Identify piping under provisions of Section 230555.

3.04 APPLICATION

A. Install unions downstream at equipment or apparatus connections.

3.05 ERECTION TOLERANCES

A. Section 014500 - Quality Control: Tolerances.

B. Establish invert elevations, slopes for drainage to ¼ inch per foot minimum. Maintain gradients.

3.06 FIELD QUALITY CONTROL

A. Drainage System: Test plug all system openings with the exception of the system's highest point. Fill system with water to the point of overflow and subject the highest point to 10-foot head of water. The system shall be considered tight if the pressure is held for not less than 30 minutes without signs of leakage.

END OF SECTION

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. This section describes the thermometers and pressure gauges for monitoring liquids and gases in mechanical equipment and systems to be provided as part of the Work.

1.02 SUBMITTALS

A. Product Data: Submit manufacturer's catalog sheets and specifications.

B. Certification - Submit certified accuracy for all products specified.

PART 2 - PRODUCTS

2.01 APPROVED MANUFACTURERS

A. Subject to compliance with the specifications, provide products from the following manufacturers.
   1. Weksler Instruments
   2. H.O. Trerice Co.
   3. Taylor Instrument Co.
   4. Moeller Instrument Co.

2.02 THERMOMETERS FOR MEASURING LIQUID TEMPERATURE

A. Thermometer Scale Ranges: Provide thermometers, with scale range 1-1/2 times the actual working temperature required for the particular application, as approved. Provide maximum of 2 degrees between graduations and 10 degrees between numerals. When scale ranges are in excess of 100 degrees, the maximum range between numerals may be 20 degrees, or as otherwise approved for the particular application.

B. Thermometers: Provide red reading or magnified column industrial type, with wide angle of vision. Thermometers containing mercury are not permitted. Design and materials as follows:
   1. Case: Heavy one piece cast aluminum or extruded brass construction, with a clear acrylic plastic or glass lens. (Adjustable Angle)
   2. Scale: White enamel background with bold black figures and graduations. Provide 7 inch scale length for installation in piping and 9 inch length for installation in tanks and similar equipment.
   3. Separable Thermowell: Provide thermometers with matching brass (for water service) or stainless steel (for steam service) separable socket thermometer wells in accordance with manufacturer’s recommendations.
   4. Stem: Swivel neck design.
   5. Locking Device: Adjustable case locknut and adjusting screw function independently to provide full 360 degree positioning of thermometer case and stem to provide optimal visibility.

2.03 PRESSURE GAUGES

A. Provide pressure gauges with 4½" dial size with a flangeless stainless steel case, stainless steel friction ring and acrylic window. Provide brass movement with a bronze bourdon tube and brass socket.

B. Dial face: white with black figures; pointer with zero adjustment screw.

C. Accuracy: ±1% of scale range, ASME B40.1 Grade 1A.

D. Approved manufacturers: Trerice No. 620 or approved equal.

E. Provide stainless steel needle valves for all pressure gauges, Trerice or approved equal.

F. Provide steel coil siphons for gauges on steam service, Trerice No. 885 or approved equal.

G. Provide pressure snubbers for gauges on any service where pressure surges or pulsations are possible, Trerice No. 872 or approved equal.

2.04 COMBINATION PRESSURE/TEMPERATURE TEST STATIONS

A. Provide test stations where shown on the Drawings.

B. Test stations: “Pete’s Plug II”, 1/4” solid brass fitting to receive either a 1/8” OD temperature or pressure probe with two valve cores of Neoprene (Max 200°F at 500 PSI), or Nordel (Max 275°F at 500 PSI). Provide fitting with a color coded cap strap with gasket, rated at 1000 PSI at 140°F. Provide material compatible with piping system that test station is installed in as per manufacturer’s recommendations.

C. When installed in insulated lines, test connection provide Pete’s XL plug, extended stem type.

D. Supply to the Owner, upon completion of the Work, a pressure and temperature test kit consisting of a 0-100 PSI, 0-230 ft. of water pressure gauge with a Number 500 gauge adapter attached,. one 25-125°F and one 0-220°F pocket testing thermometer, an extra number 500 gauge adapter, and a protective carrying case.

E. Approved Manufacturer: - Pete’s Plug II by Peterson Equipment.

2.05 RANGES FOR TEMPERATURE AND PRESSURE GAUGES

Thermometer	Steam/Condensate	60° to 260°F
Pressure Gauges	Steam/Condensate	0 to 60 psig

Note: Select the proper range so that the average operating pressure and temperature falls approximately in the middle of the scale selected. It is the Contractor’s responsibility to determine the average operating range and select the scale appropriately, using the above table as an approximate guide.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Thermometers:
1. Install thermometers, of type and scale range as required for the particular application, at locations indicated on the Drawings or as required by the Specifications.
2. Install thermometers of type, scale range, and with case style, as required for the particular application, at locations indicated on the Drawings or Specified. Angle each thermometer so that it can be easily read from a standing position at floor level.
3. Where thermometers are installed in piping with insulation 2 inches thick or greater, provide thermometer wells with extension necks. Omit extension necks where thermometers are used on bare pipe or pipe with insulation less than 2 inches thick.
4. Where thermometer wells are installed in piping 2 ½ inches and smaller, increase the pipe size by a minimum of one pipe diameter to avoid restricting the flow in the pipe or install thermometers at elbows such that the stems protrude into the flowing medium.

B. Pressure Gauges:
   1. Install gages, of type and scale range as required for the particular application, at locations indicated on the Drawings or as required by the Specifications.
   2. For measuring liquid pressure, install gauges complete with stop cocks and drain cocks.
   3. Install siphon loops on pressure gauges when installing in steam lines.

C. Pressure Snubbers and Impulse Dampers:
   1. Install "pressure snubbers" in the piping connections to all gages installed in the suction and discharge piping connections to close coupled and base mounted circulating pumps driven by motors under 10 HP.

END OF SECTION

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. This Section describes steam specialties, including trap diffusers, thermostatic air vents, vacuum breakers, pressure reducing valves, moisture separators, and steam leak detection systems for steam and condensate piping systems.

1.02 REFERENCES

A. ASME - Boilers and Pressure Vessel Codes, SEC 8-D-Rules for Construction of Pressure Vessels.

B. ASME B31.1 - Power piping.

C. ASME B31.9 - Building Services piping.

1.03 SUBMITTALS

A. Product Data: Provide product data for manufactured products and assemblies required for the Work. Include component sizes, rough-in requirements, service sizes and finishes. Include product description, model and dimensions.

B. Submit manufacturer's instructions for maintenance and repair.

C. Provide a valve and specialty application schedule.

1.04 OPERATION AND MAINTENANCE DATA

A. Maintenance Data: Include installation instructions, assembly views, lubrication instructions and replacement parts list.

1.05 RELATED WORK

A. Section 232000 - Pipe, Valves and Fittings

1.06 QUALIFICATIONS

A. Companies specializing in manufacturing products specified with at least 5 years of experience and products that have been on the market for at least 3 years.

PART 2 - PRODUCTS

2.01 THERMOSTATIC AIR VENTS

A. Brass body, seat gasket and cap with stainless steel bellows, seat and spring, threaded connections suitable for 125 psig maximum operating pressure.

B. Approved manufacturers: - Spirax/Sarco Model T202

2.02 VACUUM BREAKERS

A. Steam Systems (Atmospheric Return)
   1. Provide Vacuum Breakers on all modulating or on/off heat exchangers and coils, except in vacuum return systems. Installed in the supply side between the control valve and equipment and be of hardened ball check valve design with all working parts manufactured

from stainless steel. Construction; Brass or stainless steel bodies as required for the application, suitable for operating conditions of 210 psig (or 304 psig) saturated steam.
2. Approved manufacturers: - Spirax/Sarco Model VB.
3. Install in a vertical position with cap at the top at the highest point of the circuit. Provide n isolating valve upstream of device.

B. Steam Systems (Vacuum Return)
1. Provide swing check valves of the type specified for the piping system between the coil and the vacuum return line. Provide isolation valves and union upstream and downstream of the device.

2.03 TRAP DIFFUSERS

A. Construction: Stainless steel construction with a knitted and compacted wire mesh diffusing element.

B. For venting applications provide on the outlet side of a steam trap or liquid drainer a suitable fitting to ensure that the discharge of condensate is towards the ground or another safe enclosure.

C. Approved manufacturers: Spirax/Sarco

2.04 LIQUID EXPANSION STEAM TRAPS

A. Solidly liquid-filled thermostatic element, and field-adjustable to discharge condensate at a fixed temperature below 212°F.

B. When used for freeze protection install with outlet downwards so trap is self draining.

C. Approved manufacturers: -Spirax/Sarco - Thermoton

2.05 STEAM TRAP LEAK DETECTION SYSTEM

A. Steam trap leak detection system comprised of an in-line sensor chamber or trap with Integral Sensor and a portable indicator box and cable for test purposes. Install sensor chambers on each trap with a ductile iron or steel body with screwed or socket weld connections incorporating a level-sensing electrode.

B. Provide one hand-held indicator box with positive colored pass and fail lights, an internal circuit check facility, UL listed as intrinsically safe for use in hazardous locations. Provide an indicator cable 4 feet in length with each box.

C. System operation: - Test for steam loss by detecting the presence or absence of condensate using the difference in conductivities of water and steam indicating trap operation by a green (pass) light or a red (fail) light on the indicator box.

D. Approved Manufacturers: Spirax/Sarco - Spira-Tec Leak Detection System

2.06 PILOT OPERATED PRESSURE REDUCING VALVES

A. Provide steam pressure-reducing valves in sizes and quantities as shown on the Drawings.

B. Operation and adjustment: - Pilot-operated, spring type, single seat, designed for dead-end service and guaranteed to control delivery pressure within plus or minus 1 psi. Manually adjustable within the range shown on the Drawings.

C. Construction: - Cast steel body with 150 or 300 psi ANSI flanges as indicated on the Drawings. Provide valves with stainless steel seat rings, trim and stem.

D. Approved Model: Spirax/Sarco Series 25

2.07 MOISTURE SEPARATORS

A. High efficiency internal baffle type having a pressure drop that does not exceed an equivalent length of pipe. Iron body with screwed or flanged connections. Provide a screwed bottom drain for the installation of a trap to discharge any accumulated liquid.

B. Approved Manufacturers: Spirax/Sarco S Series.

2.08 SAFETY AND RELIEF VALVES

A. General Requirements: Valves shall be as specified by ASME Code governing manufacture of such valves within scope of their particular usage, i.e., Heating Boilers, Power Boilers, Unfired Pressure Vessels, etc., shall be tested, rated and listed by National Board of Boiler and Pressure Vessel Inspections and shall bear symbol of ASME and NBB and PVI, unless otherwise specified. Liquid relief valves do not require ASME tagging or marking, or NBB and PVI Certification. Valves for applications specified shall conform to the ASME Code, Section IV, Heating Boilers and the following:
   1. Valves for Steam Heating Boilers: (Operating at 16 psig and above) shall be sized in accordance with ASME Boiler Code and the State of New York Department of Labor Code, shall be ASME Standard, ASME tested, and NBB & PVI certified and marked in accordance with ASME requirements. Valve body and yoke shall be cast steel ASTM A 216 Grade WCB and stem, disc, seat bushing or nozzle, adjusting ring, compression screw and other trim parts shall be stainless steel or equivalent material as approved by State. Valves shall have flanged inlet and outlet connections, with inlet connection being 300 lb. class.
   2. Valves for steam heating boilers operating at a maximum pressure of 15 psig shall have a maximum pressure setting of 15 psig. Sizing of valves shall be in accordance with ASME Table HG 400.1. Valve bodies shall be bronze or cast iron, with discs and seats of bronze.
   3. Valves for Unfired Pressure Vessels: Safety and safety relief valves on secondary side of unfired pressure tanks, water heaters and heat exchangers shall comply with Code requirements governing applicable equipment as outlined in ASME Code, Section IV, Article 4, Paragraph HG 400.3 and as follows: Secondary side of heat exchanger shall be protected by officially rated valves, set for same pressure or temperature as heretofore specified, when secondary side furnishes steam or hot water for purpose equivalent to purposes for which a boiler would be installed; valves for this purpose shall be sized in accordance with Unfired Vessel Code.
   4. Relief Valves For Use On The Discharge Side of Steam Pressure Reducing Valve Stations:
      a. When pressure reducing valve station is set to deliver steam at a pressure not to exceed 10 psig, safety relief valves shall comply with the requirements of the ASME Low Pressure Boiler Code, Section 4, Article 4 and shall be sized to relief all steam that reducing valve or by-pass valve can deliver when in a wide-open position, without permitting pressure to rise above 20 psig.
      b. When pressure reducing valve station is set to deliver steam at a pressure in excess of 10 psig, safety relief valves shall be manufactured in accordance with the ASME Power Code, Section 1, but may be sized in accordance with the Unfired Pressure Vessel Code. Valves shall relieve all steam the pressure reducing valve or by-pass valve can deliver, without permitting pressure to rise more than 10 percent above the maximum allowable working pressure.

B. End Connections: Unless otherwise specified, safety valves, relief valves and safety relief valves, in sizes 3/4 inch to 3 inches IPS inclusive, may be furnished with male or female pipe thread inlet and female pipe thread outlet; valves over 3 inches IPS must be furnished with 125 lb. or 250 lb. flanged inlet and may be equipped with female threaded or 125 lb. flanged outlet.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION

A. Install Work in accordance with manufacturer's instructions and as shown on the Drawings.

3.02 PRESSURE REDUCING VALVE INSTALLATION

A. Install pressure-reducing valve stations complete with strainer, moisture separator, stream trap, pressure gauges, and shutoff valves.

B. Install moisture separator in a horizontal position with the drain directly below the line. Install a float and thermostatic trap with strainer and isolation valves in the drain line.

C. Provide a shutoff valve on both sides of the pressure-reducing valve station.

D. Provide Type 304 stainless steel pressure-sensing line for pilot operated valves.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

A. Pipes, Valves, and Fittings: Section 232000.

1.02 SUBMITTALS

A. Product Data: Manufacturer’s catalog sheets, specifications and installation instructions for each type of trap.

B. Submit manufacturer's instructions for maintenance and repair.

PART 2 - PRODUCTS

2.01 TRAPS - GENERAL

A. Unless otherwise indicated, size combination float and thermostatic, inverted bucket and impulse traps of capacity to continuously discharge 2-1/2 times normal condensate rate of particular equipment or apparatus being served.

B. Combination float and thermostatic, and inverted bucket traps with integral strainers may be submitted for approval, in lieu of separate trap and strainer, if integral strainer and trap meet individual trap and strainer specifications.

2.02 COMBINATION FLOAT AND THERMOSTATIC TRAPS

A. Product Requirements: Design for 125 psig steam pressure, when used in systems up to 30 psig inclusive, and 175 psig steam pressure for systems operating from 31 psig, to 125 psig inclusive. Base maximum ratings on 1/2 psi differential through trap. Size orifices rated for the operating steam pressure. Wearing parts shall be renewable.

B. Materials: Cast iron body and cover; copper or stainless steel float; brass or stainless steel valve mechanisms; stainless steel valve seats and stainless steel or bronze valve heads. Air vent of the balanced pressure type with bronze, monel or stainless steel bellows; stainless steel or hard bronze valve head and seat.

2.03 INVERTED BUCKET TRAPS

A. Product Requirements: Design for 125 psig steam pressure in systems up to 125 psig inclusive, and 250 psig steam pressure for systems operating from 126 psig, to 250 psig inclusive. Base ratings on a 10 psi differential through traps, except rate at a 1/2 psi differential when used as a substitute for float and thermostatic traps. Size orifices rated for the operating steam pressure. Wearing parts shall be renewable.

B. Materials: Cast iron body and cover; stainless steel or brass bucket, and stainless steel wearing parts. When used as a substitute for a float and thermostatic trap, furnish integral air vent, with stainless steel or hard bronze valve head and seat.

2.04 CONTROLLED DISC TRAPS

A. Product Requirements: Design to operate against back pressure of up to 80 percent of inlet pressure. Self-adjusting type for all loads from 10 psig to 600 psig, designed for a working steam pressure up to 600 psig and a maximum temperature of 750 degrees F.

B. Material: Stainless steel, with one moving part.

2.05 THERMOSTATIC RADIATOR TRAPS

A. Design and Materials: Balanced pressure volatile liquid filled bellows type, designed to operate at 25 psig steam pressure. Furnish bronze bodies with finished terminals and brass union; thermostatic seamless tubing bellows of phosphor bronze, monel metal or stainless steel, with a minimum of seven folds, stainless steel valve head and seat.

2.06 LIQUID EXPANSION STEAM TRAPS

A. Solidly liquid-filled thermostatic element, and field-adjustable to discharge condensate at a fixed temperature below 212°F.

B. When used for freeze protection install with outlet downwards so trap is self draining.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install traps in accordance with the manufacturer's printed installation instructions.

B. Unless otherwise indicated, install gate valve, strainer, and union upstream from the trap; install union, check valve, and gate valve downstream from trap.

C. When steam trap discharge is elevated, provide a check valve after the trap.

D. Install dirt pockets/ drip legs at all drops and risers of steam condensate lines.

E. Provide steam trap tagging, identification and schedule in accordance with valve tagging specification.

F. When freezing is a possibility, install thermodynamic steam traps in the vertical position otherwise thermodynamic traps may be installed in the horizontal position.

G. When freezing is a possibility, install float and thermostatic steam traps with a Liquid Expansion Steam Trap below the drain tapping of the trap as recommended by the manufacturer.

H. Provide piping upstream and downstream of steam traps (from drip leg connection or equipment outlet connection to condensate return main connection) at least 1 pipe size greater than trap size.

I. Combination Float and Thermostatic Traps:
   1. Use to trap equipment controlled by a modulating valve. Do not install inverted bucket traps for this service.
   2. Use where indicated, to drip the end of each steam main, and at other points where indicated, for steam systems with operating pressures up to and including 15 psig.

J. Inverted Bucket Traps:
   1. Use where indicated, to drip all steam systems operating at pressures in excess of 15 psig, and for trapping equipment with a steam supply pressure in excess of 15 psig, when the steam supply is not modulated by a control valve.
   2. Bucket traps may be used, where approved, to drip the end of each steam main, and at other points where combination float and thermostatic traps are indicated, where the steam supply is not controlled by a modulating valve.

K. Controlled Disc Traps: Use where indicated.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Requirements of the following Division 23 Sections apply to this section:
   1. Section 230010 - General Mechanical Requirements.
   2. Section 230529 - Pipe Hangers And Supports
   3. Section 230555 - Mechanical System Identification
   4. Section 230700 - Pipe Insulation

1.02 SUMMARY

A. This Section includes refrigerant piping used for air conditioning applications. This Section includes:
   1. Piping, tubing, fittings, and specialties.
   2. Special duty valves.
   3. Refrigerants.

B. Products installed but not furnished under this Section include pre-charged tubing, refrigerant specialties, and refrigerant accessories furnished as an integral part of or separately with packaged air conditioning equipment.

1.03 SUBMITTALS

A. Product data for the following products:
   1. Each type of valve specified.
   2. Each type of refrigerant piping specialty specified.

B. Shop Drawings showing layout of refrigerant piping, specialties, and fittings including, but not necessarily limited to, pipe and tube sizes, valve arrangements and locations, slopes of horizontal runs, wall and floor penetrations, and equipment connection details. Show interface and spatial relationship between piping and proximity to equipment.

C. Brazer's Certificates signed by Contractor certifying that brazers comply with requirements specified under "Quality Assurance" below.

D. Maintenance data for refrigerant valves and piping specialties, for inclusion in Operating and Maintenance Manual specified in Division 01 and Division 23.

1.04 QUALITY ASSURANCE

A. Qualify brazing processes and brazing operators in accordance with ASME "Boiler and Pressure Vessel Code," Section IX, "Welding and Brazing Qualifications".

B. Regulatory Requirements: Comply with provisions of the following codes:
   1. ANSI B31.5: ASME Code for Pressure Piping - Refrigerant Piping.
   2. ANSI/ASHRAE Standard 15: Safety Code for Mechanical Refrigeration.

C. Mechanical Code of New York State

1.05 SEQUENCING AND SCHEDULING

A. Coordinate the installation of roof piping supports, and roof penetrations.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the Work include, but are not limited to, the following:

B. Refrigerant Valves and Specialties:
1. Alco Controls Div, Emerson Electric
2. Danfoss Electronics, Inc
3. EATON Corporation, Control Div
4. Henry Valve Company
5. Parker-Hannifin Corporation, Refrigeration and Air Conditioning Division
6. Sporlan Valve Company

2.02 PIPE AND TUBING MATERIALS

A. General: Refer to Part 3, Article "PIPE APPLICATIONS" for identification of systems where the below specified pipe and fitting materials are used.

B. Copper Tubing: ASTM B 280, Type ACR, hard-drawn straight lengths, and soft-annealed coils, seamless copper tubing. Tubing shall be factory cleaned, ready for installation, and have ends capped to protect cleanliness of pipe interiors prior to shipping.

C. Copper Tubing: ASTM B 88, Type L, hard-drawn straight lengths, and soft-annealed coils, seamless copper tubing.

2.03 FITTINGS

A. Wrought-Copper Fittings: ANSI B16.22, streamlined pattern for hard drawn and soft copper.

2.04 JOINING MATERIALS

A. Brazing Filler Metals: AWS A5.8, Classification BAg-1 (Silver)

2.05 VALVES

A. General: Complete valve assembly shall be UL-listed and designed to conform to ARI 760.

B. Globe: 450 psig maximum operating pressure, 275 deg. F maximum operating temperature; cast bronze body, with cast bronze or forged brass wing cap and bolted bonnet; replaceable resilient seat disc; plated steel stem. Valve shall be capable of being repacked under pressure. Valve shall be straight through or angle pattern, with solder-end connections.

C. Check Valves - Smaller Than 7/8 inch: 500 psig maximum operating pressure, 300 deg. F maximum operating temperature; cast brass body, with removable piston, Teflon seat, and stainless steel spring; straight through globe design. Valve shall be straight through pattern, with solder-end connections.

D. Check Valves - 7/8 inch and Larger: 450 psig maximum operating pressure, 300 deg. F maximum operating temperature; cast bronze body, with cast bronze or forged brass bolted bonnet; floating piston with mechanically retained Teflon seat disc. Valve shall be straight through or angle pattern, with solder-end connections.

E. Solenoid Valves: 250 deg. F temperature rating, 400 psig working pressure; forged brass, with Teflon valve seat, two-way straight through pattern, and solder end connections. Provide manual operator to open valve. Furnish complete with NEMA 1 solenoid enclosure with 1/2 inch conduit adapter, and 24 volt, 60 Hz. normally closed holding coil.

F. Hot Gas Bypass Valve: adjustable type, sized to provide capacity reduction beyond the last step of compressor unloading; and wrought copper fittings for solder end connections.

2.06 REFRIGERANT PIPING SPECIALTIES

A. General: Complete refrigerant piping specialty assembly shall be UL-listed and designed to conform to ARI 760.

B. Strainers: 500 psig maximum working pressure; forged brass body with monel 80-mesh screen, and screwed cleanout plug; Y-pattern, with solder end connections.

C. Moisture/liquid Indicators: 500 psig maximum operation pressure, 200 deg. F maximum operating temperature; forged brass body, with replaceable polished optical viewing window, and solder end connections.

D. Filter-driers: 500 psig maximum operation pressure; steel shell, flange ring, and spring, ductile iron cover plate with steel capscrews, and wrought copper fittings for solder end connections. Furnish complete with replaceable filter-drier core kit, including gaskets. Standard capacity desiccant sieves to provide micronic filtration.

E. Flanged Unions: 400 psig maximum working pressure, 330 deg. F maximum operating temperature; two brass tailpiece adapters for solder end connections to copper tubing; flanges for 7/8 inch through 1-5/8 inch unions shall be forged steel, and for 2-1/8 inch through 3-1/8 inch shall be ductile iron; four plated steel bolts, with silicon bronze nuts and fiber gasket. Flanges and bolts shall have factory-applied rust-resistant coating.

F. Flexible Connectors: 500 psig maximum operating pressure; seamless tin bronze or stainless steel core, high tensile bronze braid covering, solder connections, and synthetic covering; dehydrated, pressure tested, minimum 7 inch in length.

2.07 REFRIGERANT

A. Refrigerant No. 410A, in accordance with ASHRAE Standard 34.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine rough-in for refrigerant piping systems to verify actual locations of piping connections prior to installation.

3.02 PIPE APPLICATIONS

A. Use Type L, or Type ACR drawn copper tubing with wrought copper fittings and brazed joints above ground, within building. Use Type K, annealed temper copper tubing for 2 inch and smaller without joints, below ground and within slabs. Mechanical fittings (crimp or flair) are not permitted.

B. Install annealed temper tubing in pipe duct. Vent pipe duct to the outside.

C. If other than Type ACR tubing is used, clean and protect inside of tubing as specified in Article "CLEANING" below.

3.03 PIPING INSTALLATIONS

A. General: Install refrigerant piping in accordance with ASHRAE Standard 15 - "The Safety Code for Mechanical Refrigeration."

B. Install piping in as short and direct arrangement as possible to minimize pressure drop.

C. Install piping for minimum number of joints using as few elbows and other fitting as possible.

D. Arrange piping to allow normal inspection and servicing of compressor and other equipment. Install valves and specialties in accessible locations to allow for servicing and inspection.

E. Provide adequate clearance between pipe and adjacent walls and hanger, or between pipes for insulation installation. Use sleeves through floors, walls, or ceilings, sized to permit installation of full thickness insulation.

F. Insulate suction lines. Liquid line are not required to be insulated, except where they are installed adjacent and clamped to suction lines, where both liquid and suction lines shall be insulated as a unit.

G. Do not install insulation until system testing has been completed and all leaks have been eliminated.

H. Install branch tie-in lines to parallel compressors equal length, and pipe identically and symmetrically.

I. Install copper tubing in rigid or flexible conduit in locations where copper tubing will be exposed to mechanical injury.

J. Slope refrigerant piping as follows:
   1. Install horizontal hot gas discharge piping with 1/2" per 10 feet downward slope away from the compressor.
   2. Install horizontal suction lines with 1/2 inch per 10 feet downward slope to the compressor, with no long traps or dead ends which may cause oil to separate from the suction gas and return to the compressor in damaging slugs.
   3. Liquid lines may be installed level.

K. Install traps and double risers where indicated, and where required to entrain oil in vertical runs.

L. Use fittings for all changes in direction and all branch connections.

M. Install exposed piping at right angles or parallel to building walls. Diagonal runs are not permitted, unless expressly indicated.

N. Install piping free of sags or bends and with ample space between piping to permit proper insulation applications.

O. Conceal all pipe installations in walls, pipe chases, utility spaces, above ceilings, below grade or floors, unless indicated to be exposed to view.

P. Install piping tight to slabs, beams, joists, columns, walls, and other permanent elements of the building. Provide space to permit insulation applications, with 1 inch clearance outside the insulation. Allow sufficient space above removable ceiling panels to allow for panel removal.

Q. Locate groups of pipe parallel to each other, spaced to permit applying insulation and servicing of valves.

R. Exterior Wall Penetrations: Seal pipe penetrations through exterior walls using sleeves and mechanical sleeve seals. Pipe sleeves smaller than 6 inch shall be steel; pipe sleeves 6 inch and larger shall be sheet metal.

S. Fire Barrier Penetrations: Where pipes pass through fire rated walls, partitions, ceilings, and floors, maintain the fire rated integrity. Refer to Division 7 for special sealers and materials.

T. Make reductions in pipe sizes using eccentric reducer fittings installed with the level side down.

U. Install strainers immediately ahead of each expansion valve, solenoid valve, hot gas bypass valve, compressor suction valve, and as required to protect refrigerant piping system components.

V. Install moisture/liquid indicators in liquid lines between filter/driers and thermostatic expansion valves and in liquid line to receiver.

W. Install moisture/liquid indicators in lines larger than 2-1/8 inch OD, using a bypass line.

X. Install unions to allow removal of solenoid valves, pressure regulating valves, expansion valves, and at connections to compressors and evaporators.

Y. Install flexible connectors at the inlet and discharge connection of compressors.

3.04 HANGERS AND SUPPORTS

A. General: Hanger, supports, and anchors are specified in Division 23 Section "PIPE HANGERS AND SUPPORTS." Conform to the table below for maximum spacing of supports:

B. Install the following pipe attachments:
   1. Adjustable steel clevis hangers for individual horizontal runs less than 20 feet in length.

C. Support horizontal copper tubing in accordance with MSS SP-69 Tables 3 and 4, excerpts of which follow below:

NOMINAL PIPE SIZE (Inches)	ROD DIAMETER (Inches)	MAXIMUM SPACING (Feet)
1/2 to 3/4	3/8	5
1	3/8	6
1-1/4	3/8	6
1-1/2	3/8	8
2	3/8	8

D. Support vertical runs at each floor.

3.05 PIPE JOINT CONSTRUCTION

A. Brazed Joints: Comply with the procedures contained in the AWS "Brazing Manual."

B. WARNING: Some filler metals contain compounds which produce highly toxic fumes when heated. Avoid breathing fumes. Provide adequate ventilation.

C. CAUTION: When solenoid valves are being installed, remove the coil to prevent damage. When sight glasses are being installed, remove the glass. Remove stems, seats, and packing of valves, and accessible internal parts of refrigerant specialties before brazing. Do no apply heat near the bulb of the expansion valve.

D. Fill the pipe and fittings during brazing, with an inert gas (i.e., nitrogen or carbon dioxide) to prevent formation of scale.

E. Heat joints using oxy-acetylene torch. Heat to proper and uniform brazing temperature.

3.06 VALVE INSTALLATIONS

A. General: Install refrigerant valves where indicated, and in accordance with manufacturer's instructions.

B. Install globe valves on each side of strainers and driers, in liquid and suction lines at evaporators, and elsewhere as indicated.

C. Install a full sized, 3-valve bypass around each drier.

D. Install solenoid valves ahead of each expansion valve and hot-gas bypass valve. Install solenoid valves in horizontal lines with coil at the top.

E. Electrical wiring for solenoid valves is specified in Division 26. Coordinate electrical requirements and connections.

F. Thermostatic expansion valves may be mounted in any position, as close as possible to the evaporator.

G. Where refrigerant distributors are used, mount the distributor directly on the expansion valve outlet.

H. Install the valve in such a location so that the diaphragm case is warmer than the bulb.

I. Secure the bulb to a clean, straight, horizontal section of the suction line using two bulb straps. Do not mount bulb in a trap or at the bottom of the line.

J. Where external equalizer lines are required make the connection where it will clearly reflect the pressure existing in the suction line at the bulb location.

K. Install pressure regulating and relieving valves as required by ASHRAE Standard 15.

3.07 EQUIPMENT CONNECTIONS

A. The Drawings indicate the general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment to allow servicing and maintenance.

3.08 FIELD QUALITY CONTROL

A. Inspect, test, and perform corrective action of refrigerant piping in accordance with ASME Code B31.5, Chapter VI.

B. Repair leaking joints using new materials, and retest for leaks.

3.09 CLEANING

A. Before installation of copper tubing other than Type ACR tubing, clean the tubing and fitting using following cleaning procedure:
   1. Remove coarse particles of dirt and dust by drawing a clean, lintless cloth through the tubing by means of a wire or an electrician's tape.
   2. Draw a clean, lintless cloth saturated with trichloroethylene through the tube or pipe. Continue this procedure until cloth is not discolored by dirt.
   3. Draw a clean, lintless cloth, saturated with compressor oil, squeezed dry, through the tube or pipe to remove remaining lint. Inspect tube or pipe visually for remaining dirt and lint.
   4. Finally, draw a clean, dry, lintless cloth through the tube or pipe.

3.10 ADJUSTING AND CLEANING

A. Verify actual evaporator applications and operating conditions, and adjust thermostatic expansion valve to obtain proper evaporator superheat requirements.

B. Clean and inspect refrigerant piping systems in accordance with requirements of Division-23 General Mechanical Requirements

C. Adjust controls and safeties. Replace damaged or malfunctioning controls and equipment with new materials and products.

3.11 COMMISSIONING

A. Charge system using the following procedure:
   1. Install core in filter dryer after leak test but before evacuation.
   2. Evacuate refrigerant system with vacuum pump; until temperature of 35 deg F is indicated on vacuum dehydration indicator.
   3. During evacuation, apply heat to pockets, elbows, and low spots in piping.

4. Maintain vacuum on system for minimum of 5 hours after closing valve between vacuum pump and system.
5. Break vacuum with refrigerant gas, allow pressure to build up to 2 psi.
6. Complete charging of system, using new filter dryer core in charging line. Provide full operating charge.
7. Train Owner's maintenance personnel on procedures and schedules related to start-up and shut-down, troubleshooting, servicing, and preventative maintenance of refrigerant piping valves and refrigerant piping specialties.

B. Review data in Operating and Maintenance Manuals. Refer to Division 01 section "Project Closeout."

C. Schedule training with Owner with at least 7 days advance notice.

END OF SECTION

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. This Section describes the galvanized steel, flexible, and aluminum ductwork for HVAC duct systems in accordance with SMACNA Duct Construction Standards, except as otherwise specified.

B. The construction material for each ductwork system shall be as listed in the “Ductwork Material Schedule” at the end of this Section.

C. This Section also describes the fittings, access doors, hangers and supports, manual volume dampers and sealants for each ductwork system as required.

1.02 RELATED WORK

A. Section 230594 - Balancing of Air and Hydronic Systems.

1.03 REFERENCES

A. ASHRAE - Handbook Fundamentals; Latest Edition.

B. SMACNA - HVAC Duct Construction Standards Metal And Flexible (latest issue)

C. ASTM A 653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

D. ASTM B 209 - Specifications for Aluminum and Aluminum-Alloy Sheet and Plate.

E. NFPA 90A - Installation of Air Conditioning and Ventilating Systems.

F. UL 555 S - Fire Dampers & Smoke Dampers.

G. NFPA 96 - Standard for Commercial Cooking Operations

H. New York State Mechanical Code.

1.04 REGULATORY REQUIREMENTS

A. Construct ductwork to NFPA 90A and New York State Mechanical Code standards.

1.05 SUBMITTALS

A. Ductwork shop drawings for approval:
   1. Coordinate layout duct drawings that differ from ductwork shown on the Drawings.
   2. The review of deviations will be for pressure drop only. The review will not address clearances or accessibility to maintain or balance the air systems. No dimensional or coordination check of the shop drawings will be made. The Contractor has the sole responsibility to review the Drawings, coordinate ductwork fabrication, and provide clearances and access for installation, maintenance and balancing of this work, and work of other trades. Unless specifically dimensioned, Drawings indicate approximate locations only. The Contractor has the sole responsibility to locate and route the ductwork.

3. Deviations such as changing direction or transforming or dividing ductwork must maintain ductwork cross-sectional area and not exceed transformation taper of 15 degrees.
4. Plans and section showing all equipment and accessories.
5. Minimum 3/8 in. scale, double line, showing sizes, transverse joints, transitions, elevations, clearances and accessories; sections where required.

B. Shop details and catalog cuts of:
1. Ductwork construction, including gauge and bracing schedule.
2. Supports.
3. Dampers.
4. Turning vanes.
5. Fire dampers.
6. Access doors.
7. Flexible connections.
8. Other accessories.

1.06 QUALITY ASSURANCE

A. Construct all ductwork in accordance with referenced SMACNA Standards, except as otherwise stated. Ductwork pressure classifications shall be in accordance with referenced SMACNA Standards, except as otherwise specified.

B. For all uninsulated ductwork casings and plenums located outdoors, the reinforcement members shall be galvanized steel or stainless steel.

C. Construction pressure classification of ductwork are shown on the Drawings. If not shown, the pressure classification shall be greater than or equal to the maximum operating static pressure (minimum 2" w.c. pressure classification).

D. All ductwork shall be free from pulsation, chatter, vibration and objectionable noise. If any of these defects appear after a system is in operation, correct by removing and replacing, or reinforcing the ductwork, at no additional cost to the Owner.

E. For all galvanized steel ductwork, zinc coating shall be minimum G90 per ASTM A 653.

PART 2 - PRODUCTS

2.01 GALVANIZED STEEL RECTANGULAR DUCTS AND FITTINGS

A. Construct ducts of galvanized sheet steel meeting ASTM A 653 with G90 coating designation, and in accordance with the latest SMACNA HVAC Duct Construction Standards Metal And Flexible and pressure classifications as stated on the Drawings (minimum 2" w.c. pressure classification).

B. No ducts shall be less than No. 22 U.S. Gauge.

C. Piping, conduit and structure shall not penetrate ductwork. Where this condition cannot be avoided and with the written permission of the Architect/Engineer, follow SMACNA HVAC Duct Construction Standards Metal and Flexible, except that sides of transition sections shall slope a maximum of 15 degrees.

D. Provide 90-degree full-radius elbows with a centerline radius 1.5 times the duct width in the plane of the bend.

E. For elbows with centerline radius less than 1.5 times the width of the duct in the plane of the bend, provide turning vanes.

F. Provide square throat elbows with manufactured turning vanes.

G. All dissimilar metals shall be connected with flanged joints made up with fiber or neoprene gaskets to prevent contact between dissimilar metals. Flanges shall be fastened with bolts protected by ferrules and washers made of the same materials as the gaskets.

H. For split fittings, the split shall be proportional to the air flow. Construct per SMACNA HVAC Duct Construction Standards- Metal and Flexible.

I. Transitions and Offsets shall follow SMACNA HVAC Duct Construction Standards Metal and Flexible, except that sides of transitions shall slope a maximum of 15 degrees.

J. All branch take-offs perpendicular to the main shall be a 45 degree entry.

K. Longitudinal seams shall be of the Pittsburgh Lock type outlined in the SMACNA HVAC Duct Construction Standards Metal and Flexible.

L. Duct transverse joints shall be selected and used consistent with the static pressure class, applicable sealing requirements, materials involved, duct support intervals and other provisions for proper assembly of ductwork outlined in the SMACNA HVAC Duct Construction Standards - Metal and Flexible. Transverse joints T-25a, T-25b (Ductmate) shall only be used. Metal clips will only be allowed (NO PVC). Ductmate shall not be used for the following (use transverse joints T-15 through T-24 in these cases):
   1. The Ductmate '45' system shall not be used for applications with duct gauges heavier than 10 or lighter than 22.
   2. The Ductmate '35' system shall not be used for applications with duct gauges heavier than 16 GA. or lighter than 26 GA.
   3. The Ductmate '25' system shall not be used for application with duct gauges heavier than 20 GA. or lighter than 26 GA.

2.02 TURNING VANES

A. Manufactured with same material as ductwork that it is installed in and to the same pressure classification as ductwork that they are installed in.

B. Provide turning vanes in all square duct elbows and as noted on the Drawings.

C. Vanes shall be single thickness Small Vane as detailed in SMACNA HVAC Duct Construction Standards Metal and Flexible.

D. Where a rectangular duct changes in size at a square-throat elbow fitting, use single thickness turning vanes with trailing edge extensions aligned with the sides of the duct.

2.03 ACCESS DOORS

A. For access doors for use in ductwork receiving Fire Rated Blanket Insulation see Ductwork Insulation Section for requirements. Fabricate all other access doors in accordance with SMACNA Duct Construction Standards Metal And Flexible and as indicated.

B. For HVAC duct systems, construct doors of the same material as the ductwork. Minimum size of access doors shall be 8 inches by 8 inches, unless shown otherwise.

C. Provide walkthrough doors where shown. These doors shall have a minimum clear width of 18 inches. Provide doors with 8 inch square double pane wire glass windows. Locate windows not to exceed 5 feet-6 inches to centerline above finished floor of installed casing. Walk-through doors shall be operable from both sides of the door.

D. Access doors shall be insulated same as duct.

E. Provide with continuous neoprene gaskets around perimeter of access doors for airtight seal.

F. Provide all access doors with cam lock latches.

G. Provide access doors with watertight gaskets in shower room exhaust ductwork. Doors shall be of extra-heavy stainless construction.

H. All access doors serving a fire damper shall be painted red and shall have a label with white letters not less than ½ inch high reading “FIRE DAMPER”. No external ductwork insulation shall conceal a fire damper access door unless there is a label attached to the insulation indicating the exact location of the access door.

I. Provide access doors in following locations:
   1. Heaters and coils in ducts: entering and leaving side.
   2. Automatic dampers: linkage side.
   3. Fire damper, on both sides of ducts.
   4. Smoke detection heads.
   5. On both sides of ducts where necessary to provide maintenance accessibility to equipment on either side.
   6. VAV boxes
   7. Heating and Cooling coils.
   8. Fan Plenums.
   9. In-Line Fans (suction and discharge sides)
   10. Other items requiring access for service/maintenance

J. Where duct access doors are concealed the Contractor shall furnish and pay for installation of access doors to be mounted in the fire rated walls and ductwork enclosures. The access doors must be fire resistive and minimum 6” larger on each side then the duct access door for the above mentioned applications.

2.04 MANUAL VOLUME DAMPER

A. Fabricate in accordance with SMACNA Duct Construction Standards Metal And Flexible, and as indicated.

B. Fabricate single blade dampers for duct sizes up to 6 inches in height.

C. Fabricate multi-blade damper of opposed blade pattern with maximum blade sizes of 4 inches for ducts above 6 inches in height. Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.

D. Except in round ductwork 12 inches and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon or sintered bronze bearings.

E. Provide locking, indicating quadrant regulators on single and multi-blade dampers. Where rod lengths exceed 30 inches, provide regulator at both ends.

F. On insulated ducts mount quadrant regulators on stand-off mounting brackets, bases, or adapters.

G. Volume damper shall be provided at each duct branch and also where shown on the Drawings. Volume dampers must be installed at each branch even if they are not shown on the Drawing.

H. Approved Manufacturers:
   1. Ruskin Mfr. Co.
   2. Arrow Damper & Louver.
   3. Imperial Damper Co.

2.05 BACKDRAFT DAMPERS

A. Dampers shall be low-leakage, parallel-blade type. Damper sizes shall be suitable for duct sizes noted on the Drawings. The dampers shall be suitable for a minimum 4000 fpm velocity.

B. Damper frames shall be minimum No. 12 gauge galvanized steel blades shall be minimum No. 16 gauge galvanized steel or Type 6063-T5 aluminum with press-fit ball bearings.

C. Dampers shall be complete with adjustable counterweights and linkage for duty at .20 inches w.g. and 3500 fpm.

D. Provide neoprene or silicone rubber blade seals.

E. Approved manufacturers - Ruskin Manufacturing Company.

2.06 DUCT TEST HOLES

A. Cut or drill temporary test holes in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.

B. Permanent test holes shall be factory fabricated, air tight flanged fittings with screw cap. Provide extended neck fittings to clear insulation.

2.07 DUCT HANGERS AND SUPPORTS

A. Provide trapeze, strap or angle iron hangers meeting SMACNA HVAC Duct Construction Standards Metal and Flexible.

B. Materials of hangers, supports and fasteners shall conform to the manufacturer’s load ratings.

C. Hangers, supports, upper attachments and inserts shall be hot-dip galvanized steel or stainless steel.

D. Fasteners for HVAC duct systems shall be hot-dip galvanized steel, cadmium-plated steel or stainless steel.

E. Secure ductwork hangers attached to concrete structures and slabs with embedded inserts, anchor bolts or concrete fasteners. A safety factor of 5 should be used in selection of all inserts and expansion bolts (if applicable safety factor shall be determined by analysis of seismic loads and the greater safety factor shall be used).

F. Provide hangers and supports not more than 12 inches from each face of a horizontal elbow.

G. Plenums shall be supported to permit personnel to enter the plenum. If no structural steel design is shown on the Drawings, it is the responsibility of the Contractor to provide the services of a licensed structural engineer in the in which the project is to be constructed to submit a structural design for review.

2.08 SEALANTS

A. Where ducts are not continuously welded or soldered, provide sealants and gaskets as required to meet the specified duct leakage allowance.

B. Provide Gaskets, Sealers, Mastics and Tapes as manufactured by Ductmate.

2.09 FIRE DAMPERS

A. Fabricate and install in accordance with NFPA 90A and UL Safety Standard 555, and AMCA Standard 500.

B. Fire Resistance: For penetrations through construction rated less than 3 hours, 1 ½ hours. For penetrations through construction rated for 3 hours or more, 3 hours.

C. Pressure Differential Rating: 4 in. w. g.

D. Velocity Rating: 2000 fpm

E. Fabricate curtain type dampers of galvanized steel with interlocking blades. Provide stainless steel closure springs and latches for horizontal installations. Configure with blades in air stream. Fabricate fire dampers for vertical and horizontal position.

F. Fabricate multiple blade fire dampers with 16 gage galvanized steel frame and blades, oil-impregnated bronze or stainless steel sleeve bearings and plated steel axles, 1/8 x 1/2 inch plated steel concealed linkage, stainless steel closure spring, blade stops, and lock.

G. Fusible links, UL 33, shall separate at 165 degrees F.

H. Acceptable Manufacturers:
   1. Greenheck Model DFD 150, 200 and 350
   2. Ruskin Mfr. Co.
   3. Arrow Damper & Louver.
   4. Imperial Damper Co.

2.10 SMOKE DAMPERS

A. Fabricate and install in accordance with NFPA 90A and UL Safety Standard 555S, and AMCA Standard 500.

B. Leakage Class: Leakage Class II per UL 555S

C. Pressure Differential Rating: 4 In. w. g.

D. Air Flow Velocity: 2000 fpm

E. Elevated Temperature Rating: 350 Deg. F per UL555S

F. Fabricate smoke dampers with 16 gage galvanized steel frame and blades, sintered bronze sleeve type bearings rotating in polished extruded holes in the damper frame, 1/2 inch dia. (minimum) plated steel axles, linkage concealed in the jamb, stainless steel blade stops, silicone rubber blade edge seals, and stainless steel compression type jamb seals.

G. Actuators: 24 VDC, 2-position, external mounting

H. Acceptable Manufacturers:
   1. Greenheck Model SMD-200 and SMD-300.
   2. Ruskin Mfr. Co.
   3. Arrow Damper & Louver.
   4. Imperial Damper Co.

2.11 STANDARD FLEXIBLE CONNECTIONS

A. Provide fabric flexible duct connections.

B. Fabric shall be UL approved, fire-retardant, closely-woven glass, double coated with neoprene, and a minimum of 4 inches wide.

C. Shall be installed at duct connections to all ceiling hung fans and where vibration will be transmitted through ductwork.

D. Approved Manufacturers:
   1. “Ventglas” by Vent Fabrics, Inc.

2.12 HEAVY DUTY FLEXIBLE CONNECTIONS

A. Heavy Duty Flexible Connections shall be used in high pressure (greater than 2 in. w.c.), high temperature (greater than 150 degree F) air applications or where the gas is highly corrosive and the duct connector must be leak proof.

B. Flexible Connectors shall be flanged. If installed outdoors, all metallic components shall be stainless steel construction. Provide flexible connector materials of construction as recommended by the manufacturer for the pressure, temperature, and gas that is being used in air handler system.

C. Approved Manufacturers:
   1. Mercer Rubber Company

2.13 FLEXIBLE DUCTS

A. Comply with SMACNA HVAC Flexible Duct Construction Standards and NFPA 90A.

B. Provide where indicated on the Drawings Flexmaster Type TL- M Flexible Metal UL181 Class I Air Duct.

C. The duct shall be constructed of .005" thick 3003-H14 aluminum alloy in accordance with ASTM B209.

D. The duct shall be spiral wound into a tube and spiral corrugated to provide strength and flexibility.

E. The internal working pressure rating shall be at least 10" w.g. positive and 10" w.g. negative with a bursting pressure of at least 2½ time the working pressure.

F. The duct shall be rated for a velocity of at least 5500 feet per minute.

G. The duct must be suitable for continuous operation at a temperature range of -40° F to +250° F.

H. Factory insulate the flexible duct with fiberglass insulation. The R value shall be at least 4.2 at a mean temperature of 75° F.

I. Cover the insulation with a fire retardant metalized vapor barrier jacket reinforced with crosshatched scrim having a permeance of not greater than 0.05 perms when tested in accordance with ASTM E96, Procedure A.

J. Install flexible metal duct as per SMACNA HVAC Duct Construction Standards Metal and Flexible (Latest Edition).

K. Flexible ductwork shall only be installed where shown on the Drawings.

2.14 GALVANIZED STEEL ROUND DUCTS AND FITTINGS

A. Construct ducts of galvanized sheet steel meeting ASTM A 653 with G90 coating designation, and in accordance with the latest SMACNA HVAC Duct Construction Standards Metal and Flexible (Latest Edition).and pressure classifications as stated on the Drawings (minimum 2" w.c. pressure classification). When the ductwork pressure classification of these standards is exceeded, construct galvanized steel round exhaust ductwork in accordance with SMACNA Round Industrial Duct Construction Standards.

B. For ductwork through 60 inches in diameter, provide ducts of spiral lock-seam construction.

C. For ductwork over 60 inches in diameter, provide ducts of welded longitudinal seam construction.

D. For ductwork through 36 inches in diameter, use beaded sleeve transverse joints.

E. For ductwork over 36 inches in diameter, use gasketed-flanged Van Stone transverse joints. Gasket shall be “440 Gasket Tape” by Ductmate Industries, Inc.

F. For ductwork under a positive pressure through 96 in. diameter and 10 in. w. g. no reinforcing is required. For ductwork under a negative pressure in exposed areas use duct gauge that will minimize the use of reinforcing as appropriate for the pressures involved.

G. Draw band joints will not be permitted.

H. All elbows shall be constructed with a centerline radius equal to 1.5 times the duct diameter.

I. Provide matching galvanized steel fittings with continuously welded seams and joints.

J. All take-off connections to duct headers shall be made using tee (90 degrees), lateral (45 degrees), tee cross, lateral cross and “Y” branch fittings of the conical type. All fittings fabricated as separate fittings shall have continuous welds along all seams and joints.

K. The use of two-piece mitered, vaned elbows will be permitted only with specific written approval from the Architect/Engineer. Provide turning vanes as per SMACNA HVAC Duct Construction Standards Metal and Flexible.

PART 3 - EXECUTION

3.01 INSTALLATION - GENERAL

A. Install ductwork in accordance with applicable SMACNA Duct Construction Standards Metal And Flexible and approved submittals, and as shown on the Drawings. Duct sizes shown are inside clear dimensions. Where internal duct liners are used, duct sizes shown are inside clear of liner. For ductwork located outside, provide reinforcing sufficient to support wind and snow loads.

B. The Drawings indicate general locations of ducts. Make additional offsets or changes in direction as required at no additional cost to the Owner.

C. Wherever ductwork is divided, maintain the cross-sectional area.

D. Do not exceed 15-degree taper when constructing duct transitions.

E. Close the open ends of ducts during construction to prevent debris and dirt from entering.

F. Secure casings and plenums to curbs according to the requirements of the SMACNA HVAC Duct Construction Standards Metal and Flexible.

G. Make changes in direction with long radius bends.

H. All unused portions of HVAC supply air and exhaust louvers shall be blanked off with Louver Blank Off Panels, see Ductwork Insulation Section.

I. All welded and scratched galvanized steel surfaces shall be touched up with zinc-rich paint.

J. 2 Hr. rated wall penetration: Where small size duct (up to 6 inches x 6 inches) is penetrating a 2 Hr wall the duct shall be constructed of 16 gauge galvanized sheet metal.

K. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

L. Patch and repair all wall penetrations.

M. Insulation: Where Drawings and Specifications indicate that ducts are to be insulated make provisions for neat insulation finish around damper operating quadrants, splitter adjusting clamps, access doors, and similar operating devices. Metal collar equivalent in depth to

insulation thickness and of suitable size to which insulation may be finished to be mounted on duct.

3.02 FITTING INSTALLATION

A. Use minimum of four sheet metal screws per joint.

B. Apply approved sealant on duct-to-duct joint before assembly. Apply additional sealant after assembly to make joint airtight.

3.03 HANGER AND SUPPORT INSTALLATION

A. Support ductwork hung from building structure using trapeze, strap or angle iron hangers conforming to SMACNA HVAC Duct Construction Standards Metal and Flexible. Provide supplemental structural steel to span joists where required.

B. Do not support ductwork from furring, hung ceilings, metal floor deck, metal roof deck or from another duct or pipe.

C. Do not hang lighting fixtures or piping from ductwork.

D. Do not use perforated band iron.

E. Support ductwork at each change in direction.

F. Where duct connects to or terminates at masonry openings or at floors where concrete curbs are not used, provide a continuous 1 ½ inch by 1 ½ inch by 3/16 inch galvanized steel angle support around the ductwork. Bolt and seal the supports to the building construction using expansion bolts and caulking compound. Seal shall be watertight at floor or wall and duct such that a spill will no pass down through the opening.

G. Fasten plenums and casings connected to concrete curbs using continuous 1 ½ inch by 1 ½ inch by ¼ inch galvanized steel angle support. Set the angle support in a continuous bead of caulking compound and anchor it to the curb with 3/8 inch diameter anchors on 16 inch centers. Terminate sheet metal at curb and bolt to angle support. Seal sheet metal to curb with a continuous bead of caulking.

H. For insulated ductwork, install hangers on the outside of the insulation. To maintain the insulation value, inset a piece of 1 inch thick, 6 pcf fiberglass board with a foil/scrim/kraft (FSK) jacket at these supports.

3.04 SEALING

A. Where ductwork is not continuously welded, soldered or gasketed, make seams and joints airtight with sealants.

B. Install the sealants in accordance with the sealant manufacturer’s instructions and recommendations.

C. Seal all ductwork seams, joints, fastener penetrations and fittings connections with sealants in accordance with SMACNA Seal Classifications as required by SMACNA Duct Pressure Classification. All ductwork, regardless of pressure classification, shall have a minimum Seal Class B.

D. Completely fill all voids when liquid sealing ductwork. Several applications may be necessary to fill voids caused by shrinkage or runout of sealant.

3.05 DUCT-MOUNTED DEVICES AND ACCESS DOORS

A. Install all dampers, coils, airflow measuring stations, humidifiers and other duct-mounted devices, specified in other sections of the specifications or as shown and provide transformations to dimensions as required. Install devices in accordance with manufacturer's recommendations. Install dampers and coils a minimum of 4 feet away from changes indirection or transitions. Allow five (5) equivalent diameters of straight ductwork upstream and one (1) equivalent diameter of straight ductwork downstream of airflow measuring devices.

B. Install access doors in ductwork, plenums and where specified and as shown. Provide access doors for inspection and cleaning automatic dampers, at fire dampers, and elsewhere as indicated. Provide minimum 18 x 18 inch size for shoulder access and as indicated. Install access doors in the bottom of the ductwork unless they are inaccessible in this location; then install the access doors in either the side or top of the ductwork, whichever is more accessible.

C. Provide fire damper at locations indicated, and where outlets pass through fire rated components and where required by authorities having jurisdiction. Install with required perimeter mounting angles, sleeves, breakaway, duct connections, corrosion resistant springs, bearings, bushings and hinges.

D. Demonstrate re-setting of fire dampers to authorities having jurisdiction and Engineer.

E. Provide flexible connections immediately adjacent to equipment in ducts associated with motorized equipment. Cover connections to medium pressure fans with leaded vinyl sheet, held in place with metal straps.

F. Pilot Ports: Locate pilot ports for measuring airflow in each main supply duct at the downstream end of the straightest run of the main and before the first branch take-off. Form pilot ports by drilling 7/16 inches holes in the duct, lined up perpendicular to airflow on maximum 8-inch centers and at least three to a duct, evenly spaced. Holes to be plugged with plastic plugs. Provide access to these for future rebalancing.

3.06 CONTROL DAMPER INSTALLATION

A. Duct openings shall be free of any obstruction or irregularities that might interfere with blade or linkage rotation or actuator mounting. Duct openings shall measure 1/4" larger than damper dimensions and shall be square, straight, and level.

B. Individual damper sections, as well as entire multiple section assemblies, must be completely square and free from racking, twisting, or bending. Measure diagonally from upper corners to opposite lower corners of each damper section. Both dimensions must be equal ±1/8".

C. Follow manufacturer's instructions for field installation of control dampers. Unless specifically designed for vertical blade application, dampers must be mounted with blade axis horizontal.

D. Install extended shaft or jackshaft per manufacturer's instructions. (Typically, a sticker on the damper face shows recommended extended shaft location. Attach shaft on labeled side of damper to that blade.)

E. Damper blades, axles, and linkage must operate without binding. Before system operation, cycle damper after installation to assure proper operation. On multiple section assemblies, all sections must open and close simultaneously.

F. Provide a visible and accessible indication of damper position on the drive shaft end.

G. Support ductwork in area of damper when required to prevent sagging due to damper weight.

H. After installation of low-leakage dampers with seals, caulk between frame and duct or opening to prevent leakage around perimeter of damper.

I. Dampers that are to be installed with air flow measuring stations shall be installed in duct runs with a minimum amount of straight duct upstream and downstream of the damper to allow accurate flow readings by the air flow measuring station. The Contractor shall verify with the manufacturer the length of straight duct runs required.

3.07 SMOKE DAMPER INSTALLATION

A. Install dampers in accordance with manufacturer's UL Installation Instructions, labeling, and NFPA 90A at locations indicated on the Drawings.

B. Dampers shall be accessible to allow inspection, adjustment, and replacement of components. Access doors in ductwork, plenums, walls, ceilings, or other general building construction shall be provided. Coordinate with other trades.

C. Where a damper is installed within a duct, a smoke detector shall be installed in the duct within 5 feet of the damper with no air outlets or inlets between the detector and the damper. The detector shall be listed for the air velocity, temperature and humidity anticipated at the point where it is installed. Other than in mechanical smoke control systems, dampers shall be closed upon fan shutdown where local smoke detectors require a minimum velocity to operate.

D. Where a damper is installed above smoke barrier doors in a smoke barrier, a spot-type detector listed for releasing service shall be installed on either side of the smoke barrier door opening.

E. Where a damper is installed within an unducted opening in a wall, a spot-type detector listed for releasing service shall be installed within 5 feet horizontally of the damper.

F. Where a damper is installed in a corridor wall or ceiling, the damper shall be permitted to be controlled by a smoke detection system installed in the corridor.

G. Where a total-coverage smoke detector system is provided within areas served by an HVAC system, dampers shall be permitted to be controlled by the smoke detection system.

3.08 DUCTWORK AND EQUIPMENT LEAK TESTING

A. Leak test each ductwork system within ten working days of ductwork installation and before ductwork is insulated and concealed.

B. All HVAC ductwork shall be tested. Follow general procedures and use apparatus as outlined in the SMACNA HVAC Air Duct Leakage Test Manual.

C. Test all ductwork at 100 percent of the pressure classifications indicated.

D. Air testing during erection shall include separate leakage air tests of air riser, horizontal distribution system, and, after all ductwork is installed and the central stations apparatus is erected, leakage testing of the whole system.

E. Use Appendix C in the SMACNA HVAC Air Duct Leakage Test Manual to determine allowable leakage rates for each duct section tested.

F. All devices, including access doors, airflow measuring devices, sound attenuators, damper casings, sensors, test ports, etc. that are furnished and/or installed in duct systems shall be included as part of the duct system leakage allowance. All joints shall be inspected and checked for audible leakage, repaired, if necessary, and retested. Duct leakage shall be limited to the following:

Average Size of Run Diameter or Equivalent	***A/100 ft. Run**
12 inches or less	10
20 inches or less	15
30 inches or less	25
40 inches or less	30
50 inches or less	30
* (A) = Permissible loss in cfm	

G. Total system leakage shall not exceed 10 percent of the scheduled design capacity of the system when tested as per SMACNA testing methods.

3.09 PAINTING

A. Upon completion of the installation, remove all protecting materials, thoroughly remove all scale and grease and leave in a clean condition for painting. Ductwork to be painted shall be as shown on the Drawings. Painting shall be in accordance with the requirements of the “Painting” Specification Section.

3.10 DUCTWORK MATERIAL SCHEDULE

AIR SYSTEM	**DUCTWORK MATERIAL**
Supply, Outside Air & Exhaust Ductwork	Galvanized Steel

END OF SECTION

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. Provide exhaust fans, as specified herein, of sizes and capacities scheduled and in locations shown on drawings.

1.02 REFERENCE CODES AND STANDARDS

A. AMCA 99 - Standards Handbook

B. AMCA 210 - Laboratory Methods of Testing Fans for Rating

C. AMCA 300 - Reverberant Room Method for Sound Testing of Fans

D. ASHRAE Handbook, HVAC Applications Volume “Sound and Vibration Control”

E. UL listed and labeled.

1.03 SUBMITTALS

A. Shop Drawings - Show fan layout, housing, materials, gauges, dimensions, weights and installation details

B. Product data - Manufacturer’s fan performance (data includes cfm, rpm, bhp, motor nameplate data, tip speed, outlet velocity and static pressure) and sound performance (data includes sound power level ratings by octave bands) as tested in accordance with AMCA Standards 210 and 300.

C. Fan performance curves - Submit curves for all fans with system performance shown, and for plus or minus 10 percent and plus or minus 20 percent change in fan rpm. Curves shall include plotted rpm, horsepower, cfm, static pressure, and fan surge line and operating point.

D. Certified AMCA Ratings - Submit ratings for air and sound performance.

E. UL Listing - Submit listing if specified.

1.04 QUALITY ASSURANCE

A. Factory balance each fan statically and dynamically, test run before shipment, and key fan wheel to fan shaft. Fans shall operate quietly and without pulsation or vibration. Conduct sound power level tests for each type fan at the factory in accordance with AMCA 300.

B. Fans shall operate in the stable range of their performance curves.

C. The fan external static pressures shown in the schedules are those required by the ductwork and apparatus, and do not include the internal and intake fan losses, inlet vanes or integral outlet dampers, inlet screens, outlet velocity heads or drive losses.

D. Factory performance test each fan assembled in or as part of apparatus specified to be performance tested. Test shall display scheduled performance characteristics, using certified, calibrated testing instruments provided by the manufacturer of the apparatus.

E. All fan performance ratings shall be based up on factory tests performed in accordance with AMCA 210. One fan of each type specified shall have actual factory performance tests performed prior to shipment. All fans shall be certified by AMCA and carry its seal.

PART 2 - PRODUCTS

2.01 CENTRIFUGAL DOWNBLAST FANS

A. Roof mounted exhaust fans shall be of the downblast direct drive type.

B. The fan housing shall fan housing shall consist of the motor cover, shroud, curb cap and lower windband, and shall be constructed of heavy-gauge aluminum. Housing shall have a rigid internal support structure and leakproof design. The fan shroud shall be one-piece with a rolled bead for extra strength, which directs exhaust air downward. The low windband shall be one piece with formed edges for added strength and the curb cap shall include prepunched mounting holes to ensure correct attachment to the roof.

C. The fan wheel shall be centrifugal, non overload, backward-inclined, constructed of aluminum and shall include a wheel cone carefully matched to the inlet cone for precise running tolerances. Wheels shall be statically and dynamically balanced.

D. Motors shall be permanently lubricated and carefully matched to the fan loads. Motors shall be readily accessible for maintenance. Motors shall be mounted on true vibration isolators, out of the airstream. Each vibration isolator shall be sized to match the weight of each fan.

E. A NEMA 1 disconnect switch shall be provided as standard. Factory wiring shall be provided from motor to the handy box.

F. All fans shall bear the AMCA Certified Ratings Seal for both sound and air performance.

G. Each fan shall bear a permanently affixed manufacturer's nameplate containing the model number and individual serial number for future identification.

H. Fans shall be manufactured by Greenheck or approved equal.

2.02 CEILING EXHAUST FANS

A. Ceiling mounted exhaust fans shall be of the centrifugal direct drive type. The fan housing shall be constructed of heavy gauge galvanized steel. The housing interior shall be lined with 0.5 in. acoustical insulation. The outlet duct collar shall include an aluminum backdraft damper and shall be adaptable for horizontal or vertical discharge.

B. The grille shall be constructed of high impact polystyrene. Grilles shall be non-yellowing.

C. The access for wiring shall be external. The motor disconnect shall be internal and of the plug in type. The motor shall be mounted on vibration isolators. The fan wheel(s) shall be of the forward curved centrifugal type, constructed of galvanized steel and dynamically balanced.

D. All fans shall be licensed to bear the AMCA Certified Ratings Seals for sound and air performance and shall be U.L. Listed and C.S.A. approved.

E. Ceiling exhaust fans shall be Model SP as manufactured by Greenheck or approved equal.

PART 3 - EXECUTION

3.01 GENERAL

A. Install fans, including all necessary structural supports and bracing as scheduled and located on the contract drawings in accordance with manufacturer's instructions and approved submittals.

B. Connect duct to fans to allow for straight and smooth air flow.

C. Provide flexible connections (minimum of 4") between fan and duct.

D. Install fan level: +/- 5 degrees vertical. Final installation shall be free of all leaks from both fan and associated ductwork.

3.02 START-UP, TESTING, DEMONSTRATION

A. Start-up fans after checkout to insure proper alignment and phased electrical connections.

B. Test fans individually and as part of system.

C. Insure fans are properly interlocked with supply fans and with control system.

D. Demonstrate operation to Owner and instruct maintenance personnel in operation of equipment.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Variable Frequency Drive (VFD).

1.02 RELATED SECTIONS

A. Section 230555 - Mechanical System Identification.

1.03 REFERENCES

A. NEMA ICS 3.1 - Safety Standards for Construction and Guide for Selection,

B. Installation and Operation of Variable Frequency Drive Systems

C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

D. UL, and cUL Approved

E. IEEE Standard 519

F. UL 508C (Power Conversion)

G. UL 508A (Industrial Control Panel)

H. CSA 22.2 No. 14-95 (Industrial Control Equipment)

I. UL 1995 (Plenum rating)

J. EN 61800-5-1 (LVD)

K. EN 61800-3 First Environment restricted

L. CE mark 2006/95/EC LVD

M. CE mark 2004/108/EC

N. RoHS

O. IBC 2006 Seismic - referencing ASC 7-05 and ICC AC-156

1.04 SUBMITTALS

A. Submit under provisions of Section 013300.

B. Shop Drawings shall include: Wiring diagrams, electrical schematics, front and side views of enclosures, overall dimensions, conduit entrance locations and requirements, nameplate legends, physical layout and enclosure details.

C. Product Data: Provide data sheets showing; voltage, ratings of customer use switching and over-current protective devices, short circuit ratings, and weights.

D. Manufacturer's Installation Instructions and Technical Manuals: Indicate application conditions and limitations of use stipulated by product testing agency specified under regulatory requirements. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of adjustable speed drive. Document the sequence of operation,

cautions and warnings, trouble shooting procedures, spare parts lists and programming guidance.

1.05 QUALITY ASSURANCE

A. VFD shall have a minimum MTBF (mean time between failures) rating of 28 years (245,280 Hours).

1.06 OPERATION AND MAINTENANCE DATA

A. Submit under provisions of Section 017823.

B. Include instructions for starting, programming, and operating VFD, and describe operating limits, which may result in hazardous or unsafe conditions.

1.07 QUALIFICATIONS

A. Manufacturer must have a minimum of 25 years of documented experience,

B. specializing in variable frequency drives.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site, under provisions of Section 016500.

B. Accept VFD on site in original packing. Inspect for damage.

C. Store in a clean, dry space. Maintain factory wrapping, or provide an additional

D. heavy canvas or heavy plastic cover, to protect units from dirt, water, construction debris, and traffic.

E. Handle carefully, in accordance with manufacturer's written instructions, to avoid damage to components, enclosure, and finish.

1.09 WARRANTY

A. Provide VFD warranty, for one year from date of startup, not to exceed 18 months from date of

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. VFD shall be Z1000 type, manufactured by Yaskawa America Inc or approved equal.

B. Motors should be inverter duty rated, per NEMA MG1 parts 30 and 31, for motor-drive compatibility.

2.02 DESCRIPTION

A. Provide enclosed variable frequency drives suitable for operation at the current,

B. voltage, and horsepower indicated on the schedule. Conform to requirements of NEMA ICS 3.1.

2.03 RATINGS

A. VFD must operate, without fault or failure, when voltage varies plus 10% or minus 15% from rating, and frequency varies plus or minus 5% from rating.

B. Displacement Power Factor: 0.98 over entire range of operating speed and load.

C. Service factor: 1.0

D. Operating Ambient Temperature: NEMA 1 (IP20): -10°C to 40°C (14°F to 104°F)

E. Ambient storage temperature: -20°C to 70°C (-4°F to 158°F)

F. Humidity: 0% to 95% non-condensing.

G. Altitude: to 3,300 feet (1000m), higher altitudes achieved by derating.

H. Vibration: 9.81m/s2 (1 G) maximum at 10 to 20 Hz, 2.0 m/s2 (0.2 G) at 20 Hz to 55 Hz.

I. Minimum Efficiency: 96% at half speed; 98% at full speed.

J. Starting Torque: 100% starting torque shall be available from 0.5 Hz. to 60 Hz.

K. Overload capability: 110% of rated FLA (Full Load Amps) for 60 seconds; 150% of rated FLA peak.

L. Controlled speed range of 40:1

M. The VFD's shall include EMI/RFI filters. The onboard RFI filter shall allow the entire VFD assembly to be CE Marked and the VFD shall meet product standard EN 61800-3 for the First Environment restricted. No Exceptions.

N. Total Harmonic Distortion (THD) compliance:
   1. Given the information provided by the customer's electric power single line diagram and distribution transformer data, the VFD manufacturer shall carry out an analysis of the system. The analysis reviews the potential for the proposed equipment, and any existing equipment, to meet IEEE 519 (tables 10.2 and 10.3) recommendations at the Point of Common Coupling (PCC). The result of the analysis shall determine if additional power quality improvement measures should be included in the proposal to meet the THD recommendations of IEEE 519. The PCC shall be at the primary side of the main distribution transformer.

O. VFDs must be suitable for use on a circuit capable of delivering not more than 100,000 RMS symmetrical amperes.

2.04 DESIGN

A. VFD shall employ microprocessor based inverter logic, isolated from all power circuits.

B. VFD shall include surface mount technology with protective coating.

C. VFD shall employ a PWM (Pulse Width Modulated) power electronic system, consisting of:
   1. Input Section:
      a. VFD input power stage shall convert three-phase AC line power into a fixed DC voltage via a solid state full wave diode rectifier, with MOV (Metal Oxide Varistor) surge protection.

b. A minimum of 5% DC bus impedance to minimize reflected current.

2. Intermediate Section:
   a. DC bus as a supply to the VFD output Section shall maintain a
   b. fixed voltage with filtering and short circuit protection.
   c. DC bus shall be interfaced with the VFD diagnostic logic circuit, for continuous monitoring and protection of the power components.
3. Output Section
   a. Insulated Gate Bipolar Transistors (IGBTs) shall convert DC bus voltage to variable frequency and voltage.
   b. The VFD shall employ PWM sine coded output technology to power the motor.
   c. Output reactors shall be provided on the output side of the drive for motor protection.

D. The VFD must be rated for operation at a carrier frequency of 5 kHz to satisfy the conditions for current, voltage, and horsepower as indicated on the equipment schedule.

E. VFD shall have an adjustable carrier frequency, from 1 kHz to 12.5 kHz (Above 250 HP from 1 kHz to 5 kHz)

F. VFD Must include an adjustable dynamic noise control for quiet motor operation

G. VFD shall have embedded Building Automation System (BAS) protocols for network communications; BACnet and Modbus/Memobus. These protocols shall be accessible via a RS-422/485 communication port.

H. VFD shall include two independent analog inputs. Selectable for either 0-10 VDC or 4-20 mA. Either input shall respond to a programmable bias and gain.

I. VFD shall include a minimum of seven multi-function digital input terminals, capable of being programmed to determine the function on a change of state. These terminals shall include, but not limited to:
   1. Remote/Local operation selection
   2. Customer Safeties
   3. BAS / Damper Interlock
   4. Emergency Override
   5. Preset Speed
   6. PI control enable / disable

J. VFD shall include two selectable 0-10 VDC or 4-20 mA analog outputs for monitoring, or "speed tracking" the VFD. The analog output signal will be proportional to output frequency, output current, output power, PI (Proportional & Integral control) feedback or DC bus voltage.

K. VFD shall provide terminals for remote input contact closure, to allow starting in the automatic mode.

L. VFD shall provide 24 Vdc, 150ma transmitter power supply

M. VFD shall include at least one external fault input, which shall be programmable for a normally open or normally closed contact. These terminals can be used for connection of firestats, freezestats, high pressure limits or similar safety devices.

N. VFD shall include three programmable form "A" contacts and one fixed “Fault” form "C" contact, capable of being programmed to determine conditions that must be met in order for them to change state. These output relay contacts shall be rated for at least 2A at 120 VAC and shall include, but not limited to:
   1. Speed agree detection
   2. Damper control

3. Hand / Auto Status
4. No load detection (broken belt alert)
5. Contactor Control for External Bypass
6. Drive Faulted
7. Serial communication status

O. VFD shall include a power loss ride through capable of 2 seconds.

P. VFD shall have DC injection braking capability, to prevent fan “wind milling” at start or stop, adjustable, current limited.

Q. VFD shall have a motor preheat function to prevent moisture accumulation in an idle motor.

R. VFD shall include diagnostic fault indication, time and date stamped faults storage and heatsink cooling fan operating hours.

S. VFD shall have a digital operator with program copy and storage functions to simplify set up of multiple drives. The digital operator shall be interchangeable for all drive ratings.

T. VFD shall include a front mounted, sealed keypad operator, with an English language illuminated LCD display. The operator will provide complete programming, program copying, operating, monitoring, real time clock and diagnostic capability. Keys provided shall include industry standard commands for Hand, Off, and Auto functions.

U. VFD plain language display shall provide readouts of; output frequency in hertz, PI feedback in percent, output voltage in volts, output current in amps, output power in kilowatts, D.C. bus voltage in volts, interface terminal status, heatsink temperature and fault conditions. All displays shall be viewed in an easy-to-read illuminated LCD.

V. VFD shall have an internal time clock. The internal time clock shall include a back up via battery. The time clock will be used to date and time stamp faults and record operating parameters at the time of fault. The internal time clock can be programmable to control start/stop functions, constant speeds, PID parameter sets and output Form-C relays.

W. VFD unit shall include the following meters to estimate use of energy:
1. Elapsed Time Meter
2. Kilowatt Meter
3. Kilowatt Hour Meter

X. VFD shall include a user selectable PI control loop, to provide closed loop set point control capability, from a feedback signal, eliminating the need for closed loop output signals from a building automation system. The PI controller shall have a differential feedback capability for closed loop control of fans and pumps for pressure, flow or temperature regulation in response to dual feedback signals.

Y. VFD shall have an independent, PI loop that can be used with a second analog input that will vary the VFD analog output and maintain a set point of an independent process (valves, dampers….).

Z. The VFD shall include HVAC specific application macros. The macros can be used to help facilitate start-up. The macros will provide initialization to program all parameters and customer interfaces for a particular application (Fans, Pumps and Cooling Towers) to reduce programming time

AA. An energy saving sleep function shall be available in both open loop (follower mode) and closed loop (PI) control, providing significant energy savings while minimizing operating hours on driven

equipment. When the sleep function senses a minimal deviation of a feedback signal from set point, or low demand in open loop control, the system reacts by stopping the driven equipment. Upon receiving an increase in speed command signal deviation, the drive and equipment resume normal operation.

AB. VFD shall include loss of input signal protection, with a selectable response strategy including speed default to a percent of the most recent speed.

AC. VFD shall include electronic thermal overload protection for both the drive and motor. The electronic thermal motor overload shall be approved by UL. If the electronic thermal motor overload is not approved by UL, a separate UL approved thermal overload relay shall be provided in the VFD enclosure.
1. VFD shall include the following program functions:
2. Critical frequency rejection capability: 3 selectable, adjustable dead bands.
3. Auto restart capability: 0 to 10 attempts with adjustable delay between attempts.
4. Ability to close fault contact after the completion of all fault restart attempts.
5. Stall prevention capability.
6. "S" curve soft start / soft stop capability.
7. Bi-directional "Speed search" capability, in order to start a rotating load.
8. 14 preset and 1 custom volts per hertz pattern.
9. Heatsink over temperature speed fold back capability
10. Terminal status indication.
11. Program copy and storage in a removable digital operator.
12. Programmable security code
13. Current limit adjustment capability, from 30% to 200% of rated full load current of the VFD.
14. Motor pre-heat capability
15. Input signal or serial communication loss detection and response strategy.
16. Anti "wind-milling" function capability.
17. Automatic energy saving function.
18. Undertorque/Overtorque Detection.
19. Fan failure detection and selectable drive action
20. Bumpless” transfer between Hand and Auto modes
21. Seven preset speeds
22. VFD shall include factory settings for all parameters, and the capability for those settings to be reset.
23. VFD shall include user parameter initialization capability to re-establish project specific parameters
24. VFD shall include programmable HVAC specific application macros
25. USB Type B port for quick and easy PC Connection
26. VFD shall include the capability to adjust the following functions, while the VFD is running:
    a. Speed command input.
    b. Acceleration adjustment from 0 to 6000 seconds.
    c. Deceleration adjustment from 0 to 6000 seconds.
    d. Select from 7 preset speeds.
    e. Analog monitor display.
    f. Removal of digital operator.

2.05 PRODUCT OPTIONS

A. Three Contactor Manual Bypass shall be provided. VFD and bypass package shall be NEMA 1 rated, fully pre-wired and ready for installation as a single UL listed device. Bypass shall include the following:
1. Drive output, and bypass contactors to isolate the VFD from the motor, when the motor is running in the bypass mode. These contactors shall be electrically and software interlocked to ensure safe operation.

2. 120 VAC control transformer, with fused primary.
3. Electronic motor overload relay, to display motor amps and protect the motor while operating in the bypass mode.
4. Disconnect switch, with a pad-lockable through-the-door handle mechanism.
5. Control and safety circuit terminal strip.
6. Current transformers on the output of the Drive/Bypass package for displaying motor current in both modes of operation as well as verification that the motor is running.
7. Provide BACnet and Modbus communication protocols as standard, with the ability to configure controller parameters view controller monitors, control I/O, clear faults and view controller status in both drive and bypass modes.
8. Door mounted control panel with; Drive/Bypass selector keys, Hand/Off/Auto selector keys, Normal/Test selector keys.
9. Door mounted control keypad with LCD display for “Control Power”, “Drive Ready”, “Drive Run”, “Drive Selected”, “Drive Fault”, “Drivel Test”, “Bypass Selected”, “Bypass Run”, “Motor OL”, ”Safety Open” “BAS Interlock”, “Auto Run”, Auto Transfer”, “Emergency Override”, “Hand Mode”, “Off Mode”, and “Auto Mode”.
10. Drive/Bypass selector keys, to allow switching between the Drive and Bypass mode.
11. Hand/Off/Auto selector keys shall provide the following operation and be programmed to operate in any of these modes upon power-up:
12. Normal/Test selector keys, to allow VFD trouble shooting while operating in bypass mode. This option is only available with the 3 contactor style bypass.
13. Hand Position - The drive is given a start command, operation is via the local speed input (digital operator/keypad). If in bypass mode, the motor is running.
14. Off Position - The start command is removed, all speed inputs are ignored, power is still applied to the drive. If in bypass mode, the motor is stopped.
15. Auto Position - The drive is enabled to receive a start command and speed input from a building automation system. If in bypass mode, the motor start/stop is controlled by the building automation system
16. Eight Programmable digital inputs (24Vdc, 8mA) shall be provided for Auto Transfer to bypass, Safety Interlock, BAS Interlock, and numerous other bypass specific functions.
17. Four Programmable form C relays (24Vdc/120 VAC, 2 Amp) for: “Motor Run”, “Damper Actuator”, “Auto Transfer”, “Drive Run”, “Hand Mode”, “Auto Mode”, “System Fault”, “Bypass Run” or ”Serial Com Run”.
18. Damper control circuit with end of travel feedback capability. This circuit shall also include two adjustable wait time functions. One is a run delay time where the drive will operate at a preset speed before the damper opens to pressurize the system. The other time function is an interlock wait time, so if the damper has not fully opened within the specified time, a fault will be declared.
19. Line voltage sensors to monitor for brownout, blackout and single phase conditions. Fault levels for each condition must be adjustable to ensure the proper settings pursuant to each application.
20. Selectable energy savings and harmonic reduction mode. Drive automatically switches to Bypass (Across-the-line) when motor is running 60 Hz for a set time and automatically switches back when frequency reference changes.

B. Main input circuit breaker with a pad-lockable through-the-door handle mechanism, able to achieve a SCCR panel rating of 100kAIC.

C. Enclosure:
   1. NEMA / UL TYPE 1 enclosures for indoor installations.
   2. NEMA / UL TYPE 12 Enclosure where dust tight enclosure is required
   3. NEMA / UL TYPE 3R enclosures for outdoor installations.

D. Engraved cabinet nameplates shall be provided.

2.06 FABRICATION

A. All standard and optional features shall be included in a single NEMA 1, plenum rated enclosure with a UL certification label.

2.07 SOURCE QUALITY CONTROL

A. In-circuit testing of all printed circuit boards shall be conducted, to insure the proper mounting and correct value of all components.

B. Final printed circuit board assemblies shall be functionally tested, via computerized test equipment. All tests and acceptance criteria shall be preprogrammed. All test results shall be stored as detailed quality assurance data.

C. All fully assembled controls shall be functionally tested, with fully loaded induction motors. The combined test data shall then be analyzed, to insure adherence to quality assurance specifications.

D. Inspect and production test, under load, each completed VFD assembly.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that surface is suitable for VFD installation.

B. Do not install VFD until the building environment can be maintained, within the service conditions required by the manufacturer.

3.02 INSTALLATION

A. Install VFD where indicated, in accordance with manufacturer's written instructions and NEMA ICS 3.

B. Tighten accessible connections and mechanical fasteners after placing VFD.

C. Provide a nameplate label on each VFD, identifying rated horsepower, full load amperes, model number, service factor and voltage/phase rating.

3.03 FIELD QUALITY CONTROL

A. Field inspection and testing to be performed under provisions of Section 014500.

B. Inspect completed installation for physical damage, proper alignment, anchorage, and grounding.

3.04 MANUFACTURER'S FIELD SERVICES

A. Prepare and start systems under provisions of Section 017500.

3.05 ADJUSTING

A. Carry out adjusting work under provisions of Section 017500. Make final adjustments to installed VFD, to assure proper operation of HVAC systems.

END OF SECTION

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. This Section describes the air terminals as specified herein, with capacities, distribution patterns and connection sizes as scheduled on the Drawings.

B. Products listed in Part 2 of this Section include:
   1. Grilles and Registers.
   2. Ceiling Diffusers.

1.02 RELATED WORK

A. Section 233113: Sheet Metal Work

1.03 REFERENCES

A. ADC 1062 GRD - Test Code for Grilles, Registers and Diffusers

B. ASHRAE 70 - Method of Testing for Rating the Airflow Performance of Outlets and Inlets.

C. ASHRAE 113 - Method of Testing Room Air Diffusion

D. ASTM C423 - Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.

E. ARI 880 - Air Terminals

F. ARI 885 - Procedure for Estimating Occupied Space Sound Levels in the Application of Air Terminals and Air Outlets.

G. NFPA 90A - Installation of Air Conditioning and Ventilation Systems

H. SMACNA - HVAC Duct Construction Standards - Metal and Flexible.

I. Mechanical Code of New York State

1.04 QUALITY ASSURANCE

A. Air Terminals will not be accepted until acoustical test results have been submitted and approved.

1.05 SUBMITTALS

A. Product data - Submit catalog cuts and installation instructions for all products specified, including standard color samples.

B. Submit published manufacturer’s performance data for all of the different types of diffusers, registers and grilles, based on testing in accordance with ASHRAE Standard 70, latest edition.

C. Performance data - For each size and type of air terminal , submit the following:
   1. Inlet static pressure in inches w.g.
   2. Maximum and minimum airflow in cfm.

3. Throw in feet at maximum cfm (and 25 percent of cfm) for terminal velocities of 50 and 100 fpm.
4. Noise Criteria (NC) curve at maximum air terminal cfm rating with blades in full-open and closed positions.

PART 2 - PRODUCTS

2.01 CEILING DIFFUSERS

A. Stamped Ceiling Diffusers:
   1. Furnish and install stamped ceiling diffusers of the sizes and capacities as shown on the Drawings.
   2. Manufacture the diffuser from corrosion-resistant steel or extruded aluminum as indicated on the Drawings.
   3. Construct the diffuser with four die-formed concentric cones in all sizes. Construct the inner cone assembly to be removable using a spring clip arrangement that permits quick, easy installation and removal.
   4. Provide units with radial opposed blade dampers. Provide the diffuser with a removable plug for screwdriver adjustment of the damper without removing the inner core.
   5. Manufacture diffusers with trim to allow for recessed mounting in into ceiling grids or for surface mount in other ceiling types.
   6. Manufacturer: Titus OMNI or approved equal.
   7. Coordinate color with Owner

2.02 RETURN GRILLES

A. Furnish and install return grilles of the type and size as shown on the Drawings. Construct the grilles with 45 degree deflection fixed blades and frames that have reinforced mitered corners.

B. Provide an opposed blade damper operable from the face of the grille for grilles connected to ductwork.

C. Manufacture grilles with trim to allow for recessed mounting into ceiling grids or for surface mount in other ceiling types. Provide concealed mounting using concealed mounting straps or concealed screw holes in neck. Countersunk screw holes in the frame face are not acceptable or frame face-mounting screws.

D. Construct the units of extruded aluminum or corrosion resistant steel as shown on the Drawings.

E. Manufacturer: Titus OMNI or approved equal.

F. Coordinate color with Owner.

2.03 SUPPLY GRILLES

A. Furnish and install supply grilles of the type and size as shown on the Drawings. Construct the grilles with a dual set of streamlined shaped, roll-formed, corrosion-resistant blades that are adjustable, and spaced on ¾" centers and frame with reinforced mitered corners.

B. Manufacture grilles with trim to allow for recessed mounting into ceiling grids or for surface mount in other ceiling types. Provide concealed mounting using concealed mounting straps or

concealed screw holes in neck. Countersunk screw holes in the frame face are not acceptable nor are frame face-mounting screws.

C. Construct the units of extruded aluminum or corrosion resistant steel as shown on the Drawings.

D. Manufacturer: Nailor Industries Inc., Model Series 61DH-O or approved equal.

E. Coordinate color with Owner.

PART 3 - EXECUTION

3.01 DIFFUSER, REGISTER AND GRILLE APPLICATION

A. See the Drawings for types, sizes, materials and installation requirements.

3.02 INSTALLATION

A. Install diffusers, grilles and registers in locations shown on the Drawings.

B. Consult the Drawings for type of ceiling in which the terminals are to be installed and match air outlet edge trim to the requirements of the ceiling type in which they are installed.

C. Install equalizing grids flush with take-off collar connection to supply duct with vanes perpendicular to air flow approaching diffuser.

D. Install in accordance with manufacturer's published recommendations as well as applicable sections of SMACNA manual and as specified above.

E. Install ceiling mounted grilles and registers with the blade deflection facing away from the line of sight.

F. Coordinate with other work, including ductwork and ductwork accessories, as necessary to interface installation of air outlets and inlets with other work

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Condensing unit package.

B. Charge of refrigerant and oil.

C. Controls and control connections.

D. Refrigerant piping connections.

E. Motor starters.

F. Electrical power connections.

1.02 RELATED SECTIONS

A. Section 230993 - Sequence of Operations.

B. Section 232300 - Refrigeration Piping.

C. Section 238126 - Ductless Split System Air Conditioner.

1.03 REFERENCES

A. ANSI/ASHRAE 15 - Safety Code for Mechanical Refrigeration.

B. ANSI/ASHRAE/IES 90 A - Energy Conservation in New Building Design Standard.

C. AHRI 210/240 - Unitary Air-Conditioning Equipment and Air-Source Heat Pump Equipment, (units less than 135,000 Btuh).

D. AHRI 360 - Commercial and Industrial Unitary Air Conditioning Equipment testing and rating standard (condensing units greater than 135,000 Btuh).

E. AHRI 340 - Commercial and Industrial Unitary Heat Pump Equipment, (heat pumps greater than 135,000 Btuh).

F. ANSI Z21.47/UL1995 - Unitary Air Conditioning Standard for safety requirements.

G. California Energy Commission Administrative Code - Title 20/24 - Establishes the minimum efficiency requirements for HVAC equipment installed in new buildings in the State of California.

H. AHRI 270 - Sound Rating of Outdoor Unitary Equipment, (units less than 135,00 Btuh).

I. AHRI 370 - Sound Rating of Large Outdoor Refrigerating and Air Conditioning Equipment (equipment above 135,000 Btuh).

1.04 SUBMITTALS

A. Submit unit performance data including: capacity, nominal and operating performance.

B. Submit Mechanical Specifications for unit and accessories describing construction, components and options.

C. Submit shop drawings indicating overall dimensions as well as installation, operation and service clearances. Indicate lift points and recommendations and center of gravity. Indicate unit shipping, installation and operating weights including dimensions.

D. Submit data on electrical requirements and connection points. Include recommended wire and fuse sizes or MCA, sequence of operation, safety and start-up instructions.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Comply with manufacturer's installation instructions for rigging, unloading, and transporting units.

B. Protect units on site from physical damage. Protect coils.

1.06 WARRANTY

A. Provide parts warranty for one year from start-up or 18 months from shipment, whichever occurs first.

B. Provide 5 year compressor warranty.

1.07 MAINTENANCE SERVICE

A. Furnish complete parts and labor service and maintenance of packaged roof top units for one year from Date of Substantial Completion by contractor.

B. Provide maintenance service with a two month interval as maximum time period between calls. Provide 24 hour emergency service on breakdowns and malfunctions.

C. Include maintenance items as outlined in manufacturer's operating and maintenance data.

D. Submit copy of service call work order or report and include description of work performed.

1.08 REGULATORY REQUIRMENTS

A. Unit shall conform to ANSI Z21.47/UL 1995 for construction of packaged air conditioner.

B. In the event the unit is not UL approved, the manufacturer must, at his expense, provide for a field inspection by a UL representative to verify conformance to UL standards. If necessary, contractor shall perform modifications to the unit to comply with UL, as directed by the UL representative, at no additional expense to the Owner.

PART 2 - PRODUCTS

2.01 SUMMARY

A. The contractor shall furnish and install air-cooled condensing units as shown as scheduled on the contract documents. The unit(s) shall be installed in accordance with this specification and perform at the specified conditions as scheduled.

B. APPROVED MANUFACTURERS
   1. Daikin
   2. LG
   3. Mitsubishi

C. Base Bid shall be Daikin air-cooled condensing units with approved alternate being LG or Mitsubishi. Alternates must still comply with the performance and features as specified with these specifications and as indicated on the design documents. Job will be awarded on basis of specified product. Substitutions must be selected and approved within 14 calendar days after award of contract.

2.02 GENERAL UNIT DESCRIPTION

A. Provide self-contained, packaged, factory-assembled and pre-wired units suitable for outdoor use consisting of cabinet, compressor(s), condensing coil and fan(s), integral subcooling circuit(s), filter drier(s), and controls. Provide expansion valve(s) and check valves for split system heat pump unit(s).

B. Performance Ratings: Energy Efficiency Rating (EER) not less than prescribed by ANSI/ASHRAE 90A.

2.03 CASING

A. House components in 18 gauge zinc-coated galvanized steel frame and panels with weather resistant, baked enamel finish. Units surface shall be tested 500 hours in salt spray test.

B. Mount controls in weatherproof panel provided with removable panels and/or access doors with quick opening fasteners.

2.04 CONDENSER COILS

A. Coils: Aluminum fins mechanically bonded to seamless copper tubing. Provide subcooling circuit(s). Factory leak test under water to 450 psig, and vacuum dehydrate. Seal with holding charge of nitrogen.

2.05 FANS AND MOTORS

A. Vertical discharge direct driven propeller type condenser fans with fan guard on discharge. Fans shall be statically and dynamically balanced.

B. Weatherproof motors suitable for outdoor use, with permanently lubricated totally enclosed or open construction motors shall be provided and shall have built in current and thermal overload protection. Motors shall be either sleeve or ball bearing type.

2.06 COMPRESSORS

A. Compressors: direct drive scroll compressors with integral centrifugal oil pump. Provide suction gas cooled motor with winding temperature limits and compressor overloads. Provide external high and low pressure cutout devices.

2.07 CONTROLS

A. Provide factory-wired condensing units with 24 volt control circuit with internal fusing and control transformers, contactor pressure lugs and/or terminal block for power wiring. Contractor to provide field installed unit mounted disconnect switch. Units shall have single point power connections.

2.08 STAGING CONTROLS

A. Provide NEC Class II, electronic, adjustable zone control to maintain zone temperature setting.

B. Provide 24 volt, adjustable thermostat to control heating and cooling stages in sequence with delay between stages, and supply fan to maintain temperature setting.
   1. Locate thermostat in room as shown on plans.

2.09 BUILDING MANAGEMENT SYSTEM

A. Interface control module to Energy Management System to be furnished and mounted by unit manufacturer. Through this interface module, all Energy Management functions (specified in Energy Management Section) shall be performed. See Building Automation and Automatic Temperature Control System Specifications. The interface module with necessary controls and sensors shall all be factory mounted (not field mounted). If not furnished by unit manufacturer, this shall be furnished by Energy Management System Contractor for factory mounting by rooftop unit manufacturer in rooftop unit and rated for service up to 140 F. The only field connection to Energy Management System shall be a single communication link.

B. Control Functions: Include unit scheduling, occupied/unoccupied mode, start-up and coast-down modes, demand limiting, night setback, timed override and alarm shutdown.

C. Diagnostic Functions: Include supply fan status, , and a field supplied and installed sensor, to provide a dirty filter alarm.

D. Provide capabilities for Boolean Processing and trend logs as well as "templated" reports and logs.

2.10 MISCELLANEOUS FEATURES

A. Neoprene Isolators: Provide field-installed rubber-in-shear isolators.

B. Low Ambient Control: Electronic head pressure control that allows operation to 0 degrees F outdoor ambient.

C. Condenser Coil guard: Metal grille with Polyvinyl chloride coating to cover condenser coil area.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide for connection to electrical service.

C. Install units on vibration isolation.

D. Provide connection to refrigeration piping system and evaporators.

END OF SECTION

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. Provide air handlers, as specified herein, of sizes and capacities scheduled and in locations shown on drawings.

1.02 RELATED SECTIONS

A. Section 232300 - Refrigeration Piping

B. Section 237213 - Air Cooled Condensing Unit

C. Division 26.

1.03 REFERENCES

A. AMCA Publication 99 - Standards Handbook.

B. AMCA Standard 500-D - Laboratory Methods of Testing Dampers for Rating.

C. ANSI/ABMA Standard 9 - Load Ratings and Fatigue Life for Ball Bearings.

D. ANSI/AMCA Standard 204 - Balance Quality and Vibration Levels for Fans.

E. ANSI/AHRI Standard 410 - Forced Circulation Air-Cooling and Air-Heating Coils.

F. ANSI/AHRI Standard 430 - Central Station Air Handling Units.

G. ANSI/ASHRAE Standard 52.2 - Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size.

H. ANSI/ASHARE Standard 62.1 - Ventilation for Acceptable Indoor Air Quality.

I. ANSI/ASHARE Standard 90.1 - Energy Standard for Buildings Except Low-Rise Residential Buildings.

J. ANSI/NEMA MG 1 - Motors and Generators.

K. ANSI/UL 900 - Standard for Safety Air Filter Units.

L. AHRI Standard 260 - Sound rating of Ducted Air Moving and Conditioning Equipment.

M. ASHRAE Standard 111 - Measurement, Testing, Adjusting, and Balancing of Building HVAC Systems.

N. ASTM C1071 - Thermal and Acoustic Insulation (Mineral Fiber, Duct Lining Material).

O. ASTM C1338 - Standard Test Method for Determining Fungi Resistance of Insulation Material and Facings.

P. ASTM E477 - Standard Test Method for Measure Acoustical and Airflow Performance of Duct Liner Materials and Prefabricated Silencers.

Q. NFPA 70 - National Electrical Code®.

R. NFPA 90A - Standard for the Installation of Air Conditioning and Ventilation Systems.

S. UL 1995 - Standard for Safety Heating and Cooling Equipment

1.04 QUALITY ASSURANCE

A. Air Coils: Certify capacities, pressure drops and selection procedures in accordance with current AHRI Standard 410.

B. Air handling units with fan sections utilizing single fans shall be rated and certified in accordance with AHRI Standard 430.

C. ISO 9001 Certification.

1.05 SUBMITTALS

A. No equipment shall be fabricated or delivered until the receipt of approved shop drawings from the Owner or Owner's approved representative.

B. AHU manufacturer shall provide the following information with each shop drawing/product data submission:
   1. Dimensioned arrangement drawings for each AHU including a plan and elevation view of the assembled unit with overall dimensions, lift points, unit shipping split locations and dimensions, installation and operating weights, and installation, operation and service clearances.
   2. All electrical, piping, and ductwork requirements, including sizes, connection locations, and connection method recommendations.
   3. Each component of the unit shall be identified and mechanical specifications shall be provided for unit and accessories describing construction, components, and options.
   4. All performance data, including capacities and airside and waterside pressure drops, for components.
   5. Fan curves shall be provided for fans with the design operating points indicated. Data shall be corrected to actual operating conditions, temperatures, and altitudes.
   6. A filter schedule must be provided for each air handling unit supplied by the air handling unit manufacturer. Schedule shall detail unit tag, unit size, corresponding filter section location within the AHU, filter arrangement (e.g. angled/flat), filter depth, filter type (e.g. pleated media), MERV rating, and filter quantity and size.
   7. A schedule detailing necessary trap height shall be provided for each air handling unit. Schedule shall detail unit tag, unit size, appropriate trap schematic with recommended trap dimensions, and unit supplied base rail height. Contractor shall be responsible for additional trap height required for trapping and insulation beyond the unit supplied base rail height by adequate housekeeping pad.
   8. A coil valve coordination schedule shall be provided for each air handling unit supplied by the air handling unit manufacturer. Schedule shall detail unit tag, coil type and corresponding section location within the AHU, valve style (e.g. global, ball), valve type (e.g. electronic 2-way/3-way), valve position (e.g. normally open/closed), size, flow coefficient (CV), and close-off pressure.
   9. An electrical MCA - MOP schedule shall be provided for each electrical circuit to which field-power must be supplied. Schedule to detail unit tag, circuit description, voltage/phase/hertz, Minimum Circuit Ampacity (MCA), and calculated Maximum Overcurrent Protection (MOP).
   10. Sound data shall be provided using AHRI 260 test methods. Unit discharge, inlet, and radiated sound power levels in dB shall be provided for 63, 125, 250, 500, 1000, 2000, 4000, and 8000 Hz.

C. The AHU manufacturer shall provide appropriate sets of submittals as referenced in the General Conditions and shall submit to the Owner electronic copies of the IOM.

D. The AHU manufacturer shall list any exceptions to the specification.

1.06 REGULATORY REQUIREMENTS

A. Agency Listings/Certifications
   1. Unit shall be manufactured to conform to UL 1995 and shall be listed by either UL/CUL or ETL. Units shall be provided with listing agency label affixed to the unit. In the event the unit is not UL/CUL or ETL approved, the contractor shall, at his/her expense, provide for a field inspection by a UL/CUL or ETL representative to verify conformance. If necessary, contractor shall perform modifications to the unit to comply with UL/CUL or ETL as directed by the representative, at no additional expense to the owner.
   2. Certify air handling units in accordance with AHRI Standard 430. Units shall be provided with certification label affixed to the unit. If air handling units are not certified in accordance with AHRI Standard 430, contractor shall be responsible for expenses associated with testing of units after installation to verify performance of fan(s). Any costs incurred to adjust fans to meet scheduled capacities shall be the sole responsibility of the contractor.
   3. Certify air handling coils in accordance with AHRI Standard 410. Units shall be provided with certification label affixed to the unit. If air handling coils are not certified in accordance with AHRI Standard 410, contractor shall be responsible for expenses associated with testing of coils after installation to verify performance of coil(s). Any costs incurred to adjust coils to meet scheduled capacities shall be the sole responsibility of the contractor.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Comply with manufacturer's installation instructions for rigging, unloading, and transporting units.

B. Installing contractor shall be responsible for storing AHU in a clean, dry place and protect from weather and construction traffic. Handle carefully to avoid damage to components, enclosures, and finish.

1.08 START-UP AND OPERATING REQUIREMENTS

A. Do not operate units for any purpose, temporary or permanent, until ductwork is clean, filters in place, bearings lubricated (if applicable), condensate properly trapped, piping connections verified and leak-tested, belts aligned and tensioned, all shipping braces removed, bearing set screws torqued, and fan has been test run under observation.

1.09 WARRANTY

A. AHU manufacturer shall provide, at no additional cost, a standard parts warranty that covers a period of one year from unit start-up or 18 months from shipment, whichever occurs first. This warrants that all products are free from defects in material and workmanship and shall meet the capacities and ratings set forth in the equipment manufacturer's catalog and bulletins.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Approved manufacturer shall be Trane, with pre-approved alternates considered. Manufacturers not pre-approved, must obtain pre-approval in writing from consulting engineer prior to bid day. Alternates must comply with all performance and features as called for in this specification. Job awarded on basis of specified equipment. Alternate will be evaluated and considered after job is awarded.

B. Manufacturer must clearly define any exceptions made to Plans and Specifications. Any deviations in layout or arrangement shall be submitted to consulting engineer prior to bid date. Acceptance of deviation(s) from specifications shall be in the form of written approval from the consulting engineer. Mechanical Contractor is responsible for expenses that occur due to exceptions made.

C. Basis of Design:
   1. VTS
   2. Trane
   3. Daikin
   4. Approved equal

2.02 GENERAL

A. Unit layout and configuration shall be as defined in project plans and schedule.

B. Unit manufacturer to provide an integral base frame to support all sections of unit and raise unit for proper trapping. Unit base frames not constructed of galvanized steel shall be chemically cleaned and coated with both a rust-inhibiting primer and finished coat of rust-inhibiting enamel.

C. Entire indoor air handling unit shall have a full perimeter base rail for structural rigidity and condensate trapping. Refer to drawings for base height.

D. Note: All exposed surfaces (cabinet, frame, fans, coils, etc) shall be finished with MicroGuard Protective Treatment System. Refer to Adsil specification section 09800 for product and application requirements.

E. Size Limitation: Air handling units must be installed in the attic mechanical rooms. The equipment access for these rooms is the outside air louvers (approx. 56” high x 30” wide clear opening - contractor to verify in field prior to procuring equipment). Contractor must coordinate with other disciplines for the removal of the existing louvers and repair/preparation of this opening and coordinate the equipment installation sequence and size of equipment sections to use this opening for rigging of equipment through this opening.

2.03 UNIT CASING

A. House components in heavy gauge, zinc-coated, galvanized steel frame and panels with weather resistant, baked enamel finish.

B. Provide unit with access panels with captive screws.

C. Unit shall be completely insulated with foil faced, cleanable, fire retardant, permanent, odorless glass fiber material.

D. Unit shall have electrical and refrigerant connection bushings or plugs.

2.04 ACCESS DOORS

A. Interior and exterior shall be of the same construction as the interior and exterior wall panels.

B. All doors downstream of cooling coils shall be provided with a thermal break construction of door panel and door frame.

C. Gasketing shall be provided around the full perimeter of the doors to prevent air leakage.

D. Door hardware shall be surface-mounted to prevent through-cabinet penetrations that could likely weaken the casing leakage and thermal performance.

E. Handle hardware shall be designed to prevent unintended closure.

F. Access doors shall be hinged and removable without the use of specialized tools to allow.

2.05 PRIMARY DRAIN PANS

A. All cooling coil sections shall be provided with a double sloped, removable, cleanable, composite drain pan.

B. The outlet shall be located at the lowest point of the pan and shall be sufficient diameter to preclude drain pan overflow under any normally expected operating condition.

C. All drain pan threaded connections shall be visible external to the unit. Threaded connections under the unit floor shall not be accepted.

D. The installing contractor is responsible to ensure the unit is installed level, trapped in accordance with the manufacturer's requirements, and visually inspected to ensure proper drainage of condensate.

2.06 SECONDARY CONTAINMENT PAN

A. Provide a secondary containment pan with leak detector sensor under the air handling unit.

2.07 FANS

A. Unit shall have a double inlet, double width, forward curved, centrifugal type fan with adjustable belt drive.

B. Fan sections shall have a minimum of one access door located on the drive side of the unit to allow inspection and maintenance of the fan, motor, and drive components. Construct door(s) per Section 2.04.

C. Belt-driven fans shall be provided with permanently lubricated, self-aligning, anti-friction bearings selected for L-50 200,000-hour average life per ANSI/AFBMA Standard 9.

D. Belts shall be enclosed as required by OSHA standard 29 CFR 1910 to protect worker from accidental contact with the belts and sheaves.

E. Fan Motor shall have:
   1. Adjustable motor sheaves.
   2. Thermal Overload protection.
   3. Permanently lubricated bearings.
   4. Meet Energy Policy of 1992 (EPACT)

2.08 COILS

A. Evaporator Coils
   1. 3/8” internally enhanced copper tube mechanically bonded to lanced aluminum plate fins.
   2. Refrigerant suction and liquid connections shall be clearly labeled on unit exterior.
   3. Coils shall be factory pressure and leak tested to 449 psig.
   4. Coils shall include drain pans per section 2.05.

B. Heating Steam Coils
   1. Extended surface type, utilizing aluminum fins and DLP-type copper tubes with cast brass supply and return connections.
   2. Coils shall be of serpentine design with horizontal tubes, vertical fins, and center supply and return connections. All tube bends shall be brazed.
   3. Tubes shall be mechanically bonded to the collars of the fins.
   4. Coils shall be capable of operating at steam pressures and temperatures of 5.0 psig and 250 deg F.

2.09 FILTERS

A. Filter rack for one inch (1”), throw-away filters.

B. Filter section shall have side access filter guides and access door(s) extending the full height of the casing to facilitate filter removal. Construct doors in accordance with Section 2.04. Filters to be of size and quantity required to maximize filter face area for each air handling unit.

C. Filter type, MERV rating, and arrangement shall be provided as defined in project plans and schedule.

D. Manufacturer shall provide one set of startup filters.

2.10 CONTROLS

A. Provide factory-wired condensing units with 24 volt control circuit with internal fusing and control transformers, contactor pressure lugs and/or terminal block for power wiring. The unit shall be completely internally wired, with number and colored wires.

B. Provide magnetic indoor fan contactor, low voltage terminal strip, and evaporator defrost control.

C. Contractor to provide field installed unit mounted disconnect switch. Units shall have single point power connections.

D. Provide with discharge air temperature sensor and outside air dry bulb / wet bulb (enthalpy) sensor/transmitter.

E. Provide with Reliatel controls.

F. Provide with communications module to provide BACNet communications interface with the central HVAC controller.

G. Provide with discharge air smoke detector.

PART 3 - EXECUTION

3.01 SHIPPING

A. Paper copies of the IOM shall also be shipped with the AHU.

B. The AHU manufacturer shall identify all shipments with the order number. Enough information shall be provided with each shipment to enable the Mechanical Contractor to confirm the receipt of units when they are received. For parts too small to mark individually, the AHU manufacturer shall place them in containers.

C. To protect equipment during shipment and delivery, all indoor units shall be completely stretch or shrink wrapped. Wrap shall be a minimum of 7 mil plastic. Pipe ends and pipe connection holes in the casing shall be capped or plugged prior to shipment.

D. After loading the equipment for shipment, the AHU manufacturer shall contact the shipping contact on the order and provide the name of the carrier, description of equipment, order number, shipping point, and date of shipment.

3.02 ON-SITE STORAGE

A. If equipment is to be stored for a period of time prior to installation, the Mechanical Contractor shall remove all stretch or shrink wrap from units upon receipt to prevent unit corrosion and shall either place the units in a controlled indoor environment or shall cover the units with canvas tarps and place them in a well-drained area. Covering units with plastic tarps shall not be acceptable.

3.03 FIELD EXAMINATION

A. The Mechanical Contractor shall verify that the mechanical room and/or roof are ready to receive work and the opening dimensions are as indicated on the shop drawings and contract documents.

B. The Mechanical Contractor shall verify that the proper power supply is available prior to starting of the fans.

3.04 INSTALLATION

A. The Mechanical Contractor shall be responsible to coordinate ALL installation requirements with the Owner and the Owner’s selected Mechanical Contractor to ensure that a complete installation for each unit is being provided. Coordination efforts shall include such items as unloading and hoisting requirements, field wiring requirements, field piping requirements, field ductwork requirements, requirements for assembly of field-bolted or -welded joints, and all other installation and assembly requirements.

B. The AHU manufacturer shall provide all screws and gaskets for joining of sections in the field.

C. The Mechanical Contractor shall verify that the following items have been completed prior to scheduling the AHU manufacturer's final inspection and start up:
   1. All spring-isolated components have had their shipping restraints removed and the components have been leveled.
   2. On all field-joined units, that all interconnections have been completed, i.e., electrical and control wiring, piping, casing joints, bolting, welding, etc.
   3. Refrigerant piping connections have been completed, evacuated and tested and system has been properly charged.
   4. All ductwork connections have been completed and all ductwork has been pressure tested for its intended service.
   5. All power wiring, including motor starters and disconnects, serving the unit has been completed.
   6. All automatic temperature and safety controls have been completed.
   7. All dampers are fully operational.
   8. All shipping materials have been removed.
   9. All (clean) filter media has been installed in the units.

3.05 LEVELING

A. The Mechanical Contractor shall level all unit sections in accordance with the unit manufacturer’s instructions. The Mechanical Contractor shall provide and install all necessary permanent shim material to ensure individual sections and entire assembled units are level.

3.06 FINAL INSPECTION AND START UP SERVICE

A. After the Mechanical Contractor has provided all water and steam piping connections, ductwork connections, and field control wiring, and Electrical Contractor has provided all the field power wiring, the Mechanical Contractor shall inspect the installation. The Mechanical Contractor shall then perform startup of the equipment.

B. The Mechanical Contractor, shall perform the following tests and services and submit a report outlining the results:
   1. Record date, time, and person(s) performing service.
   2. Lubricate all moving parts.
   3. Check all motor and starter power lugs and tighten as required.
   4. Verify all electrical power connections.
   5. Conduct a start up inspection per the AHU manufacturer's recommendations.
   6. Record fan motor voltage and amperage readings.
   7. Check fan rotation and spin wheel to verify that rotation is free and does not rub or bind.
   8. Check fan for excessive vibration.
   9. Check V belt drive or coupling for proper alignment.
   10. Check V belt drive for proper tension. Tighten the belts in accordance with the AHU manufacturer's directions. Check belt tension during the second and seventh day's operation and re-adjust belts, as may be required, to maintain proper tension as directed by the AHU manufacturer.
   11. Remove all foreign loose material in ductwork leading to and from the fan and in the fan itself.
   12. Disengage all shipping fasteners on vibration isolation equipment.
   13. Check safety guards to insure they are properly secured.
   14. Secure all access doors to the fan, the unit and the ductwork.
   15. Switch electrical supply "on" and allow fan to reach full speed.
   16. Physically check each fan at start up and shut down to insure no abnormal or problem conditions exist.
   17. Check entering and leaving air temperatures (dry bulb and wet bulb) and simultaneously record entering and leaving heating hot water temperatures and outside air temperature.
   18. Check all control sequences.

END OF SECTION

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. Outdoor, roof curb mounted, air-to-air heat pump unit utilizing a hermetic scroll compressor for cooling and heating duty with supplemental electric heating. Units shall discharge supply air vertically or horizontally as shown on contract drawings.

1.02 RELATED SECTIONS

A. Section 233113 - Sheet Metal Work.

B. Division 26.

1.03 SUBMITTALS

A. Shop Drawings: Submit drawings for each size of factory fabricated roof curb.

B. Product Data: Manufacturer's catalog sheets, brochures, performance charts, standard schematic drawings, specifications and installation instructions for each size unit.

C. Contract Closeout Submittals - Operation and Maintenance Data: Deliver 2 copies, covering the installed products, to the Director's Representative.

1.04 QUALITY ASSURANCE

A. Regulatory Requirements:
   1. Unit shall be factory tested and the design, construction and installation shall be in accordance with the following: AHRI Standards 210/240 and 340/360, NFPA, UL, ASHRAE 15, Safety Code for Mechanical Refrigeration, and all State and Local codes or regulations having jurisdiction.
   2. Unit shall be listed by ETL as a total package.
   3. Rate cooling capacities in accordance with ARI Standard 210.
   4. Electrical components shall be UL listed.
   5. Roof curb shall be designed to NRCA criteria per Bulletin B-1986.
   6. Insulation and adhesive shall meet NFPA 90A requirements for flame spread and smoke generation.
   7. Unit shall meet ASHRAE 90.1 minimum efficiency requirements.
   8. 3 phase units shall be Energy Star certified.

1.05 PRODUCT DELIVERY

A. Unit shall be stored and handled per manufacturer's recommendations.

B. Unit shall only be stored or positioned in the upright position.

C. Deliver each unit as an integral factory packaged assembly.

1.06 MAINTENANCE

A. Maintenance Service: A fully equipped authorized service organization capable of guaranteeing response within 8 hours to service calls shall be available 24 hours a day, 7 days a week to service the completed Work.

B. Extra Materials: Provide with each unit, one spare set of air filters. Suitable box and label spare filters as to their usage.

PART 2 - PRODUCTS

2.01 ELECTRIC HEATING & COOLING PACKAGED ROOFTOP UNITS

A. General
1. The unit is a packaged factory assembled heating or cooling system. The unit includes all factory wiring with a single point power connection, phase and voltage monitor, refrigerant piping and charge, R-410A, and operating oil charge. Single refrigerant circuit, sizes 036 ton to 096 ton, or dual refrigerant circuits, sizes 120 ton to 140 ton, include a microprocessor based control system. The unit includes, based on project requirements, all special features necessary to provide fully conditioned ventilation air at neutral conditions to the building.

B. Unit Cabinet
1. Double wall design, constructed of G-90 galvanized steel, bonderized, and pre-coated with a polyester pre-coat finish.
   a. The top cover is a minimum of 18 gauge sheet metal with 2.0 in. thick, closed cell polyisocyanurate foam insulation with a 24 gauge sheet metal interior liner.
   b. Access panels and doors are a minimum of 20 gauge sheet metal with 2.0 in. thick, closed cell polyisocyanurate foam insulation with a 24 gauge sheet metal interior liner, this applies to the indoor air tunnel only. Access doors are equipped with stainless steel hinges and quarter turn, adjustable, draw tight cam-action latches.
   c. Corner and center posts are 16 or 18 gauge galvanized steel.
   d. Base pans are 16 or 18 gauge galvanized steel. All openings through the base pan have upturned flanges at least 0.5 in. in height.
   e. Base pans are insulated with 0.375 in. thick closed cell foam insulation
   f. Condensate pan is 20 gauge stainless steel insulated with closed cell neoprene insulation.
   g. Base rail is double flanged 16 gauge galvanized steel or welded closed section structural steel tubing.
   h. Roof sections are sloped for proper drainage and include drip edge.
2. Unit casing can withstand up to 2,500 hour salt spray exposure per ASTM B117.
3. The unit has insulated access doors, hinged for easy access to the controls compartment and all other areas requiring servicing. Each door seals against a triple edge co-extruded EPDM gasket to help prevent air and water leakage and for ease and safety during servicing. Access doors include a thermal break.
4. Interior cabinet surfaces are lined with 24 gauge galvanized steel.
5. The unit has a factory-installed sloped condensate drain connection fabricated of stainless steel with welded corners and drain connection.
6. The unit is equipped with fittings in frame rails to facilitate overhead rigging.
7. Filters are accessible through a hinged access panel.
8. The outdoor air opening has a factory provided hood with bird screen. Exhaust hoods are included with the economizer or exhaust options.

C. Fans
1. Indoor evaporator fans:

a. Direct-drive plenum fan(s) are provided and both axial and radial clearances must be equal to or greater than fan manufacturer's recommendations for full rated fan performance and efficiency.
b. Base mounted and external rotor fans with EC motors are statically and dynamically balanced at the factory as a single rotating assembly to a quality level of G=2.5 in accordance with DIN ISO 1940-1.

2. Condenser Fans:
a. Fans are external rotor direct driven axial fans with a minimum 5 1/2 in. spun venturi for high efficiency and low noise, with cast profiled blades.
b. The fan motor assembly is end mounted to a structurally rigid welded finger guard.
c. Fans discharge air vertically upward and the finger guard is powder coated.
d. Fans are statically and dynamically balanced as an assembly to a quality level of G=6.3 in accordance with DIN ISO 1940-1.

D. Refrigerant Components
1. Compressors:
a. Fully hermetic, scroll type compressors with overload protection and short cycle protection with minimum on and off timers
1) On models 036 ton to 210 ton, a digital compressor is available for the lead refrigeration circuit. A digital control module (DCM) is included. The control system is capable of unloading the compressor in an unlimited number of steps from 100% capacity down to 20% capacity
2) On models 240 ton and above, a variable speed compressor with VFD on the lead refrigeration circuit is available.
3) Standard on/off scrolls are available on lag refrigeration circuits.
b. The compressor is installed in an insulated compartment accessible through hinged access doors, isolated from the treated air stream.
c. Line voltage controls, operating controls, refrigerant circuit access points, refrigerant flow control devices, and compressors are accessible from a single location behind left and right hinged access doors for ease of service.
d. Compressors are mounted on rubber in shear isolators and refrigerant lines to include reaction torque loops.
e. Reverse rotation protection is provided for all compressors.
f. Crankcase heaters are only activated during compressor off mode.

2. Coils:
a. The standard evaporator coil has enhanced surface aluminum plate fins mechanically bonded to seamless internally grooved copper tubes with brazed tube joints.
b. Evaporator coils are six row with intertwined circuiting.
c. Standard air-over condenser coils have enhanced surface aluminum plate fins mechanically bonded to seamless internally grooved copper tubes with brazed tube joints.
d. Coaxial water-to-refrigerant heat exchanger coils are mounted in an un-insulated compartment. Coils and water piping are insulated with 1 1/2 in. closed cell insulation.
e. Coils are pressure tested at 650 psig prior to unit assembly; leak tested at 150 psig with a final test at 475 psig.

3. Refrigerant Circuit and Refrigerant Safety Components shall include:
a. The unit is equipped with single refrigerant circuit, sizes 036 ton to 096 ton, or dual refrigerant circuits, sizes 120 ton to 140 ton, with each circuit containing:
1) Solid core filter drier
2) Field-adjustable externally equalized thermostatic expansion valve
3) Minimum load valve, optional hot gas bypass
4) Service access ports

b. The unit is equipped with VFD-controlled variable condenser fan speed low ambient head pressure control to allow operation down to 35°F.
c. The unit includes modulating head-pressure valves for part-load operation.

4. Filter Section:
   a. The standard filter section has 2 in. filter racks. Optional 4 in. and 2 in. plus 4 in. are available. 2 in. thick MERV8 pleated mediafilters are standard.
5. Unit Controls:
   a. Microprocessor controls:
      1) BACnet and Modbus protocols. LonWorks protocol capable, requires optional card.
      2) Provide a 5°F temperature difference between cooling and heating set points to meet ASHRAE 90.1, energy standard.
      3) Provide and display a current alarm list and an alarm history list.
      4) Compressor minimum run time (3 minutes) and minimum off time (5 minutes) are provided.
      5) Have service run test capability
      6) Have a service diagnostic mode.
      7) Has a minimum of two capacity stages, single circuit, or three capacity stages, dual circuit, of mechanical capacity control, excluding hot gas bypass, controlled with logic to maintain supply-air temperature set point.
      8) Is complete with self-contained low voltage control circuit.
   b. Safties:
      1) The unit incorporates a solid-state compressor lockout which provides optional reset capability at the space thermostat if any of the following safety devices trip and shut off the compressor:
      2) Compressor lockout protection provided for either internal or external overload
      3) Low-pressure protection
      4) Freeze protection, evaporator coil
      5) High-pressure protection
      6) Loss of charge protection
   c. The supply-air sensor is located in the unit and is used for compressor stage control.
   d. The unit is equipped with a supply fan status switch to protect the system in the event of a fan drive failure.
   e. Induced draft heating section is provided with the following minimum protections:
      1) High-temperature limit switch
      2) Differential pressure switch for proof of induced draft
      3) Flame rollout switch
      4) Flame proving controls
      5) Redundant style gas valve

E. Motors:
1. Compressor motors are cooled by refrigerant gas passing through motor windings and have either internal line break thermal and current overload protection or external current overload modules with compressor temperature sensors.
2. All condenser fan motors are totally enclosed air-over (IP54) with permanently lubricated ball bearings, class F insulation and manual reset overload protection.
3. All indoor fan motors meet the minimum efficiency requirements as established by the Energy Policy Act of 1992 (EPACT), effective October 24, 1997.
4. Standard indoor fan motors are open drip proof design. Optional totally enclosed fan-cooled motors (non-ECM) are available.

F. Unit Operating Characteristics

1. The unit is capable of starting and running at 115°F (46.1°C) outdoor ambient air temperature per maximum load criteria of AHRI Standard 340/360.
2. The unit with standard controls operates in cooling down to an outdoor ambient temperature of 35°F (1.6°C).
3. Units are equipped with a motorized two position outdoor air (OA) damper for 100% OA operation.
4. Units are equipped with an enthalpy control economizer with modulating outdoor and return air dampers.
5. The unit is provided with fan time delay to prevent cold air delivery, gas heat only.

G. Electrical Requirements
1. All unit power wiring enters the unit cabinet at a single location with a single power point connection.
2. The control panel incorporates touch-safe design.

H. Factory Installed Options:
1. Hot gas reheat (HGRH):
   a. A factory-installed HGRH coil is available. The HGRH coil is available on the lead circuit only or with a second coil for reheat both refrigerant circuits. Units with modulating HGRH have variable speed low ambient head pressure control.
2. Energy recovery: wheel:
   a. The factory-installed enthalpy wheel is certified to meet the requirements of AHRI Standard 1060 and is AHRI listed.
   b. The enthalpy wheel is constructed of corrugated synthetic fibrous media with a desiccant intimately bound and uniformly and permanently dispersed throughout the matrix structure of the media.
   c. The desiccant material is molecular sieve, 4 angstrom or smaller.
   d. The rotor is constructed of alternating layer of flat and corrugated media.
   e. Wheel construction is fluted or formed honeycomb geometry to eliminate internal wheel bypass.
   f. The wheel frames are evenly spaced steel spokes with a galvanized steel outer band and rigid center hub.
   g. The wheel seals are full contact nylon brush type.
   h. The wheel slides out of the cabinet side for service.
   i. Wheel cassettes are constructed of galvanized steel. Cassettes are integral purge section.
   j. The wheel bearings are inboard mounted permanently sealed roller bearings or externally flanged bearings.
   k. The wheel is driven by a fractional horsepower AC motor via a multilink drive belt.
   l. Energy wheel defrost control and air bypass are available.
3. Electric Heat:
   a. Electric resistance heaters are factory-installed, nichrome element type, open wire coils with 0.375 in. inside diameter, insulated with ceramic bushings, and include operating and safety controls. Coil ends are staked and welded to terminal screw slots.
   b. Factory-installed electric heat shall be Silicon controlled rectifier (SCR) control providing infinite capacity adjustment
4. Convenience outlet: is factory-installed and internally mounted with an externally accessible 115 V, 15 A GFCI, female receptacle with hinged cover. Factory-wired GFI with a step-down transformer and 15.0 A breaker.

5. NEMA 3R non-fused disconnect switch: is factory-installed, externally mounted, and UL approved. Non-fused switch provides unit power shutoff. It is accessible from outside the unit and provides power off lockout capability. Standard SCCR is 5 kVA.
6. Dirty filter status switch: the manual reset filter status switch is a pressure differential switch and indicates a dirty filter. The switch is factory installed.
7. Fan status switch: the unit is equipped with a field-adjustable differential air pressure switch installed across the filters or supply fan to provide proof of airflow.
8. Phase or voltage monitor: a factory-installed under-voltage and phase loss sensor stops the unit when the voltage is too low, phases are out of sequence, or a phase is dropped. The unit restarts automatically within five minutes after the correct power is supplied.
9. 4 in. filters
10. Full perimeter roof curb: the curb is formed of a minimum of 16 gauge galvanized steel with wood nailer strip and is capable of supporting entire unit weight.

I. Approved Manufacturers:
   1. Daikin
   2. TempMaster
   3. York

PART 3 - EXECUTION

3.01 INSTALLATION

A. General:
   1. Install the unit in accordance with the manufacturer's published instructions.
   2. The manufacturer's trained service technician provides start-up supervision for each unit.
   3. Duct connections to units must allow for straight and smooth airflow.
   4. Make the connections to the roof cub before setting the unit. The sleeve duct penetrations through the roof.
   5. Trap the drain lines and run the full size from the condensate drain connection to the appointed drain location.

B. Roof Curbs:
   1. Install curbs in complete accordance with the manufacturer’s printed instructions, and as indicated.
   2. Deliver roof curbs to construction contractor for installation.

3.02 FIELD QUALITY CONTROL

A. Preliminary Requirements: Employ the services of a Company Field Advisor of the rooftop air conditioner manufacturer for the following:
   1. Inspect air conditioner installations prior to start-up.
   2. Supervise initial start-up of machine.
   3. Instruction of School Personnel.
   4. Service.

B. Pre-Start-Up, Start-Up and Instruction: Upon completion of the installation of the air conditioner, to the satisfaction of the Company Field Advisor, start-up and preliminary testing shall be accomplished under the Company Field Advisor’s supervision. When all necessary adjustments have been made and air conditioner is properly operating, the Company Field Advisor shall instruct school personnel in the operation and maintenance of the air conditioner and accessories.

END OF SECTION

PART 1 - GENERAL

1.01 SYSTEM DESCRIPTION

A. The variable capacity, heat pump air conditioning system shall consist of multiple evaporators, refrigerant pipe joints and headers, a two-pipe refrigeration distribution system using PID control, and an air-cooled condensing unit. The condensing unit shall be a direct expansion (DX), air-cooled heat pump, multi-zone air-conditioning system with variable speed inverter driven compressors using R-410A refrigerant. The condensing unit shall be capable of connection to an indoor evaporator capacity up to 200% of the condensing unit capacity. All zones shall each be capable of operating separately with individual temperature control.

B. The condensing unit shall be interconnected to indoor unit models in accordance with the manufacturer's recommendations. The indoor units shall be connected to the condensing unit utilizing manufacturer approved piping joints and headers to ensure correct refrigerant flow and balancing. T- style joints are not acceptable.

C. Operation of the system shall permit either cooling or heating of all of the indoor units simultaneously. Each indoor unit or group of indoor units shall be able to provide set temperature independently via a local remote controller, an Intelligent Controller, an Intelligent Manager or a BMS interface.

D. An outdoor air shall be delivered to the system via an energy recovery ventilator. The energy recovery ventilator shall incorporate a high-efficiency paper, cross-flow heat exchanger core in order to provide both sensible and latent heat recovery.

1.02 SYSTEM DESCRIPTION

A. Advanced Zoning - A single system shall provide for up to 62 zones.

B. Autocharging - Each system shall have a refrigerant auto-charging function.

C. Oil Return Heating - Each system shall maintain continuous heating during oil return operation. Reverse cycle (cooling mode) oil return during heating operation shall not be permitted due to the potential reduction in space temperature.

D. Independent Control - Each indoor unit shall use a dedicated electronic expansion valve for independent control.

E. VFD Inverter Control - Each condensing unit shall use a high efficiency, variable speed “inverter” compressor coupled with inverter fan motors for superior part load performance.

F. Compressor capacity shall be modulated automatically to maintain constant suction and condensing pressures while varying the refrigerant volume for the needs of the cooling or heating loads.

G. Indoor units shall use PID to control superheat to deliver a comfortable room temperature condition and optimize efficiency.

H. Flexible Design
   1. Systems shall be capable of up to 540 ft. (640 ft. equivalent) of linear piping between the condensing unit and furthest located indoor unit.

2. Systems shall be capable of up to 3,280 ft. total “one-way” piping in the piping network.
3. Systems shall have a vertical (height) separation of up to 295 ft. between the condensing unit and the indoor units.
4. Systems shall be capable of up to 295 ft. from the first branch point.
5. The condensing unit shall have the ability to connect an indoor unit evaporator capacity of up to 200% of the condensing unit capacity.
6. Systems shall be capable of 49 ft. between indoor units.
7. Condensing units shall be supported with a fan motor ESP up to 0.32” WG as standard to allow connection of discharge ductwork and to prevent discharge air short circuiting.

I. Simple Wiring - Systems shall use 16/18 AWG, 2 wire, multi-stranded, non-shielded and non-polarized daisy chain control wiring.

J. Advanced Diagnostics - Systems shall include a self diagnostic, auto-check function to detect a malfunction and display the type and location.

K. Each condensing unit shall incorporate contacts for electrical demand shedding.

L. Advanced Controls - Each system shall have at least one remote controller capable of controlling up to 16 indoor units.

M. Each system shall be capable of integrating with open protocol BACnet and LonWorks building management systems.

1.03 QUALITY ASSURANCE

A. The units shall be tested by a Nationally Recognized Testing Laboratory (NRTL), in accordance with ANSI/UL 1995 - Heating and Cooling Equipment, and shall bear the Listed Mark.

B. All wiring shall be in accordance with the National Electrical Code (N.E.C.).

C. The units shall be rated in accordance with Air-conditioning Refrigeration Institute’s (ARI) Standard 210 and bear the ARI Certification label.

D. The system shall be manufactured in an ISO 9001 and ISO 14001 facility, which are standards set by the International Standard Organization (ISO). The system shall be factory tested for safety and function.

E. The condensing unit shall be factory charged with R410A refrigerant.

F. The energy recovery ventilator shall be certified in accordance with Air Conditioning, Heating, and Refrigeration Institute’s (AHRI) Standard 1060 and bear the AHRI Certified label.

G. The energy recovery heat exchanger core shall be tested in accordance with Underwriters Laboratories (UL) 723 and shall have a flame spread rating of not more than 25, and a smoke developed rating of not more than 50.

H. The energy recover system efficiency shall meet or exceed 65% thermal efficiency and 40% enthalpy recovery efficiency.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Equipment shall be stored and handled according to the manufacturer's recommendations.

1.05 WARRANTY

A. Condensing Unit
   1. The manufacturer shall warrant to the customer who is the original owner and user of the products specified above ("Customer") that under normal use and maintenance for comfort cooling and conditioning applications such products (the "Products") will be free from defects in material or workmanship. This warranty shall apply to parts only and is limited in duration to one (1) year from the earlier to occur of (a) the date of original installation, whether or not actual use begins on that date, or (b) eighteen (18) months from the date of shipment. Customer must present proof of the original date of receipt and of installation of the Product in order to establish the effective date of this warranty. Otherwise the effective date will be deemed to be the date of manufacture plus sixty (60) days. Repaired or replacement parts shall be warranted for the balance of the warranty period applicable to the original part following the date on which the repaired or replacement part is provided to the Customer.
   2. For its compressors only, the manufacturer shall provide the above warranty (which is applicable to parts only) for a seven (7) year period. This extended warranty for compressors shall be limited in duration to seven (7) years from the earlier to occur of (a) the date of original installation, whether or not actual use begins on that date, or (b) eighteen (18) months from the date of shipment, and applies to the compressor and compressor parts only. The effective date of this extended warranty shall be established as above.

B. Indoor Unit
   1. The units shall have a manufacturer's warranty for a period of one (1) year from date of installation. The units shall have a limited labor warranty for a period of one (1) year from date of installation. The compressors shall have a warranty of seven (7) years from date of installation. During the stated period, should any part fail due to defects in material and workmanship, it shall be repaired or replaced at the discretion of the manufacturer according to their terms and conditions. All warranty service work shall be performed by a manufacturer factory trained service professional.

C. Energy Recovery Unit
   1. The manufacturer shall warrant to the customer who is the original owner and user of the products specified above ("Customer") that under normal use and maintenance for comfort cooling and conditioning applications such products (the "Products") will be free from defects in material or workmanship. This warranty applies to parts only and is limited in duration to one (1) year from the earlier to occur of (a) the date of original installation, whether or not actual use begins on that date, or (b) eighteen (18) months from the date of shipment. Customer must present proof of the original date of receipt and of installation of the Product in order to establish the effective date of this warranty. Otherwise the effective date will be deemed to be the date of manufacture plus sixty (60) days. Repaired or replacement parts are warranted for the balance of the warranty period applicable to the original part following the date on which the repaired or replacement part is provided to the Customer.
   2. For the core only, the manufacturer shall provide the above warranty for a six (6) year period. This extended warranty for the core is limited in duration to six (6) years from the

earlier to occur of (a) the date of original installation, whether or not actual use begins on that date, or (b) twenty-four (24) months from the date of shipment. The effective date of this extended warranty shall be established as above.

D. System Installation Requirements
   1. The system must be installed by a factory trained contractor/dealer. The bidders shall be required to submit training certification proof with bid documents. The mechanical contractor's installation price shall be based on the systems installation requirements. The mechanical contractor bids with complete knowledge of the HVAC system requirements. Untrained contractors who wish to bid this project shall contact the manufacturer to arrange training prior to bid day.

1.06 SUBMITTALS

A. Submit manufacturer's product data including capacity of unit, electrical requirements, airflow, sound pressure data, indoor and outdoor unit measurements, weight, control schematics, and wiring diagrams.

PART 2 - PRODUCTS

2.01 DESIGN BASIS

A. The basis of design is Daikin AC. All bidders shall furnish the minimum system standards as defined by the base bid model numbers, model families or as otherwise specified herein. In any event, the contractor shall be responsible for all specified items and intents of this document without further compensation.

B. Alternates:
   1. LG VRF
   2. Mitsubishi VRV
   3. Approved alternate

2.02 CONDENSING UNIT

A. General: The condensing unit shall be designed specifically for use with a variable refrigerant volume system.
   1. The condensing unit shall be factory assembled and pre-wired with all necessary electronic and refrigerant controls. The refrigeration circuit of the condensing unit shall consist of scroll compressors, motors, fans, condenser coil, electronic expansion valves, solenoid valves, 4-way valve, distribution headers, capillaries, filters, shut off valves, oil separators, service ports and refrigerant regulator.
   2. Liquid and suction lines shall be individually insulated between the condensing and indoor units.
   3. The connection ratio of indoor units to condensing unit shall be permitted up to 200%.
   4. The condensing unit shall be able to support the connection of multiple indoor units.
   5. The system shall automatically restart operation after a power failure. System settings shall be saved in the event of a power loss without the need for reprogramming.
   6. The unit shall incorporate an auto-charging feature.
   7. The condensing unit shall be modular in design and should allow for side-by-side installation with minimum spacing.
   8. The following safety devices shall be included on the condensing unit: high pressure sensor and switch, low pressure switch, control circuit fuses, crankcase heaters, fusible

plug, overload relay, inverter overload protector, thermal protectors for compressor and fan motors, over current protection for the inverter and anti-recycling timers.

9. To ensure the liquid refrigerant does not flash when supplying to the various indoor units, the circuit shall be provided with a sub-cooling feature.
10. Oil recovery cycle shall be automatic occurring 2 hours after start of operation and then every 8 hours of operation. Each system shall maintain continuous heating during oil return operation. Reverse cycle (cooling mode) oil return during heating operation shall not be permitted due to the potential reduction in space temperature.
11. The condensing unit shall be capable of heating operation at 0°F dry bulb ambient temperature without additional low ambient controls or an auxiliary heat source.

B. Unit Cabinet:
1. The condensing unit shall be completely weatherproof and corrosion resistant. The unit shall be constructed from rust-proofed mild steel panels coated with a baked enamel finish.

C. Fan:
1. The condensing unit shall consist of propeller type, direct-drive fan motor(s) that have multiple speed operation via a DC (digitally commutating) inverter.
2. The condensing unit fan motor shall have multiple speed operation of the DC (digitally commutating) inverter type.
3. The fan shall be a vertical discharge configuration.
4. The fan motor shall have inherent protection and permanently lubricated bearings and be mounted.
5. The fan motor shall be provided with a fan guard to prevent contact with moving parts.
6. Night setback control of the fan motor for low noise operation by way of automatically limiting the maximum speed shall be a standard feature.

D. Condenser Coil:
1. The condenser coil shall be manufactured from copper tubes expanded into aluminum fins to form a mechanical bond.
2. The heat exchanger coil shall be of a waffle louver fin and rifled bore tube design to ensure high efficiency performance.
3. The heat exchanger on the condensing units shall be manufactured from Hi-X seamless copper tube with N-shape internal grooves mechanically bonded on to aluminum fins to an e-Pass Design.
4. The fins shall be covered with an anti-corrosion acrylic resin and hydrophilic film type E1.
5. The pipe plates shall be treated with powdered polyester resin for corrosion prevention. The thickness of the coating must be between 2.0 to 3.0 microns.

E. Compressor:
1. The inverter scroll compressors shall be variable speed (PVM inverter) controlled and capable of changing the speed to follow the variations in total cooling and heating load as determined by the suction gas pressure as measured in the condensing unit. In addition, samplings of evaporator and condenser temperatures shall be made so that the high/low pressures detected are read every 20 seconds and calculated. With each reading, the compressor capacity (INV frequency or STD ON/OFF) shall be controlled to eliminate deviation from target value.
2. The inverter driven compressor in each condensing unit shall be of highly efficient reluctance DC (digitally commutating), hermetically sealed scroll “G2-type” with a maximum speed of 7,980 rpm.

3. Neodymium magnets shall be adopted in the rotor construction to yield a higher torque and efficiency in the compressor instead of the normal ferrite magnet type. At complete stop of the compressor, the neodymium magnets will position the rotor into the optimum position for a low torque start.
4. The capacity control range shall be as low as 4% to 100%.
5. Each non-inverter compressor shall also be of the hermetically sealed scroll type.
6. Each compressor shall be equipped with a crankcase heater, high pressure safety switch, and internal thermal overload protector.
7. Oil separators shall be standard with the equipment together with an intelligent oil management system.
8. The compressor shall be spring mounted to avoid the transmission of vibration.
9. In the event of compressor failure in a system with multiple compressors, the remaining compressors shall continue to operate and provide heating or cooling as required at a proportionally reduced capacity. The microprocessor and associated controls shall be designed to specifically address this condition.
10. In the case of multiple condenser modules, conjoined operation hours of the compressors shall be balanced by means of the Duty Cycling Function, ensuring sequential starting of each module at each start/stop cycle, completion of oil return, completion of defrost or every 8 hours.

F. Electrical:
1. Refer to equipment schedules located on drawings for power requirements.
2. The control voltage between the indoor and condensing unit shall be 16VDC non-shielded, stranded 2 conductor cable.
3. The control wiring shall be a two-wire multiplex transmission system, making it possible to connect multiple indoor units to one condensing unit with one 2-cable wire, thus simplifying the wiring installation.
4. The control wiring lengths shall be as shown below.

G. Operating Range:
1. The operating range in cooling shall be 23°F DB ~ 122°F DB.
2. The operating range in heating shall be 0°F DB - 77°F DB / -4°F WB - 60°F WB.

2.03 4-WAY CEILING CASSETTE INDOOR UNITS (3'X3')

A. General: Indoor unit shall be a round flow ceiling cassette fan coil unit, operable with R-410A refrigerant, equipped with an electronic expansion valve, for installation into the ceiling cavity equipped with an air panel grill. Unit to be connected to outdoor unit heat pump or heat recovery model. It shall be a round flow air distribution type, fresh white, impact resistant with a washable decoration panel. The supply air shall be distributed via motorized louvers which can be horizontally and vertically adjusted from 0° to 90°. Computerized PID control shall be used to control superheat for temperature control. The unit shall be equipped with a programmed drying mechanism that dehumidifies while limiting changes in room temperature.

B. Performance: Refer to equipment schedules on drawings.

C. Indoor Unit:
1. The indoor unit shall be completely factory assembled and tested. Included in the unit is factory wiring, piping, electronic proportional expansion valve, control circuit board, fan motor thermal protector, flare connections, condensate drain pan, condensate drain pump, condensate safety shutoff and alarm, self-diagnostics, auto-restart function, 3-minute fused time delay, and test run switch.

2. Indoor unit and refrigerant pipes shall be charged with dehydrated air prior to shipment from the factory.
3. Both refrigerant lines shall be insulated from the outdoor unit.
4. The round flow supply air flow shall be adjustable to different airflow patterns to accommodate various installation configurations including corner installations.
5. Return air shall be through the concentric panel, which includes a resin net, mold resistant, antibacterial filter.
6. The indoor units shall be equipped with a condensate pan with antibacterial treatment and condensate pump. The condensate pump shall provide up to 33-1/2” of lift and have a built in safety shutoff and alarm.
7. The indoor units shall be equipped with a return air thermistor.
8. The indoor unit shall be separately powered. Refer to equipment schedule on drawings for power requirements.

D. Unit Cabinet:
1. The cabinet shall be space saving and shall be located into the ceiling.
2. The unit shall consist of multiple auto-swing positions.
3. The airflow of the unit shall have the ability to shut down outlets with multiple patterns allowing for simpler installation in irregular spaces.
4. Fresh air intake shall be possible via an optional fresh air intake kit. Refer to equipment schedule on drawings for options selected.
5. A branch duct knockout shall exist for branch ducting of supply air.
6. The cabinet shall be constructed with sound absorbing foamed polystyrene and polyethylene insulation.
7. High efficiency MERV 13 air filters shall be available for each model unit. Refer to equipment schedule on drawings for options selected.

E. Fan:
1. The fan shall be direct-drive turbo fan type with statically and dynamically balanced impeller with three fan speeds available.
2. The airflow rate shall be available in three settings.
3. The fan motor shall be equipped as standard with adjustable external static pressure (ESP) settings to allow operation with a MERV 13 filter as necessary.
4. The fan motor shall be thermally protected.

F. Filter:
1. The return air shall be filtered by means of a washable long-life filter with mildew proof resin and antibacterial treatment.
2. Optional high efficiency disposable MERV 13 filters shall be available.

G. Coil:
1. Coils shall be of the direct expansion type constructed from copper tubes expanded into aluminum fins to form a mechanical bond.
2. The coil shall be of a waffle louver fin and high heat exchange, rifled bore tube design to ensure highly efficient performance.
3. The coil shall be a 2-row cross fin copper evaporator coil with 17 FPI design completely factory tested.
4. The refrigerant connections shall be flare connections.
5. A condensate pan with antibacterial treatment shall be located under the coil.
6. A condensate pump shall be located below the coil in the condensate pan with a built in safety alarm.

7. A thermistor will be located on the liquid and gas line.

H. Electrical:
1. A separate power supply will be required. Refer to equipment schedule on drawings for electrical requirements.
2. Transmission (control) wiring between the indoor and outdoor unit shall be a maximum of 3,280 feet (total 6,560 feet).
3. Transmission (control) wiring between the indoor unit and remote controller shall be a maximum distance of 1,640 feet.

I. Control:
1. The unit shall have controls provided by the manufacturer to perform input functions necessary to operate the system.
2. The unit shall be compatible with interfacing with a BMS system via optional LonWorks or BACnet gateways. Refer to equipment schedule on drawings for options selected.

2.04 REFRIGERANT PIPING

A. The system shall be capable of refrigerant piping up to 540 actual feet or 620 equivalent feet from the condensing unit to the furthest indoor unit, a total combined liquid line length of 3,280 feet of piping between the condensing and indoor units with 295 feet maximum vertical difference, without any oil traps.

B. Piping joints and headers shall be used to ensure proper refrigerant balance and flow for optimum system capacity and performance. T style joints shall not be acceptable as this will negatively impact proper refrigerant balance and flow for optimum system capacity and performance.

PART 3 - EXECUTION

3.01 GENERAL

A. Install all equipment, piping, and controls in accordance with manufacturer’s installation instructions.

B. Install refrigerant piping as per manufacturer’s instructions and specification.

C. Mount the outdoor condensing unit on a concrete equipment pad or equipment support rails.

D. Support the indoor unit as per the manufacturer’s instructions.

E. Mount the controller. Coordinate exact location with the owner.

F. Install the drain line. Pitch drain line in the direction of flow.

G. Install new filter on indoor unit.

H. Clean all equipment after installation.

END OF SECTION

PART 1 - GENERAL

1.01 SYSTEM DESCRIPTION

1.02 QUALITY ASSURANCE

A. The energy recovery ventilator shall be Certified by the Home Ventilating Institute (HVI) under CSA 439. Both a heating and a cooling test must be run to demonstrate year round energy recovery.

B. All wiring shall be in accordance with the National Electric Code (NEC).

C. Manufacturer shall be able to provide evidence of independent testing of the core by Underwriters Laboratory (UL), verifying a maximum flame spread index (FSI) of 25 and a maximum smoke developed index (SDI) of 50 thereby meeting NFPA 90A and NFPA 90B requirements for materials in a compartment handling air intended for circulation through a duct system. The method of test shall be UL Standard 723.

D. Unit shall be Listed under UL 1812 Standard for Ducted Air to Air Heat Exchangers. The unit must pass commercial flammability requirements and shall not be labeled “For Residential Use Only”.

E. The ERV core shall be warranted to be free of manufacturing defects and to retain its functional characteristics, under circumstances of normal use, for a period of ten years from the date of purchase. The balance-of-unit shall be warranted to be free of manufacturing defects and to retain its functional characteristics, under circumstances of normal use, for a period of five years from the date of purchase.

1.03 DELIVERY, STORAGE, AND HANDLING

A. Equipment shall be stored and handled according to the manufacturer’s recommendations.

1.04 WARRANTY

A. LIMITED WARRANTY
1. The warranties (hereinafter, the “Warranty”) apply with respect to parts only and not labor. Accordingly, subject to the conditions and limitations set forth herein, the Warranty entitles the Customer to receive, at the option of the manufacturer only, a repaired or replacement part and does not entitle Customer to installation thereof. However, for the first one (1) year only of the Warranty period, the manufacturer shall provide labor services to repair a Product or install repaired or replacement parts at its designated repair facilities, or at its option, compensate its authorized dealer and authorized contractor at the manufacturer’s standard fixed rates then in effect (irrespective of charges actually imposed and time actually expended) to provide such services.

1.05 SUBMITTALS

A. Submit manufacturer’s product data including capacity of unit, electrical requirements, airflow, sound pressure data, control schematics, and wiring diagrams.

PART 2 - PRODUCTS

2.01 DESIGN BASIS

A. The basis of design is Nova. All bidders shall furnish the minimum system standards as defined by the base bid model numbers, model families or as otherwise specified herein. In any event, the contractor shall be responsible for all specified items and intents of this document without further compensation.

2.02 PERFORMANCE

A. Energy Transfer
   1. The ERV shall be capable of transferring both sensible and latent energy between airstreams. Latent energy transfer shall be accomplished by direct water vapor transfer from one airstream to the other, without exposing transfer media in succeeding cycles directly to the exhaust air and then to the fresh air.

B. Passive Frost Control
   1. The ERV core shall perform without condensing or frosting under normal operating conditions (defined as outside temperatures above -10°F and inside relative humidity below 40%). Occasional more extreme conditions shall not affect the usual function, performance or durability of the core. No condensate drains will be allowed.

C. Continuous Ventilation
   1. Unit shall have the capacity to operate continuously without the need for bypass, recirculation, pre-heaters, or defrost cycles under normal operating conditions.

D. Positive Airstream Separation
   1. Water vapor transfer shall be through molecular transport by hydroscopic resin and shall not be accomplished by “porous plate” mechanisms. Exhaust and fresh airstreams shall travel at all times in separate passages, and airstreams shall not mix.

E. Laminar Flow
   1. Airflow through the ERV core shall be laminar over the products entire operating airflow range, avoiding deposition of particulates on the interior of the energy exchange plate material.

2.03 CONSTRUCTION

A. Construction
   1. The energy recovery component shall be of fixed-plate cross-flow construction, with no moving parts.
   2. No condensate drain pans or drains shall be allowed and unit shall be capable of operating in both winter and summer conditions without generating condensate.
   3. The unit case shall be constructed of 24-gauge steel, with lapped corners and zinc plated screw fasteners. The case shall be finished with textured, powder coat paint (GR90 case shall be constructed of G90 galvanized steel.)
   4. Access doors shall provide easy access to blowers, ERV cores, and filters. Doors shall have an airtight compression seal using closed cell foam gaskets.
   5. Case walls and doors shall be fully insulated with 1 inch, expanded polystyrene foam insulation faced with a cleanable foil face on all exposed surfaces.

6. The ERV cores shall be protected by a MERV-8 rated, spun polyester, disposable filter in both airstreams.
7. The unit shall have a line-cord power connection and be supplied with an internal 24 VAC transformer and relay (G90 shall have hardwired line voltage connection and be controlled by line voltage controls provided by others.)
8. Standby power draw shall not exceed 1 Watt for the unit along with an optional automatic control.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install all equipment, piping, and controls in accordance with manufacturer's installation instructions.

B. Locate and orient unit to provide the shortest and most straight duct connections. Provide service clearances as indicated on the plans. Locate units distant from sound critical occupancies.

C. Use integral mounting flange and hanging bar system to mount the unit to a structurally suitable surface.

D. Support the indoor unit as per the manufacturer's instructions.

E. Install new filter on unit.

F. Clean all equipment after installation.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

1.02 SUBMITTALS

A. Shop Drawings: Certified shop drawings for all coils not furnished as part of factory prefabricated unitized mechanical equipment.

B. Product Data: Submit manufacturer's catalog sheets, performance charts, test data, standard schematic drawings, specifications and installation instructions for each coil.

C. Quality Control Submittals:
   1. Certificates: Prior to the approval of coils, the Director may at his option, require certified copies of coil performance and data sheets for all coils.

1.03 QUALITY ASSURANCE

A. Requirements of Regulatory Agencies:
   1. Heating coils and cooling coils shall meet the applicable fabrication and testing requirements of the Safety Code for Mechanical Refrigeration ASHRAE 15. Ratings of coils, with the exception of the direct expansion refrigerant type, shall be in accordance with ARI Standard 410, "Forced Circulation Air Cooling and Air Heating Coils".
   2. Published coil data, complete with sizing information, shall be available for all coils submitted for approval.

PART 2 - PRODUCTION

2.01 FABRICATION AND DESIGN

A. Fabricate coils of seamless copper, red brass or inhibited Admiralty metal tubes, with aluminum or copper flat plate fins with formed collars permanently bonded to the tubes by mechanical expansion of the tubes, or equivalent method as approved by the Director. In applications where water sprays impinge on coils, all as specified or indicated, furnish flat plate or helically wound type fins, either corrugated or plain, fabricated of copper. Furnish helically wound fins, evenly and tightly wound and fastened to form a secure bond, with the entire surface of the tubes being tinned with solder, before the fins are wound on the tubes. Design encased filter banks, so as to permit the removal of any individual coil, without disturbing other coils in the bank. Coil extensions shall pass through ends of casing and shall be air and water tight. Design coils for use with steam or water for a minimum working pressure of 200 psig WSP, 200 psig OWG and factory test at 250 psig air under water.

B. Design steam heating coils for use with modulating control valves.

C. Design of coils for use with ethylene glycol solution shall be as specified for water coils.

D. Select coils with the indicated number of tube rows, fin spacing, size and end connections required to meet the load requirements and other conditions indicated.

E. Unless otherwise indicated, the requirements of this Section do not apply to coils that are incorporated in cataloged completely factory packaged air cooled condensers, fan coil units, unit heaters, self contained air conditioning units, refrigeration unit coolers, product coolers, gravity finned coils for refrigeration use, standing type refrigerated plate coils and other equipment as indicated.

2.02 HOT GAS REHEAT COILS

A. Refrigerant Coils: Furnish coils of the direct expansion type with a distributing header for each coil with circuiting as required, and a suction header so arranged that every tube in each circuit of the coil is supplied with an equal amount of refrigerant. Braze all coil joints. Design coils for a minimum working pressure of 250 psig and factory test at 300 psig air under water, followed by cleaning, thorough dehydration under vacuum and sealing at the factory.

2.03 CASING

A. Furnish all coils, with the exception of coils in factory packaged air handling units, with casings fabricated from a minimum of No. 16 USS gage galvanized steel, with bolting flanges on sides and ends. Securely fasten coils to casings.

2.04 COIL SUPPORTS

A. Furnish supports designed to allow for free expansion movement of the tubes. Furnish chilled water cooling coil supports fabricated from galvanized steel, with a factory applied corrosion resistant coating.

PART 3 - EXECUTION

3.01 APPLICATION

A. Install coils of type and kind as indicated, in accordance with the manufacturers instructions.

END OF SECTION

PART 1 - GENERAL

1.01 SYSTEM DESCRIPTION

A. The variable capacity, heat pump heat recovery air conditioning system shall be a Mitsubishi Electric CITY MULTI VRFZ (Variable Refrigerant Flow Zoning).

B. The R2-Series system shall consist of a PURY outdoor unit, BC (Branch Circuit) Controller, multiple indoor units, and M-NET DDC (Direct Digital Controls). Each indoor unit or group of indoor units shall be capable of operating in any mode independently of other indoor units or groups. System shall be capable of changing mode (cooling to heating, heating to cooling) with no interruption to system operation. To ensure owner comfort, each indoor unit or group of indoor units shall be independently controlled and capable of changing mode automatically when zone temperature strays 1.8 degrees F from set point for ten minutes. The sum of connected capacity of all indoor air handlers shall range from 50% to 150% of outdoor rated capacity.

C. The S-Series system shall consist of the PUMY outdoor unit, multiple CITY MULTI indoor units (- E models), and M-NET DDC (Direct Digital Controls). The PUMY outdoor unit shall be a horizontal discharge, 208/230 volt, single-phase unit. Each CITY MULTI indoor unit or group of CITY MULTI indoor units shall be independently controlled.

1.02 QUALITY ASSURANCE

A. The units shall be listed by Electrical Testing Laboratories (ETL) and bear the ETL label.

B. All wiring shall be in accordance with the National Electrical Code (N.E.C.).

C. The units shall be manufactured in a facility registered to ISO 9001 and ISO14001 which is a set of standards applying to environmental protection set by the International Standard Organization (ISO).

D. All units must meet or exceed the 2010 Federal minimum efficiency requirements and the proposed ASHRAE 90.1 efficiency requirements for VRF systems. Efficiency shall be published in accordance with the DOE alternative test procedure, which is based on the Air-Conditioning, Heating, and Refrigeration Institute (AHRI) Standards 340/360, 1230 and ISO Standard 13256-1.

E. A full charge of R-410A for the condensing unit only shall be provided in the condensing unit.

1.03 DELIVERY, STORAGE AND HANDLING

A. Unit shall be stored and handled according to the manufacturer’s recommendation.

1.04 CONTROLS

A. The control system shall consist of a low voltage communication network of unitary built-in controllers with on-board communications and a web-based operator interface. A web controller with a network interface card shall gather data from this system and generate web pages accessible through a conventional web browser on each PC connected to the network. Operators shall be able to perform all normal operator functions through the web browser interface.

B. System controls and control components shall be installed in accordance with the manufacturer's written installation instructions.

C. Furnish energy conservation features such as optimal start, night setback, request-based logic, and demand level adjustment of overall system capacity as specified in the sequence.

D. System shall provide direct and reverse-acting on and off algorithms based on an input condition or group conditions to cycle a binary output or multiple binary outputs.

E. Provide capability for future system expansion to include monitoring and use of occupant card access, lighting control and general equipment control.

F. Control system start-up shall be a required service to be completed by the manufacturer or a duly authorized, competent representative that has been factory trained in Mitsubishi controls system configuration and operation. The representative shall provide proof of certification for Mitsubishi CMCN Essentials Training and/or CMCN Hands-On Training indicating successful completion of no more than two (2) years prior to system installation. This certification shall be included as part of the equipment and/or controls submittals. This service shall be equipment and system count dependent and shall be a minimum of one (1) eight (8) hour period to be completed during normal working hours.

PART 2 - PRODUCTS

2.01 WARRANTY

A. The units shall be covered by the manufacturer's limited warranty for a period of one (1) year from date of installation. If the systems are:
   1. designed by a certified CITY MULTI Diamond Designer,
   2. installed by a contractor that has successfully completed the Mitsubishi Electric three day service course, AND
   3. verified with a completed commissioning report submitted to and approved by the Mitsubishi Electric Service Department, then the units shall be covered by an extended manufacturer's limited warranty for a period of five (5) years from date of installation.

B. In addition the compressor shall have a manufacturer's limited warranty for a period of seven (7) years from date of installation.

C. If, during this period, any part should fail to function properly due to defects in workmanship or material, it shall be replaced or repaired at the discretion of the manufacturer.

D. This warranty shall not include labor.

E. Manufacturer shall have a minimum of twenty-nine years of HVAC experience in the U.S. market.

F. All manufacturer technical and service manuals must be readily available for download by any local contractor should emergency service be required. Registering and sign-in requirements which may delay emergency service reference are not allowed.

G. The CITY MULTI VRFZ system shall be installed by a contractor with extensive CITY MULTI install and service training. The mandatory contractor service and install training should be performed by the manufacturer.

PART 3 - PRODUCTS

3.01 R2-SERIES OUTDOOR UNIT

A. General: The R2-Series PURY outdoor unit shall be used specifically with CITY MULTI VRFZ components. The PURY outdoor units shall be equipped with multiple circuit boards that interface to the M-NET controls system and shall perform all functions necessary for operation. Each outdoor unit module shall be completely factory assembled, piped and wired and run tested at the factory.
   1. Outdoor unit shall have a sound rating no higher than 60 dB(A) individually or 64 dB(A) twinned. Units shall have a sound rating no higher than 50 dB(A) individually or 53 dB(A) twinned while in night mode operation. If an alternate manufacturer is selected, any additional material, cost, and labor to meet published sound levels shall be incurred by the contractor.
   2. Both refrigerant lines from the outdoor unit to the BC (Branch Circuit) Controller (Single or Main) shall be insulated.
   3. There shall be no more than 3 branch circuit controllers connected to any one outdoor unit.
   4. Outdoor unit shall be able to connect to up to 50 indoor units depending upon model.
   5. The outdoor unit shall have an accumulator with refrigerant level sensors and controls.
   6. The outdoor unit shall have a high pressure safety switch, over-current protection, crankcase heater and DC bus protection.
   7. The outdoor unit shall have the ability to operate with a maximum height difference of 164 feet and have total refrigerant tubing length of 1804-2625 feet. The greatest length is not to exceed 541 feet between outdoor unit and the indoor units without the need for line size changes or traps.
   8. The outdoor unit shall be capable of operating in heating mode down to -4?F ambient temperatures or cooling mode down to 23?F ambient temperatures, without additional low ambient controls. If an alternate manufacturer is selected, any additional material, cost, and labor to meet low ambient operating condition and performance shall be incurred by the contractor.
   9. The outdoor unit shall be capable of operating in cooling mode down to -10?F with optional manufacturer supplied low ambient kit.
   10. Manufacturer supplied low ambient kit shall be provided with predesigned control box rated for outdoor installation and capable of controlling kit operation automatically in all outdoor unit operation modes.
   11. Manufacturer supplied low ambient kit shall be listed by Electrical Laboratories (ETL) and bear the ETL label.
   12. Manufacturer supplied low ambient kit shall be factory tested in low ambient temperature chamber to ensure operation. Factory performance testing data shall be available when requested.
   13. The outdoor unit shall have a high efficiency oil separator plus additional logic controls to ensure adequate oil volume in the compressor is maintained.
   14. Unit must defrost all circuits simultaneously in order to resume full heating more quickly.
   15. Partial defrost which may extend “no or reduced heating” periods shall not be allowed.

B. Unit Cabinet:
   1. The casing(s) shall be fabricated of galvanized steel, bonderized and finished. Units cabinets shall be able to withstand 960 hours per ASTM B117 criteria for seacoast protected models (-BS models)

C. Fan:

1. Each outdoor unit module shall be furnished with one direct drive, variable speed propeller type fan. The fan shall be factory set for operation under 0 in. WG external static pressure, but capable of normal operation under a maximum of 0.24 in. WG external static pressure via dipswitch.
2. All fan motors shall have inherent protection, have permanently lubricated bearings, and be completely variable speed.
3. All fan motors shall be mounted for quiet operation.
4. All fans shall be provided with a raised guard to prevent contact with moving parts.
5. The outdoor unit shall have vertical discharge airflow.

D. Refrigerant
1. R410A refrigerant shall be required for PURY-P-T/Y(S)KMU-A outdoor unit systems.
2. Polyester (POE) oil shall be required. Prior to bidding, manufacturers using alternate oil types shall submit material safety data sheets (MSDS) and comparison of hygroscopic properties for alternate oil with list of local suppliers stocking alternate oil for approval at least two weeks prior to bidding.

E. Coil:
1. The outdoor coil shall be of nonferrous construction with lanced or corrugated plate fins on copper tubing.
2. The coil fins shall have a factory applied corrosion resistant blue-fin finish.
3. The coil shall be protected with an integral metal guard.
4. Refrigerant flow from the outdoor unit shall be controlled by means of an inverter driven compressor.
5. The outdoor coil shall include 4 circuits with two position valves for each circuit, except for the last stage.

F. Compressor:
1. Each outdoor unit module shall be equipped with one inverter driven scroll hermetic compressor. Non inverter-driven compressors, which cause inrush current (demand charges) and require larger wire sizing, shall not be allowed.
2. A crankcase heater(s) shall be factory mounted on the compressor(s).
3. The outdoor unit compressor shall have an inverter to modulate capacity. The capacity shall be completely variable with a turndown of 19%-5% of rated capacity, depending upon unit size.
4. The compressor will be equipped with an internal thermal overload.
5. The compressor shall be mounted to avoid the transmission of vibration.
6. Field-installed oil equalization lines between modules are not allowed. Prior to bidding, manufacturers requiring equalization must submit oil line sizing calculations specific to each system and module placement for this project.

G. Controls:
1. The outdoor unit shall have the capability of up to 8 levels of demand control for each refrigerant system

H. Electrical:
1. The outdoor unit electrical power shall be 208/230 volts, 3-phase, 60 hertz.
2. The outdoor unit shall be capable of satisfactory operation within voltage limits of 187- 228 volts (208V/60Hz), 207-253V (230V/60Hz).
3. The outdoor unit shall be controlled by integral microprocessors.

4. The control circuit between the indoor units, BC Controller and the outdoor unit shall be 24VDC completed using a 2-conductor, twisted pair shielded cable to provide total integration of the system.

3.02 BRANCH CIRCUIT (BC) CONTROLLERS FOR R2-SERIES SYSTEMS

A. General
   1. The BC (Branch Circuit) Controllers shall include multiple branches to allow simultaneous heating and cooling by allowing either hot gas refrigerant to flow to indoor unit(s) for heating or subcooled liquid refrigerant to flow to indoor unit(s) for cooling. Refrigerant used for cooling must always be subcooled for optimal indoor unit LEV performance; alternate branch devices with no subcooling risk bubbles in liquid supplied to LEV and are not allowed.
   2. The BC (Branch Circuit) Controllers shall be specifically used with R410A R2-Series systems. These units shall be equipped with a circuit board that interfaces to the M-NET controls system and shall perform all functions necessary for operation. The unit shall have a galvanized steel finish. The BC Controller shall be completely factory assembled, piped and wired. Each unit shall be run tested at the factory. This unit shall be mounted indoors, with access and service clearance provided for each controller. The sum of connected capacity of all indoor air handlers shall range from 50% to 150% of rated capacity.

B. BC Unit Cabinet:
   1. The casing shall be fabricated of galvanized steel.
   2. Each cabinet shall house a liquid-gas separator and multiple refrigeration control valves.
   3. The unit shall house two tube-in-tube heat exchangers.

C. Refrigerant
   1. R410A refrigerant shall be required.

D. Refrigerant valves:
   1. The unit shall be furnished with multiple branch circuits which can individually accommodate up to 54,000 BTUH and up to three indoor units. Branches may be twinned to allow more than 54,000 BTUH.
   2. Each branch shall have multiple two-position valves to control refrigerant flow.
   3. Service shut-off valves shall be field-provided/installed for each branch to allow service to any indoor unit without field interruption to overall system operation.
   4. Linear electronic expansion valves shall be used to control the variable refrigerant flow.

E. Integral Drain Pan:
   1. An Integral drain pan and drain shall be provided

F. Electrical:
   1. The unit electrical power shall be 208/230 volts, 1 phase, 60 Hertz. Provide with unit mounted disconnect switch.
   2. The unit shall be capable of satisfactory operation within voltage limits of 187-228 (208V/60Hz) or 207-253 (230/60Hz).
   3. The BC Controller shall be controlled by integral microprocessors
   4. The control circuit between the indoor units and outdoor units shall be 24VDC completed using a 2-conductor, twisted pair shielded cable to provide total integration of the system.

3.03 S-SERIES OUTDOOR UNIT

A. General: The PUMY outdoor units shall be equipped with multiple circuit boards that interface to the M-NET controls system and shall perform all functions necessary for operation. The outdoor unit shall be completely factory assembled, piped and wired. Each unit shall be run tested at the factory.
   1. The sum of connected capacity of all CITY MULTI indoor units shall range from 50% to 130% of outdoor rated capacity.
   2. Outdoor unit shall have a sound rating no higher than 52 dB(A).
   3. Both refrigerant lines from the outdoor unit to indoor units shall be individually insulated.
   4. The outdoor unit shall have an accumulator with refrigerant level sensors and controls.
   5. The outdoor unit shall have a high pressure safety switch, low pressure safety switch and over-current protection and DC bus protection.
   6. The outdoor unit shall have the ability to operate with a maximum height difference of 98 feet and have a total refrigerant tubing length of 393 feet. The greatest length is not to exceed 262 feet between the outdoor unit and the CITY MULTI indoor units and shall not require line size changes nor traps.
   7. The outdoor unit shall have rated performance for heat operation at 0°F ambient temperature without additional low ambient controls.
   8. The outdoor unit shall be capable of cooling operation down to 23oF outdoor ambient without additional low ambient controls.
   9. The outdoor unit shall have a high efficiency oil separator plus additional logic controls to ensure adequate oil volume in the compressor is maintained.

B. Unit Cabinet:
   1. The casing shall be fabricated of galvanized steel, bonderized and finished with a powder coated baked enamel.

C. Fan:
   1. The unit shall be furnished with two direct drive, variable speed motors.
   2. The fans will be forward curved type blades for quiet operation.
   3. The fan motor shall have inherent protection, have permanently lubricated bearings, and be completely variable speed.
   4. The fan motor shall be mounted for quiet operation.
   5. The fan shall be provided with a raised guard to prevent contact with moving parts.
   6. The outdoor unit shall have horizontal discharge airflow.

D. Refrigerant
   1. R410A refrigerant shall be required for PUMY-P-NHMU outdoor unit systems.

E. Coil:
   1. The outdoor coil shall be of nonferrous construction with lanced or corrugated fins on copper tubing.
   2. The coil fins will have a factory applied corrosion resistant blue-fin finish.
   3. The coil shall be protected with an integral metal guard.
   4. Refrigerant flow from the outdoor unit shall be controlled by means of an inverter driven compressor.

F. Compressor:
   1. The compressor shall be a single high performance, inverter driven, modulating capacity scroll compressor.

2. The outdoor unit compressor shall have an inverter to modulate capacity. The capacity shall be completely variable down to 33% of rated capacity for the PUMY-P36NHMU (- BS) and 25% for the PUMY-P48NHMU (-BS).
3. The compressor shall be equipped with an internal thermal overload.
4. The compressor shall be mounted to avoid the transmission of vibration.

G. Electrical:
1. The outdoor unit electrical power shall be 208/230 volts, 1-phase, 60 hertz. Provide with unit mounted disconnect switch.
2. The unit shall be capable of satisfactory operation within voltage limitations of 187-228 volts (208V/60Hz) or 207-253 volts (230V/60Hz)
3. The outdoor unit shall be controlled by integral microprocessors.
4. The control circuit between the indoor units and the outdoor unit shall be 24VDC completed using a 2-conductor, twisted pair, non-polar shielded cable to provide total integration of the system.

3.04 PLFY-P**NCMU-ER4 (4-WAY CEILING-RECESSED CASSETTE WITH GRILLE) INDOOR UNIT

A. General:
1. The PLFY-P**NCMU-ER4 shall be a four-way cassette style indoor unit that recesses into the ceiling with a ceiling grille. The indoor unit shall be factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, piping, electronic modulating linear expansion device, control circuit board and fan motor. The unit shall have a self-diagnostic function, 3-minute time delay mechanism, an auto restart function, an emergency operation function and a test run switch. Indoor unit and refrigerant pipes shall be charged with dehydrated air before shipment from the factory.

B. Unit Cabinet:
1. The cabinet shall be a compact 22-7/16” wide x 22-7/16” deep so it will fit within a standard 24” square suspended ceiling grid.
2. The cabinet panel shall have provisions for a field installed filtered outside air intake.
3. Four-way grille shall be fixed to bottom of cabinet allowing two, three or four-way blow.

C. Fan:
1. The indoor fan shall be an assembly with a turbo fan direct driven by a single motor.
2. The indoor fan shall be statically and dynamically balanced to run on a motor with permanently lubricated bearings.
3. The indoor fan shall consist of three (3) speeds, Low, Mid, and High.
4. The indoor unit shall have an adjustable air outlet system offering 4-way airflow, 3-way airflow, or 2-way airflow.
5. The auto air swing vanes shall be capable of automatically swinging up and down for uniform air distribution.

D. Filter:
1. Return air shall be filtered by means of a long-life washable filter.

E. Coil:
1. The indoor coil shall be of nonferrous construction with smooth plate fins on copper tubing.
2. The tubing shall have inner grooves for high efficiency heat exchange.
3. All tube joints shall be brazed with phos-copper or silver alloy.
4. The coils shall be pressure tested at the factory.
5. A condensate pan and drain shall be provided under the coil.

6. The unit shall be provided with an integral condensate lift mechanism that will be able to raise drain water 19-3/4” inches above the condensate pan.
7. Both refrigerant lines to the PLFY indoor units shall be insulated.

F. Electrical:
1. The unit electrical power shall be 208/230 volts, 1-phase, 60 hertz.
2. The system shall be capable of satisfactory operation within voltage limits of 187-228 volts (208V/60Hz) or 207-253 volts (230V/60Hz).

G. Controls:
1. This unit shall use controls provided by Mitsubishi Electric to perform functions necessary to operate the system.
2. Indoor unit shall compensate for the higher temperature sensed by the return air sensor compared to the temperature at level of the occupant when in HEAT mode. Disabling of compensation shall be possible for individual units to accommodate instances when compensation is not required.
3. Control board shall include contacts for control of external heat source. External heat may be energized as second stage with 1.8°F - 9.0°F adjustable deadband from set point.
4. Indoor unit shall include no less than four (4) digital inputs capable of being used for customizable control strategies.
5. Indoor unit shall include no less than three (3) digital outputs capable of being used for customizable control strategies.
6. Manufacturer to provide drain pan level sensor powered by a 20-year life lithium battery.
7. Sensor shall require no external power for operation and shall have an audible indication of low battery condition.
8. The drain pan sensor shall provide protection against drain pan overflow by sensing a high condensate level in the drain pan. Should this occur the control shuts down the indoor unit before an overflow can occur. A thermistor error code will be produced should the sensor activate indicating a fault which must be resolved before the unit re-starts.

3.05 PEFY-NMAU (CEILING-CONCEALED DUCTED) INDOOR UNIT

A. General:
1. The PEFY shall be a ceiling-concealed ducted indoor fan coil design that mounts above the ceiling with a 2-position, field adjustable return and a fixed horizontal discharge supply and shall have a modulating linear expansion device. The PEFY shall be used with the R2-Series outdoor unit and BC Controller, Y-Series outdoor unit, or S-Series outdoor unit. The PEFY shall support individual control using M-NET DDC controllers.

B. Indoor Unit:
1. The indoor unit shall be factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, piping, electronic modulating linear expansion device, control circuit board and fan motor. The unit shall have a self-diagnostic function, 3-minute time delay mechanism, and an auto restart function. Indoor unit and refrigerant pipes shall be charged with dehydrated air before shipment from the factory.

C. Unit Cabinet:
1. The unit shall be, ceiling-concealed, ducted.
2. The cabinet panel shall have provisions for a field installed filtered outside air intake.

D. Fan:

E. PEFY-NMAU models shall feature external static pressure settings from 0.14 to 0.60 in.

1. WG.
2. The indoor unit fan shall be an assembly with one or two Sirocco fan(s) direct driven by a single motor.
3. The indoor fan shall be statically and dynamically balanced and run on a motor with permanently lubricated bearings.
4. The indoor fan shall consist of three (3) speeds, High, Mid, and Low plus the Auto-Fan function
5. The indoor unit shall have a ducted air outlet system and ducted return air system.

F. Filter:
1. Return air shall be filtered by means of a standard factory installed return air filter.
2. Optional return filter box (rear or bottom placement) with high-efficiency filter shall be available for all PEFY indoor units.

G. Coil:
1. The indoor coil shall be of nonferrous construction with smooth plate fins on copper tubing.
2. The tubing shall have inner grooves for high efficiency heat exchange.
3. All tube joints shall be brazed with phos-copper or silver alloy.
4. The coils shall be pressure tested at the factory.
5. A condensate pan and drain shall be provided under the coil.
6. The condensate shall be gravity drained from the fan coil.
7. Both refrigerant lines to the PEFY indoor units shall be insulated.

H. Electrical:
1. The unit electrical power shall be 208/230 volts, 1-phase, 60 hertz.
2. The system shall be capable of satisfactory operation within voltage limits of 187-228 volts (208V/60Hz) or 207-253 volts (230V/60Hz).

I. Controls:
1. This unit shall use controls provided by Mitsubishi Electric Cooling & Heating to perform functions necessary to operate the system. Please refer to Part 5 of this guide specification for details on controllers and other control options.
2. Indoor unit shall compensate for the higher temperature sensed by the return air sensor compared to the temperature at level of the occupant when in HEAT mode. Disabling of compensation shall be possible for individual units to accommodate instances when compensation is not required.
3. Control board shall include contacts for control of external heat source. External heat may be energized as second stage with 1.8°F - 9.0°F adjustable deadband from set point.
4. Indoor unit shall include no less than four (4) digital inputs capable of being used for customizable control strategies.
5. Indoor unit shall include no less than three (3) digital outputs capable of being used for customizable control strategies.
6. Manufacturer to provide drain pan level sensor powered by a 20-year life lithium battery.
7. Sensor shall require no external power for operation and shall have an audible indication of low battery condition.
8. The drain pan sensor shall provide protection against drain pan overflow by sensing a high condensate level in the drain pan. Should this occur the control shuts down the indoor unit before an overflow can occur. A thermistor error code will be produced should the sensor activate indicating a fault which must be resolved before the unit re-starts.

3.06 HEAT PUMP VRF OUTDOOR CONDENSING UNIT

A. Acceptable Manufacturers: Mitsubishi or approved equal

B. General:
1. The Y-Series PUHY outdoor unit shall be specifically used with CITY MULTI VRF components. The PUHY outdoor units shall be equipped with multiple circuit boards that interface to the M-NET controls system and shall perform all functions necessary for operation. Each outdoor unit module shall be completely factory assembled, piped, wired and run tested at the factory.
a. The model nomenclature and unit requirements are shown below. All units requiring a factory supplied twinning kit shall be piped together in the field, without the need for equalizing line(s). If an alternate manufacturer is selected, any additional material, cost, and labor to install additional lines shall be incurred by the contractor.

OUTDOOR UNIT MODEL NOMENCLATURE		
208/230 Volt		Twinning Kit
Model Number	Units	
PUHY-P72TKMU	(1) PUHY-P72TKMU	None
PUHY-P96TKMU	(1) PUHY-P96TKMU	None
PUHY-P120TKMU	(1) PUHY-P120TKMU	None
PUHY-P144TKMU	(1) PUHY-P144TKMU	None
PUHY-P168TSKMU	(1) PUHY-P96TKMU (1) PUHY-P72TKMU	CMY-Y100CBK3
PUHY-P192TSKMU	(1) PUHY-P72TKMU (1) PUHY-P120TKMU	CMY-Y100CBK3
PUHY-P216TSKMU	(1) PUHY-P96TKMU (1) PUHY-P120TKMU	CMY-Y100CBK3
PUHY-P240TSKMU	(2) PUHY-P120TKMU	CMY-Y100CBK3
PUHY-P264TSKMU	(2) PUHY-P72TKMU (1) PUHY-P120TKMU	CMY-Y300CBK2
PUHY-P288TSKMU	(1) PUHY-P72TKMU (1) PUHY-P96TKMU (1) PUHY-P120TKMU	CMY-Y300CBK2
PUHY-P312TSKMU	(1) PUHY-P72TKMU (2) PUHY-P120TKMU	CMY-Y300CBK2
PUHY-P336TSKMU	(1) PUHY-P96TKMU (2) PUHY-P120TKMU	CMY-Y300CBK2
PUHY-P360TSKMU	(3) PUHY-P120TKMU	CMY-Y300CBK2

b. Outdoor unit shall have a sound rating no higher than 60 dB(A) individually or 65 dB(A) twinned. Units shall have a sound rating no higher than 50 dB(A) individually or 55 dB(A) twinned while in night mode operation. If an alternate manufacturer is selected, any additional material, cost, and labor to meet published sound levels shall be incurred by the contractor.
c. Outdoor unit shall be able to connect to up to 50 indoor units depending upon model.
d. Both refrigerant lines from the outdoor unit to indoor units shall be insulated.
e. The outdoor unit shall have an accumulator with refrigerant level sensors and controls.
f. The outdoor unit shall have a high pressure safety switch, over-current protection and DC bus protection.
g. The outdoor unit shall have the ability to operate with a maximum height difference of 164 feet (294 feet optional) and have a total refrigerant tubing length of 3280 feet. The greatest length is not to exceed 541 feet between the outdoor unit and the indoor units without the need for line size changes or traps.
h. The outdoor unit shall be capable of operating in heating mode down to -4°F ambient temperature or cooling mode down to 23°F ambient temperature, without additional low ambient controls. If an alternate manufacturer is selected, any additional material,

cost, and labor to meet low ambient operating condition and performance shall be incurred by the contractor.

i. The outdoor unit shall be capable of operating in cooling mode down to -10°F with optional manufacturer supplied low ambient kit.
j. Manufacturer supplied low ambient kit shall be provided with predesigned control box rated for outdoor installation and capable of controlling kit operation automatically in all outdoor unit operation modes.
k. Manufacturer supplied low ambient kit shall be listed by Electrical Laboratories (ETL) and bear the ETL label.
l. Manufacturer supplied low ambient kit shall be factory tested in low ambient temperature chamber to ensure operation. Factory performance testing data shall be available when requested.
m. The outdoor unit shall be provided with a manufacturer supplied 20 gauge hot dipped galvanized snow /hail guard. The snow/hail guard protects the outdoor coil surfaces from hail damage and snow build-up in severe climates.
n. The outdoor unit shall have a high efficiency oil separator plus additional logic controls to ensure adequate oil volume in the compressor is maintained.
o. Equipment must be labeled “Assembled in USA” on equipment nameplate. Manufacturer must provide documentation from U.S. Customs and Border Protection indicating the equipment is a product of the U.S.

C. Unit Cabinet:
1. The casing(s) shall be fabricated of galvanized steel, bonderized and finished. Units cabinets shall be able to withstand 960 hours per ASTM B117 criteria for seacoast protected models (–BS models).

D. Fan:
1. Each outdoor unit module shall be furnished with one direct drive, variable speed propeller type fan.
2. The fan motor shall have inherent protection, have permanently lubricated bearings, and be completely variable speed. The fan shall be factory set for operation under 0 in. WG external static pressure, but capable of normal operation under a maximum of 0.24 in. WG external static pressure via dipswitch.
3. The fan motor shall be mounted for quiet operation.
4. The fan shall be provided with a raised guard to prevent contact with moving parts.
5. The outdoor unit shall have vertical discharge airflow.

E. Refrigerant
1. R410A refrigerant shall be required for PUHY-T/Y(S)KMU-A outdoor unit systems.
2. Polyolester (POE) oil shall be required. Prior to bidding, manufacturers using alternate oil types shall submit material safety data sheets (MSDS) and comparison of hygroscopic properties for alternate oil with list of local suppliers stocking alternate oil for approval at least two weeks prior to bidding.

F. Coil:
1. The outdoor coil shall be of nonferrous construction with lanced or corrugated plate fins on copper tubing.
2. The coil fins shall have a factory applied corrosion resistant blue-fin finish.
3. The coil shall be protected with an integral metal guard.
4. Refrigerant flow from the outdoor unit shall be controlled by means of an inverter driven compressor.

5. The outdoor coil shall include 4 circuits with two position valves for each circuit, except for the last stage.

G. Compressor:
1. Each outdoor unit module shall be equipped with one inverter driven scroll hermetic compressor. Non inverter-driven compressors, which cause inrush current (demand charges) and require larger wire sizing, shall not be allowed.
2. A crankcase heater(s) shall be factory mounted on the compressor(s).
3. The outdoor unit compressor shall have an inverter to modulate capacity. The capacity shall be completely variable with a turndown of 18%-4% of rated capacity, depending upon unit size
4. The compressor shall be equipped with an internal thermal overload.
5. The compressor shall be mounted to avoid the transmission of vibration.

H. Electrical:
1. The outdoor unit electrical power shall be 208/230 volts, 3-phase, 60 hertz.
2. The outdoor unit shall be capable of satisfactory operation within voltage limits of 187-228 volts (208V/60Hz), 207-253V (230V/60Hz).
3. The outdoor unit shall be controlled by integral microprocessors.
4. The control circuit between the indoor units, BC Controller and the outdoor unit shall be 24VDC completed using a 2-conductor, twisted pair shielded cable to provide total integration of the system.

PART 4 - CONTROLS

4.01 OVERVIEW

A. General:
1. The CITY MULTI Controls Network (CMCN) shall be capable of supporting remote controllers, centralized controllers, an integrated web based interface, graphical user workstation, and system integration to Building Management Systems via BACnet® and LonWorks®.

4.02 ELECTRICAL CHARACTERISTICS

A. General:
1. The CMCN shall operate at 24VDC. Controller power and communications shall be via a common non-polar communications bus.

B. Wiring:
1. Control wiring shall be installed in a daisy chain configuration from indoor unit to ME remote controller to indoor unit, to the BC controller (main and subs, if applicable) and to the outdoor unit. Control wiring to remote controllers shall be run from the indoor unit terminal block to the controller associated with that unit.
2. Control wiring for centralized controllers shall be installed in a daisy chain configuration from outdoor unit to outdoor unit, to the system controllers (centralized controllers and/or integrated web based interface), to the power supply.
3. Provide one wall mounted Simple MA remote controller for each indoor unit. Control wiring for the remote controllers shall be from the remote controller to the first associated indoor unit (TB-15) then to the remaining associated indoor units (TB-15) in a daisy chain configuration.

4. The AG-150, GB-50ADA, GB-24 centralized controller shall be capable of being networked with other AG-150, GB-50ADA and GB-24 centralized controllers for centralized control.

C. Wiring type:
1. Wiring shall be 2-conductor (16 AWG), twisted, stranded, shielded wire as defined by the Diamond System Builder output.
2. Network wiring shall be CAT-5e with RJ-45 connection.

4.03 CITY MULTI CONTROLS NETWORK

A. The CITY MULTI Controls Network (CMCN) consists of remote controllers, centralized controllers, and/or integrated web based interface communicating over a high-speed communication bus. The CITY MULTI Controls Network shall support operation monitoring, scheduling, error email distribution, personal web browsers, tenant billing, online maintenance support, and integration with Building Management Systems (BMS) using either LonWorks® or BACnet® interfaces.
1. CMCN System Configuration CMCN: Remote ControllersRCe Backlit Simple MA Remote Controller (PAC-YT53CRAU)
2. The Backlit Simple MA Remote Controller (PAC-YT53CRAU) shall be capable of controlling up to 16 indoor units (defined as 1 group). The Backlit Simple MA Remote Controller shall be compact in size, approximately 3” x 5” and have limited user functionality. The Backlit Simple MA supports temperature display selection of Fahrenheit or Celsius. The Backlit Simple MA Remote Controller shall allow the user to change on/off, mode (cool, heat, auto (R2/WR2-Series only), dry, and fan), temperature setting, and fan speed setting and airflow direction. The Backlit Simple MA Remote Controller shall be able to limit the set temperature range from the Backlit Simple MA. The Backlit Simple MA Remote controller shall be capable of night setback control with upper and lower set temperature settings. The room temperature shall be sensed at either the Backlit Simple MA Remote Controller or the Indoor Unit dependent on the indoor unit dipswitch setting. The Backlit Simple MA Remote Controller shall display a four-digit error code in the event of system abnormality/error.
3. The Backlit Simple MA Remote Controller shall only be used in same group with Deluxe MA Remote Controllers (PAR-21MAAU), Wireless MA Remote Controllers (PAR-FL32MA-E / PAR-FA32MA-E), or with other Backlit Simple MA Remote Controllers (PAC-YT53CRAU), with up to two remote controllers per group.
4. The Backlit Simple MA Remote Controller shall be capable of controlling the fan speed of an interlocked LOSSNAY to high/low/stop.
5. The Backlit Simple MA Remote Controller shall require no addressing. The Backlit Simple MA Remote Controller shall connect using two-wire, stranded, non-polar control wire to TB15 connection terminal on the indoor unit. The Simple MA Remote Controller shall require cross-over wiring for grouping across indoor units.

PAC-YT53CRAU (BACKLIT SIMPLE MA REMOTE CONTROLLER)			
ITEM	**DESCRIPTION**	**OPERATION**	**DISPLAY**
ON/OFF	RUN AND STOP OPERATION FOR A SINGLE GROUP	EACH GROUP	EACH GROUP
OPERATION MODE	SWITCHES BETWEEN COOL/DRYING/AUTO/FAN/HEAT/SETBACK. OPERATION MODES VARY DEPENDING ON THE AIR CONDITIONER UNIT. AUTO MODE IS IN THE R2/WR2-SERIES ONLY.	EACH GROUP	EACH GROUP

TEMPERATURE SETTING	SETS THE TEMPERATURE FROM 40°F - 95°F DEPENDING ON OPERATION MODE AND INDOOR UNIT.	EACH GROUP	EACH GROUP
FAN SPEED SETTING	HI/MID-2/MID-1/LOW/AUTO AVAILABLE FAN SPEED SETTINGS DEPENDING ON INDOOR UNIT.	EACH GROUP	EACH GROUP
AIR FLOW DIRECTION SETTING	AIR FLOW DIRECTION ANGLES (4 OR 5 ANGLE SWING) AUTO LOUVER ON/OFF AIR FLOW DIRECTION SETTINGS VARY DEPENDING ON THE INDOOR UNIT MODEL.	EACH GROUP	EACH GROUP
TIMER OPERATION	NOT AVAILABLE	N/A	N/A
PERMIT / PROHIBIT LOCAL OPERATION	INDIVIDUALLY PROHIBIT OPERATION OF EACH LOCAL REMOTE CONTROL FUNCTION (START/STOP, CHANGE OPERATION MODE, SET TEMPERATURE, RESET FILTER). *1: CENTRALLY CONTROLLED IS DISPLAYED ON THE REMOTE CONTROLLER FOR PROHIBITED FUNCTIONS.	N/A	EACH GROUP *1
DISPLAY INDOOR UNIT INTAKE TEMP	MEASURES AND DISPLAYS THE INTAKE TEMPERATURE OF THE INDOOR UNIT WHEN THE INDOOR UNIT IS OPERATING.	N/A	EACH GROUP
DISPLAY BACKLIGHT	PRESSING THE BUTTON LIGHTS UP A BACKLIGHT. THE LIGHT AUTOMATICALLY TURNS OFF AFTER A CERTAIN PERIOD OF TIME. (THE BRIGHTNESS SETTINGS CAN BE SELECTED FROM BRIGHT, DARK, AND LIGHT OFF.)	N/A	EACH UNIT
ERROR	WHEN AN ERROR IS CURRENTLY OCCURRING ON AN AIR CONDITIONER UNIT, THE AFFLICTED UNIT AND THE ERROR CODE ARE DISPLAYED	N/A	EACH UNIT
TEST RUN	OPERATES AIR CONDITIONER UNITS IN TEST RUN MODE. *2 THE DISPLAY FOR TEST RUN MODE WILL BE THE SAME AS FOR NORMAL START/STOP (DOES NOT DISPLAY “TEST RUN”).	EACH GROUP	EACH GROUP *2
VENTILATION EQUIPMENT	UP TO 16 INDOOR UNITS CAN BE CONNECTED TO AN INTERLOCKED SYSTEM THAT HAS ONE LOSSNAY UNIT.	EACH GROUP	N/A
SET TEMPERATURE RANGE LIMIT	SET TEMPERATURE RANGE LIMIT FOR COOLING, HEATING, OR AUTO MODE.	EACH GROUP	EACH GROUP
PROHIBITION/ PERMISSION OF SPECIFIED	BY THE SETTING FROM SYSTEM CONTROLLER, THE OPERATION FOR THE FOLLOWING MODES IS PROHIBITED.	N/A	EACH GROUP

PAC-YT53CRAU (BACKLIT SIMPLE MA REMOTE CONTROLLER)			
ITEM	**DESCRIPTION**	**OPERATION**	**DISPLAY**
MODE	AT COOLING PROHIBITED : COOL, DRY, AUTO, AT HEATING PROHIBITED : HEAT, AUTO, AT COOLING-HEATING PROHIBITED : COOL, HEAT, DRY, AUTO		

5.01 CMCN: SYSTEM INTEGRATION

A. The CMCN shall be capable of supporting integration with Building Management Systems (BMS).

B. BAC-HD150: BACnet® Interface

C. The Mitsubishi Electric Cooling & Heating BACnet® interface, BAC-HD150, shall be compliant with BACnet® Protocol (ANSI/ASHRAE 135-2004) and be Certified by the (BTL) BACnet® Testing Laboratories. The BACnet® interface shall support BACnet Broadcast Management (BBMD). The BACnet® interface shall support a maximum of 50 indoor units. Operation and monitoring points include, but are not limited to, on/off, operation mode, fan speed, prohibit remote controller, filter sign reset, alarm state, error code, and error address. Power Supply (PAC-SC51KUA)

D. The power supply shall supply 24VDC (TB 3) for the AG-150 centralized controller and 24VDC (TB 2) voltage for the central control transmission.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.02 DESCRIPTION OF WORK

A. Power supply wiring from power source to power connection on terminal unit. Include starters, disconnects, and required electrical devices, except where specified as furnished, or factory-installed, by manufacturer.

B. Provide interlock wiring between electrically-operated terminal units; and between terminal units and field-installed control devices.

C. Interlock wiring specified, as factory-installed is work of this section.

D. Provide the following electrical work as work of this section:
   1. Control wiring between field-installed controls, indicating devices, and terminal unit control panels.
   2. Control wiring specified, as work of Division 23 for HVAC controls is work of that section.

1.03 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of terminal units, of types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

B. Units shall be tested and certified in accordance with ARI Standard 840.

C. Unit insulation and adhesive shall meet the requirements for flame spread rating of lower than 25 per ASTM E84 and smoke generation rating of lower than 50 per ASTM E84. Only closed cell insulation shall be used. The use of fiberglass insulation is not acceptable.

D. Each coil shall be factory tested for leakage at 350 psig air pressure with coil submerged in water.

1.04 SUBMITTALS

A. Product Data: Submit manufacturer's specifications for terminal units showing dimensions, capacities, ratings, performance characteristics, gages and finishes of materials, and installation instructions.

B. Shop Drawings: Submit assembly-type shop drawings showing unit dimensions, construction details, and field connection details.

C. Wiring Diagrams: Submit manufacturer's electrical requirements for power supply wiring to terminal units. Submit manufacturer's ladder-type wiring diagrams for interlock and control wiring. Clearly differentiate between portions of wiring that are factory-installed and portions to be field-installed.

D. Samples: Submit 3 samples of each type of cabinet finish and color furnished.

E. Maintenance Data: Submit maintenance instructions, including lubrication instructions, filter replacement, motor and drive replacement, and spare parts lists. Include this data, product data, and shop drawings in maintenance manuals; in accordance with requirements of Division 1.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Handle terminal units and components carefully to prevent damage, breaking, denting and scoring. Do not install damaged terminal units or components; replace with new.

B. Store terminal units and components in clean dry place. Protect from weather, dirt, fumes, water, construction debris, and physical damage.

C. Comply with Manufacturer's rigging and installation instructions for unloading terminal units, and moving them to final location.

PART 2 - PRODUCTS

2.01 UNIT VENTILATORS

A. General: Provide unit ventilators having cabinet sizes, and in locations indicated, and of capacities, style, and having accessories as scheduled. Unit ventilators shall be designed for floor (vertical) mounting. Units shall incorporate hot water heat as specified. Include in basic unit cabinets, dampers, fan board assembly, motors, and coils. The unit shall be a factory-assembled bolt-together unit ventilator. Contained within the unit enclosure shall be a factory-installed motor, wiring, blowers, coil(s), bearing, and outdoor/return air dampers. Units shall be of draw-thru design. Blow-thru design is not acceptable.

B. Unit Construction:
   1. Unit frame shall be constructed of heavy gage galvanized steel components that form a rigid foundation and resist corrosion.
   2. Unit shall be 21 7/8 inches deep and include a false back to allow alignment of unit outside air passage with existing outside air louver connection.
   3. Unit composed of three main sub-assembled modules: Blower Module, Coil Module and Damper Module. Modules shall be removable without disassembling the unit.
   4. Modules shall be externally insulated using closed cell insulation.
   5. Unit back shall be insulated using closed cell insulation.
   6. Exterior access panels shall be constructed of heavy gage galvanized steel that has been cleaned and pretreated before painting to maximize corrosion resistance. Exterior service access panels shall be retained by tamper-resistant fasteners. Panels shall be electrostatically coated with polyester powder baked on textured paint.

C. Vertical Unit:
   1. Cabinet shall be provided with three 16-gage exposed front panels, service access panels with tamper-resistant hex socket head threaded fasteners and retainer chains for safety and ease of service.
   2. Cabinet models shall have standard textured baked powder finished panels. Cabinet tops shall be charcoal bronze with a steel bar-stock discharge grille. Cabinet top shall have textured charcoal finish.
   3. External access panels shall be easily removed from outside of the unit for easy access to filters and routine maintenance. Unit top shall be easily removed for routine maintenance.
   4. Unit shall include leveling legs to compensate for floor irregularities.

D. Coils:
   1. Hot water coils shall be constructed of mechanically expanded copper tubing minimum wall .016" inside, aluminum fins, minimum thickness .025". The fin surface shall be enhanced to the maximum degree by incorporating a raised lance design. Coils shall be pressure tested at no less than 350 psig at the factory to ensure they are leak tight. Hot water coils shall be constructed of mechanically expanded copper tubing minimum wall .016", inside aluminum fins minimum thickness .045". The coil performance shall be maximized by incorporation of a waffle design of the fin surface. Coils shall be pressure tested at no less than 350 psig at the factory to ensure they are teak tight. A coil low limit shall be factory mounted on the leaving side of the heating coil. If the capillary device senses a temperature less than 38°F along any 6" the device will actuate, device shall be SPDT, auto reset.
   2. Direct expansion (DX) coils shall be furnished and capped for future connection.
   3. Steam coils shall be the freeze resistant double tube, distribution type utilizing a tube-in-tube design with a long copper header. Non-distributing type coils are not acceptable. Ferrous materials in the header are also not acceptable.

E. Pipe Tunnel:
   1. Units rated 500 to 1500 CFM vertical units shall have an integral pipe tunnel that can be used for piping across the unit. This tunnel shall be insulated, with closed cell insulation, from the unit and accessible from each end compartments to allow maximum flexibility of crossover piping installation.

F. Drain Pans:
   1. Unit drain pan shall be double sloped welded galvanized steel to prevent standing water.
   2. Drain pan will be coated to prevent external condensation during cooling.
   3. Drain connections (7/8 in. OD) shall be supplied on both ends of pan for field conversion of slope and drain hand connection if required.
   4. Drain pan slope shall be field convertible without removing the coil module.
   5. Heating only units shall come equipped with a double sloped drain pan for future cooling needs.

G. Fan and Motor:
   1. Fan and motor assembly shall be direct driven. One end of drive shaft shall be mounted in a sleeve-type or ball bearing, with other end of shaft supported by motor bearings.
   2. Fan wheels shall be double-width, double-inlet with forward-curved blades, and shall operate at low speed. Fan wheels shall be mounted on a hollow one piece steel shaft.
   3. Fan wheels shall be statically and dynamically balanced.
   4. Fan (blower) housings shall be constructed from heavy-gage steel and mounted to a heavy-gage galvanized steel fan deck.
   5. To prevent vibration transmission to the unit frame, motor and shaft bearing shall be resiliently mounted. The drive shaft shall be connected to motor with a flexible coupling.
   6. Fan motors shall be mounted outside of the airstream on a heavy-gage steel partition and removable without removing the blower module.
   7. Units shall be supplied with permanently split capacitor (PSC) multi-tap transformer motors. All motors shall have integral high temperature reset and shall be protected with cartridge-type fuse(s).

H. Filters:

1. Unit shall be supplied with 1-in. throwaway filter. The unit shall be capable of incorporating a 2 in. filter. For even loading, filter shall be positioned to filter mixed outdoor and return air.
2. Filter track shall be field adjustable to accept 1-in. or 2-in. permanent or renewable media replacement filters.

I. Dampers:
1. Unit shall contain a single outdoor-air/return-air damper with multiple sealing points. Damper shall be constructed of extruded aluminum with external closed cell insulation. The damper assembly shall include an anti-draft plate to prohibit outdoor air from penetrating the classrooms through the damper assembly.

J. Accessories:
1. Exterior wall louver

K. Manufacturer: Subject to compliance with requirements. Provide unit ventilators of one of the following:
1. Daikin
2. Magicaire
3. AAF
4. Approved Equal

L. Provide finished side panels and matching filler sections by the same manufacturer, where new unit ventilators are smaller than the existing unit ventilators being replaced, or where the unit ventilator is larger than the existing and no new cabinetry is specified. No unfinished wall surfaces shall be exposed after installation.

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine areas and conditions under which terminal units are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.02 INSTALLATION OF UNIT VENTILATORS

A. General: Install unit ventilators as indicated, and in accordance with manufacturer's installation instructions.

B. Locate unit ventilators as indicated, level and shim units, anchor to substrate.

C. Provide all blocking, weather stripping, insulation boards, fire rated marine grade plywood, etc. to provide a level, plumb, and air and weather tight seal of unit ventilators to existing exterior wall/OA louver.

D. Adjust and level unit ventilators to within ±1/8" of adjacent cabinetry surfaces. Bring to the attention of the construction manager any conditions which prevent the ability to meet this requirement as soon as they are found.

E. Install piping as indicated.

F. Protect units with protective covers during balance of construction.

G. Coordinate all demolition of existing equipment and adjacent cabinetry with the Owner prior to the start of any work.

H. In no case shall there be any exposed sharp corners or edges which can lead to cuts or abrasions by the normal activity of the occupants.

3.03 ELECTRICAL WIRING

A. General: Install electrical devices furnished by manufacturer not specified to be factory-mounted. Furnish copy of manufacturer's wiring diagram.

B. Verify that electrical wiring installation is in accordance with manufacturer's submittal. Do not proceed with equipment start-up until wiring installation is acceptable to equipment installer.

3.04 ADJUSTMENT AND CLEANING

A. General: After construction is completed, including painting, clean unit exposed surfaces, vacuum clean terminal coils and inside of cabinets.

B. Retouch any marred or scratched surfaces of factory-finished cabinets, using finish materials furnished by manufacturer. Provide extra touch up paint to owner.

C. Install new filter units for terminals requiring the same.

D. Test, adjusting, and balancing is specified in other Division 23 sections; not work of this section.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Excavation and backfill for electrical work.

B. Demolition of existing electrical systems.

C. Primary power wiring and distribution system.

D. Secondary power wiring and distribution system.

E. Wiring devices.

F. Distribution panels and switches.

1.02 RELATED WORK

A. Foundations and pads required for equipment furnished under this division of specifications.

B. Field painting, except such painting as is required to maintain shop coat painting and factory finish painting.

C. Flashing and sealing of conduits through outside walls.

D. Cutting and patching for electrical work, except for errors and omissions under this Division.

1.03 QUALITY ASSURANCE

A. It is understood that the rights and benefits given the Owner by the guarantees found in the technical specifications are in addition to and not in derogation of any rights or benefits found in the special and general provisions of the contract.

B. Electrical equipment provided under this Division shall be turned over in operating condition. Instruction on further operation and maintenance shall be included in the operating and maintenance instructions.

1.04 REFERENCES

A. Perform work in accordance with standards listed below. Where these specifications are more stringent, they take precedence. In case of conflict, obtain a decision from the Engineer.
   1. NFPA-70: National Electrical Code
   2. NFPA-101: Life Safety Code
   3. New York State Energy Code
   4. New York State Building Code
   5. Applicable New York State Administrative Code
   6. Applicable Town Ordinances.
   7. Electric utility rules and regulations.
   8. Telephone utility rules and regulations.
   9. IBC: International Building Code
   10. IFC: International Fire Code
   11. IMC: International Mechanical Code
   12. IPC: International Plumbing Code

13. IGC: International Fuel Gas Code
14. IEBC: International Existing Building Code
15. ECCC:Supplement to the New York State Energy Conservation Construction Code
16. MPS: Manual of Planning Standards
17. 155: 8 NYCRR 155 Regulations of the Commissioner of Education

1.05 PERMITS AND FEES

A. The Contractor shall obtain and pay for all permits, construction charges, fees, licenses, certificates, inspections and other use charges required in connection with the work.

B. Such permits include, but are not limited to:
   1. Transportation and disposal of debris.
   2. Temporary Electrical Services and Permanent Electrical Service.
   3. Electrical Inspectors, Inc., or a pre-approved electrical inspection agency.
   4. Road opening permits.

PART 2 - PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. All materials and equipment used in carrying out these specifications shall have UL listing and label. Specifications and drawings indicate name, type, or catalog numbers of materials and equipment to be used as standards. Proposals shall be based on these standards. Contractor may use materials and equipment equivalent to those specified, subject to Engineer's approval.

PART 3 - EXECUTION

3.01 COORDINATION

A. Carefully examine specifications, drawings and project site to be thoroughly familiar with items which require electrical connections and coordination. Electrical drawings are diagrammatic and shall not be scaled for exact sizes.

B. Notify other Contractors of any deviations or special conditions necessary for the installation of work. Interferences between work of various contractors to be resolved prior to installation. Work installed not in compliance with specifications and drawings and without properly checking and coordinating as specified above shall, if necessary, be removed and properly reinstalled without additional cost to the Owner. Engineer to be mediating authority in all disputes arising on project.

C. Equipment shall be installed in accordance with manufacturer's recommendation. Where conflicts occur between contract documents and these recommendations, a clarification shall be requested of the Engineer for decision before preceding with such work.

D. Insofar as it is possible to determine in advance, advise masonry tradesmen to leave proper chases and openings. Place all outlets, anchors, sleeves, and supports prior to pouring concrete or installation of masonry work. Should the Contractor neglect doing this, any cutting and/or patching required to be done is at this Contractor's expense.

E. FIRE ALARM – For any facilities that utilize an existing fire alarm system, the contractor shall coordinate with the owner and fire alarm monitoring company prior to removing or disabling any devices. It shall be the contractor’s responsibility to provide fire watch as per the latest addition

of the Fire Code of New York State. The contractor shall provide fire watch for all areas of a facility while occupied and unoccupied when any device or part of the fire alarm system is de-activated or put into “test mode”.

3.02 CUTTING AND PATCHING

A. Repair or replace routine damage caused by cutting in performance of work under this Division.

B. Correct unnecessary damage caused due to installation of electrical work, brought about through carelessness or lack of coordination.

C. Holes cut through floor slabs to be core drilled with drill designed for this purpose. All openings, sleeves, and holes in slabs to be properly sealed, fire proofed and waterproofed.

D. Repairs to be performed with materials which match existing materials and to be installed in accordance with appropriate sections of these specifications.

3.03 TESTS

A. On completion of work, installation shall be completely operational and entirely free from ground, short circuits, and open circuits. Perform a thorough operational test in presence of the Engineer. Balance all circuits so that feeders to panels are not more than 10% out of balance between phases with all available load energized and operating. Furnish all labor, materials and instruments for above tests.

B. Furnish Engineer with a copy of such tests including identification of each circuit and readings recorded, also the main service ground resistance test as described in Section 260526 of these specifications. Test information to include ampere readings of all panels and major circuit breakers, isolation resistance reading of motors and transformers.

3.04 IDENTIFICATION OF EQUIPMENT

A. Properly identify the following:
   1. Distribution panels.
   2. Disconnect switches.
   3. Service entrance equipment and main circuit breaker.

B. Use permanently attached black phenolic plates with 1/4-inch white engraved lettering on the face of each, attached with two sheet metal screws.

C. Panelboard identification plates shall indicate panel by name.

3.05 INSTALLATION

A. The Contractor shall carefully move and replace existing equipment, appliances and all related items, as required to conduct proposed work.

B. Install and conduct all work per applicable NEC, State and local codes.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Electrical demolition.

1.02 SUBMITTALS

A. Submit under provisions of Section 013300.

B. Shop Drawings: Indicate demolition and removal sequence and location of salvageable items; location and construction of temporary work.

1.03 REGULATORY REQUIREMENTS

A. Conform to applicable code for demolition work, safety of structure and dust control.

B. Obtain required permits from authorities.

C. Notify affected utility companies before starting work and comply with their requirements.

D. Do not close or obstruct egress width to exits.

E. Do not turn off electric equipment without authorization from Owner.

F. Conform to procedures applicable when discovering hazardous or contaminated materials.

G. Obtain a utilities mark-out of all buried underground utilities for telephone, electric, gas, sewer and water, including all customer owned utilities.

1.04 SCHEDULING

A. Schedule Work to coincide with new construction.

PART 2 - PRODUCTS

2.01 NOT USED.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify field circuiting arrangements at Mamaroneck Elementary School.

B. Verify that abandoned wiring and equipment serve only abandoned facilities.

C. Demolition drawings are based on visual field observation. Report discrepancies to the Engineer before disturbing existing installation.

D. Beginning of demolition means installer accepts existing condition.

3.02 PREPARATION

A. Coordinate utility service outages with Utility Company.

B. Provide power, wiring and connections to maintain all existing power, control and telemetry systems in service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations.

3.03 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

A. Remove, relocate, and extend existing installations to accommodate new construction, as indicated on drawings.

B. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.

C. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned outlets which are not removed.

D. Repair adjacent construction and finishes damaged during demolition and extension work.

E. Provide caps and filler plates/plugs for all openings in equipment and enclosures after removal of conduits.

F. Maintain access to existing electrical installations which remain active. Modify installation or provide access panel as appropriate.

G. Remove demolished materials from site as work progresses.

H. Completely remove and dispose of all electrical power, control, and telemetry feeds including conduits, conductors, boxes and supports not scheduled to remain after new construction is tested and operational.

I. Where existing devices and equipment are called to be removed, Contractor shall maintain circuit continuity to all existing devices and equipment remaining on that circuit. Contractor shall provide all required conduit, conductors and boxes as required.

3.04 CLEANING AND REPAIR

A. Clean and repair existing materials and equipment which remain or are to be reused.

B. Remove temporary work.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Wires and cables.

B. In general, the wires and cables included under this Section shall include, but not be limited to, the following:
   1. 600V power and control cable

C. All conductors to be continuous from origin to panel or equipment termination without splices.

1.02 REFERENCES

A. ANSI/NFPA 70 - National Electric Code.

B. NECA Standard of Installations.

1.03 SUBMITTALS

A. Submit product data under provisions of Section 013300.

1.04 QUALITY ASSURANCE

A. Products used in the work of this Section shall be produced by manufacturers regularly engaged in the manufacturing, installing and servicing of similar items with a history of successful production acceptable to the Engineer as specified herein and in accordance with the General Conditions.

B. Contractor shall submit the following information pertaining to the manufacturer(s):
   1. Complete literature, performance, and technical data describing the proposed equipment and listing of items made by the manufacturer.
   2. Location of closest service office from which this equipment shall be serviced.
   3. Location of closest parts inventory for item installation.

1.05 COORDINATION

A. Coordination:
   1. Coordinate wire and cable required with the equipment being furnished by others for the satisfactory operation of the equipment or system.
   2. Review installation procedures under other sections and contracts and coordinate them with the work specified herein.
   3. Notify other prime contractors in advance of the installation of the work included to provide them with sufficient time for installation and coordination of interrelated items that are included in their contracts and that must be installed in conjunction with the work included in this Section.

1.06 PROJECT CONDITIONS

A. Verify that embedded conduit, in masonry and concrete, is installed as shown on the Drawings prior to the work being enclosed by others.

B. The Contractor shall be present at all concrete pours made by the General Contractor.

C. Conductor sizes are based on copper at 75°C.

D. Wire and cable routing shown on Drawings is approximate unless dimensioned or specifically called for such as where conduit is to be embedded in concrete or masonry. Route wire and cable as required to meet project conditions and shall be routed above ceilings, directly under joists, in pipe trenches, where available, and in masonry. Where exposed conduit is permitted, it shall be run to maximize wall space.

E. Field verify destination location to determine cable routing.

F. Where wire and cable routing is not shown for proposed destination, determine exact routing and lengths required. Routing shall be reviewed with the Engineer.

PART 2 - PRODUCTS

2.01 CONDUCTORS

A. Install products in accordance with manufacturer's recommendations.

B. Single copper conductors with 600-volt insulation.

C. Minimum size of feeder conductors and grounds shall be No. 12 AWG.

D. Insulation: No. 12 AWG and No. 10 AWG, provide ANSI/NFPA 70, Type THWN-2.

E. Use solid conductor for feeder and branch circuits, 10 AWG and smaller.

F. All conductors shall include complete set of manufacturer's markings for insulation and conductor size.

G. Manufacturers shall be ANACONDA, TRIANGLE, ROME, or approved equal.

H. Provide white colored neutral conductors; provide black, color coded phase conductors; provide green colored ground conductors.

2.02 MECHANICAL CONNECTORS

A. Conductor tapping connectors shall be BURNDY Servit split bolt, Series KS and KS3, or approved equal.

B. Split bolt connectors shall use BURNDY Type SC Servit cover on indoor applications.

C. Terminal lugs shall be BURNDY Universal Terminal Series. Terminal lugs shall be sized for proper ampacity and proper number of conductor holes. Each conductor shall occupy only one hole on a terminal lug.

D. Conductor tapping connectors for multiple conductors shall be BURNDY Series V-Tap with V-Tap covers, and V-Blok mounting platforms.

PART 3 - EXECUTION

3.01 INSTALLATION

A. General:
   1. Make terminations in accordance with cable manufacturers instructions for the particular type of wire and cable.
   2. Splices are not allowed in the underground duct and manhole systems. If splices are required, the Contractor shall obtain approval in writing from the Engineer prior to splicing.
   3. All splices shall be in made in terminal boxes.

B. Wire and Cable Sizes: The sizes of wire and cable shall be as shown on the Contract Drawings, or if not shown, as approved by the Engineer. Minimum size wire shall be No. 12 AWG for all power, lighting and receptacle circuits. Wires for control circuits shall be No. 14 AWG minimum. Wire for instrumentation circuits shall not be smaller than No. 16 AWG. If due to field routing the voltage drop exceeds 2.5%, the size of conductors shall be increased such that 2.5% is the maximum voltage drop incurred.

C. Number of Wires: The number of wires indicated on the Contract Drawings for the various control, indications, and metering circuits were determined for general schemes of control and for particular indication and metering systems. Coordinate wiring schemes with equipment schematics.

D. Wiring Identification: All wiring shall have a unique wire number and be labeled at both ends. Wire numbers shall correspond with the equipment terminal wire numbers. Where no wire numbers are indicated, the Contractor shall assign wire numbers. Wire numbers shall not be duplicated.

E. Cable Identification Tags: The Contractor shall furnish all labor and materials and affix in a permanent way to each cable in manholes, cable compartments and vaults, junction boxes, pull boxes and points of termination, a laminated plastic tag, bearing clearly printed, the cable number indicated on the Contract Drawings or some other approved identification number or symbol. All cables shall be temporarily tagged with its full ID number immediately after it has been pulled.

F. Wiring Supplies: Only electrical wiring supplies manufactured under high standards of production and meeting the approval of the Engineer shall be used. Friction tape shall be in accordance with ASTM D69.

G. Training of Cable: Furnish all labor and material required to train cables around cable vaults within buildings and in manholes in any outdoor underground duct system. Sufficient length of cable shall be provided in each manhole and vault so that the cable can be trained and racked in an approved manner. In training or racking, the radius of bend of any cable shall be not less than the manufacturer's recommendation. All manhole cables shall be arc and fireproofed.

H. Connections at Control Panels, Limit Switches and Similar Devices:
   1. Where stranded wires are terminated at panels, and/or devices connections shall be made by solderless lug, crimp type ferrule or solder dipped.
   2. Where enclosure sizes and sizes of terminals at limit switches, solenoid valves, float switches, pressure switches, temperature switches, and other devices make 7-strand, No. 12 AWG, wire terminations impractical, the Contractor shall terminate external circuits in

an adjacent junction box of proper size and shall install No. 14 AWG stranded wires to the junction box in a conduit.

I. Pulling Temperature: Cable shall not be flexed or pulled when the temperature of the insulation or of the jacket is such that damage will occur due to low temperature embrittlement. When cable will be pulled with an ambient temperature within a three day period prior to pulling of 40°F or lower, cable reels shall be stored during the three day period prior to pulling in a protected storage with an ambient temperature not lower than 55 degrees F and pulling shall be completed during the work day for which the cable is removed from the protected storage.

J. Color Coding:
1. Conductor jacket shall be color coded as follows:

AC POWER

208Y/120 Volt 3 phase (NEC)
Phase A Black
Phase B Red
Phase C Blue
Neutral White
Ground Green

2. Equipment Ground - GREEN

3.02 IDENTIFICATION

A. Identify wire and cable under provisions of Section 260553.

B. Identify each conductor with its circuit number.

3.03 FIELD QUALITY CONTROL

A. Perform field inspection and testing under provisions of Section 014500.

B. Inspect wire and cable for physical damage and proper connection.

C. Measure tightness of bolted connections and compare torque measurements with manufacturer's recommended values.

D. Field Testing:
1. Wires and cables shall be tested before being connected to motors, devices or terminal blocks.

2. If tests reveal defects or deficiencies, the Contractor shall make the necessary repairs or shall replace the cable as directed by the Engineer, without additional cost to the Owner.
3. All tests shall be made by and at the expense of the Contractor who shall supply all testing equipment.

E. Continuity Tests: All cables, wires and shields shall be tested for continuity. Testing for continuity shall be by test light or buzzer.

F. Insulation-Resistance Tests:
1. 600V power and control cables and wires shall be tested for their insulation-resistance values. Test shall utilize a megohmmeter with applied voltage to be 1000VDC for one (1) minute. Insulation-resistance test shall be performed on each conductor with all other conductors grounded. The resistance value shall be 20 megohms or greater.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Grounding electrodes and conductors.

B. Equipment grounding conductors.

C. Bonding.

1.02 REFERENCES

A. ANSI/NFPA 70 - National Electric Code.

1.03 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc.

PART 2 - PRODUCTS

2.01 COMPONENTS

A. Ground clamps:
   1. OZ ELECTRICAL MANUFACTURING COMPANY, Type "CG" for connection to water main piping and Type "GC" for connection to ground rod; with cable installed parallel or 90 degrees to pipe/rod under separate clamp.
   2. Or equal by STEEL CITY or APPLETON

B. Raceways, conductors, outlet boxes, pull and junction boxes to be furnished in accordance with applicable sections of these specifications.

C. Rod Electrode: Solid Copper, 3/4-inch diameter, 10 feet long.

D. Wire: Copper, sized to meet NFPA 70 requirements.

PART 3 - EXECUTION

3.01 INSTALLATION

A. General:
   1. Clean all conductive surfaces on equipment to be grounded, to assure good electrical continuity.
   2. Effectively bond all grounding conductors to grounding rod electrodes, equipment enclosures and ground busses.
   3. Locate all grounding attachments away from areas subject to physical damage. Provide protective covering as required.
   4. Install service entrance building ground as per NEC and Local Utility requirements.
   5. Service entrance shall be bonded to street side of first flange or coupling of incoming main water line with heavy duty ground clamp. Bonding conductor to be sized in accordance with NFPA 70.

6. Building steel shall be bonded to ground bus on main service with a conductor the same size as in B.1 below.
7. Install new service grounds and grounding systems for new service as per Local Utility and NEC requirements.
8. Generators shall have a dedicated grounding system for a separately derived system for switching neutrals.

B. Feeder/Branch Circuits:
1. All circuits shall have a separate green grounding conductor in conduit sized in accordance with NFPA 70. Minimum size of conductor shall be No. 12 AWG.
2. Flexible conduit will not be approved as achieving continuity of ground. All flexible conduit to have a jumper wire sized to ampacity of branch breaker and to be connected to conduit system on both ends; this applies to fixtures, motors, controls, etc.

C. Transformers:
1. Transformers shall be grounded and grounding conductors and conduits sized in accordance with NFPA 70.

3.02 TEST

A. Test ground on main service. Ground system resistance shall be no greater than 10 ohms using test equipment similar to a "Biddle" test. Test data to be submitted to the Engineer for approval and such approved test data to become a part of the Record Documents.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. System of supporting devices and hangers for support or bracing for conduit, electrical equipment, safety switches, fixtures, panelboards, outlet boxes, junction boxes and cabinets.

1.02 REFERENCES

A. ANSI/NFPA 70 - National Electric Code.

1.03 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc.

PART 2 - PRODUCTS

2.01 EQUIPMENT REQUIREMENTS

A. Provide appropriate corrosion-resistant supporting devices and hangers for electrical equipment, as manufactured by ERICO PRODUCTS, INC., CADDY FASTENERS, STEEL CITY, MINERALLAC or equivalent.
   1. "Z" purlin clips.
   2. Conduit clips.
   3. Beam clamps (universal and vertical flange).
   4. Beam clamps (set screw type).
   5. Combination push-in conduit clips.
   6. Combination conduit hanger clamps.
   7. Flexible conduit clips.
   8. Special combination conduit clips.
   9. One hole steel straps.
   10. Conduit hangers.

B. Provide materials, sizes and types of anchors, fasteners and supports to carry the loads of equipment, wire in conduit and conduit.

2.02 CHANNEL SUPPORT SYSTEM

A. Channel systems and supports shall be manufactured by KINDORF/THOMAS & BETTS, or approved equal.

B. Channels shall be 1-1/2" x 1-1/2".

C. Channels and all associated accessories and bolts shall be hot dipped galvanized.

D. Channels shall have 9/16" bolt holes on 1-1/2" centers.

E. Provide end caps for all channels.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Secure conduits to within 3 feet of each outlet box, junction box, cabinet, fitting, etc., and at intervals not to exceed 10 feet in accordance with currently effective edition of the National Electric Code.

B. In seismic zones, support conduits 1 inch and smaller at 6 foot intervals.

C. Install clamps secured to structure for feeder and other conduits routed against structure. Use drop rods and hangers to support conduits run apart from the structure.

D. Provide and install suitable angle iron, channel iron or steel metal framing with accessories to support or brace electrical equipment including safety switches, fixtures, panelboards, etc.

E. Paint all supporting metal not otherwise protected, with rust inhibiting primer and then with a finish coat if appropriate to match the surrounding metal surfaces. Prepainted or galvanized support material is not required to be painted or repainted.

F. Do not use chains, perforated iron, baling wire or tie wire for supporting conduit runs. Use of clips to support conduit to top of t-bar ceiling grid will not be permit-ted.

G. Obtain permission from Engineer before drilling or cutting structural members.

H. Install surface mounted cabinets and panelboards with a minimum of four anchors.

I. Do not fasten supports to pipes, ducts, mechanical equipment and conduit.

J. Install products in accordance with manufacturer's instructions.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Conduit system with associated couplings, connectors and fittings. Conduits to be mechanically and electrically continuous from outlet to outlet and from outlets to cabinets, pull or junction boxes.
   1. Conduit Use - Rigid Galvanized Conduit:
      a. All exterior circuits below ground.
   2. Conduit Use - PVC Sch. 80
      a. Secondary service power feeds from Con Edison transformers only.
   3. Conduit Use - Electrical Metallic Tubing (EMT) Conduit:
      a. All interior circuits above ground.
   4. Conduit Use - Metal Clad (MC) Cable:
      a. All 15 and 20 amp branch circuits concealed in walls or ceilings.
   5. Conduit Use - Flexible Liquid-tight Metal Conduit:
      a. Connecting motors, generators and other equipment subject to vibration, maximum length - 3 feet.
      b. Passing through building expansion joints.
   6. Surface mounted raceway (Wiremold)
      a. For use in finished areas on block walls and plaster walls, only.
   7. J-Hooks
      a. For use above finished ceilings for fire alarm cable only.

B. Device Boxes: Provide each fixture switch, receptacle and other wiring device with a box of appropriate size and depth for its particular location use unless indicated otherwise.

C. Pull boxes, junction boxes and wire troughs

1.02 REFERENCES

A. ANSI C80.1 - Rigid Steel Conduit, Zinc Coated.

B. ANSI/NFPA 70 - National Electric Code.

C. NECA Standard of Installation.

D. ANSI/NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.

E. NEMA TC 3 - PVC Fittings for use with Rigid PVC conduit and tubing.

F. ANSI C80.3 - Electrical Metallic Tubing, Zinc Coated.

G. ANSI/NEMA OS1 - Sheet-steel outlet boxes, device boxes, covers and box supports.

H. NEMA 250 - Enclosures for electrical equipment (1000 volts maximum).

1.03 SUBMITTALS

A. Submit product data under provisions of Section 013300.

B. Working Drawings:
   1. Prior to equipment submission, submit a list of proposed manufacturers with the products they produce proposed for the contract.
   2. Manufacturer's catalog cuts for the conduit, boxes, fittings and supports proposed for use.
   3. Construction details of conduit racks and other conduit support systems with seismic restraint details and calculations signed by a licensed Engineer.
   4. Scaled working drawings showing proposed routing of all conduits, inclusive of conduits routed above grade on exterior support structures, embedded in structural concrete and conduits directly buried in earth. Drawings shall show locations of pull and junction boxes and all penetrations in walls and floor slabs.

1.04 REGULATORY REQUIREMENTS

A. Furnish products listed and classified by Underwriters Laboratories, Inc.

B. Conform to requirements of ANSI/NFPA 70.

1.05 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Section 017839.

B. Accurately record actual routing of all conduits.

1.06 FIELD SAMPLES

A. Provide under provisions of Section 014500.

B. Provide field sample of conduit two each at 2 feet in length.

C. Provide field sample of expansion/deflection fitting, two each.

1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, protect, and handle products in accordance with manufacturers' recommendations.

B. Accept conduit on site. Inspect for damage.

C. Protect conduit from corrosion and entrance of debris by storing abovegrade. Provide appropriate covering.

1.08 PROJECT CONDITIONS

A. Verify all conduit routings by field measurements.

B. Verify routing and termination locations of conduit prior to rough-in.

C. Conduit routing is shown on Drawings in approximate locations unless dimensioned. Route as required to complete wiring system. Provide all required sweeps, boxes and fittings.

PART 2 - PRODUCTS

2.01 RIGID GALVANIZED CONDUIT

A. Rigid conduit shall be hot dipped, galvanized, or electro-galvanized steel by Wheatland, Triangle, Republic or approved equal.

B. Associated couplings, connectors and fittings shall be as manufactured by THOMAS & BETTS CORP., O.Z. GEDNEY CO., EFCOR or approved equal. Catalog numbers used below are those of THOMAS & BETTS CORP. based on 3/4-inch size and are considered standards by which equivalents are to be judged.

C. ERICKSON couplings, Series 676 or approved equal, shall be used where neither length of conduit can be rotated.

D. Conduit connectors shall be threaded type. Set screw and compression type connections ARE NOT acceptable.

E. Sealing fitting locknuts shall be Series 142SL.

F. Steel or malleable iron insulated bullet hub, Series 370-379, complete with sealing "O" ring. DO NOT use "die cast" material.

G. Entrance ells shall be Series 1491 or approved equal.

H. Combination coupling shall be Series 531 for connecting rigid galvanized conduit to electrical metallic tubing.

2.02 PVC CONDUIT

A. PVC conduit shall be manufactured by WHEATLAND, TRIANGLE REPUBLIC or approved equal.

B. Description: NEMA TC 2; Schedule 80 PVC.

C. Fittings and Conduit Bodies: NEMA TC3.

2.03 ELECTRICAL METALLIC TUBING (EMT)

A. Electrical metallic tubing shall be WHEATLAND, TRIANGLE, REPUBLIC, or approved equal.

B. Associated couplings, connectors and fittings shall be as manufactured by THOMAS & BETTS CORP., O.Z. GEDNEY CO., EFCOR, or approved equal. Catalog numbers used below are those of THOMAS & BETTS CORP. based on 3/4-inch size and are considered standards by which equivalents are to be judged.

C. EMT connectors shall be TC-2125C compression type with threaded locknut. Set screw connectors will not be acceptable.

D. EMT couplings shall be TK-2125C compression type. Set screw connectors will not be acceptable.

2.04 METAL CLAD CABLE (MC)

A. Metal clad cable shall be manufactured by BICCGENERAL or approved equal.

B. Associated couplings, connectors and fittings shall be as manufactured by THOMAS & BETTS CORP., O.Z. GEDNEY CO., EFCOR or approved equal.

C. Conductors shall be types THHN and THWN. Ground wire shall be sized as per NEC with green THHN/THWN insulation. All conductors shall be cabled and wrapped in polyester tape. All conductors shall be rated for 600 VAC.

D. Armor material shall be Aluminum Interlocked Armor.

2.05 SURFACE MOUNTED RACEWAY (WIREMOLD)

A. Manufacturer: Wire Mold shall be manufactured by LEGRAND or approved equal.

B. Model: 700 Series - One-Piece Steel Surface Raceway.

C. Paint wire mold to match existing wall color.

D. UL5 and ADA compliant.

E. UL and cUL Listed.

2.06 HAZARDOUS LOCATION SEALING HUB

A. Hazardous location sealing hubs shall be O-Z/GEDNEY EYH, EYH-SG or approved equal.

B. Contractor shall provide hazardous sealing fittings of different types and configurations to facilitate the installation as manufactured by O-Z/GEDNEY or approved equal.

C. Sealing compound and fiber shall be O-Z/GEDNEY type EYC and EYF.

2.07 DUCT SEAL

A. RectorSeal or approved equal.

B. Model #: 81881

2.08 J-HOOKS

A. TO BE USED ABOVE FINISHED CEILING ONLY. FOR FIRE ALARM CABLE ONLY. ALL EXPOSED FIRE ALARM CABLE SHALL BE IN CONDUIT.

B. Erico Caddy HP J. Hook Series or approved equal.

C. Provide wire retainers for all.

D. Provide mounting hardware and accessories as required.

E. Spacing of J-Hooks and supports shall not exceed 5’-0” on center.

2.09 FLEXIBLE LIQUID-TIGHT METAL CONDUITS AND FITTINGS

A. Liquid-tight flexible metal conduit shall be ANACONDA or approved equal.

B. Description: Interlocked steel construction with PVC jacket.

C. Provide flexible liquid-tight conduits and fittings as manufactured by THOMAS & BETTS CORP., O.Z. GEDNEY CO. or approved equal. Catalog numbers used below are those of the THOMAS & BETTS CORP., based on 3/4" size and are to be considered as standards by which equivalents are to be judged. All conduit shall be liquid-tight flexible type, UL type UA, or suitable for exposure to continuous or intermittent moisture.

D. Flexible liquid-tight connectors shall be Series 5333 or approved equal.

2.10 OUTLET AND DEVICE BOXES

A. Acceptable Manufacturers: Raco, General Electric or approved equal.

B. Sheet Metal Outlet Boxes - All concealed boxes shall be NEMA OSI, galvanized steel:
1. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported. Provide 1/2" male fixture stubs where required.

C. Concrete Ceiling Boxes: Concrete type.

D. Cast Boxes: All exposed surface mounted boxes shall be NEMA FB1, Type FD, cast feralloy. Provide gasketed cover by box manufacturer.

2.11 PULL BOXES

A. All pull boxes used for this project shall be minimum CONED B-3-6 or specifically approved equal for all customer installed power and control circuits.

B. Provide H-20 Cast-Iron Traffic Load Cover. Cover shall have 3” high logo “Electric”.

2.12 JUNCTION BOXES

A. Acceptable Manufacturers: RACO, GENERAL ELECTRIC or approved equal.

B. Sheet metal boxes: NEMA OS1, galvanized steel.

C. Covers: Galvanized steel.

2.13 WIRE TROUGH

A. Wireways shall be manufactured by Square D, Class 526, rain tight trough or approved equal.

B. Wireway shall be completely enclosed with removable covers.

C. Construction: 16 Gauge Galvanized Steel. 8-inch and 12-inch wire trough shall be 14-gauge galvanized steel.

D. Finish: ANSI-49 epoxy paint applied by cathodic electro-deposition paint process over a corrosion resistant phosphate preparation.

E. UL listed.

2.14 EXTERIOR WIRE TROUGH

A. Wireways shall be manufactured by SQUARE D, Class 526, rain tight.

B. Wireway shall be completely enclosed with removable covers.

C. Construction: Wireway shall be constructed of Type 304 stainless and shall have stainless steel screw clamps, and oil resistant gaskets.

D. All hardware, bolts, brackets, and supports shall be constructed of Type 304 stainless steel.

2.15 ELECTRICALLY CONDUCTIVE CORROSION-RESISTANT THREAD COMPOUND

A. KOPR-SHIELD or approved equal.

PART 3 - EXECUTION

3.01 INSTALLATION OF CONDUITS

A. Minimum size of conduits shall be 3/4-inch.

B. Minimum conduit depth shall be 24" below grade, measured to the top of the conduit on exterior underground installations.

C. Conduit joints shall be cut square, threaded, reamed smooth, and drawn up tight so conduit ends will butt in couplings, connectors and fittings.

D. All threaded conduits and fittings shall have KOPR-SHIELD compound applied to all threads prior to assembly.

E. Make bends or offsets with standard ells or field bends with an approved bender.

F. Run concealed conduits in direct line with long sweep bends or offsets. Run exposed conduits parallel to and at right angles to building lines. Group multiple conduit runs in banks.

G. Secure conduits to all boxes and cabinets with double locknuts and bushings so system will be electrically continuous from service to all outlets.

H. Install conduit in accordance with NECA Standard of Installation.

I. Cap ends of conduits to prevent entrance of water and other foreign material during construction.

J. Complete all conduit systems before pulling conductors.

K. Support conduits under provisions of Section 260529.

L. Provide approved expansion joints or fittings and bonding jumpers where conduits in concrete pass through building expansion joints.

M. Provide cable supports in conduits rising vertically in accordance with the National Electric Code, Article 300-19.

N. Provide No. 12 AWG copper pull wires or nylon cord in all empty conduits. Steel wire not acceptable as pull wire.

O. Install conduit to preserve fire resistance rating of partitions and other elements.

P. Ground and bond conduit under provisions of Section 260526.

Q. Where neither length of conduit can be rotated, ERICKSON couplings Series 676 shall be used.

R. In areas where enclosed and gasketed fixtures and weatherproof devices are specified, where rigid conduit enters a sheet metal enclosure, junction box and outlet box, and not terminated in a threaded hub, a steel, or malleable iron nylon insulated bullet hub, complete with recessed sealing "O" ring, shall be used, Series 370-379 . DO NOT use die cast material.

S. In concrete slabs block up conduit from forms and securely fasten in place. All conduits in slabs shall be installed below concrete slab.

T. Where conduits running overhead pass through building expansion joints, install flexible liquid tight conduit of same size with sufficient slack to allow conduits on either side of expansion joint to move a minimum of 3-inches in any direction. Provide supports as required on each side of expansion joint, all in accordance with seismic requirements of specific area.

U. Failure to route conduit through building without interfering with other equipment and construction shall not constitute a reason for an extra charge. Equipment, conduit and fixtures shall fit into available spaces in building and shall not be introduced into building at such times and manner as to cause damage to structure. Equipment requiring servicing shall be readily accessible.

V. Arrange supports to prevent misalignment during wiring installation.

W. Support conduit using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.

X. Group related conduits; support using conduit rack. Construct rack using steel channel; provide space on each for 25 percent additional conduits.

Y. Do not support conduit with wire or perforated pipe straps. Remove wire used for temporary supports.

Z. Do not attach conduit to ceiling support wires.

AA. Arrange conduit to maintain headroom and present neat appearance.

AB. Route exposed conduit parallel and perpendicular to walls.

AC. Route conduit installed above accessible ceilings parallel and perpendicular to walls.

AD. Route conduit in and under slab from point-to-point.

AE. Do not cross conduits in slab.

AF. Maintain adequate clearance between conduit and piping.

AG. Maintain 12-inch clearance between conduit and surfaces with temperatures exceeding 104°F (40°C).

AH. Bring conduit to shoulder of fittings; fasten securely.

AI. Use conduit hubs with sealing locknuts to fasten conduit in damp and wet locations.

AJ. Install no more than equivalent of three 90-degree bends on interior locations between boxes. Use conduit bodies to make sharp changes in direction, as around beams. Use factory elbows for bends in metal conduit larger than 2-inch size.

AK. Avoid moisture traps; provide junction box with drain fitting at low points in conduit system.

AL. Do not use dissimilar strap or clamp supports. Provide dielectric tape, fittings, straps, and bushings where dissimilar metals are used.

AM. Where fittings for liquid-tight flexible conduit are brought into an enclosure with a knockout, a gasket assembly, consisting of one piece "O" ring, with a Buna-R sealing material, Series 5200, shall be installed on outside of box. Fittings shall be made of either steel or malleable iron only, and shall have insulated throats or insulated bushings.

AN. A copper ground wire sized in accordance with NEC shall be installed on the inside of the conduit as a jumper around flexible conduit to assure a continuity of ground.

AO. Install a copper jumper across all flexible conduit including lighting fixtures, controls and other utilization equipment.

AP. Install liquid-tight flexible conduit in such a manner as to prevent liquids from running on surface toward fittings.

AQ. Allow sufficient slack conduit to reduce the effect of vibration.

AR. Complete all conduit systems before pulling the conductors.

AS. Support in accordance with requirements of National Electric Code.

3.02 INSTALLATION OF BOXES

A. Install boxes concealed in finished walls.

B. Locate boxes to prevent moisture from entering or accumulating within them.

C. Support boxes independently of conduit, as required by the National Electric Code.

D. Provide 4" x 1-1/2" octagonal, 4" x 1-1/2" square or 4" x 2-1/8" square ceiling outlet boxes.

E. Where required to hang a specific fixture, provide a fixture stud of the no-bolt, self-locking type on ceiling outlets.

F. Provide 2-1/2" x 3-3/4" one gang masonry boxes for switches and receptacles installed concealed in concrete block walls. For increased cubic capacity, provide 3-1/2" x 3-3/4" one gang masonry boxes. Where more than two conduits enter the box from one direction, provide 4" square boxes with square cut device covers not less than 1" deep specifically designed for this purpose. Use round edge plaster rings only if the block walls are to be plastered. Use sectional or gang-type outlet boxes only in drywall construction.

G. Provide 4-11/16" square outlet boxes with square cut device corners for block walls or round edge plaster rings for plastered walls for telephone outlets. Single gang device boxes are not acceptable.

H. Provide fittings with threaded hubs for screw connections and with the proper type covers for switches and receptacles served by exposed conduit. Use pressed steel outlet only for ceiling fixture outlets.

I. Provide condulets with threaded hubs and covers and with proper configurations for all changes of direction of exposed conduits. Standard conduit ells may be used if they do not interfere or damage or mar the appearance of the installation.

J. Use boxes of sufficient cubic capacity to accommodate the number of conductors to be installed, in accordance with the National Electric Code.

K. Effectively close unused openings in boxes with metal plugs or plates.

L. Set boxes so that front edges are flush with finished surfaces.

M. Support boxes from structural members with approved braces.

N. Install blank device plates on outlet boxes left for future use.

O. Provide bushings in holes through which cords or conductors pass.

P. Install boxes so that the covers will be accessible at all times.

Q. Electrical boxes may be installed in vertical fire resistive assemblies classified as fire/smoke and smoke partitions without affecting the fire classification, provided such openings occur on one side only in each framing space and that openings do not exceed 16 square inches. All clearance between such boxes and the gypsum board shall be completely filled with joint compound or approved fire-resistive compound. The wall shall be built around outlet boxes larger than 16 square inches so as not to interfere with the wall rating.

3.03 INSTALLATION OF PULL BOXES, JUNCTION BOXES AND WIRE TROUGHS

A. Provide junction boxes as shown on Drawings and otherwise where required, sized according to number of conductors in box or type of service to be provided. Minimum junction box size 4-inch square and 2-1/8-inches deep. Provide screw covers for junction boxes.

B. Install boxes in conduit runs wherever necessary to avoid long runs or too many bends. Do not exceed 100-foot runs without pull boxes. Install pull boxes at all 90-degree bends.

C. Rigidly secure boxes to walls or ceilings. Conduit runs will not be considered adequate support.

D. Install boxes with covers in accessible locations. Size boxes in accordance with the National Electric Code.

E. Do not install pull boxes or junction boxes for joint use of line voltage and signal or low voltage controls unless all conductors are insulated for the highest voltage being used in the same box.

F. Coordinate installation of exterior pull boxes with General contractor to establish elevations of finished grades and pavements. All castings shall have chimney adjustment of + 6”.

3.04 CONDUIT LOCATIONS

A. Route all conduit concealed in walls or above finished ceilings. Provide boxes and conduits concealed in walls for all power and controls.

B. Surface mounted conduits will only be allowed in pipe trenches, existing block walls, electrical rooms, and mechanical rooms. Surface mounted conduits shall only be permitted for vertical runs. All horizontal runs shall be installed above finished ceilings.

C. Surface mounted raceway (wiremold) conduit will only be allowed on finished block walls or on plaster walls, where conduit cannot be run concealed. All horizontal runs shall be installed above finished ceilings, where drop ceilings are located.

D. All conduit and wiremold shall be primed and painted to match existing adjacent wall color.

E. J-Hooks are only permitted to be used above finished ceilings for fire alarm cable.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Nameplates and labels.

B. Wire and cable markers.

C. Conduit markers.

1.02 REFERENCES

A. ANSI/NFPA 70 - National Electrical Code.

1.03 SUBMITTALS

A. Submit under provisions of Section 013300.

B. Product Data: Provide catalog data for nameplates, labels and markers.

C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Underwriters Laboratories, Inc. Include instructions for storage, handling, protection, examination, preparation and installation of product.

1.04 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

PART 2 - PRODUCTS

2.01 NAMEPLATES AND LABELS

A. Nameplates: Engraved three-layer laminated plastic, white letters on black background.

B. Locations:
1. Distribution panelboards.

C. Letter Size:
1. Use 1/4 inch (6 mm) letters for identifying all control pilot lights.

D. Labels: Embossed adhesive tape, with 3/16” (5mm) white letters on black background. Use for identifying existing equipment, distribution panels, switchboards, disconnect switches, and individual electrical devices.

2.02 WIRE MARKERS

A. Manufacturers:
1. 3M ELECTRICAL SPECIALTY DIV., Product Scotch Code.
2. THOMAS & BETTS CORP., Product E-Z Code.
3. Substitutions shall be permitted only after receiving written approval from the Engineer.

B. Description: Epoxy film tape type wire markers.

C. Locations: Each conductor at panelboards, auxiliary gutters, pull boxes, outlet and junction boxes, circuit breakers and each load connection.

D. Legend:
   1. Power and Lighting Circuits: Branch circuit or feeder number indicated on drawings.
   2. Control Circuits: Control wire number indicated on interconnection diagrams on drawings.

2.03 CONDUIT MARKERS

A. Manufacturers:
   1. THOMAS & BETTS CORP.
   2. Substitutions shall be permitted only after receiving written approval from the Engineer.

B. Description: Self-sticking vinyl; black letters on orange background.

C. Location: Furnish markers for each conduit longer than 6 feet (1.8 m).

D. Spacing: 20 feet (6 m) on center.

2.04 UNDERGROUND WARNING TAPE

A. Manufacturers:
   1. THOMAS & BETTS CORP., Model NAF-0700.
   2. Substitutions shall be permitted only after receiving written approval from the Engineer.

B. Description: 6 inch (150 mm) wide plastic tape, detectable type, colored red with suitable warning legend describing buried electrical lines.

PART 3 - EXECUTION

3.01 PREPARATION

A. Degrease and clean surfaces to receive nameplates and labels.

3.02 APPLICATION

A. Install nameplate and label parallel to equipment lines.

B. Secure nameplate to equipment front using screws, rivets or adhesive.

C. Secure nameplate to inside surface of door on panelboard that is recessed in finished locations.

D. Apply conduit markers at 20 foot (6 m) intervals.

E. Identify underground conduits using underground warning tape. Install one tape per trench at 3 inches (75 mm) below finished grade.

3.03 ELECTRICAL EQUIPMENT IDENTIFICATION

A. The Contractor shall identify all existing circuits in existing distribution panels, switchboards and disconnect switches to remain.

B. Label all circuits identifying the load served including all individual circuit breakers.

C. Label all new circuit breakers and switches used for new feeder and branch circuits.

D. Contractor shall furnish a minimum of 5 custom engrave three-layer laminated plastic labels with up to 20 words per label as directed by the engineer/owner in addition to the required labels for all pilot devices, switches, controls and timers.

END OF SECTION

H2M

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Surge protection device.

1.02 RELATED SECTIONS

1.03 STANDARDS

A. The specified suppressor shall be designed, manufactured, tested and installed in compliance with:
   1. American National Standards Institute and Institute of Electrical and Electronic Engineers (ANSI/IEEE C62.11, C62.41 and C62.45).
   2. Federal Information Processing Standards Publication 94 (FIP PUB 94).
   3. National Electrical Manufacturer Association (NEMA LS-1).
   4. National Fire Protection Association (NFPA 20, 70, 75 and 78).
   5. Underwriters Laboratories (UL 1449).
   6. CAN/C22.2 No. 8-M1986; CSA Electrical Certification Notice No. 516.
   7. The system individual units shall be UL listed under UL 1449 Standard for Transient Voltage Surge Suppressions (TVSS) and the surge ratings shall be permanently affixed to the TVSS.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. MCG ELECTRONICS, INC., Deer Park, New York.

B. Approved equal.

2.02 MANUFACTURED UNITS

A. Surge suppression shall be series Surge Free Model No. 400LS.

2.03 SYSTEM REQUIREMENTS

A. The specified surge protective device shall provide effective high energy surge diversion for application ANSI/IEEE C62.41-1991 Location Category C3 environments. Testing per ANSI/IEEE C62.45-1992 using ANSI/IEEE C62.41 Category C3 waveforms and amplitudes. UL 1449 listing. The specified surge protective device shall provide:
   1. 400,000 transient amps, per phase of surge protection.
   2. Peak surge current ratings must be independently tested and verified.
   3. All mode protection, L-N, L-G, L-L, N-G.
   4. Integral disconnect with safety dead front.
   5. Each MOV protected from over-current, thermal overload and monitored individually.
   6. Self diagnostics with comprehensive LED bar graph on front panel showing the exact % level of protection available.
   7. Audible fault alarm with silence switch.
   8. Event counter, indication of time and date of last event (battery backup for time and date).
   9. Remote alarm relay contacts (surge protected), Form C.
   10. Micro-Z low impedance installation cable.

11. Twenty year warranty on entire system.
12. LIFETIME “NO NONSENSE” WARRANTY ON FIELD REPLACEABLE POWER MODULES AND FUSES.

B. Environmental Requirements:
1. Magnetic Fields: Connection shall be made using low impedance Micro-Z cabling provided with the suppressor for maximum magnetic field cancellation. Unit shall be shunt-installed with no series connected elements.
2. Operating Temperature: Operating temperature range shall be -40° to +71° C (-40° to +160° F).
3. Storage Temperature: Storage temperature range shall be -40° to +85° C.
4. Relative Humidity: Operation shall be reliable in an environment with 0% to 95% non-condensing relative humidity.
5. Operating Altitude: The system shall be capable of operation up to an altitude of 13,000 feet above sea level.
6. Operating Voltage: Maximum continuous operating voltage shall be no less than 115% and no greater than 140% of the nominal rated line voltage.
7. Power Frequency: The power frequency range shall be 47 to 440 Hertz.

C. Electrical Requirements:
1. Unit Operating Voltage Requirements:

Voltage:	Description:	Joules (8/20us):	Vpeak L-N (20kV, 10kA):	Vpeak L-N (6kV, 500A):
120/208 VAC	3phase, 4W + gnd, wye	26496	600V	505V

2. Unit shall be installed in parallel with the protected equipment. No series connected protective elements shall be used.
3. The maximum surge current capacity per phase of the specified system, based on the standard IEEE 8/20 microsecond waveform, shall be at least: 1 Event at 400 kA. The surge life (8/20us) shall be at least 25,000 @ 25 kA occurrences. The transient suppression capability shall be bi-directional and suppress both positive and negative impulses.
4. The suppressor shall be capable of interrupting a 200 kA, short circuit current delivered from the AC power line. The interrupt capability must be confirmed and documented by a recognized independent testing laboratory.
5. The suppressor shall be designed so as to minimize the internal surge path impedance. Direct point-to-point internal wiring is inherently inductive and not acceptable. Connection to the power service shall be constructed for best performance.
6. Equipment shall be as manufactured by MCG Electronics, Inc.: Model: 400LS-Family or engineering department approved equal with supporting test data.

D. Protection System Components:
1. Replaceable modules: The suppressor shall be constructed using field replaceable protection modules. The suppressor shall have individually fused and monitored 40mm Metal Oxide Varistors (MOV’s), including neutral to ground protection mode. Each module will provide five times (5X) redundant protection, with three modules per each phase and five fuses per module. The status of each module shall be locally monitored with a green LED that becomes red in a fault condition. The transient peak rating of the fuse shall be coordinated with the Ipeak handling capability of the MOV so that the surge path capability

is not limited by the series fusing. In addition, each MOV shall incorporate a thermal disconnect means to remove a shorted MOV safely from the protection system.

2. Self-Diagnostics: Red, green and yellow solid state LED indicators shall be provided on the hinged front cover to indicate protection status. An illuminated green LED indicates power is present at the protector on all phases, and an illuminated red LED shall indicate that one or more of the modules have reduced protection. An illuminated yellow LED shall indicate a suppression event. Both front panel and internal LEDs are required to provide power and fault indications in the event of even the loss of a single fuse or MOV. Relay operation shall be in a fail-safe operating mode (i.e., continuously energized so that power failure, reduced protection, or a break in the remote monitoring line will cause a fault indication at the remote monitor).
3. Remote Alarm Capability: Relay alarm contacts shall be provided for remote alarm monitoring capability of unit status. Form C normally open and normally closed contacts shall be provided with voltage and current limiting protection.
4. Audible Alarm: The specified system shall be equipped with an audible alarm which shall be activated when any one or more of the modules has a reduced protection condition. A mute option shall be provided for the audible alarm.
5. Advanced Diagnostic LED Display: A front panel, microprocessor controlled LED display, in the form of a bar graph, will indicate the protection status of each MOV on each phase including neutral to ground. A event counter will display number of suppressed transient events with a time and date stamp.
6. Integral Disconnect: Unit shall be provided with dead front disconnect to remove power from protector for maintenance access. The disconnect should not be accessed from the front panel unless the unit meets the minimum clamp voltage requirements.
7. NEMA 12 Enclosure: 14 gauge steel, with stainless steel hardware.

PART 3 - EXECUTION

3.01 INSTALLATION AND MAINTENANCE

A. The unit shall be factory installed in accordance with the manufacturer’s printed instruction to maintain warranty. All local and national codes must be observed.

B. Units shall be installed as close as possible to the load side lugs of the main service switch to which it is connected using low impedance Micro-Z cabling.

C. A 3-pole disconnect shall be provided to insure safety of maintenance personnel.

3.02 TWENTY YEAR WARRANTY

A. Manufacturer to provide twenty (20) year warranty to cover repair or replacement with a new device. Manufacturer to provide no cost replacement of fused protection modules for the life of the suppressor.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Switchboards.

1.02 SUBMITTALS

A. Submit product data under provisions of Section 013300.

B. Include electrical ratings, dimensions, mounting, material, running overcurrent protection, branch circuit overcurrent protection, wiring diagrams and accessories.

C. Provide detailed scaled 1/2" = 1'-0" drawings of switchboard including any and all instrumentation and control drawings on 24 inch x 36 inch blueprints for floor plans showing switchboard layout, locations and clearances.

D. Provide detailed scaled 3/4" = 1'-0" elevation drawings of switchboard including instrumentation and controls. Elevation drawings shall show all switches, circuit breakers, transfer switches, CT area, power monitors, etc., scaled locations of all knockouts and cutouts on exterior of enclosures for review and approved by Engineer.

E. Provide detailed scaled 3/4" = 1'-0" elevation drawings of switchboard including instrumentation and controls for interior mounting of all equipment. Drawings shall show all protective devices, circuit breakers, fuses, wiring, timers, terminal blocks and cable connection points.

F. Provide catalog cuts for each device including pilot lights, switches, timers, circuit breakers, fuses, meters, protective devices, etc.

1.03 REFERENCES

A. National Electrical Manufacturers Association (NEMA) - No. ICS-1, General Standards for Industrial Control and Systems; No. ICS-2, Industrial Control Devices, Controllers and Assemblies; No. ICS-6, Enclosures for Industrial Control and Systems.

B. ANSI/NFPA 70 - National Electrical Code.

C. ASTM D 178 - Specification for Rubber Insulating Matting.

D. Underwriters Laboratories, Inc. (UL) - No. 891, Switchboards.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. EATON Pow-R-Line Xpert.

B. Specifically Approved Equal. Substitute manufacturers shall be responsible to meet the exact dimensions detailed on the drawings. Switchboard manufacturer shall provide applicable U.L. labeling for all sections shown on drawings and for complete installation of all equipment specified to be packaged into the Switchboard. All equipment specified to be installed in Switchboard shall be factory installed by Switchboard manufacturer. No exceptions.

2.02 SWITCHBOARDS

A. Switchboards shall be in accordance with UL, NEMA, NEC and as shown on the Drawings.

B. Switchboard center is based on Eaton Pow-R-Line Xpert dimensions. Contractor shall be responsible to meet dimension requirements if substitution is proposed.

C. Switchboard shall be complete, floor mounted, metal enclosed, grounded, indoor type. The switchboard shall be NEMA Standard, Class 11, Type C except where other NEMA Standard classes and types are shown on the Drawings.

D. Ratings shall be 100,000 AIC for all switchboards with 100,000 AIC for Main Circuit Breaker.

E. Shall conform to the arrangements and details of the Drawings and to the spaces designated for installation.

F. All switchboard doors shall be removable with a wiring plug harness for quick removal of doors with disconnecting wire terminations.

G. Design the switchboard to withstand the mechanical stresses caused by rough handling during shipment in addition to the electrical and mechanical stresses which will occur during operation of the switchboards.

H. Coordinate components of the switchboards and their arrangements electrically and mechanically. The components and the control wiring shall conform to the approved shop drawings as furnished for the various applicable electrical and mechanical sections of the specifications.

I. Assemble, connect and wire the switchboards at the factory in accordance with the NEMA Standard class and type for each switchboard.

J. Thoroughly clean, phosphatize and paint the metal surfaces at the factory with primer and baked enamel or lacquer finishes.

K. Switchboard shall have the following features:
   1. Standard Vertical Sections:
      a. Approximately 90 inches high, front and rear line-up, fabricated by a single manufacturer.
      b. Rugged steel assemblies with bracing, reinforcing gussets and jig-welding to assure rectangular rigidity. The sections shall be completely metal-enclosed, including their bottoms.
      c. Steel shall not be less than code gauge, leveled.
      d. Bolts, nuts and washers shall be rustproof metal.
      e. Spaces within the sections shall be suitable and adequate.
      f. Mount the sections on adequate structural steel supports at the factory, front and rear, for the full length of each center. Install the centers so the supports will rest on top of the concrete floor surfaces except where concrete pads are indicated. Anchor the centers with bolts, not less than 1/2-inch diameter.
      g. End panels shall be screw-removable to facilitate future additions.
      h. Removable panels shall have screws which remain in the panels when the panels are removed. Screws shall be received by self-aligning, self-retaining nuts attached within the assemblies.

2. Bus Bars and Interconnections:
   a. Shall be copper, rated as indicated on drawings. Minimum size shall be 2000 amps and shall adhere to all other applicable codes having jurisdiction.
   b. Shall be totally enclosed with all spacing as required by all applicable codes having jurisdiction.
   c. Bus bar joints and interconnection joints shall be plated with silver, tin, nickel or cadmium, constant high-pressure type with high strength copper-silicon bolts and nuts.
   d. Insulation:
      1) High strength polyester glass or equal.
      2) High track-resistance.
      3) High impulse and dielectric strength, especially at elevated temperatures, for withstanding the maximum short circuit currents.
      4) High flame-retardant, self-extinguishing.
      5) NEMA Standard for 65°C temperature rise shall apply.
   e. Shall have horizontal main buses and vertical buses for connecting the circuit breakers and switches.
   f. Shall have an adequate ground bus that extends across the entire width of each center.
   g. Bus bars shall be designed to extend to additional sections when so shown on the Drawings in addition to extending through dead corner cubicles.
   h. Temperature rises shall not exceed the NEMA Standards.
3. Completely equipped spaces for future circuit breakers and switches.
4. Identify each circuit breaker, switch or other device with a separate nameplate of laminated black phenolic resin with white core and engraved lettering not less than 3/16-inch high. Identify each device by its name or other designation as indicated in drawings.

L. Test the switchboard at the factory to assure that the switchboards do not have any defects. Additional “spot” testing such as contact resistance shall be conducted at bus connections between switchboard sections installed at the site.

M. Electrical Matting: Dielectric strength 30,000 volts, 3 feet wide, 1/4 inch thick corrugated ASTM D 178 Type 2, Class II.

N. All circuit breakers shall be rated 100,000 AIC. AIC based on stand alone ratings. Manufacturers rating using combined systems ratings to use lower AIC rated breakers is not acceptable.

O. Main Protective Device - Eaton Insulated Case Breaker, Fixed Mount Main (**For breaker 1200A and above**)
   1. Circuit breakers shall comply with the requirements of UL. Breakers shall be three-pole, 100% rated type or approved equal.
      a. Circuit breaker element shall have spring charged/discharged indicators and circuit breaker open or closed and ready to close indicators all of which shall be visible to the operator with the compartment door closed.
      b. Provide interlocks to prevent racking the circuit breaker unless the breaker is open.
   2. Ratings: Interrupting up to 100 kA at 480V without fuses. Short time current ratings for each circuit breaker shall be as indicated on the drawings or data tables. Circuit breakers shall be 600-volt class.
   3. Operating Mechanism: Mechanically and electrically trip-free, stored-energy operating mechanism with the following features:

a. Normal Closing Speed: independent of both control and operator.

4. Each low voltage circuit breaker shall be equipped with self-powered, microprocessor-based trip-device to sense overload and short circuit conditions. The device shall measure true RMS current. The tripping system shall consist of high accuracy (<1%) Rogowski coil sensors on each phase, a release mechanism and the following features:
   a. Field Installable and interchangeable front mounted trip units. Trip units can be upgraded for future expansion in functionality, such as communication.
   b. Functions: Long time, short time and extended instantaneous protection function (EIP) shall be provided to allow the breaker to be applied at the withstand rating of the breaker with minus 0% tolerance so that there is no instantaneous override whatsoever. This feature shall furthermore allow the circuit breaker to be applied up to the full instantaneous rating of the breaker on systems where the available fault current exceeds the breakers withstand rating. Each shall have an adjustable pick-up setting. In addition, long time and short time bands shall each have adjustable time delay. Short time function shall include a switchable I2t ramp.
   c. A software program shall be made available free of charge to support system coordination studies. The software will allow time current curves to be generated for the chosen settings.
   d. Individual LED's shall indicate an overcurrent, short circuit or ground fault trip condition.
   e. Time-current characteristics shall be field adjustable locally or optionally remotely via a bus system Ethernet.
   f. Current Adjustability shall be accomplished by use of dial settings and rating plugs on trip units. The rating plug shall be front mounted and upgradeable. Upgrades to the rating plugs shall not require changes to the CT.
   g. Pickup Points: 10 Long Time Settings.
   h. Field Installable Ground-fault protection with at least three time-delay bands and an adjustable current pickup and an I2t ramp. Arrange to provide protection for four-wire service.
   i. Field Installable Communications and metering functions shall be provided per schedule.
   j. A LCD display shall be available to simplify settings & viewing data locally.
   k. The option to remotely switch protection settings shall be provided whenever a generator is part of the power distribution system.
   l. Field installable configurable [analog], [digital] output relays shall be available to connect directly to the trip unit.
   m. Waveform capture and display shall be accomplished on the trip units LCD display.
5. Terminal Block Connections, shall be front mounted and utilize Screw Type Terminals.
6. Control Switch: One for each electrically operated circuit breaker.
7. Undervoltage Trip - field installable: Adjustable time-delay.
8. Indicating Lights: To indicate circuit breaker is open or closed, for electrically operated circuit breakers.
9. Accessories shall be front mounted.
10. Portable lifting yoke for drawout circuit breakers.
11. Field interchangeable accessories shall include CT's, trip units, racking mechanism and all internal & external accessories.
12. The main breaker shall have a Dynamic Arc Flash Sentry. The main breaker shall have a dual protective setting capability with graphic waveform display. The main breaker will allow the installer to set two different trip curves into one breaker. One curve will be set for standard operating mode and the second curve, with instantaneous protection shall be set for arc flash mode. The switchboard shall be outfitted with a 24 VDC power supply,

CubicleBus digital input module, annunciator panel with flashing light and a UPS power supply. The arc flash mode shall be actuated by a keyed. The breakers with frames rated 1200 amps or higher shall be equipped with Dynamic Arc Flash Sentry to comply with NEC 2014 240.87.

2.03 POWER MONITOR

A. Manufacturer: EATON
   1. Model No: PMX1100 Series.
   2. 208 volt.

B. Quantity: One (1) required, 208V, 3 phase 4w.

C. Provide current and potential transformers for all three phases and neutral for digital ammeters/voltmeters.

D. The power monitor shall incorporate a vacuum display and keypad to allow the user to read the following parameters:
   1. Voltage V1, V2, V3.
   2. Current I1, I2, I3, In, Iavg.
   3. Power P1, P2, P3, Psum.
   4. Reactive Power Q1, Q2, Q3, Qsum.
   5. Apparent Power S1, S2, S3, Ssum.
   6. Frequency.
   7. Power Factor.
   8. Energy.
   9. Reactive Energy.
   10. Apparent Energy.
   11. Demand.
   12. Load Features.
   13. Four Quadrant Powers.
   14. Power Quality.
   15. Voltage Harmonics.
   16. Current Harmonics.
   17. Voltage Crest Factor.
   18. Current K Factor.
   19. Voltage Unbalance Factor.
   20. Current Unbalance Factor.
   21. Max/Min Statistics with Time Stamps.

E. Power monitor shall have the following features:
   1. Alarms
   2. I/O Option Module
   3. Anti-tampering Seal
   4. Data Logging (8mb)
   5. Automatic Frequency adaption.
   6. Power Quality Event Logging.
   7. Communication
      a. Modbus RTU Protocol and DNP 3.0 via RS485
      b. Ethernet (Modbus TCP, HTTP, SMTP, SNTP)
      c. Profibus DP
      d. BACnet IP, BACnet MS/TP

e. Dual RS485 Communication Ports

8. 0.2% accuracy.

F. Power monitors shall be factory installed on the Switchboard enclosure doors as indicated on drawings.
   1. The power monitor shall be installed in ATS cabinet on the load side and shall monitor Utility power only.

PART 3 - EXECUTION

3.01 PREPARATION

A. Provide and install concrete housekeeping pad as shown on drawings

B. Provide and install electrical matting to extend 24 inches beyond end of switchboard. Cut matting clear of obstructions.

C. Shop inspect and test switchboard in accordance with NEMA PB 2.

D. Make completed switchboard available for inspection at manufacturers factory prior to packaging for shipment. Notify Owner at least seven (7) days prior to inspection.

E. Allow witnessing of factory inspections and tests at manufacturers test facility. Notify Owner at least seven (7) days before inspections and tests are scheduled.

3.02 INSTALLATION

A. Install switchboard in location as indicated on contract drawings in accordance with NEMA, NEC and manufacturer's instructions.

B. Tighten accessible bus connections and mechanical fasteners after placing switchboard.

C. Install fuses in each switch.

D. Meter pans, meters, current transformers, and ground fault protection (where applicable) shall be factory installed into switchboards as per Con Edison specifications.

3.03 ADJUSTING

A. Adjust all operating mechanisms for free mechanical movement.

B. Tighten bolted bus connections in accordance with manufacturers instructions.

C. Adjust circuit breaker trip and time delay settings to values as indicated by Architect in field.

3.04 SOURCE QUALITY CONTROL

A. Provide Owner and Architect/Engineer with a copy of all test records.

B. Provide Owner and Architect/Engineer with Operations and Maintenance Manual prior to contract closeout.

C. Touch up scratched or marred surfaces to match original finishes.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Distribution panelboards.

1.02 REFERENCES

A. ANSI/NFPA 70 - National Electric Code.

B. NECA Standard of Installation.

C. NEMA AB1 - Molded Case Circuit Breakers.

D. NEMA PB1 - Panelboards.

E. NEMA PB1.1 - Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.

F. NEMA ICS2 - Industrial Control Devices, Controllers and Assemblies.

G. NEMA KS1 - Enclosed Switches.

1.03 SUBMITTALS

A. Submit product data under provisions of Section 013300.

B. Indicate outline and support point dimensions, voltage, main bus ampacity, integrated short circuit ampere rating, and circuit breaker arrangement and sizes.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. New Panelboards
   1. Panelboards shall be manufactured by Eaton.
   2. Approved equal.

2.02 PANELBOARD REQUIREMENTS

A. Provide panelboards of circuit breaker, dead-front safety type, UL labeled, and meeting all applicable requirements of the National Electrical Manufacturers Association.

B. Provide panelboards with lugs (both main lugs and branch circuit lugs) suitable and UL approved for both aluminum and copper conductors.

C. Provide electrically isolated neutral bars.

D. Provide separate ground bars complete with lugs or connectors on bar.

E. Provide key operated door and door lock. Door shall prevent access to operate circuit breakers.

F. Provide panelboards with sequence phased bus bars or distributed phase bussing for voltage and phase as indicated on drawings.

G. Refer to drawings for numbers of branch circuits, their ratings, number of poles, arrangements, etc.

H. Provide typed circuit directory cards.

I. Provide front filler plates for unused breaker knockouts.

J. Refer to drawings for Ratings and Features.

K. All bus bars, including ground bars shall be tin-plated copper.

L. All circuit breakers shall be bolt-on type.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Ground separate ground bars to panel boxes and to the main service entrance ground bus with a code-sized grounding conductor installed in the same conduit as the phase and neutral conductors under provisions of Section 260526.

B. Install all circuits using a common neutral bus bay in accordance with the National Electric Code. Balance all circuits to achieve not greater than 7% unbalanced neutral current in panel feeders.

C. Provide six circuit breaker handle lock-on devices for each lighting and miscellaneous power panelboard for installation by the contractor on circuits as directed by the Engineer to prevent unauthorized personnel from turning off circuits to controls, unit heaters, autodial alarm system, etc. Provide spare lock-on devices over to the Engineer.

D. Install panelboards in accordance with NEMA PB 1.1.

E. Install panelboards plumb.

F. Height: 6 feet (2 m) to top of panel board.

G. Provide typed circuit directory for each branch circuit panelboard. Handwritten circuit directory cards will not be accepted. Revise directory to reflect circuiting changes required to balance phase loads.

H. Provide a typed circuit directory in accordance with NEC sections 110.22 and 408.4. Circuits shall be labeled with detailed information describing the switches function and equipment location.

I. For all existing circuits terminated to a new panelboard, contractor shall trace out and update the circuit directory in accordance with NEC sections 110.22 and 408.4. Include all costs for this work in base bid.

J. Revise directory to reflect circuiting changes required to balance phase loads.

K. Provide engraved plastic nameplates under the provisions of Section 260553.

3.02 FIELD QUALITY CONTROL

A. Maintain proper phasing for multi-wire branch circuits.

B. Visual and Mechanical Inspection: Inspect for physical damage, proper alignment, anchorage, and grounding. Check proper installation and tightness of connections for circuit breakers, fusible switches, and fuses.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Switches, receptacles, device plates and other wiring devices as indicated on Drawings.

1.02 RELATED SECTIONS

A. Section 260533 - Raceways and Boxes for Electrical Systems.

1.03 REFERENCES

A. ANSI/NFPA 70 - National Electric Code.

B. NEMA WD1 - General Purpose Wiring Devices.

1.04 SUBMITTALS

A. Submit product data under provisions of Section 013300.

B. Provide manufacturer's catalog information showing dimensions, colors and configuration.

1.05 REGULATORY REQUIREMENTS

A. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

PART 2 - PRODUCTS

2.01 SWITCHES

A. Manufacturers: HUBBELL, BRYANT, GENERAL ELECTRIC.

B. Single pole, 20 amp, 120/277 VAC, NEMA WD-1, heavy duty, UL20.

C. Device Plate: Stainless steel.

2.02 RECEPTACLES

A. Manufacturers: HUBBELL, BRYANT, GENERAL ELECTRIC.

B. 20 amp, 125 VAC, NEMA WD-1, heavy duty.

C. 20 amp, 125 VAC, NEMA WD-1, heavy duty, ground fault circuit interrupter.

D. Duplex type.

E. Device Plate: Stainless steel.

2.03 MANUAL MOTOR RATED THERMAL SWITCH

A. Acceptable Manufacturers: SQUARE D, Class 2510, Type KG1A, Type KG2C (3-pole, 600V) or approved equal.

B. Contractor shall coordinate voltage, phase and current rating with equipment.

2.04 CONTACTORS

A. Manufacturers: Square D, Model No. LO1000V02.

B. 4 pole, 30 amp, open type contactor.

C. Electrically held coil, 120VAC.

D. Quantity required: Two (2)

PART 3 - EXECUTION

3.01 INSTALLATION

A. Mounting:
   1. Mount all switches 46-inches above finished floor to center line of switch unless noted otherwise.
   2. Mount all receptacles 18-inches above finished floor to center line of receptacle unless noted otherwise.
   3. Install switches with OFF position down.

B. Polarity: Properly wire all receptacles so that the hot wire, the neutral wire and the ground wire connect to the proper terminal on all receptacles.

C. Grounding: Install all devices in boxes specified under Section 260533 and install a No. 12 green ground wire from device grounding terminal to the outlet box in accordance with the National Electric Code.

D. Install device plates on switch, receptacle and blank outlets in full contact with wall surface.

3.02 FIELD QUALITY CONTROL

A. Inspect each wiring device for defects.

B. Operate each wall switch with circuit energized and verify proper operation.

C. Verify that each receptacle device is energized.

D. Test each receptacle device for proper polarity.

E. Test each GFCI receptacle device for proper operation.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Disconnect switches.

1.02 REFERENCES

A. NEMA KS-1 - Enclosed Switches.

B. ANSI/UL 198C - High Intensity Capacity Fuses, Current Limiting Types.

C. FS W-S 865 - Switch, Box (Enclosed), Surface Mounted.

D. NEMA AB1 - Molded Case Circuit Breakers.

1.03 SUBMITTALS

A. Submit product data under provisions of Section 013300.

B. Include outlet drawings with dimensions and equipment ratings for voltage, capacity, horsepower and short circuit current ratings.

1.04 RELATED SECTION

A. Section 260553 - Identification for Electrical Systems.

1.05 COORDINATION

A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

PART 2 - PRODUCTS

2.01 DISCONNECT SWITCHES

A. Disconnect switches shall be GENERAL ELECTRIC, heavy-duty Type TH or approved equal.

B. 75ºC conductor ratings.

C. Ratings: 240VAC

D. Quick-break, quick-make, load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position.

E. Suitable for use as service entrance equipment.

F. UL listed for Class R 200,000 RMS amps, symmetrical IC.

G. Enclosures: Refer to drawings.

2.02 MOLDED CASE CIRCUIT BREAKERS

A. Install molded case circuit breakers for Main Circuit Breaker, Generator Circuit Breaker and Panel Circuit Breakers.

B. Molded Case Circuit Breaker:
   1. Manufacturer: SIEMENS
      a. 125 Amp, 3 Pole Type ED6.
      b. 250 Amp, 3 Pole Type HFD6.
      c. 400Amp, 3 Pole Type HJD6.
      d. 600Amp, 3 Pole Type HLD6.
      e. 800Amp, 3 Pole Type HMD6.
   2. AIC Rating: 65,000 amperes.
   3. Thermal magnetic with interchangeable trip

C. Enclosure
   1. Manufacturer: SIEMENS
   2. Rating: NEMA 1 (for interior use) or NEMA 3Rl (for exterior use).
   3. External Throw.
   4. Suitable for Service Entrance Equipment (where applicable).

D. Main Protective Devices 1200A and Above shall be Eaton Insulated Case Breaker. The main breaker shall have a Dynamic Arc Flash Sentry. The main breaker shall have a dual protective setting capability with graphic waveform display, i.e. the Siemens WL breakers ETU776 trip unit or equal. The main breaker will allow the installer to set two different trip curves into one breaker. One curve will be set for standard operating mode and the second curve, with instantaneous protection shall be set for arc flash mode. The switchboard shall be outfitted with a 24 VDC power supply, CubicleBus digital input module, annunciator panel with flashing light and a UPS power supply. The arc flash mode shall be actuated by a keyed. The breakers with frames rated 1200 amps or higher shall be equipped with Dynamic Arc Flash Sentry to comply with NEC 2014 240.87.

2.03 EXTRA MATERIALS

A. Provide one complete set based on number of poles of spare fuses for each fused disconnect switch. Provide to Owner.

PART 3 - EXECUTION

3.01 INSTALLATION REQUIREMENTS

A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.

B. Temporary Lifting Provisions: Removed temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

C. Provide switches/enclosed circuit breakers at locations as indicated on drawings.

D. Refer to disconnect switch schedule on drawings for ampacity ratings, fuse sizes, number of poles and enclosure ratings.

E. Install engraved nameplates on each switch and enclosed circuit breaker identifying the following:
   1. Switch designated.
   2. Load served.
   3. Power origination.

3.02 ADJUSTING

A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

B. Set field-adjustable circuit breaker trip ranges.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Main CB/current transformer/meter cabinet and meter pan.

B. Transformer to be mounted on a reinforced concrete pad/pull box.

C. Primary and secondary conduits, conductors, excavation, concrete and backfill.

1.02 RELATED SECTIONS

A. Section 260526 - Grounding and Bonding for Electrical Systems.

1.03 REFERENCES

A. ANSI/NFPA 70 - National Electric Code.

1.04 SUBMITTALS

A. Submit product data under provisions of Section 013300.

PART 2 - PRODUCTS

2.01 METERING EQUIPMENT

A. Meter pans, meter, current transformers and ground fault circuit protection shall be on Local Utility's approved lists of manufacturers and models.

B. CT Cabinets, Current Transformers and Ground Fault Protection shall be factory installed into motor control center manufacturer’s structures as per Local Utility specifications.

2.02 COMBINATION TRANSFORMER PAD/PULL BOX

A. Combination transformer pad/pull box shall be as per Local Utility requirements.

B. Conduit penetrations shall be provided for both primary and secondary penetrations into transformer and into pull box so that minimum ground cover is maintained in accordance with NEC and Local Utility requirements. Enter primary and secondary conduits/conductors into transformer pullbox in accordance with Local Utility requirements.

2.03 PULL BOXES

A. Provide pull boxes including property line pull boxes as per Local Utility requirements for both primary and secondary services.

B. Provide Local Utility approved type TS for all primary services and secondary services above 400 amperes.

C. Provide Local Utility approved type B-3-6 for secondary services 400 amperes and less.

2.04 CABLE

A. Install new primary and secondary service conductors in conduit.

B. Primary service conductors shall be 15 KV, copper size 1/0, type TR-XLPE with 220 mils insulation thickness as per Local Utility requirements.

C. Secondary service conductors shall be copper type XHHW-2 as per Local Utility requirements.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Coordinate primary and secondary service installation with Local Utility prior to beginning work.

B. Provide secondary service to incoming cubicle of motor control center, coordinate service requirements with Local Utility prior to commencing work.

C. All metering equipment and ground fault protection shall be factory installed in motor control center.

D. Contractor shall file application for new electrical service. Contractor shall coordinate with owner for all information related to the service application.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Temporary generators for use during construction.

1.02 REFERENCES

A. ANSI/NFPA 70 - National Electric Code.

1.03 SUBMITTALS

A. Submit under provisions of Section 013300.

B. Shop Drawings: Indicate locations where temporary electric services will be located and routed.

1.04 REGULATORY REQUIREMENTS

A. Provide temporary power in accordance with National Electric Code.

B. Obtain required permits from authorities.

C. Notify affected utility companies before starting work and comply with their require-ments.

D. Do not close or obstruct egress width to exits.

E. Do not turn off electric equipment without authorization from Owner and Engineer. Provide 72 hours advance notification.

1.05 SCHEDULING

A. Provide temporary electric generators as shown on the contract drawings before removing or temporarily disabling existing electrical service.

PART 2 - PRODUCTS

2.01 TEMPORARY GENERATOR

A. Minimum of one (1) Temporary generator shall be available during the entire contract period when existing electrical service is disabled until new electrical ser-vice and distribution is permanently on-line and in service.

B. Temporary generators shall be installed and maintained per NEC, OSHA, N.Y. State Uniform Building Code and local code requirements.

C. Temporary generator shall be a minimum of 100KW @ 120/208 Volt 3Ø, 4 wire.

D. All existing equipment shall be protected against damage caused by the installation, operation and removal of the temporary generator service. Any equipment or items damaged shall be replaced at no cost to the Owner.

E. Provide portable sound-attenuated generators system for temporary electric services.

F. Provide all necessary wire, cables and conduit for connection between portable gen-erators and equipment listed in the temporary generator plan on the contract drawings and deemed necessary by the owner. Generators shall be configured to be automatically started and stopped.
   1. Provide all necessary fuel for operation. Generators shall be diesel powered.
   2. Provide and install a lockable fence enclosure to protect and secure generators from vandalism and theft.
   3. Upon completion of the project, remove all temporary electric light and power work and restore all affected finishes, connections and site work.

G. Review the contract drawings for alternate temprary generator size and additional requirements.

2.02 MINIMUM SYSTEM REQUIREMENTS

A. The temporary engine generators shall start and provide continuous power to all of the existing site loads as shown on the contract drawings and loads required for construction purposes with 100 percent block loading at the time of transfer.

B. The genset shall be trailer mounted with an integral sub base tank:

C. The 100KW Genset shall be provided with a minimum of a 150 gallon diesel fuel tank. Review the contract drawings for alternate temprary generator size and additional requirements.

D. All gensets to be provided with an electronic governor.

E. The fuel storage tank shall utilize double wall sub base containment.

F. Strobe light to indicate low fuel level alarm

G. Provide portable sound-attenuated generator system for temporary electric service. Sound level must not exceed 65 dBA at 50’.

H. 110 VAC receptacle for use at low voltages

I. Voltage: 120/208V

J. Trailer shall be provided with out-riggers to provide security and remove load from trailer tires when genset is in stationary position.

K. AC voltage and frequency meters, digital display panel, panel backlighting, Run-off-auto switch, self diagnostics, idle mode control, and voltmeter/ammeter phase selector switch.

L. Overcurrent sensing, Voltage adjustment potentiometer.

M. Provide all necessary wire, cables and conduit for connection between portable gen-erator and all electrical equipment.

N. Provide a full tank of fuel with delivery of unit. Generator shall be diesel powered.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify existing system voltage characteristics and match to existing system voltage characteristics.

B. Verify that the temporary service is sized to accommodate all loads.

C. Determine locations and routings for temporary electric wires, cables and conduits with Engineer and Owner.

3.02 TEMPORARY POWER

A. Temporary wiring and power shall be installed so as not to be a hazard and shall be protected from damage. Separate circuits shall be provided for light and power. Over-current protective devices and switches shall be provided. All equipment, tools, metal cabinets and boxes shall be grounded.

B. Disable existing power only to make final connections or when new service is to be installed.

C. Temporary electric service shall not be obtained from other existing electrical sys-tems located on the site.

D. Temporary wires, cables and conduits shall be protected from damage and accessi-bility by unauthorized persons.

E. Pay for all fuel and maintenance of unit during course of project. Power shall not be interrupted during any course of construction, except when transferring from utility to temporary generator and back to new utility power. Power interruptions shall be limited to two (2) 20 minute durations and owner shall be notified a minimum of 72 hours before any power interruptions.

END OF SECTION

PART 1 -GENERAL

1.01 SECTION INCLUDES

A. Addressable Duct Smoke Detectors

B. Fan Shutdown

1.02 REFERENCES

A. NFPA 70 - National Electrical Code.

B. NFPA 72, 72G, 72H - National Fire Alarm Code.

C. NFPA 101 - Life safety code.

1.03 WORK INCLUDED

A. Furnish and install as described in these specifications and as indicated on the drawings, fire alarm and smoke detection equipment with battery backup.
   1. All equipment shall be UL listed under category UOJZ as an integrated control system; equipment listed under category UOXX as a control unit accessory shall not be acceptable. The installation shall meet the applicable requirements of NFPA 72 and New York State Code, as well as those standards set by the authorities having jurisdiction.
   2. All panels and peripheral devices shall be the standard product of a single manufacturer and shall display the manufacturer's name on each component. The catalog numbers specified under this section constitute the type, product quality, material and desired operating features.
   3. Provide all labor, materials and services to perform all operations required for the complete installation and related work shown on the drawings and as specified herein.
   4. All electrical work and equipment shall meet the requirements of NFPA 70 and 72.
   5. For any facilities that utilize an existing fire alarm system, the contractor shall coordinate with the owner and fire alarm monitoring company prior to removing or disabling any devices. It shall be the contractor’s responsibility to provide fire watch as per the latest addition of the Fire Code of New York State. The contractor shall provide fire watch for all areas of a facility while occupied and unoccupied when any device or part of the fire alarm system is de-activated or put into “test mode”.

1.04 SUBMITTALS

A. Submit product data as required by Section 013300.
   1. Two copies of all submittals shall be submitted to the Architect/Engineer for review.
   2. All references to manufacturer’s model numbers and other pertinent information herein is intended to establish minimum standards of performance, function and quality.
   3. Equivalent equipment (compatible UL-Listed) from other manufacturers may be substituted for the specified equipment as long as the minimum standards are met, and upon approval of the Architect/Engineer.

B. Shop drawings:
   1. Provide a list (bill of materials) of all types of equipment and components provided.
   2. Provide annunciator layout and system wiring diagram showing each device and wiring connection required, including existing equipment. Provide a description of operation of the system. Provide system ampere load and time calculations to substantiate compliance

with battery back up (24 hours in non-alarm condition followed by 5 minutes in alarm, after normal power loss)

3. Sufficient information, clearly presented shall be included to determine compliance with drawings and specifications.
4. Include manufacturer's printed product data with name(s), model numbers, ratings, power requirements, equipment layout, device arrangement, complete wiring point-to-point diagrams, and conduit layouts.

C. Manuals:
1. Submit simultaneously with the shop drawings, complete operating and maintenance manual listing the manufacturers name(s) including technical data sheets.
2. Wiring diagrams shall indicate internal wiring for each item of equipment and the interconnections between the items of equipment.
3. Provide a clear and concise description of operation that gives, in detail, the information required to properly operate the equipment and system.
4. Indicate application conditions and limitations of use stipulated by product testing agency.
5. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of products

D. Test Reports and Certifications:
1. Indicate satisfactory completion of required tests and inspections.
2. Together with the shop drawing submittal, submit a certification from the major equipment manufacturer indicating that the proposed supervisor of installation and the proposed performer of contract maintenance is an authorized representative of the major equipment manufacturer. Include names and addresses in the certification.

E. Contractor shall provide Engineer with a complete set of drawings (including all floors, crawl spaces, closets, open spaces) showing a complete survey of all new and existing fire equipment devices and appliances prior to any work. Contractor shall submit complete package with a New York State Professional Engineer stamp all drawings, submittals, and applications. Pay for all fees to obtain permits and approval.

1.05 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Section 017839.

B. On as-built installation drawings: Record actual locations of initiating devices, signaling appliances, and end-of-line devices, including those that are existing.

C. Provide a written sequence of operation to the owner.

D. Provide site specific software and program, including all addressable points.

E. A completed NFPA 72 Inspection and Testing form shall be submitted to the owner, prior to system acceptance.

1.06 OPERATION AND MAINTENANCE DATA

A. Submit under provisions of Section 017839.

B. Maintenance and testing shall be on a semiannual basis or as required by the Authority Having Jurisdiction (AHJ). A preventive maintenance schedule shall be provided by the Contractor that shall describe the protocol for preventative maintenance. The schedule shall include:

1. Systematic examination, adjustments and cleaning of all detectors, manual fire alarm stations, control panels, power supplies, relays and all accessories of the fire alarm system.
2. Each circuit in the fire alarm system shall be tested semiannually.
3. Each smoke detector shall be tested in accordance with the requirements of NFPA 72 Chapter 7.

1.07 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum ten (10) years documented experience, and with service facilities within fifty (50) miles of project location.

B. Installer: Company specializing in installing the products specified in this section with minimum three (3) years documented experience, and certified by the State of New York as fire alarm installer.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. EDWARDS EST (EXISTING SYSTEM)

2.02 GENERAL

A. All equipment and components shall be new, and the manufacturer's current model. The materials, appliances, equipment and devices shall be tested and listed by a nationally recognized approval agency for use as part of a protected premises protective signaling (fire alarm) system.

B. All equipment and components shall be installed in strict compliance with manufacturers' recommendations. Consult the manufacturer's installation manuals for all wiring diagrams, schematics, physical equipment sizes, etc., before beginning equipment installation.

C. All equipment shall be attached to walls and ceiling/floor assemblies and shall be held firmly in place (e.g., detectors shall not be supported solely by suspended ceilings). Fasteners and supports shall be adequate to support the required load.

2.03 CONDUIT AND WIRE

A. Conduit:
1. Conduit shall be in accordance with the National Electric Code (NEC), local and state requirements.
2. All wiring shall be installed using plenum rated cable.
3. Cable must be separated from any open conductors, as per NEC Article 760-29.
4. Wiring for 24 volt control, alarm notification, emergency communication and similar power-limited auxiliary functions may be run in the same conduit as initiating and signaling line circuits. All circuits shall be provided with transient suppression devices and the system shall be designed to permit simultaneous operation of all circuits without interference or loss of signals
5. Conduit shall enter the Fire Alarm Control Panel, Remote Annunciator Panel and/or backboxes where conduit entry is designated and permitted by the FACP manufacturer.
6. Conduit shall be ¾ inch (19.1 mm) minimum.

7. In finished areas where conduit cannot be concealed, surface mounted raceway is to be used.

B. Wire:
1. All fire alarm system wiring shall be new.
2. Wiring shall be in accordance with local, state and national codes (e.g., NEC Article 760), and as recommended by the manufacturer of the fire alarm system. Number and size of conductors shall be as recommended by the fire alarm system manufacturer, but not less than 18 AWG (1.02 mm) for Initiating Device Circuits and Signaling Line Circuits, and not less than 14 AWG (1.63mm) for Notification Appliance Circuits. All wiring shall be of the type recommended by the manufacturer.
3. All wire and cable shall be listed and/or approved by a recognized testing agency for use with a protective signaling system.
4. All wire and cable shall have a fire resistance rating suitable for the installation as indicated in NFPA 70, and shall test free from grounds or crosses between conductors.
5. Wiring used for the multiplex communication loop shall be twisted and shielded and installed in conduit unless specifically excepted by the fire alarm equipment manufacturer. The system shall permit use of IDC and NAC wiring in the same conduit with the communication loop
6. All field wiring shall be completely supervised.

C. Terminal Boxes, Junction Boxes and Cabinets:
1. All boxes and cabinets shall be UL listed for their use and purpose.

D. Circuits shall be arranged to serve like categories (manual, smoke, horn, strobe). Mixed category circuitry shall not be permitted except on signaling line circuits connected to addressable reporting devices.

2.04 SEQUENCE OF OPERATIONS

A. Fire Alarm System Sequence of Operation
1. Operation of any manual fire alarm station or activation of any smoke sensor, area smoke detector, duct smoke detector, or heat detector throughout the building shall automatically:
a. Sound all horns throughout the building with an individual Temporal ‘3’ Code. The alarm signals may be silenced during the alarm condition by operation of the FACP alarm silence switch. Subsequent alarm conditions shall re-sound the alarm horns.
b. Flash all alarm strobe lights throughout the building. The alarm strobe lights shall be turned off when the system is reset.
c. Display a general alarm indication and system status summary (numbers of alarm, supervisory and/or trouble conditions) on the FACP liquid crystal display (LCD). Pressing the alarm acknowledge key shall display, for thirty (30) seconds, the individual device or circuit display, to include the "alarm" status and custom label (up to forty characters and spaces) for the addressable device or circuit of alarm initiation on the liquid crystal display (LCD). At the end of the thirty (30) second period, the general alarm indication and system status summary shall again be displayed. The individual device/circuit display may be recalled at any time by repressing the alarm acknowledge key or until the alarm condition is reset to normal.
d. Enter the alarm condition custom label with time and date of occurrence into the FACP historical alarm log for future recall.
e. Shutdown all fans over 1000 CFM.
f. Release Magnetic Door Hold Opens.
g. Recall elevator as per existing system programming.

h. Activate circuit and initiate alarm to central station. The Central station monitoring shall be furnished by owner.

2. Operation of any carbon monoxide detector the building shall automatically:
   a. Sound the integral sounder base on the carbon monoxide detector in alarm only, with an individual Temporal ‘4’ Code. The alarm signals shall only be silenced when carbon monoxide detector is no longer in alarm.
   b. Display/sound an alarm indication and system status summary (numbers of alarm, supervisory and/or trouble conditions) on the FACP liquid crystal display (LCD) stating “Carbon Monoxide Alarm”. Pressing the alarm acknowledge key shall display, for thirty (30) seconds, the individual device or circuit display, to include the "alarm" status and custom label (up to forty characters and spaces) for the addressable device or circuit of alarm initiation on the liquid crystal display (LCD). At the end of the thirty (30) second period, the general alarm indication and system status summary shall again be displayed. The individual device/circuit display may be recalled at any time by repressing the alarm acknowledge key or until the alarm condition is reset to normal.
   c. Enter the alarm condition custom label with time and date of occurrence into the FACP historical alarm log for future recall.
   d. Shutdown all fans over 1000 CFM.
   e. Release Magnetic Door Hold Opens.
   f. Recall elevator as per existing system programming.
   g. Activate circuit and initiate alarm to central station stating “Carbon Monoxide Alarm”. The Central station monitoring shall be furnished by owner.

2.05 MAIN FIRE ALARM CONTROL PANEL (EXISTING TO REMAIN)

A. GE EST (existing)

2.06 SMOKE DETECTION

A. Shall be compatible with existing fire alarm control panel as stated in the installation manuals and comply with UL 268, "Smoke Detectors for Fire Protective Signaling Systems," Include the following features:
   1. Operating Voltage: 24 VDC, nominal,
   2. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore normal operation,
   3. Plug-In Arrangement: Sensor and associated electronic components are mounted in a module that connects to a fixed base with a twist-Locking plug connection. Base shall provide break-off plastic tab that can be removed to engage the head/base locking mechanism. No special tools shall be required to remove head once it has been locked. Removal of the detector head shall interrupt the supervisory circuit of the fire alarm detection loop and cause a trouble signal at the control unit,
   4. Each sensor base shall contain) LED that will flash each time it is scanned by the Control Unit (once every 4 seconds). In alarm condition, the [detector head][sensor base] LED shall be on steady.
   5. Each sensor base shall contain a magnetically actuated test switch to provide for easy alarm testing at the sensor location,
   6. Each sensor shall be scanned by the Control Unit for its type identification to prevent inadvertent substitution of another sensor type, Upon detection of a "wrong device", the control unit shall operate with the installed device at the default alarm settings for that sensor; 2.5% obscuration for photoelectric sensor, 135-deg F and 15-deg F rate-of-rise for the heat sensor, but shall indicate a "Wrong Device" trouble condition.

7. The sensor's electronics shall be immune from false alarms caused by EMI and RFI.
8. Addressability. Sensors include a communication transmitter and receiver in the mounting base having a unique identification and capability for status reporting to the FACP. Sensor address shall be located in base to eliminate false addressing when replacing sensors.
9. Removal of the sensor head for cleaning shall not require the setting of addresses.

B. Type: Smoke sensors shall be of the photoelectric type where acceptable per manufacturer specifications ionization type sensors may be used.

C. Duct Smoke Detector: Photoelectric type, with sampline tube of design and dimensions as recommended by the manufacturer for the specific duct size and installation conditions where applied.
1. The Duct Housing shall provide a supervised relay driver circuit fo driving up to 15 relays with a single "Form C., contact rated at 7 A@28VDC or 10A@120VAC.
2. Duct Housing shall provide a relay control trouble indicator Yellow LED.
3. Compact Duct Housing shall have a transparent cover to monitor for the presence of smoke. Cover shall secure to housing by means of four (4) captive fastening screws.
4. Duct Housing shall provide two (2) Test Ports for measuring airflow and for testing. These ports will allow aerosol injection in order to test the activation of the duct smoke detector.
5. For maintenance purposes, it shall be possible to clean the duct housing samplng tubes by accessing them through the duct housing front cover.
6. Each duct detector shall have a Remote Test Station with an alarm LED and test switch. Duct Smoke Sensor shall be compatible with existing fire alarm control panel and shall be Photoelectric type with sampling tube of deisgn and dimensions as recommended by manufacturer for the specific duct size and installation conditions were applied.
7. Duct Housing shall provide a relay control trouble ndictor Yellow LED.
    a. Compact Duct Housing shall have a transparent cover to monitor for the presence of smoke. Cover shall seccure to housing by means of four (4) captive fastening screws.
    b. Duct Housing shall provide two (2) test ports for measuring airflow and for testing. These ports will allow aerosol injection in order to test the activation of the duct smoke sensor.
    c. Duct Housing shall provide a magnetic test area and Red sensor status LED.
    d. For maintenance purposes, it shall be possible to clean the duct housing sampling tubes by accessing them through the duct housing fron cover.
    e. Each duct sensor shall have a Remote Test Station with an alarm LED and test switch.
8. All exterior duct dectors shall be provided with compatible Weatherproof Duct Housing Enclosure.

2.07 CONTROL MODULES FOR FAN SHUTDOWN

A. Shall be compatible with existing fire alarm control panel as stated in the installation manuals. Include the following features:
1. Shutdown associated fan with an addressable module upon general fire alarm activation.

PART 3 - EXECUTION

3.01 INSTALLATION

A. No installation shall begin without approved plans from the fire marshal or AHJ.

B. The entire system shall be installed in a workmanlike manner, in accordance with approved manufacturer's wiring diagrams. The Contractor shall furnish all conduit, wiring, outlet boxes, junction boxes, cabinets and similar devices necessary for the complete installation.

C. All penetrations of floor slabs and fire walls shall be fire stopped in accordance with all local fire codes.

D. End of Line Devices (Resistors/Diodes/Capacitors): Shall be furnished as required for mounting as directed by the manufacturer.

E. All wiring shall be color coded throughout, to National Electrical Code standards and a minimum of No. 18 AWG., unless otherwise noted. All wiring shall be of the type recommended by the manufacturer.

F. All wires shall test free from grounds or crosses between conductors.

G. Fire alarm system terminal and junction locations shall be identified in accordance with NFPA Standard 70, Section 760-3. Terminal and junction boxes shall be painted red and stenciled in white letters "FIRE ALARM", preventing unintentional interference with the fire alarm system wiring during testing, servicing and additional modifications to the system.

H. All final connections between system equipment and the wiring shall be made under the supervision of a trained manufacturer's technical representative.

I. The contractor shall submit to the Authority Having Jurisdiction (AHJ), all necessary drawings and equipment specifications required for a complete AHJ approved system. Drawings shall be prepared by the Contractor.

J. The Contractor shall have a licensed New York State Professional Engineer Stamp all drawings and applications. Pay for all fees to obtain all necessary permits.

K. All junction boxes housing relays must be labeled with P-Touch type labeler with relay point number and device it serves, i.e. (0001-Flow Switch 1).

L. Contractor to review points list prior to programming with Owner. Contractor only to program approved points list. Any changes to program not previously approved by Owner will be done at Contractor’s expense.

3.02 CLEAN UP

A. Upon completion of the installation, all debris created by the installation shall be removed from the premises or disposed of as directed by the Owner.

B. It shall be the responsibility of the installing contractor to assure that construction debris does not adversely affect any sensing devices installed as part of this project. Should it be deemed necessary by the engineer, owner or AHJ, the installing contractor shall be responsible for the clearing of all devices prior to final acceptance.

3.03 TESTS

A. Prior to the final acceptance test, the Contractor and a trained manufacturer's technical representative shall test the completed system for proper operation. The system shall be

demonstrated to perform all of the functions as below listed in 3.04 C. Any system, equipment or wiring failures discovered during said test shall be repaired or replaced before requesting scheduling of the final acceptance test.

B. The system shall be tested for final acceptance in the presence of the Owner's representative, Architect's representative, Engineer's representative, the local Code enforcement official, Contractor's representative and the Manufacturer's representative.

C. During the final acceptance test:
   1. Every smoke detector, heat detector and carbon monoxide detector shall be tested.
   2. Every audible alarm signaling device shall be sounded.
   3. Every visual alarm signaling device shall be lit or flashed.
   4. Confirm central station alarm monitoring receives signal.

D. Upon successful completion of all final acceptance tests, the Contractor's and Manufacturer's representatives shall each author and sign a letter confirming the successful completion of testing. Two (2) copies of each letter shall be forwarded to the Owner's representative, the Architect's representative, the Engineer's representative and the local Code enforcement official.

E. All final acceptance testing shall be done at a time convenient to the local Code enforcement official and the Owner's representatives and all testing costs shall be born by the Contractor as part of this Contract.

3.04 DOCUMENTATION AND TRAINING

A. The Contractor shall provide the services of a trained manufacturer's employee for a period of two (2) hours, during normal business hours, to instruct the Owner's designated personnel on the operation and maintenance of the entire system.

3.05 MAINTENANCE AND TESTING AGREEMENT

A. The equipment manufacturer shall provide to the Owner a price quotation for a one (1) year fire alarm system maintenance and testing agreement to begin upon final acceptance of the system. System Supplier shall have a local service organization with a minimum of 20 factory trained technicians. Technicians shall be NICET Level 2 certified.

3.06 SERVICE AND MAINTENANCE

A. The equipment manufacturer shall make available a fully equipped service organization, capable of guaranteeing an on-site service response time within eight (8) hours to a service request call. Said service shall be available twenty-four (24) hours per day and seven (7) days per week.

B. The equipment manufacturer shall make available, to the Owner, a price quotation for a one (1) year maintenance and testing agreement, to take effect on the date of final acceptance

3.07 GUARANTEE

A. The Contractor shall guarantee all wiring and equipment to be free from inherent mechanical and electrical defects for one (1) year. Manufacturer shall make available to the Owner a local service department, which shall stock standard parts on the premises. Maintenance is to be provided during normal working hours, at no cost to the owner, for a period of twelve (12)

months from the date of acceptance of the installation, unless damage is caused by misuse, abuse or accident.

END OF SECTION

APPENDIX

FINAL REPORT FOR ENVIRONMENTAL INSPECTION SERVICES –
MAMARONECK ELEMENTARY SCHOOL (DATED 01/20/21)

FINAL REPORT OF ENVIRONMENTAL SERVICES

Performed at:

MAMARONECK AVEUE ELEMENTARY SCHOOL
INTERCOM AND PUBLIC ADDRESS SYSTEM REPLACEMENT
7 NOSBAND AVENUE
WHITE PLAINS, NY 10605

Prepared for:

White Plains Public Schools
5 Homeside Lane
White Plains, NY 10605

Prepared by:

WSP USA Solutions, Inc.
500 Summit Lake Drive, Suite 450
Valhalla, NY 10595
Tel. (914) 747-1120

Project No. 31402956.001
Final Submission Date: January 20, 2021

January 20, 2021

Mr. Frank Stefanelli
Director of Facilities
White Plains School District
508 North Street
White Plains, NY 10605

Subject: **Final Report of Environmental Services**
Mamaroneck Avenue Elementary School
Intercom and Public Address System Replacement
7 Nosband Avenue
White Plains, NY 10605

Dear Mr. Stefanelli:

WSP USA Solutions, Inc. has completed a material inspection at the Mamaroneck Avenue Elementary School located at 7 Nosband Avenue, White Plains, NY 10605. The inspection included visual observation, material sampling, and laboratory sample analysis of suspect Asbestos-Containing Materials (ACM), Lead Based Paints (LBP) and Polychlorinated Biphenyls (PCBs) as part of the Intercom and Public Address System Replacement project at the Mamaroneck Avenue Elementary School.

The attached report presents descriptions and results of the material sampling procedures and visual analysis. Relevant general project information is provided, followed by our findings, assessments and recommendations. Laboratory analysis data and certifications are provided in the Appendices.

If you have any questions concerning this report or if we may be of further assistance to you, please contact us.

Sincerely,

WSP USA SOLUTIONS, INC.

Craig Napolitano, CHMM
Vice President, Emergency Management & IH Services

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1.0 EXECUTIVE SUMMARY

WSP USA Solutions, Inc. has performed a material inspection for the presence or absence of Asbestos-Containing Materials (ACM), Lead Based Paints (LBP) and Polychlorinated Biphenyls (PCBs) at the Mamaroneck Avenue Elementary School located at 7 Nosband Avenue, White Plains, NY 10605. The intent of this inspection was to screen for ACM, LBP and PCBs that may be impacted during the Intercom and Public Address System Replacement project at the Mamaroneck Avenue Elementary School.

Nick Casale and Michael Gelfand of WSP performed this inspection on January 03, 2021 Mr. Casale is licensed as a New York State Department of Labor (NYSDOL) Asbestos Inspector (Cert# 17-25789) and a licensed New York State EPA as a Lead Inspector (Cert# LBP-I-I207478-1). Mr. Gelfand is licensed as a New York State Department of Labor (NYSDOL) Asbestos Inspector (Cert# 98-17113) and a licensed New York State EPA as a Lead Risk Assessor (Cert# LBP-R-11499-1)

The results of the visual inspection and bulk sample analysis determined that the following suspect ACM, LBP and PCB materials may be impacted by the proposed Intercom and Public Address System Replacement project at the Mamaroneck Avenue Elementary School:

A. ASBESTOS-CONTAINING MATERIAL

Analytical results of the bulk samples collected on 01/13/2021 by WSP indicate that the following materials **contain asbestos** (greater than 1-percent).

- **None**

The following materials **Contain Asbestos as per AHERA Report:**

- **9”x9” Floor Tile/Mastic (Not Affected by Current SOW)**

Analytical results of the bulk samples collected on 01/13/2021 by WSP indicate that the following materials **did not contain asbestos** (less than 1-percent);

- Joint Compound (White)
- Gypsum Wall Board (White)
- Brick Mortar (Grey)

The following materials **did not contain asbestos as per AHERA Report:**

- 2’x4’ Fissured Ceiling Tile, White
- 2’x4’ Gouged Ceiling Tile, White
- 2’x2’ Smooth Ceiling Tile, White
- 2’x4’ Large Gouged Ceiling Tile, White
- Wall Plaster, White Coat

- Wall Plaster, Brown Coat
- 1’ x 1’ Ceiling Tile
- Glue Dabs to 1’ x 1’ Ceiling Tile
- Gypsum Above 1’ x 1’ Ceiling Tile
- 12” x 12” Floor Tile – White
- 12” x 12” Floor Tile – Green
- 12” x 12” Floor Tile – Brown Speckle
- 12” x 12” Floor Tile – Beige Speckle
- Mastic to 12” x 12” Floor Tile
- Backing on Ceramic Wall Tile
- Floor Coating
- Grout – Ceramic Wall Tile
- Glue – Ceramic Wall Tile
- Mortar – Ceramic Floor Tile
- Gypsum Board (Auditorium Ceiling)
- Ceiling Plaster, White Coat (Auditorium)
- Ceiling Plaster, White Coat (Auditorium)

B. LEAD-BASED PAINT

Based upon XRF readings, lead has been confirmed to exist in the following tested combinations:

- **Dark Blue Paint on Plaster Lower Wall (Ground Floor, Hall)**
- **Light Blue Paint on Metal Picture Rail (Ground Floor, Hall)**
- **Yellow Paint on Plaster Upper Wall (Room 114)**
- **Yellow Paint on Plaster Lower Wall (Room 114)**
- **Peach Paint on Plaster Upper Wall (1st Floor, Hallway)**
- **Lime Green Paint on Plaster Upper Wall (Room 106)**
- **Beige Paint on Plaster Upper Wall (Room 104)**
- **Beige Paint on Cork Corkboard (Room 104)**
- **Lime Green Paint on Plaster Upper Wall (Room 217)**
- **Lime Green Paint on Plaster Lower Wall (Room 217)**
- **Purple Paint on Cork Corkboard (Room 217)**
- **Dark Blue Paint on Plaster Lower Wall (2nd Floor, Hallway)**

Lead was **not detected** in the following tested combinations via XRF readings:

- Light Blue Paint on Plaster Upper Wall (Ground Floor, Hall)
- Beige Paint on Sheetrock Wall (Room 19)
- Beige Paint on Metal Electrical Panel (Room 19)
- Beige Paint on Concrete Upper Wall (Room 16)
- Beige Paint on Brick Upper Wall (Room 16)
- Beige Paint on Sheetrock Upper Wall (Cafeteria)

- Blue Paint on Sheetrock Lower Wall (Cafeteria)
- Silver Paint on Metal Speaker (Cafeteria)
- Beige Paint on Plaster Lower Wall (Cafeteria)
- Blue Paint on Plaster Upper Wall (Cafeteria)
- Blue Paint on Metal Electrical Box (Room 114)
- Yellow Paint on Metal Electrical Conduit (Room 114)
- Blue Paint on Plaster Lower Wall (1st Floor, Hallway)
- Lime Green Paint on Plaster Lower Wall (Room 106)
- Lime Green Paint on Cork Corkboard (Room 106)
- Lime Green Paint on Wood Corkboard Border (Room 106)
- Lime Green Paint on Cinderblock Upper Wall (Room 106)
- Beige Paint on Plaster Lower Wall (Room 104)
- Beige Paint on Wood Corkboard Border (Room 104)
- Beige Paint on Brick Wall (Gym)
- Beige Paint on Plaster Wall (Auditorium)
- Beige Paint on Sheetrock Ceiling (Auditorium)
- Light Blue Paint on Plaster Upper Wall2nd Floor, Hallway

C. PCB-CONTAINING MATERIAL

Analytical results of the bulk samples collected indicate that the following materials **contain PCB** (greater than 50 PPM):

- **No suspect caulking's/glazing's being affected by Intercom and Public Address System Replacement project**

Analytical results of the bulk samples collected indicate that the following materials **did not contain PCB** (less than 50 PPM):

- No suspect caulking's/glazing's being affected by Intercom and Public Address System Replacement project

2.0 FIELD INSPECTION PROCEDURES AND SAMPLE ANALYSIS METHODS

A. ASBESTOS-CONTAINING MATERIAL

Guidelines used for the inspection were established by the Environmental Protection Agency (EPA) in the Guidance for Controlling Asbestos Containing Materials in Buildings, Office of Pesticides and Toxic Substances, Doc 560/5-85-024, and 40 CFR Part 763, Asbestos Hazard Emergency Response Act (AHERA).

Field information was organized in accordance with the AHERA methodology of homogenous area (HA). During the Inspection, reasonable effort was made to identify all locations and types of ACM materials associated with the scope of work. Sampling has included multiple samples of the same materials chosen at random. However, due to inconsistencies of a manufacturer's processes and the

contractor's installation methods, materials of similar construction may contain various amounts of asbestos. Furthermore, some materials that were not originally specified to contain asbestos may in fact contain this mineral. For example, cementitious pipe insulation and plaster were frequently mixed with asbestos at the construction site for ease of application. Locating all asbestos materials can only be definitively achieved by conducting exploratory demolition and sampling every section of pipe insulation, fitting or valve covering, fireproofing, and other suspect ACM.

Bulk samples of suspect ACM are analyzed using polarized light microscopy (PLM) coupled with dispersion staining, as described in 40 CFR Part 763 and the National Emissions Standard for Hazardous Air Pollutants (NESHAPS). NESHAPS is the standard industry protocol for the determination of asbestos in building materials. A suspect material is immersed in a solution of known refractive index and subjected to illumination by polarized light. The color displays that result are compared to a standardized atlas whereby the specific variety of asbestos is determined. It should also be recognized that PLM is primarily a qualitative identification method whereby asbestos percentage, if any, is estimated. While EPA, New York State, and New York City regulations governing ACM consider materials containing greater then 1-percent as asbestos, accurately quantifying asbestos content below 5-percent has been shown to be unreliable.

The New York State Department of Health has recently revised the PLM Stratified Point Counting Method. The March 25th, 2011 method, "Polarized Light Microscopy Methods for Identifying and Quantifying Asbestos in Bulk Samples" can be found as Item 198.1 in the Environmental Laboratory Approval program (ELAP) Certification manual. Whereas the procedure of analysis for bulk samples that fall into the category of "Non-friable Organically Bound" (NOB) can be found in the March 25th 2011 method "Polarized-Light Microscope Method for Identifying and Quantifying Asbestos in Non-Friable Organically Bound Bulk Samples", Item 198.6 in the ELAP Certification Manual. This category includes any sample in a flexible to rigid asphalt or vinyl matrix (floor tiles, mastic, roofing shingles, roofing felt, etc.). These samples must be "ashed" in a muffle furnace at 480-degrees Celsius (to remove organic matrix), treated with acid (to remove any mineral carbonate), and filtered through a 0.4-micron polycarbonate filter before being analyzed by PLM. The sample must be weighted between each of these steps to track the percent loss of organic matrix.

ELAP has determined that analysis of NOB materials is not reliably performed by PLM. Therefore, if PLM analysis yields results of 1-percent asbestos or less, the result must be confirmed by TEM. For bulk samples that undergo TEM analysis, the March 25th, 2011 method "Transmission Electron Microscope Method for Identifying and Quantitating Asbestos in Non-Friable organically Bound Bulk Samples" must be used and can be found as Item 198.4 in the ELAP Certification Manual. ELAP certified laboratories must include the following statement with their PLM analysis results for each "negative" (1-percent or less asbestos) NOB sample: "Polarized-light microscopy is not consistently reliable in detecting asbestos in floor coverings and similar non-friable organically bound materials. Before this material can be considered or treated as non-ACM, confirmation must be made by quantitative transmission electron microscopy".

All samples are initially analyzed by Polarized Light Microscopy in accordance with Item 198.1 and 198.6 of the ELAP Certification Manual. Samples which yield a negative PLM result and which are classified as a "non-friable" material, are then re-analyzed utilizing TEM methodology in accordance with Item 198.4 of the ELAP Certification Manual. The laboratory performing both these analysis procedures is EMSL located at 307 West 38th Street | New York, NY 10018. The laboratory has received accreditation from the following agencies:

- National Voluntary Laboratory Accreditation Program (Lab Code 101048-10)
- New York State Environmental Laboratory Approval Program (Lab No. 11469)
- American Industrial Hygiene Association Accredited Laboratory (Lab No. 102344)

B. LEAD-BASED PAINT

Painted surfaces within the space equivalents in the scope of work were identified and grouped together by component type, substrate and visible color. In similar fashion, the inspection continued in each space equivalent with the identification of unique combinations of component, substrate and visible color. A random representative area of each unique combination was sampled and tested. For each of these designated components, an area on the component was chosen which represents the paint on that building component. During the inspection, components that are accessible surfaces, friction surfaces, impact surfaces, or have deteriorated paint was identified.

The readings of paint surfaces were taken using Heuresis Pb200i XRF Lead Paint Spectrum Analyzer. The Heuresis method of measurement is based on the spectrometric analysis of lead K-shell X-ray fluorescence within a controlled depth of interrogation. The Heuresis Analyzer uses a Co-57 radioactive source and an advanced, solid-state, room temperature, radiation detector to generate and detect the x-ray fluorescence spectrum of a painted surface. The spectrum is then analyzed by a microprocessor to eliminate the effects of substrate and other factors such as scattering to allow an accurate determination of the amount of lead on a surface. The Heuresis automatically analyzes spectrometric data in real time and differentiates the lead signal from the spectrum. The x-ray fluorescence properties are determined through calibration process and are used for automatic substrate correction and calculation of the lead content of a painted surface.

For quality control, the XRF instrument was calibrated using a U.S. Department of Commerce National Institute of Standards and Technology (NIST) Level III 1.0 mg/cm2 lead based paint film. For each calibration, three (3) XRF readings were taken on the paint film. The average of these three (3) readings was then subtracted from the known lead content in the paint film. The difference was compared with an Environmental Protection Agency (EPA)-approved tolerance range. Such calibration procedures were conducted at the start and at the end of the workday.

C. POLYCHLORINATED BIPHENYLS (PCBs)

PCBs belong to a broad family of man-made organic chemicals known as chlorinated hydrocarbons. PCBs were domestically manufactured from 1929 until their manufacture was banned in 1979. They have a range of toxicity and vary in consistency from thin, light-colored

liquids to yellow or black waxy solids. Due to their non-flammability, chemical stability, high boiling point, and electrical insulating properties, PCBs were used in hundreds of industrial and commercial applications including electrical, heat transfer, and hydraulic equipment; as plasticizers in paints, plastics, and rubber products; in pigments, dyes, and carbonless copy paper; and many other industrial applications.

Although no longer commercially produced in the United States, PCBs may be present in products and materials produced before the 1979 PCB ban. Products that may contain PCBs include: Transformers and capacitors, Oil used in motors and hydraulic systems, Fluorescent light ballasts, Adhesives and tapes, Caulking, Plastics, etc.

The PCBs used in these products were chemical mixtures made up of a variety of individual chlorinated biphenyl components, known as congeners. Most commercial PCB mixtures are known in the United States by their industrial trade names. The most common trade name is aroclor.

Polychlorinated biphenyls (PCBs) are regulated pursuant to the United States Environmental Protection Agency Code of Federal Regulations (40 CFR Part 761) and the Toxic Substances Control Act (TSCA – 15 U.S.C. 2605). These regulations require certain testing and reporting requirements to determine management, recycling and disposal options for PCBs.

3.0 INSPECTION SCOPE AND MATERIAL ASSESSMENT

The areas inspected for ACM materials that may be impacted by the proposed Intercom and Public Address System Replacement project at the Mamaroneck Avenue Elementary School. Locations surveyed include:

- Throughout Building

A. ASBESTOS-CONTAINING MATERIAL

Analytical results of the bulk samples collected on 01/13/2021 by WSP indicate that the following materials **contain asbestos** (greater than 1-percent).

- **None**

The following materials **Contain Asbestos as per AHERA Report:**

- **9”x9” Floor Tile/Mastic (Not Affected by Current SOW)**

Analytical results of the bulk samples collected on 01/13/2021 by WSP indicate that the following materials **did not contain asbestos** (less than 1-percent);

- Joint Compound (White)
- Gypsum Wall Board (White)
- Brick Mortar (Grey)

The following materials **did not contain asbestos as per AHERA Report:**

- 2'x4' Fissured Ceiling Tile, White
- 2'x4' Gouged Ceiling Tile, White
- 2'x2' Smooth Ceiling Tile, White
- 2'x4' Large Gouged Ceiling Tile, White
- Wall Plaster, White Coat
- Wall Plaster, Brown Coat
- 1' x 1' Ceiling Tile
- Glue Dabs to 1' x 1' Ceiling Tile
- Gypsum Above 1' x 1' Ceiling Tile
- 12" x 12" Floor Tile – White
- 12" x 12" Floor Tile – Green
- 12" x 12" Floor Tile – Brown Speckle
- 12" x 12" Floor Tile – Beige Speckle
- Mastic to 12" x 12" Floor Tile
- Backing on Ceramic Wall Tile
- Floor Coating
- Grout – Ceramic Wall Tile
- Glue – Ceramic Wall Tile
- Mortar – Ceramic Floor Tile
- Gypsum Board (Auditorium Ceiling)
- Ceiling Plaster, White Coat (Auditorium)
- Ceiling Plaster, White Coat (Auditorium)

B. LEAD-BASED PAINT

Based upon XRF readings, lead has been confirmed to exist in the following tested combinations:

- **Dark Blue Paint on Plaster Lower Wall (Ground Floor, Hall)**
- **Light Blue Paint on Metal Picture Rail (Ground Floor, Hall)**
- **Yellow Paint on Plaster Upper Wall (Room 114)**
- **Yellow Paint on Plaster Lower Wall (Room 114)**
- **Peach Paint on Plaster Upper Wall (1st Floor, Hallway)**
- **Lime Green Paint on Plaster Upper Wall (Room 106)**
- **Beige Paint on Plaster Upper Wall (Room 104)**
- **Beige Paint on Cork Corkboard (Room 104)**
- **Lime Green Paint on Plaster Upper Wall (Room 217)**
- **Lime Green Paint on Plaster Lower Wall (Room 217)**
- **Purple Paint on Cork Corkboard (Room 217)**
- **Dark Blue Paint on Plaster Lower Wall (2nd Floor, Hallway)**

Lead was **not detected** in the following tested combinations via XRF readings:

- Light Blue Paint on Plaster Upper Wall (Ground Floor, Hall)
- Beige Paint on Sheetrock Wall (Room 19)
- Beige Paint on Metal Electrical Panel (Room 19)
- Beige Paint on Concrete Upper Wall (Room 16)
- Beige Paint on Brick Upper Wall (Room 16)
- Beige Paint on Sheetrock Upper Wall (Cafeteria)
- Blue Paint on Sheetrock Lower Wall (Cafeteria)
- Silver Paint on Metal Speaker (Cafeteria)
- Beige Paint on Plaster Lower Wall (Cafeteria)
- Blue Paint on Plaster Upper Wall (Cafeteria)
- Blue Paint on Metal Electrical Box (Room 114)
- Yellow Paint on Metal Electrical Conduit (Room 114)
- Blue Paint on Plaster Lower Wall (1st Floor, Hallway)
- Lime Green Paint on Plaster Lower Wall (Room 106)
- Lime Green Paint on Cork Corkboard (Room 106)
- Lime Green Paint on Wood Corkboard Border (Room 106)
- Lime Green Paint on Cinderblock Upper Wall (Room 106)
- Beige Paint on Plaster Lower Wall (Room 104)
- Beige Paint on Wood Corkboard Border (Room 104)
- Beige Paint on Brick Wall (Gym)
- Beige Paint on Plaster Wall (Auditorium)
- Beige Paint on Sheetrock Ceiling (Auditorium)
- Light Blue Paint on Plaster Upper Wall2nd Floor, Hallway

C. PCB-CONTAINING MATERIAL

Analytical results of the bulk samples collected indicate that the following materials **contain PCB** (greater than 50 PPM):

- **No suspect caulking's/glazing's being affected by Intercom and Public Address System Replacement project**

Analytical results of the bulk samples collected indicate that the following materials **did not contain PCB** (less than 50 PPM):

- No suspect caulking's/glazing's being affected by Intercom and Public Address System Replacement project

4.0 INSPECTION RESULTS

A. ASBESTOS-CONTAINING MATERIAL

The asbestos inspection involved a thorough visual examination of all areas that may be impacted by the proposed Intercom and Public Address System Replacement project at the Mamaroneck Avenue Elementary School. The following suspect materials were sampled and analyzed for asbestos content by WSP:

4.1 Table 4.1 – Suspect Materials Inspected

HOMOGENOUS MATERIAL	LOCATION	MATERIAL	ASBESTOS CONTENT
WSP Sampled on 01/13/2021			
A	Throughout	Joint Compound (White)	NAD
B	Throughout	Gypsum Wall Board (White)	NAD
C	Exterior	Brick Mortar (Grey)	NAD
AHERA Report			
-	Throughout	2'x4' Fissured Ceiling Tile, White	NAD
-	Throughout	2'x4' Gouged Ceiling Tile, White	NAD
-	Throughout	2'x2' Smooth Ceiling Tile, White	NAD
-	Throughout	2'x4' Large Gouged Ceiling Tile, White	NAD
-	Throughout	Wall Plaster, White Coat	NAD
-	Throughout	Wall Plaster, Brown Coat	NAD
-	Throughout	1' x 1' Ceiling Tile	NAD
-	Throughout	Glue Dabs to 1' x 1' Ceiling Tile	NAD
-	Throughout	Gypsum Above 1' x 1' Ceiling Tile	NAD
-	Throughout	12" x 12" Floor Tile – White	NAD
-	Throughout	12" x 12" Floor Tile – Green	NAD
-	Throughout	12" x 12" Floor Tile – Brown Speckle	NAD
-	Throughout	12" x 12" Floor Tile – Beige Speckle	NAD
-	Throughout	Mastic to 12" x 12" Floor Tile	NAD
-	Throughout	Backing on Ceramic Wall Tile	NAD
-	Throughout	Floor Coating	NAD
-	Throughout	Grout – Ceramic Wall Tile	NAD
-	Throughout	Glue – Ceramic Wall Tile	NAD
-	Throughout	Mortar – Ceramic Floor Tile	NAD
-	Auditorium Ceiling	Gypsum Board	NAD
-	Auditorium	Ceiling Plaster, White Coat	NAD
-	Auditorium	Ceiling Plaster, White Coat	NAD
-	**Throughout**	**9"x9" Floor Tile/Mastic (Not Affected by Current SOW)**	**ACM**

Bold = Positive for ACM NAD = No Asbestos Detected NA/PS = Not analyzed/ positive sample

4.2 CONDITION AND FRIABLITY ASSESSMENT TABLE

For each inspection conducted, the inspector classifies ACM or Assumed ACM materials by friability and condition. This helps to determine the extent of damage in certain areas as well as the potential for further damage and Asbestos release due to disturbance of the material.

Table 4.2 – Condition and Friability Assessment

Location	Material	Quantity	Friability	Condition
No asbestos containing materials found during WSP inspection on 1/13/2021 which may be disturbed by the Intercom and Public Address System Replacement project.				

Condition Definitions:
Good: None/Minimal apparent damage to ACM
Fair: Up to 10% localized damage or up to 25% of the entire ACM is damaged
Poor: Over 10% localized damage or over 25% of the entire ACM is damaged

4.3 SAMPLE ANALYSIS TABLE

Laboratory analysis results, in tabular form, are included in Appendix A.

B. LEAD-BASED PAINT

The lead Inspection involved a thorough visual examination of all accessible areas impacted by the proposed Intercom and Public Address System Replacement project at the Mamaroneck Avenue Elementary School. The following suspect surfaces were tested for lead content:

Test Number	Sample Location	Building Component	Color	Substrate	Condition	Lead Content (mg/cm2)
1	Calibration Check @ 1.0	---	---	---	---	1.2
2	Calibration Check @ 1.0	---	---	---	---	1.1
3	Calibration Check @ 1.0	---	---	---	---	1.1
4	Calibration Check @ 0.0	---	---	---	---	0.1
5	Calibration Check @ 0.0	---	---	---	---	0.0
6	Calibration Check @ 0.0	---	---	---	---	0.1
7	**Ground Floor, Hall**	**Lower Wall**	**Dark Blue**	**Plaster**	**Intact**	**1.2**
8	Ground Floor, Hall	Upper Wall	Light Blue	Plaster	Intact	0.5
9	**Ground Floor, Hall**	**Picture Rail**	**Light Blue**	**Metal**	**Intact**	**1.0**
10	Room 19	Wall	Beige	Sheetrock	Intact	0.3

Test Number	Sample Location	Building Component	Color	Substrate	Condition	Lead Content (mg/cm2)
11	Room 19	Electrical Panel	Beige	Metal	Intact	0.0
12	Room 16	Upper Wall	Beige	Concrete	Intact	0.1
13	Room 16	Upper Wall	Beige	Brick	Intact	0.1
14	Cafeteria	Upper Wall	Beige	Sheetrock	Intact	0.1
15	Cafeteria	Lower Wall	Blue	Sheetrock	Intact	0.2
16	Cafeteria	Speaker	Silver	Metal	Intact	0.0
17	Cafeteria	Lower Wall	Beige	Plaster	Intact	0.1
18	Cafeteria	Upper Wall	Blue	Plaster	Intact	-0.3
19	**Room 114**	**Upper Wall**	**Yellow**	**Plaster**	**Intact**	**10.8**
20	**Room 114**	**Lower Wall**	**Yellow**	**Plaster**	**Intact**	**9.1**
21	Room 114	Electrical Box	Blue	Metal	Intact	0.0
22	Room 114	Electrical Conduit	Yellow	Metal	Intact	0.3
23	**1st Floor, Hallway**	**Upper Wall**	**Peach**	**Plaster**	**Intact**	**1.5**
24	1st Floor, Hallway	Lower Wall	Blue	Plaster	Intact	0.9
25	**Room 106**	**Upper Wall**	**Lime Green**	**Plaster**	**Intact**	**4.5**
26	Room 106	Lower Wall	Lime Green	Plaster	Intact	0.8
27	Room 106	Corkboard	Lime Green	Cork	Intact	0.1
28	Room 106	Corkboard Border	Lime Green	Wood	Intact	0.6
29	Room 106	Upper Wall	Lime Green	Cinderblock	Intact	0.3
30	**Room 104**	**Upper Wall**	**Beige**	**Plaster**	**Intact**	**4.7**
31	Room 104	Lower Wall	Beige	Plaster	Intact	0.9
32	**Room 104**	**Corkboard**	**Beige**	**Cork**	**Intact**	**1.1**
33	Room 104	Corkboard Border	Beige	Wood	Intact	0.6
34	Gym	Wall	Beige	Brick	Intact	0.4
35	Auditorium	Wall	Beige	Plaster	Intact	-0.1
36	Auditorium	Ceiling	Beige	Sheetrock	Intact	0.1
37	**Room 217**	**Upper Wall**	**Lime Green**	**Plaster**	**Intact**	**8.7**
38	**Room 217**	**Lower Wall**	**Lime Green**	**Plaster**	**Intact**	**3.1**
39	**Room 217**	**Corkboard**	**Purple**	**Cork**	**Intact**	**10.7**
40	**2nd Floor, Hallway**	**Lower Wall**	**Dark Blue**	**Plaster**	**Intact**	**1.0**
41	2nd Floor, Hallway	Upper Wall	Light Blue	Plaster	Intact	0.7
42	Calibration Check @ 1.0	---	---	---	---	1.1
43	Calibration Check @ 1.0	---	---	---	---	1.1
44	Calibration Check @ 1.0	---	---	---	---	1.0

Test Number	Sample Location	Building Component	Color	Substrate	Condition	Lead Content (mg/cm2)
45	Calibration Check @ 0.0	---	---	---	---	0.1
46	Calibration Check @ 0.0	---	---	---	---	0.0
47	Calibration Check @ 0.0					0.0

C. PCB-CONTAINING MATERIAL

The PCB Inspection involved a thorough visual examination of all areas that may be impacted by the proposed Intercom and Public Address System Replacement project at the Mamaroneck Avenue Elementary School. The following suspect materials were tested for PCB content:

HOMOGENOUS MATERIAL	LOCATION	MATERIAL	PCB CONTENT (PPM)
No suspect caulking's/glazing's being affected by Intercom and Public Address System Replacement project			

Bold = Positive for PCB ND = No PCB Detected

5.0 AREAS NOT ACCESSIBLE

During the inspection the following areas were not accessible:

Spaces within Walls/Floors/Ceilings: No destructive sampling was performed on concealed spaces in walls to access plenum, chases etc. It should be assumed that asbestos containing materials may exist in these spaces. Any suspect materials encountered during work should be sampled for analysis before work continues.

Building Envelope: No destructive sampling was performed on the building envelope. It should be assumed that asbestos, lead and PCB containing materials may exist in these spaces. Any suspect materials encountered during work should be sampled for analysis before work continues.

6.0 CONCLUSIONS AND RECOMMENDATIONS

No ACM & PCB have been identified in this inspection that may be impacted as part of the proposed Intercom and Public Address System Replacement project at the Mamaroneck Avenue Elementary School.

LBP was identified in this inspection that may be impacted as part of the proposed Intercom and Public Address System Replacement project at the Mamaroneck Avenue Elementary School.

The ACM, LBP & PCB inspection was conducted at the request of White Plains School District for the proposed Intercom and Public Address System Replacement project at the Mamaroneck Avenue Elementary School. Any change in the scope of work will require further investigation to accurately classify any additional ACM, LBP or PCBs resulting from the modified or updated scope of work.

7.0 ASBESTOS ABATEMENT COST ESTIMATE

A cost estimate was not generated since no ACM will be disturbed during the Intercom and Public Address System Replacement project at the Mamaroneck Avenue Elementary School. Any alteration to the scope of work will require further investigation to accurately classify any additional ACM resulting from the modified or updated scope of work.

8.0 REPORT CERTIFICATIONS

This report, and the supporting data, findings, conclusions, opinions, and recommendations it contains represent the result of WSP's efforts for the environmental inspection work for the Mamaroneck Avenue Elementary School, Intercom and Public Address System Replacement project.

Opinions and recommendations presented in this report apply to site conditions and features as they existed at the time of WSP's site visits, and those reasonably foreseeable. They cannot necessarily apply to conditions and features of which WSP is unaware and has not had the opportunity to evaluate.

The conclusions presented in this report are professional opinions solely upon WSP's visual observations of accessible areas, laboratory test data, and current regulatory requirements. These conclusions are intended exclusively for the purpose stated herein and the site indicated for the project indicated.

Prepared by:

Josue Garcia
NYS DOL Inspector

Reviewed by:

Craig Napolitano, CHMM
Vice President, Emergency Management & IH Services

APPENDIX A:
ASBESTOS SAMPLE ANALYSIS RESULTS IN TABULAR FORM

APPENDIX A
SAMPLE ANALYSIS RESULTS IN TABULAR FORM
MAMARONECK AVENUE ELEMENTARY SCHOOL
INTERCOM AND PUBLIC ADDRESS SYSTEM REPLACEMENT
7 NOSBAND AVENUE
WHITE PLAINS, NY 10605

Homogeneous Area No.	Sample No.	Location	Material	PLM Result	TEM Result
WSP Sampled on 01/13/2021					
A	01	Copy Center in Basement	Joint Compound (White)	NAD	N/A
	02	Special ED Room 118		NAD	N/A
B	03	Copy Center in Basement	Gypsum Wall Board (White)	NAD	N/A
	04	Special ED Room 118		NAD	N/A
C	05	Exterior Main Entrance	Brick Mortar (Grey)	NAD	N/A
	06	Exterior by Room 106		NAD	N/A

Bold = Positive for ACM
NAD = No Asbestos Detected
N/A = Not Applicable
NA/PS = Not analyzed/ positive sample

APPENDIX B:
ASBESTOS BULK SAMPLE FIELD DATA SHEETS WITH CHAIN OF CUSODY & LABORATORY RESULTS

EMSL Analytical, Inc.

307 West 38th Street New York, NY 10018
Tel/Fax: (212) 290-0051 / (212) 290-0058
http://www.EMSL.com / manhattanlab@emsl.com

EMSL Order: 032100561
Customer ID: LBAP78
Customer PO: 31402956.001.02
Project ID:

Attention: Alex Smolyar
WSP USA Solutions Inc
96 Morton Street
8th floor
New York, NY 10014

Phone: (212) 612-7900
Fax:
Received Date: 01/14/2021 1:59 PM
Analysis Date: 01/14/2021
Collected Date: 01/13/2021

Project: 31402956.001.02/ WHITE PLAINS SCHOOL DISTRICT / MAMARONECK AVE ELEMENTARY SCHOOL / BUILDING THROUGHOUT / PA SYSTEM

Test Report:Asbestos Analysis of Bulk Material

Test	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos
Sample ID 01		**Description**	COPY CENTER IN BSMT - JOINT COMPOUND (WHITE)		
032100561-0001		**Homogeneity**	Homogeneous		
PLM NYS 198.1 Friable	01/14/2021	White		35.00% Ca Carbonate 5.00% Mica 35.00% Non-fibrous (other) 15.00% Perlite 10.00% Quartz	**None Detected**
PLM NYS 198.6 VCM					**Not Analyzed**
PLM NYS 198.6 NOB					**Not Analyzed**
TEM NYS 198.4 NOB					**Not Analyzed**
Sample ID 02		**Description**	SPECIAL ED ROOM 118 - JOINT COMPOUND (WHITE)		
032100561-0002		**Homogeneity**	Homogeneous		
PLM NYS 198.1 Friable	01/14/2021	White		40.00% Ca Carbonate 10.00% Mica 40.00% Non-fibrous (other) 10.00% Perlite	**None Detected**
PLM NYS 198.6 VCM					**Not Analyzed**
PLM NYS 198.6 NOB					**Not Analyzed**
TEM NYS 198.4 NOB					**Not Analyzed**
Sample ID 03		**Description**	COPY CENTER IN BSMT - GYPSUM WALL BOARD (WHITE)		
032100561-0003		**Homogeneity**	Homogeneous		
PLM NYS 198.1 Friable	01/14/2021	Brown/ Gray	15.00% Cellulose 3.00% Glass	20.00% Ca Carbonate 30.00% Gypsum 25.00% Non-fibrous (other) 7.00% Quartz	**None Detected**
PLM NYS 198.6 VCM					**Not Analyzed**
PLM NYS 198.6 NOB					**Not Analyzed**
TEM NYS 198.4 NOB					**Not Analyzed**
Sample ID 04		**Description**	SPECIAL ED ROOM 118 - GYPSUM WALL BOARD (WHITE)		
032100561-0004		**Homogeneity**	Homogeneous		
PLM NYS 198.1 Friable	01/14/2021	Brown/ Gray	12.00% Cellulose 2.00% Glass	10.00% Ca Carbonate 50.00% Gypsum 21.00% Non-fibrous (other) 5.00% Quartz	**None Detected**
PLM NYS 198.6 VCM					**Not Analyzed**
PLM NYS 198.6 NOB					**Not Analyzed**
TEM NYS 198.4 NOB					**Not Analyzed**

Initial report from: 01/14/2021 18:04:23

EMSL Analytical, Inc.

307 West 38th Street New York, NY 10018

Tel/Fax: (212) 290-0051 / (212) 290-0058

http://www.EMSL.com / manhattanlab@emsl.com

EMSL Order:	032100561
Customer ID:	LBAP78
Customer PO:	31402956.001.02
Project ID:	

Test Report:Asbestos Analysis of Bulk Material

Test	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos
Sample ID 05 *032100561-0005*		**Description** EXTERIOR MAIN ENTRANCE - BRICK MORTAR (GREY) **Homogeneity** Homogeneous			
PLM NYS 198.1 Friable	01/14/2021	Gray		35.00% Ca Carbonate 50.00% Non-fibrous (other) 15.00% Quartz	**None Detected**
PLM NYS 198.6 VCM					**Not Analyzed**
PLM NYS 198.6 NOB					**Not Analyzed**
TEM NYS 198.4 NOB					**Not Analyzed**
Sample ID 06 *032100561-0006*		**Description** EXTERIOR BY ROOM 106 - BRICK MORTAR (GREY) **Homogeneity** Homogeneous			
PLM NYS 198.1 Friable	01/14/2021	Gray	2.00% Cellulose	15.00% Ca Carbonate 48.00% Non-fibrous (other) 35.00% Quartz	**None Detected**
PLM NYS 198.6 VCM					**Not Analyzed**
PLM NYS 198.6 NOB					**Not Analyzed**
TEM NYS 198.4 NOB					**Not Analyzed**

Initial report from: 01/14/2021 18:04:23

EMSL Analytical, Inc.
307 West 38th Street New York, NY 10018
Tel/Fax: (212) 290-0051 / (212) 290-0058
http://www.EMSL.com / manhattanlab@emsl.com

EMSL Order:	032100561
Customer ID:	LBAP78
Customer PO:	31402956.001.02
Project ID:	

Test Report:Asbestos Analysis of Bulk Material

The samples in this report were submitted to EMSL for analysis by Asbestos Analysis of Bulk Materials via NYS ELAP Approved Methods. The reference number for these samples is the EMSL Order ID above. Please use this reference number when calling about these samples.

Report Comments:

Sample Receipt Date:	1/14/2021	Sample Receipt Time:	1:59 PM
Analysis Completed Date:	1/14/2021	Analysis Completed Time:	5:05 PM

Analyst(s):

Kerrie Gibson

Kerrie Gibson PLM NYS 198.1 Friable (3)

Kleyvin Vaquero PLM NYS 198.1 Friable (3)

Samples reviewed and approved by:

James Hall, Laboratory Manager
or Other Approved Signatory

NOB = Non Friable Organically Bound N/A = Not Applicable VCM = Vermiculite Containing Material

-In New York State, TEM is currently the only method that can be used to determine if NOB materials can be considered or treated as non-asbestos containing.
All samples examined for the presence of vermiculite when analyzed via NYS 198.1.
-NYS Guidelines for Vermiculite containing samples are available at http://www.wadsworth.org/labcert/elapcert/forms/VermiculiteInterimGuidance_Rev070913.pdf EMSL maintains liability limited to cost of analysis. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. Samples were received in good condition unless otherwise noted.
This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government. This report may contain data that is not covered by the NVLAP accreditation.

Samples analyzed by EMSL Analytical, Inc. New York, NY NYS ELAP 11506, NVLAP Lab Code 101048-9

Initial report from: 01/14/2021 18:04:23

032100561

ASBESTOS SURVEY DATA SHEET/ CHAIN OF CUSTODY

PAGE 1 OF 1

PROJECT NO.: 31402956.001.02
CLIENT: White Plains School District
PROJECT SITE: Mamaroneck Ave Elementary School
Project Manager: Alexander Smolyar

LOCATION(S) SURVEYED: Building Throughout
PROPOSED PROJECT: PA System
DATE(S) OF INSPECTION: 1/13/21
Inspector(s): Nicholas Casale, Michael Gelfand

LOUIS BERGER
TELEPHONE NO. : (212) 612-7900 FAX NO.: (212) 363-4341
ADDRESS: 96 Morton Street, 8th Floor, New York, NY 10014

RESULTS TO: Lb.Labresults@wsp.com

TURNAROUND TIME: ☐ 12 HR. ☒ 24 HR. ☐ 48 HR. ☐ 72 HR.

HA	SAMPLE NO.	SAMPLE LOCATION	MATERIAL DESCRIPTION	APPROX. QUANTITY (LF/SF)	FIELD NOTES
A	1	Copy Center in Bsmt	Joint Compound (White)		
↓	2	Special ED Room 118	↓		
B	3	Copy Center in Bsmt	Gypsum Wall Board (White)		
↓	4	Special Ed Room 118	↓		
C	5	Exterior Main Entrance	Brick Mortar (Grey)		
↓	6	Exterior by Room 106	↓		

EMSL MANHATTAN LAB
RECEIVED
21 JAN 14 PM 1:59

Page 1 Of 1

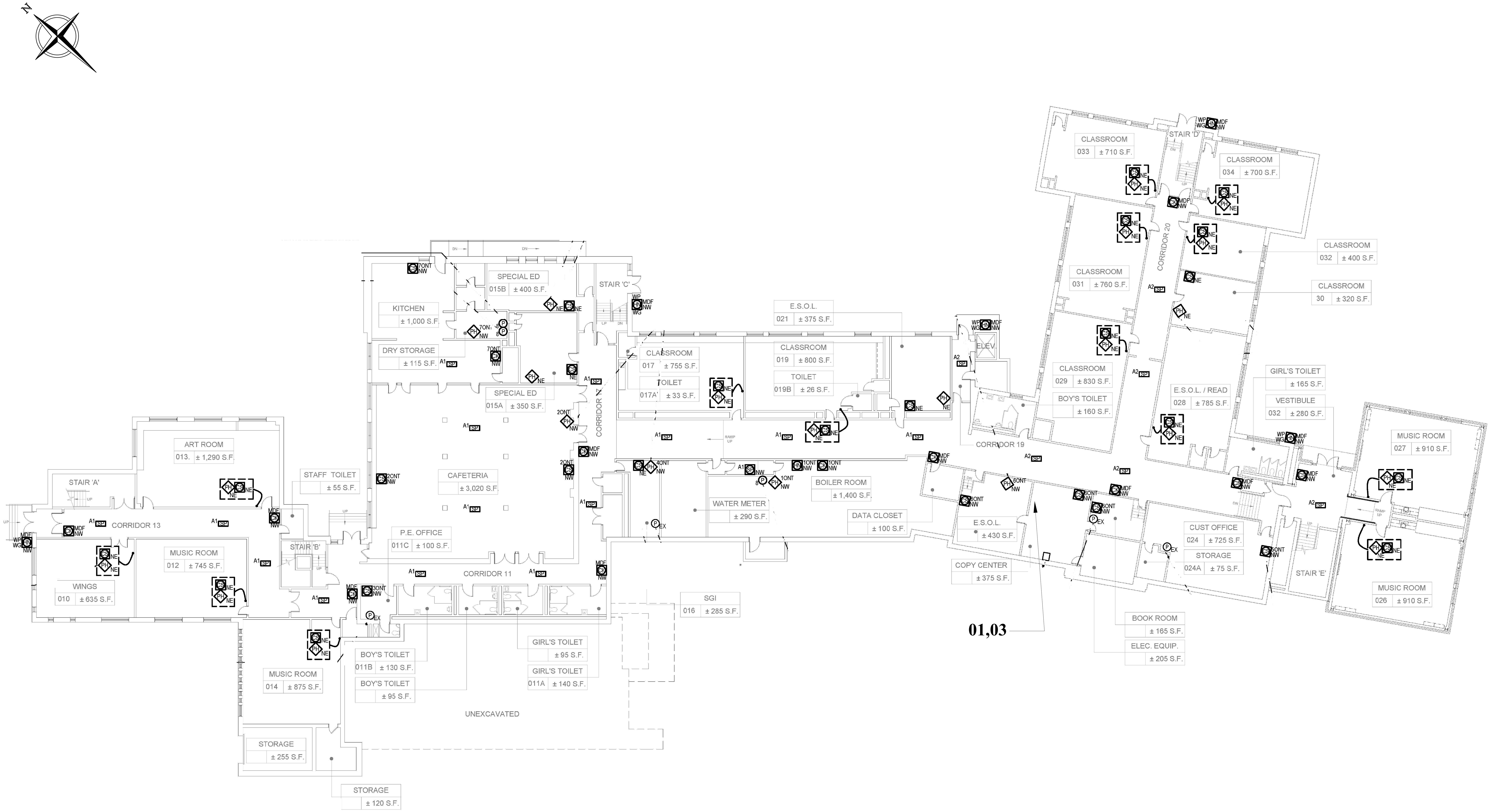
CHAIN OF CUSTODY

Relinquished by: (print)	(Sign)			Relinquished by: (print)	(Sign)			Relinquished by: (print)	(Sign)		
J. Wang N. Casale		1/14/21	2:00 AM/PM			/ /	AM/PM			/ /	AM/PM
Received by: (print) Maren Huttman	(Sign)	1/14/21	1:59 AM/PM	Received by: (print)	(Sign)	/ /	AM/PM	Received by: (print)	(Sign)	/ /	AM/PM

NOTE: USE STOP AT FIRST POSITIVE METHODOLOGY FOR EVERY HOMOGENEOUS MATERIAL

OrderID: 032100561

APPENDIX C:
ASBESTOS BULK SAMPLE LOCATION DRAWINGS



1 BSL001 GROUND FLOOR PLAN

SCALE: NOT TO SCALE

CONSULTANTS: ENVIRONMENTAL CONSULTANT

96 Morton Street, 8th Floor, New York, New York 10014
TEL. 212.612.7900 FAX 212.363.4341 WWW.LOUISBERGER.COM

MARK	DATE	DESCRIPTION

"ALTERATION OF THIS DOCUMENT EXCEPT BY A LICENSED PROFESSIONAL IS ILLEGAL"

DESIGNED BY:	DRAWN BY: JP	CHECKED BY: JG	REVIEWED BY: AS
PROJECT No.: 31402956.001	DATE: JANUARY 2021	SCALE: AS SHOWN	

CLIENT

White Plains City School District

Intercom and Public Address System Replacement at the Mamaroneck Avenue Elementary School

7 Nosaband Ave
White Plains, NY 10605

CONTRACT

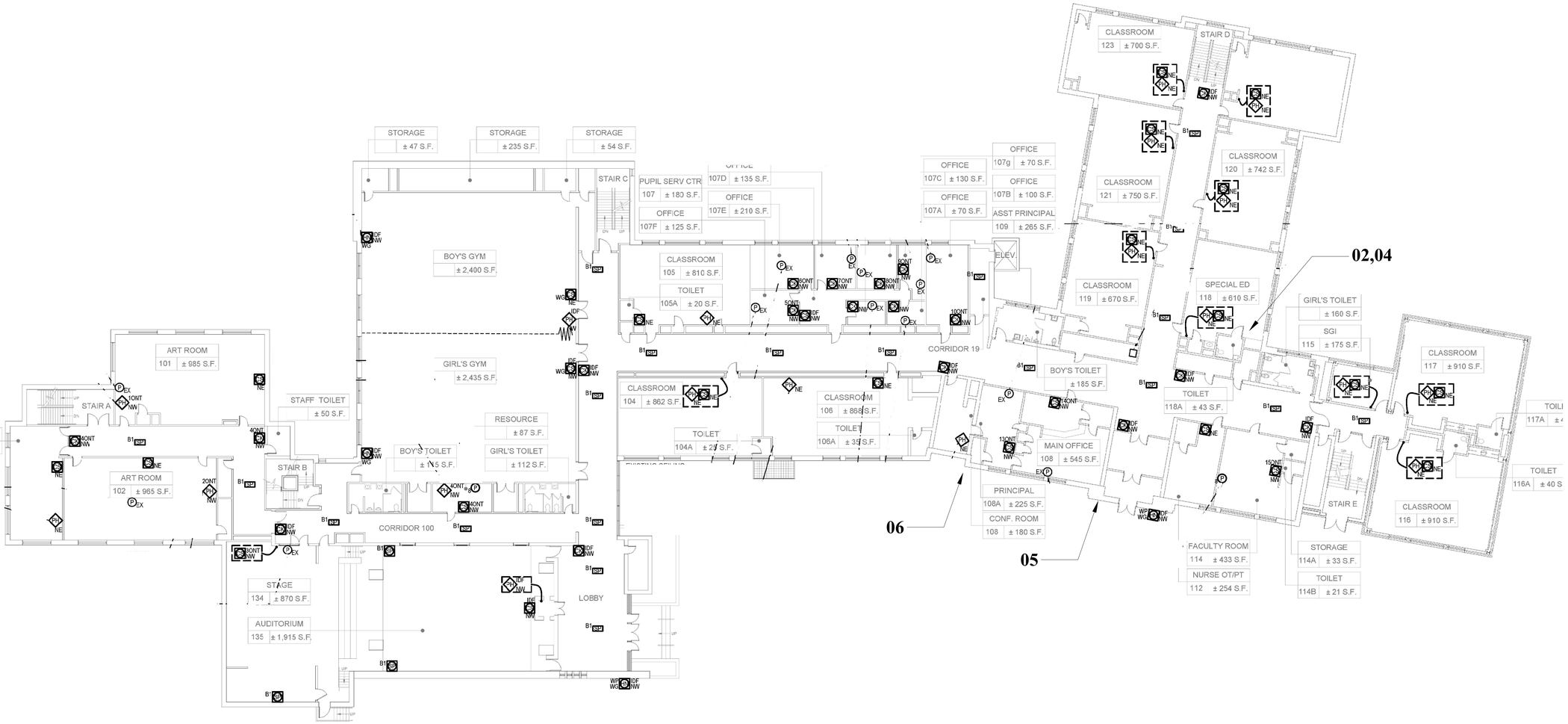
STATUS

SHEET TITLE

BULK SAMPLE LOCATIONS GROUND FLOOR PLAN

DRAWING No.

BSL001



1 BSL002 FIRST FLOOR PLAN

SCALE: NOT TO SCALE

CONSULTANTS: ENVIRONMENTAL CONSULTANT
wsp
96 Morton Street, 8th Floor, New York, New York 10014
TEL. 212.612.7900 FAX 212.363.4341 WWW.LOUISBERGER.COM

MARK	DATE	DESCRIPTION

DESIGNED BY:	DRAWN BY:	CHECKED BY:	REVIEWED BY:
	JP	JG	AS

PROJECT No.:	DATE:	SCALE:
31402956.001	JANUARY 2021	AS SHOWN

CLIENT

White Plains City School District

Intercom and Public Address System Replacement at the Mamaroneck Avenue Elementary School

7 Nosaband Ave
White Plains, NY 10605

CONTRACT

STATUS

SHEET TITLE

BULK SAMPLE LOCATIONS FIRST FLOOR PLAN

DRAWING No.

BSL002

Z:\NYC\CAD\CADD\TEMP-2021\SCHOOL DISTRICT\31402956.001 - WHITE P. MAMARONECK AVE E.\BSL001.dwg Last Modified: Jan 20, 2021 - 12:17pm By USJPK6273A

APPENDIX D:
ASBESTOS CONTAINING MATERIALS LOCATION DRAWINGS
N/A

APPENDIX E:
LEAD XRF SHOT RESULTS

WSP	XRF CALIBRATION CHECK FORM	PAGE 1 OF 3

PROJ. NO.:		DATE:	1/13/21
PROJECT NAME:		INSPECTOR NAME:	N.C, M.G.
CLIENT:		INSPECTOR SIGNATURE:	
SITE:	White Plains-Mamaroneck Ave ES	PROJ. MANAGER:	A.S.

LOUIS BERGER a WSP USA Company TELEPHONE #: (212) 612-7900 FAX #: (212) 425-1618 ADDRESS: 96 Morton Street, 8th Floor, New York, NY 10014	XRF MAKE/MODEL: RMD LPA-1 (Serial#3675) Heuresis Pb200i (Serial#2150)	LLW#:	JOB#:
	NOTES:		

CALIBRATION CHECK – PRIOR TO LEAVING OFFICE

1.02 mg/cm² Calibration Block		FIRST READING	SECOND READING	THIRD READING	AVERAGE
CALIBRATION TIME:	TEST #	1	2	3	
R	XRF READING	1.2	1.1	1.1	

CALIBRATION CHECK – PRIOR TO LEAVING OFFICE

mg/cm² Calibration Block		FIRST READING	SECOND READING	THIRD READING	AVERAGE
CALIBRATION TIME:	TEST #	4	5	6	
0.0	XRF READING	0.1	0.0	0.1	

CALIBRATION CHECK – FIELD-START

mg/cm² Calibration Block		FIRST READING	SECOND READING	THIRD READING	AVERAGE
CALIBRATION TIME:	TEST #	42	43	44	
1.02	XRF READING	1.1	1.1	1.0	

CALIBRATION CHECK – FIELD-END/2-HR (circle one)

mg/cm² Calibration Block		FIRST READING	SECOND READING	THIRD READING	AVERAGE
CALIBRATION TIME:	TEST #	45	46	47	
0.0	XRF READING	0.1	0.0	0.0	

CALIBRATION CHECK – FIELD-END/2-HR (circle one)

mg/cm² Calibration Block		FIRST READING	SECOND READING	THIRD READING	AVERAGE
CALIBRATION TIME:	TEST #				
	XRF READING				

CALIBRATION CHECK – FIELD-END/2-HR (circle one)

mg/cm² Calibration Block		FIRST READING	SECOND READING	THIRD READING	AVERAGE
CALIBRATION TIME:	TEST #				
	XRF READING				

CALIBRATION CHECK – FIELD-END/2-HR (circle one)

mg/cm² Calibration Block		FIRST READING	SECOND READING	THIRD READING	AVERAGE
CALIBRATION TIME:	TEST #				
	XRF READING				

WSP
199 Water St., 23 Fl.
New York, NY 10038
Tel. 212-612-7900 Fax. 212-363-4341

XRF LEAD-BASED PAINT TESTING DATA SHEET/CHAIN OF CUSTODY

PROJECT NO.: _____
CLIENT: _____
INSPECTOR(S): _____
PROJ. MANAGER: _____

PROJECT NAME: _____ XRF SERIAL #: ~~RMD-2456~~
PROJECT LOCATION: Mamaroneck ES Viken
Pb200i
INSPECTION DATE: 1/15/21 UN 2911

SPACE CHARACTERISTICS:
FLOOR #: _____ ROOM #: _____ ROOM NAME: _____

NOTES:

SAMPLE #	SUBSTRATE	COMPONENT DISCRIPTION: COLOR	CONDITION [I / F / P]	COMPONENT	WALL/SIDE DESIGN.	SIDE [L/C/R]	HEIGHT [L/M/U]	COMPONENT REPLICANT	QUANTITY (IF POSITIVE) [SF]	PHOTO	NOTES (DETERIORATION TO FRICTION/IMPACT AND/OR MOISTURE?)	XRF READING [mg/cm²]
7	M (PL) S C CB PG CR B W V CT G FG OTHER: ~~LW~~	D. Blue	I	LW	A B (C) D RM CTR FL CL						Ground Fl Wall	1.2
8	M (PL) S C CB PG CR B W V CT G FG OTHER: UW	L. Blue	I	UW	A B (C) D RM CTR FL CL						↓	0.5
9	(M) PL S C CB PG CR B W V CT G FG OTHER:	L. Blue	I	Picture Rail	A B (C) D RM CTR FL CL						↓	1.0
10	M PL (S) C CB PG CR B W V CT G FG OTHER:	Beige	I	W	(A) B C D RM CTR FL CL						Rm 19	0.3
11	(M) PL S C CB PG CR B W V CT G FG OTHER:	Beige	I	El. Panel	(A) B C D RM CTR FL CL						↓	0.0
12	M PL S (C) CB PG CR B W V CT G FG OTHER:	↓	I	UW	A (B) C D RM CTR FL CL						Rm 16	0.1
13	M PL S C CB PG CR (B) W V CT G FG OTHER:	↓	I	UW	A B C D RM CTR FL CL						↓	0.1
14	M PL (S) C CB PG CR B W V CT G FG OTHER:	Beige		UW	A B C (D) RM CTR FL CL						reference	0.1
15	M PL (S) C CB PG CR B W V CT G FG OTHER:	Blue	I	UW	A B C (D) RM CTR FL CL						↓	0.2
16	(M) PL S C CB PG CR B W V CT G FG OTHER:	Silver	F	Speaker	A B C D RM CTR FL (CL)						↓	0.0
17	M (PL) S C CB PG CR B W V CT G FG OTHER:	Beige		LW	(A) B C D RM CTR FL CL						↓	0.1
18	M (PL) S C CB PG CR B W V CT G FG OTHER:	Blue		UW	(A) B C D RM CTR FL CL						↓	-0.3
19	M (PL) S C CB PG CR B W V CT G FG OTHER:	Yellow	I	UW	A B C (D) RM CTR FL CL						Rm 114	10.8
20	M (PL) S C CB PG CR B W V CT G FG OTHER:	Yellow	I	LW	A B C (D) RM CTR FL CL						↓	9.1
21	(M) PL S C CB PG CR B W V CT G FG OTHER:	Blue	I	El. Box	A B C (D) RM CTR FL CL						↓	0.0
22	(M) PL S C CB PG CR B W V CT G FG OTHER:	Yellow	I	El. Conduit	A B C (D) RM CTR FL CL						↓	0.3
23	M (PL) S C CB PG CR B W V CT G FG OTHER:	Peach	I	UW	A B C (D) RM CTR FL CL						1 Fl. Hallway	1.5
24	M (PL) S C CB PG CR B W V CT G FG OTHER:	Blue	I	LW	A B C (D) RM CTR FL CL						↓	0.9
~~25~~	M PL S C CB PG CR B W V CT G FG OTHER:				A B C D RM CTR FL CL						~~↓~~	

Side: Left/Center/Right; Height: Lower/Middle/Upper; Substrate: M: Metal; PL: Plaster; S: Sheetrock; C: Concrete; CB: Cinder Block; CR: Sinks, Water Closets, etc.; CT: Ceramic Tile; PG: Porcelain-glazed Block; B: Brick; W: Wood; V: Vinyl; FG: Fiberglass; G: Glass ; Condition: I = Intact; F = Fair; P = Poor; Initial Result: P = Positive; N = Negative;

WSP
199 Water St., 23 Fl
New York, NY 10038
Tel. 212-612-7900 Fax. 212-363-4341

XRF LEAD-BASED PAINT TESTING DATA SHEET/CHAIN OF CUSTODY

PROJECT NO.: _____ PROJECT NAME: _____ XRF SERIAL #: RMD-2456

CLIENT: _____ PROJECT LOCATION: _____

INSPECTOR(S): _____

PROJ. MANAGER: _____ INSPECTION DATE: _____

SPACE CHARACTERISTICS:

FLOOR #: _____ ROOM #: _____ ROOM NAME: _____

NOTES:

SAMPLE #	SUBSTRATE	COMPONENT DISCRIPTION: COLOR	CONDITION [I / F / P]	COMPONENT	WALL/SIDE DESIGN.	SIDE [L/C/R]	HEIGHT [L/M/U]	COMPONENT REPLICANT	QUANTITY (IF POSITIVE) [SF]	PHOTO	NOTES (DETERIORATION TO FRICTION/IMPACT AND/OR MOISTURE?)	XRF READING [mg/cm²]
25	M (PL) S C CB PG CR B W V CT G FG OTHER:	Lime Green	I	UW	(A) B C D RM CTR FL CL						Rm 106	4.5
26	M PL S C CB PG CR B W V CT G FG OTHER: plaster			LW	(A) B C D RM CTR FL CL							0.8
27	M PL S C CB PG CR B W V CT G FG OTHER: cork			Corkboard	(A) B C D RM CTR FL CL							0.1
28	M PL S C CB PG CR B (W) V CT G FG OTHER:			Corkboard Border	(A) B C (D) RM CTR FL CL							0.6
29	M PL S C (CB) PG CR B W V CT G FG OTHER:			UW	A B C (D) RM CTR FL CL							0.3
30	M (PL) S C CB PG CR B W V CT G FG OTHER:	Beige		UW	(A) B C D RM CTR FL CL						Rm 104	4.7
31	M PL S C CB PG CR B W V CT G FG OTHER: plaster			LW	(A) B C D RM CTR FL CL							0.9
32	M PL S C CB PG CR B W V CT G FG OTHER: cork			Corkboard	(A) B C D RM CTR FL CL							1.1
33	M PL S C CB PG CR B (W) V CT G FG OTHER:			Corkboard Border	(A) B C D RM CTR FL CL							0.6
34	M PL S C CB PG CR (B) W V CT G FG OTHER:	Beige	I	W	(A) B C D RM CTR FL CL						Gym	0.4
35	M (PL) S C CB PG CR B W V CT G FG OTHER:	Beige	I	W	A B C (D) RM CTR FL CL						Audit	-0.1
	M PL S C CB PG CR B W V CT G FG OTHER:				A B C D RM CTR FL CL						~~Office~~ Used as storage	
36	M PL (S) C CB PG CR B W V CT G FG OTHER:	Beige	I	CL	A B C D RM CTR (FL) CL							0.1
37	M (PL) S C CB PG CR B W V CT G FG OTHER:	Lime Green	I	UW	(A) B C D RM CTR FL CL						Rm 27	8.7
38	M (PL) S C CB PG CR B W V CT G FG OTHER:			LW	(A) B C D RM CTR FL CL							3.1
39	M PL S C CB PG CR B W V CT G FG OTHER: cork	Purple		Cork board	(A) B C D RM CTR FL CL						X	10.7
40	M (PL) S C CB PG CR B W V CT G FG OTHER:	~~L~~ D. Blue		LW	(A) B C D RM CTR FL CL						2 FI Hallway	1.0
41	M (PL) S C CB PG CR B W V CT G FG OTHER:	L. Blue		UW	(A) B C D RM CTR FL CL							0.7
	M PL S C CB PG CR B W V CT G FG OTHER:				A B C D RM CTR FL CL							

Side: Left/Center/Right; Height: Lower/Middle/Upper; Substrate: M: Metal; PL: Plaster; S: Sheetrock; C: Concrete; CB: Cinder Block; CR: Sinks, Water Closets, etc.; CT: Ceramic Tile; PG: Porcelain-glazed Block; B: Brick; W: Wood; V: Vinyl; FG: Fiberglass; G: Glass ; Condition: I = Intact; F = Fair; P = Poor; Initial Result: P = Positive; N = Negative;

APPENDIX F:
PCB BULK SAMPLE FIELD DATA SHEETS WITH CHAIN OF CUSTODY & LABORATORY RESULTS
N/A

APPENDIX G:
COMPANY LICENSE, PERSONAL CERTIFICATIONS AND LABORATORY ACCREDITATIONS

NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER

Expires 12:01 AM April 01, 2021
Issued April 01, 2020

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

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

MR. JAMES HALL
EMSL ANALYTICAL, INC
307 WEST 38TH STREET
NEW YORK, NY 10018

NY Lab Id No: 11506

is hereby APPROVED as an Environmental Laboratory for the category
ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE
All approved subcategories and/or analytes are listed below:

Miscellaneous

Asbestos in Friable Material	Item 198.1 of Manual
	EPA 600/M4/82/020
Asbestos in Non-Friable Material-PLM	Item 198.6 of Manual (NOB by PLM)
Asbestos in Non-Friable Material-TEM	Item 198.4 of Manual
Asbestos-Vermiculite-Containing Material	Item 198.8 of Manual

Serial No.: 61413

United States Department of Commerce
National Institute of Standards and Technology

Certificate of Accreditation to ISO/IEC 17025:2017

NVLAP LAB CODE: 101048-9

EMSL Analytical, Inc.

New York, NY

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 dated January 2009).

2020-07-01 through 2021-06-30

Effective Dates

For the National Voluntary Laboratory Accreditation Program

National Voluntary Laboratory Accreditation Program

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017

EMSL Analytical, Inc.
307 W. 38th Street
New York, NY 10018
Mr. Jim Hall
Phone: 212-290-0051 Fax: 212-290-0058
Email: jhall@emsl.com
http://www.emsl.com

ASBESTOS FIBER ANALYSIS **NVLAP LAB CODE 101048-9**

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

01213 005363759 16

NEW YORK STATE OF OPPORTUNITY. Department of Labor

MICHAEL GELFAND

C/O LOUIS BERGER 96 MORTON ST, 8TH FLOOR
NEW YORK NY 10014

Enclosed is your new card.

NYS Department of Labor

The Department of Labor is happy to provide this improved card. We welcome your comments: nysdol@labor.ny.gov or call (518) 457-2735

YOUR NEW CARD

United States Environmental Protection Agency

This is to certify that

Michael Gelfand

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 April 27, 2022

LBP-R-11499-1
Certification #

April 13, 2019
Issued On

John Gorman, Chief
Pesticides & Toxic Substances Branch

01213 005580562 61

NEW YORK STATE OF OPPORTUNITY. Department of Labor

NICHOLAS S CASALE

Enclosed is your new card.

NYS Department of Labor

The Department of Labor is happy to provide this improved card. We welcome your comments: nysdol@labor.ny.gov or call (518) 457-2735

YOUR NEW CARD

United States Environmental Protection Agency

This is to certify that

Nicholas S Casale

has fulfilled the requirements of the Toxic Substances Control Act (TSCA) Section 402, and has received certification to conduct lead-based paint activities pursuant to 40 CFR Part 745.226 as:

Inspector

In the Jurisdiction of:

All EPA Administered Lead-based Paint Activities Program States, Tribes and Territories

This certification is valid from the date of issuance and expires September 24, 2022

LBP-I-I207478-1

Certification #

September 10, 2019

Issued On

John Gorman, Chief

Pesticides & Toxic Substances Branch

APPENDIX H:
SCOPE OF WORK DRAWINGS

ELECTRICAL LEGENDS

SYMBOL	DESCRIPTION	COMMENTS
S_3	THREE - WAY SWITCH	46" AFF TO CL UON
S_4	FOUR - WAY SWITCH	46" AFF TO CL UON
S_I	ILLUMINATED SWITCH	46" AFF TO CL UON
S^A	SINGLE POLE SWITCH; "A" INDICATES SWITCH CONTROL	46" AFF TO CL UON
S_D	SINGLE POLE DIMMER SWITCH	46" AFF TO CL UON
S_{3D}	THREE - WAY DIMMER SWITCH	46" AFF TO CL UON
S_K	SINGLE POLE KEYED SWITCH	46" AFF TO CL UON
S_{K3}	KEYED THREE - WAY SWITCH	46" AFF TO CL UON
S_{K4}	KEYED FOUR - WAY SWITCH	46" AFF TO CL UON
S_P	SWITCH AND PILOT LIGHT	
S_T	SWITCH WITH THERMAL OVERLOAD PROTECTION (CONTRACTOR SHALL COORDINATE VOLTAGE AND PHASE WITH EQUIPMENT)	
S_{OSVS}	OCCUPANCY/VACANCY SENSOR WITH MANUAL OVERRIDE, WALL MOUNT	
TC	TIME CLOCK	
E,G	EMERGENCY SHUT OFF SWITCH; 'E' INDICATES ELECTRICAL; 'G' INDICATES GAS	
	2 #12 AWG + #12 AWG GND IN 3/4" E.C. CONCEALED IN WALL OR CEILING	
	3 #12 AWG + #12 AWG GND IN 3/4" E.C. CONCEALED IN OR BELOW SLAB	
LP1-3S	DEDICATED HOME RUN TO PANEL LP1 FOR CIRCUIT NO. 3S ONLY. 2 #12 AWG + #12 AWG GND IN 3/4" E.C. CONCEALED IN WALL OR CEILING	
	SIMPLEX RECEPTACLE: 120V, 20A. COORDINATE MOUNTING HEIGHT WITH MECHANICAL CONTRACTOR TO CLEAR BASEBOARDS.	FLUSH
	DUPLEX RECEPTACLE: 120V, 20A. COORDINATE MOUNTING HEIGHT WITH MECHANICAL CONTRACTOR TO CLEAR BASEBOARDS.	FLUSH
	QUAD RECEPTACLE, DOUBLE DUPLEX RECEPTACLE: 120V, 20A. COORDINATE MOUNTING HEIGHT WITH MECHANICAL CONTRACTOR TO CLEAR BASEBOARDS.	FLUSH
C	DUPLEX RECEPTACLE: 120V, 20A; SUBSCRIPT "C" INDICATES CEILING MOUNT.	FLUSH
	DUPLEX RECEPTACLE: 120V, 20A; FLOOR MOUNTED.	FLUSH
	QUAD RECEPTACLE: 120V, 20A; FLOOR MOUNTED.	
D/T	DUPLEX RECEPTACLE AND DATA JACK: 120V, 20A; FLOOR MOUNTED.	
D/T	DATA JACK; FLOOR MOUNTED.	
IG	ISOLATED GROUND DUPLEX RECEPTACLE. COORDINATE MOUNTING HEIGHT WITH MECHANICAL CONTRACTOR TO CLEAR BASEBOARDS.	FLUSH
GFI	DUPLEX RECEPTACLE: 120V, 20A; WITH GROUND FAULT INDICATOR. COORDINATE MOUNTING HEIGHT WITH MECHANICAL CONTRACTOR TO CLEAR BASEBOARDS.	FLUSH
UC	DUPLEX RECEPTACLE: 120V, 20A; SUBSCRIPT "UC" INDICATES UNDER COUNTER	AS PER ENGINEER
CT	DUPLEX RECEPTACLE: 120V, 20A; SUBSCRIPT "CT" INDICATES COUNTER TOP.	AS PER ENGINEER
WP	DUPLEX RECEPTACLE: 120V, 20A; SUBSCRIPT "WP" INDICATED WEATHER PROOF.	AS PER ENGINEER
USB	DUPLEX RECEPTACLE: 120V, 20A; SUBSCRIPT "USB" INDICATES INTEGRAL USB.	FLUSH
40 240	SPECIAL PURPOSE OUTLET: 240V, 40A. VERIFY NEMA CONFIGURATION WITH EQUIPMENT MANUFACTURER.	AS PER ENGINEER
TL	TWISTED LOCK RECEPTACLE: 125V, 20A, 3 WIRE; UNLESS OTHERWISE NOTED.	AS PER ENGINEER
	SURFACE RACEWAY WITH 2 GROUNDED AND ISOLATED TYPE DUPLEX RECEPTACLES AND 1 DATA OUTLET PER POSITION, 18" AFF UNLESS OTHERWISE NOTED.	
S1	MAGNETIC STARTER "S1"; SEE STARTER SCHEDULE	
DS1	DISCONNECTION SWITCH "DS1"; SEE DISCONNECT SWITCH SCHEDULE.	
J	JUNCTION BOX.	
J 4X	NEMA 4X STAINLESS STEEL JUNCTION BOX WITH GASKET COVER.	
J S	JUNCTION BOX RECESSED IN WALL WITH BLANK COVER. PROVIDE 3/4" E.C. AND DRAG LINE TO ABOVE FINISHED CEILING. MOUNT 18" AFF, UNLESS OTHERWISE NOTED.	
J M	FOR MONITOR, JUNCTION BOX RECESSED IN WALL WITH BLANK COVER. PROVIDE 3/4" E.C. AND DRAG LINE TO ABOVE FINISHED CEILING.	
J HD	FOR HAND DRYER, JUNCTION BOX RECESSED IN WALL WITH BLANK COVER. PROVIDE 3/4" E.C. AND DRAG LINE TO ABOVE FINISHED CEILING. COORDINATE MOUNTING HEIGHT WITH ARCHITECT.	
T T1	TRANSFORMER "T1"; SEE TRANSFORMER SCHEDULE.	
P1	ELECTRICAL PANEL "P1", RECESSED; SEE PANEL SCHEDULE.	
P1	ELECTRICAL PANEL "P1", SURFACE MOUNT; SEE PANEL SCHEDULE.	
	CONDUIT GOING UP.	
	CONDUIT GOING DOWN.	
T	TELEPHONE. PROVIDE 3/4" E.C. WITH DRAG LINE TO AFC AND EMPTY J. BOX RECESSED IN WALL WITH BLANK COVER.	
TV	CABLE TELEVISION. PROVIDE 3/4" E.C. WITH DRAG LINE TO AFC AND EMPTY J. BOX RECESSED IN WALL WITH BLANK COVER.	
D	DATA. PROVIDE 3/4" E.C. WITH DRAG LINE TO AFC AND EMPTY J. BOX RECESSED IN WALL WITH BLANK COVER.	
D/T	COMBINED DATA AND TV. PROVIDE 3/4" E.C. WITH DRAG LINE TO AFC AND EMPTY J. BOX RECESSED IN WALL WITH BLANK COVER.	
S	SECURITY CAMERA. PROVIDE 3/4" E.C. WITH DRAG LINE TO AFC AND EMPTY J. BOX RECESSED IN WALL WITH BLANK COVER.	

ABBREVIATION	DESCRIPTION	COMMENTS
AFF	ABOVE FINISHED FLOOR	
AFC	ABOVE FINISHED CEILING	
AFCI	ARC FAULT CIRCUIT INTERRUPTER	
AFG	ABOVE FINISHED GRADE	
AHJ	AUTHORITY HAVING JURISDICTION	
AMP, A	AMPERE	
ATS	AUTOMATIC TRANSFER SWITCH; SEE TRANSFER SWITCH SCHEDULE	
AWG	AMERICAN WIRE GAUGE	
BFC	BELOW FINISHED CEILING	
CL	CENTERLINE	
CT	COUNTER TOP	
CONED	CON EDISON (LOCAL ELECTRIC UTILITY)	
E.C.	ELECTRICAL CONDUIT	
GFCI	GROUND FAULT CIRCUIT INTERRUPTER	
GFI	GROUND FAULT INDICATOR	
GND	GROUND	
IDF	INTERMEDIATE DISTRIBUTION FRAME	
MCB	MAIN CIRCUIT BREAKER	
MDF	MAIN DISTRIBUTION FRAME	
MLO	MAIN LUGS ONLY	
N.T.S.	NOT TO SCALE	
ONT	OPTICAL NETWORK TERMINAL	
POE	POWER OVER ETHERNET	
TYP	TYPICAL	
UON	UNLESS OTHERWISE NOTED	
UC	UNDER COUNTER	
V	VOLT	
VAC	VOLTS ALTERNATING CURRENT	
VDC	VOLTS DIRECT CURRENT	
X-FMR	TRANSFORMER	
WP	WEATHERPROOF	

SYMBOLS LEGEND

CLASSROOM 101 ± 100 S.F.	ROOM DESIGNATION
A2.2	BUILDING SECTION CUT
A2.2	WALL SECTION CUT
A2.2	DETAIL KEY
A2.2	ELEVATION KEY
H	COLUMN GRID
	ELEVATION LINE
1 Title SCALE:	DRAWING TITLE
4 3 A2.2 1 2	INTERIOR ELEVATION REFERENCE
1 E1.0	SEE DETAIL# ON DWG #

COMMUNICATION LEGEND

SYMBOL	DESCRIPTION	COMMENTS
#IDF NW	SURFACE WALL MOUNTED COMBINATION IP CLOCK/SPEAKER. - SUBSCRIPT "NW" REPRESENT NEW DATA DROP REQUIRED. - SUBSCRIPT "#IDF" (EX: 1IDF,2IDF,MDF,ETC) REPRESENTS THE DISTRIBUTION FRAME TO TERMINATE TO. PROVIDE AND INSTALL CAT6 CABLE IN 3/4" E.C. TO CORRESPONDING DISTRIBUTION FRAME (IDF/MDF). PUNCH DOWN TO NEW PATCH PANEL. PROVIDE AND INSTALL 6'-0" CAT6 PATCH CABLE BETWEEN PATCH PANEL AND NEW 24-PORT ONT. PROVIDE AND INSTALL NEW PATCH PANEL AND NEW ONT AS PER FLOOR PLANS	NOTES C1,C2
#ONT NW	SURFACE WALL MOUNTED COMBINATION IP CLOCK/SPEAKER. - SUBSCRIPT "NW" REPRESENT NEW DATA DROP REQUIRED. - SUBSCRIPT "#ONT" (EX: 1ONT, 2ONT, ETC) REPRESENTS THE ONT TO TERMINATE TO. PROVIDE AND INSTALL CAT6 CABLE IN 3/4" E.C. TO CORRESPONDING ONT.	NOTES C1,C2,C4,A1
NE	SURFACE WALL MOUNTED COMBINATION IP CLOCK/SPEAKER. - SUBSCRIPT "NE" REPRESENT EXISTING DATA DROP TO BE UTILIZED. PROVIDE AND INSTALL 5'-0" CAT6 CABLE IN 3/4" E.C. BETWEEN NEW CLOCK/SPEAKER AND EXISTING DATA DROP.	NOTES C1,A1
A1	WALL MOUNTED ANALOG SPEAKER. - SUBSCRIPT "A" REPRESENTS CORRESPONDING GATEWAY (SPEAKER BREAKOUT MODULES) CONTROLLER. "1" REPRESENTS GATEWAY CHANNEL AND POWER SUPPLY CHANNEL.	NOTES C1,C3
A1 DEP	DROP CEILING, RECESSED MOUNTED ANALOG SPEAKER. - SUBSCRIPT "A" REPRESENTS CORRESPONDING GATEWAY (SPEAKER BREAKOUT MODULES) CONTROLLER. "1" REPRESENTS GATEWAY CHANNEL AND POWER SUPPLY CHANNEL.	NOTES C1,C3
WG WP #IDF NW	EXTERIOR WEATHERPROOF WALL MOUNTED IP PAGING HORN. - SUBSCRIPT "NW" REPRESENT NEW DATA DROP REQUIRED. -SUBSCRIPT "#IDF" (EX: 1IDF,2IDF,MDF,ETC) REPRESENTS THE DISTRIBUTION FRAME TO TERMINATE TO. PROVIDE AND INSTALL CAT6 CABLE IN 3/4" E.C. TO CORRESPONDING DISTRIBUTION FRAME (IDF/MDF). PUNCH DOWN TO PATCH PANEL. PROVIDE AND INSTALL 6'-0" CAT6 PATCH CABLE BETWEEN PATCH PANEL AND 24-PORT ONT. PROVIDE AND INSTALL NEW PATCH PANEL AND NEW ONT AS PER FLOOR PLANS. -MOUNT AT APPROXIMATELY 10'-0" AND PROVIDE ALL MOUNTING HARDWARE AS REQUIRED. -SUBSCRIPT WG REPRESENT WIRE GUARD	NOTES C1,C2
WG WP #ONT NW	EXTERIOR WEATHERPROOF WALL MOUNTED IP PAGING HORN. - SUBSCRIPT "NW" REPRESENT NEW DATA DROP REQUIRED. - SUBSCRIPT "#ONT" (EX: 1ONT, 2ONT, ETC) REPRESENTS THE ONT TO TERMINATE TO. PROVIDE AND INSTALL CAT6 CABLE IN 3/4" E.C. TO CORRESPONDING ONT. -MOUNT AT APPROXIMATELY 10'-0" AND PROVIDE ALL MOUNTING HARDWARE AS REQUIRED. -SUBSCRIPT WG REPRESENT WIRE GUARD	NOTES C1,C2,C4
#IDF NW	SURFACE WALL MOUNTED IP CLOCK. -SUBSCRIPT "NW" REPRESENT NEW FEMALE RJ45 DATA DROP AND JUNCTION BOX REQUIRED. -SUBSCRIPT "#IDF" (EX: 1IDF,2IDF,MDF,ETC) REPRESENTS THE DISTRIBUTION FRAME TO TERMINATE TO. PROVIDE AND INSTALL CAT6 CABLE IN 3/4" E.C. TO CORRESPONDING DISTRIBUTION FRAME (IDF/MDF). PUNCH DOWN TO PATCH PANEL. PROVIDE AND INSTALL 6'-0" CAT6 PATCH CABLE BETWEEN PATCH PANEL AND 24-PORT ONT. PROVIDE AND INSTALL NEW PATCH PANEL AND NEW ONT AS PER FLOOR PLANS.	NOTES C1,C2
PH #ONT NW	WALL MOUNTED IP TELEPHONE. - SUBSCRIPT "NW" REPRESENT NEW FEMALE RJ45 DATA DROP AND JUNCTION BOX REQUIRED. - SUBSCRIPT "#ONT" (EX: 1ONT, 2ONT, ETC) REPRESENTS THE ONT TO TERMINATE TO. PROVIDE AND INSTALL CAT6 CABLE IN 3/4" E.C. TO CORRESPONDING ONT. PROVIDE AND INSTALL 5'-0" CAT6 PATCH CABLE BETWEEN PHONE AND EXISTING DATA DROP, UON. (TELEPHONE PROVIDED BY DISTRICT, INSTALLED BY CONTRACTOR)	NOTES C4,A2
PH NE	NEW WALL MOUNTED IP TELEPHONE. - SUBSCRIPT "NE" REPRESENT EXISTING DATA DROP TO BE UTILIZED. PROVIDE AND INSTALL 5'-0" CAT6 CABLE IN 3/4" E.C. BETWEEN NEW PHONE AND EXISTING DATA DROP (UON), (TELEPHONE PROVIDED BY DISTRICT, INSTALLED BY CONTRACTOR)	NOTE A2

GENERAL PUBLIC ADDRESS SYSTEM NOTE:

G1. EQUIPMENT LAYOUT AS SHOWN ON THE FLOOR PLANS ARE BASED AROUND VALCOM OR TELECOR EQUIPMENT. CONTRACTOR SHALL INCLUDE LOWEST COST SYSTEM IN BASE BID. REFER TO SPECIFICATION 274110 FOR ALL PA SYSTEM EQUIPMENT AND FOR ADDITIONAL INFORMATION. REFER TO FLOOR PLANS FOR QUANTITIES AND LOCATIONS. THE INTENT IS TO HAVE SCHOOL WIDE, FULLY IP BASED PUBLIC ADDRESS SYSTEM. FULL SYSTEM INCLUDES, BUT IS NOT LIMITED TO ALL EQUIPMENT, MOUNTING HARDWARE, PROGRAMMING, LICENSING, POWER SUPPLIES, AMPLIFIERS, WIRE AND CONDUIT AS REQUIRED FOR A FULLY FUNCTIONING SYSTEM AS DESCRIBED IN THE SPECIFICATIONS AND ON THE FLOOR PLANS.

COMMUNICATIONS LEGEND NOTES:

C1. REFER TO SPECIFICATION 274110 FOR ALL PA SYSTEM EQUIPMENT SPECIFICATION AND FOR ADDITIONAL INFORMATION. REFER TO FLOOR PLANS FOR QUANTITIES AND LOCATIONS. PROVIDE ALL MOUNTING HARDWARE AS REQUIRED. COORDINATE ALL CAT 6 INSULATION COLORS AND RJ45 JACK COLORS WITH DISTRICT PRIOR TO ORDERING.

C2. CONTRACTOR SHALL PROVIDE AND INSTALL INLINE PUNCH DOWN RJ45 CONNECTORS INSIDE CLOCK/SPEAKER INCLOSURE (TRIPPLITE MODEL #: N238-001-WH OR APPROVED EQUAL) FOR NEW DATA DROP AND A 1'-0" PATCH CABLE BETWEEN SPEAKER/CLOCK AND DATA JACK.

C3. REFER TO DETAIL 1 ON DRAWING E200 FOR ADDITIONAL INFORMATION ON THE ANALOG SPEAKER GATEWAY (SPEAKER BREAKOUT MODULE) AND ASSOCIATED EQUIPMENT.

C4. CONTRACTOR SHALL NOTE THAT THE ONT DESIGNATION FOR THE CONNECTION BETWEEN THE IP SYSTEM TO THE IP CLOCKS/SPEAKERS/TELEPHONES ONLY APPLIES WITHIN A SINGLE DRAWING. FOR EXAMPLE, IF THERE IS AN IP CLOCK/SPEAKER/TELEPHONE WITH AN ONT DESIGNATION "1ONT" ON DRAWING E100, THAT IP SPEAKER/CLOCK/TELEPHONE SHALL BE POWERED/CONTROLLED FROM "1ONT" ON DRAWING E100, UNLESS OTHERWISE NOTED.

GENERAL DEMOLITION NOTES:

GD1. CONTRACTOR SHALL REMOVE AND DISPOSE OF EXISTING PA SYSTEM IN IT'S ENTIRETY ONCE NEW SYSTEM IS INSTALLED, TESTED AND ACCEPTED. REMOVE AND DISPOSE OF INCLUDES ALL WIRING, CONDUIT, CLOCKS, SPEAKERS, ENCLOSURES, HEAD END EQUIPMENT AND RACK, UNLESS OTHERWISE NOTED. SURFACES BEHIND REMOVED EQUIPMENT SHALL BE PATCH, PRIMED, AND PAINTED TO MATCH EXISTING, UNLESS OTHERWISE NOTED.

GD2. FOR BIDDING PURPOSES, CONTRACTOR SHALL ASSUME ONE CLOCK AND ONE SPEAKER TO BE DEMOLISHED PER CLASSROOM. FOR BIDDING PURPOSES, CONTRACTOR SHALL ASSUME ONE CLOCK AND ONE SPEAKER TO BE DEMOLISHED PER OFFICE. FOR BIDDING PURPOSES, CONTRACTOR SHALL ASSUME ONE HALLWAY SPEAKER TO BE DEMOLISHED FOR EVERY 100 FEET OF HALLWAY.

ADD/DEDUCT/ALTERNATE NOTES:

A1. CONTRACTOR SHALL INCLUDE ALL COSTS TO PROVIDE AND INSTALL THE EMERGENCY CALL STATION, IN ALL CLASSROOMS, AS SHOWN IN DETAIL 2 - DRAWING E200 (CONSISTENT WITH THE NEMA SB 40-2008 COMMUNICATIONS SYSTEMS FOR LIFE SAFETY IN SCHOOLS) IN ADD/ALTERNATE #E1, ONLY.

A2. CONTRACTOR SHALL INCLUDE ALL COSTS ASSOCIATED WITH WORK INSTALLING TELEPHONE PROVIDED BY THE OWNER IN ADD/ALTERNATE #E2, ONLY

LIST OF DRAWINGS

H2M architects + engineers

2700 Westchester Ave., Suite 415
Purchase, NY 10577
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CONSULTANTS:

MARK	DATE	DESCRIPTION
	12-28-20	SED SUBMISSION

STATE OF NEW YORK · MICHAEL WILLIAM TWITTY · 039954 · LICENSED PROFESSIONAL ENGINEER

DESIGNED BY:	DRAWN BY:	CHECKED BY:	REVIEWED BY:
LK	LK/GT		

PROJECT No.:	DATE:	SCALE:
WPSD 2010	DECEMBER 2020	AS SHOWN

CLIENT

White Plains City School District

Intercom and Public Address System Replacement at the Mamaroneck Avenue Elementary School

White Plains Public Schools · WP · REAL LIFE LEARNING

7 Nosband Ave
White Plains NY, 10605

66-22-00-01-0-010-016

CONTRACT

CONTRACT E
ELECTRICAL CONSTRUCTION

STATUS

SED - FINAL BID SET

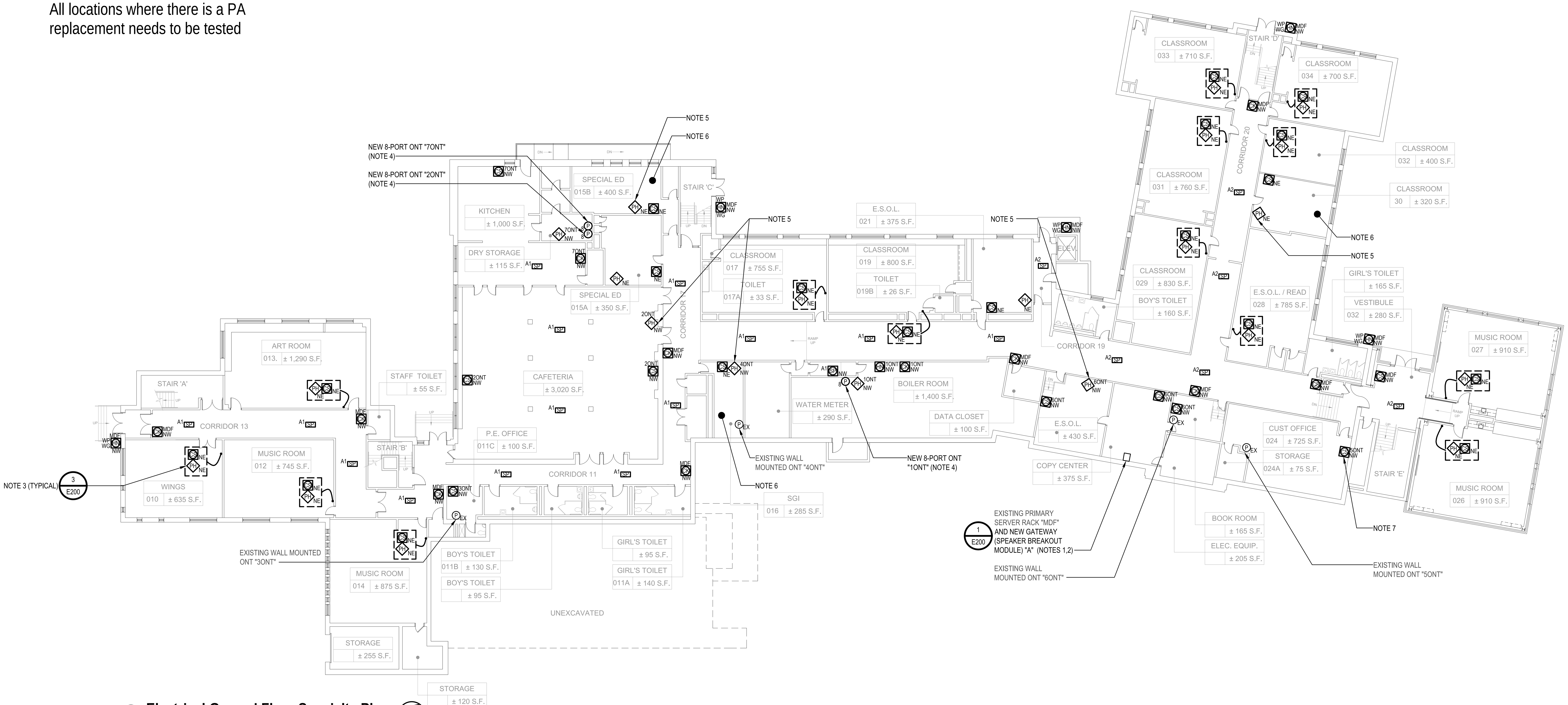
SHEET TITLE

ELECTRICAL LEGENDS

DRAWING No.

E001.00

All locations where there is a PA replacement needs to be tested



1 Electrical Ground Floor Specialty Plan

SCALE: 1/16"=1'-0"

GENERAL ELECTRICAL NOTES:

G1. CONTRACTOR SHALL NOTE THAT THIS DRAWING IS FOR REFERENCE ONLY. CONTRACTOR SHALL COORDINATE WITH THE DISTRICT FOR ALL NEW EQUIPMENTS AND TERMINATION PRIOR TO ORDERING AND INSTALLATION.

G2. FOR BIDDING PURPOSES CONTRACTOR SHALL ASSUME NEW CLOCK/SPEAKER SYSTEM IS 6'-0" AWAY FROM EXISTING LOCATION IN CLASSROOMS, UNLESS OTHERWISE NOTED. PROVIDE PATCH CABLE AND WIREMOLD AS REQUIRED TO EXTEND TO NEW LOCATION.

G3. CONTRACTOR SHALL PROVIDE A 10-1/2" X 10-1/2" METAL PLATE TO COVER EXISTING HOLE CREATED FROM THE REMOVAL OF THE EXISTING CLOCK ON THE EXISTING ENCLOSURE COVER CONTRACTOR SHALL PROVIDE SCREWS TO BE FLUSH WITH EXISTING CLOCK/TELEPHONE SYSTEM ENCLOSURE COVER. PRIME PAINT THE METAL PLATE TO MATCH EXISTING ADJACENT COLOR.

G4. CONTRACTOR SHALL REMOVE EXISTING INLINE RJ45 CONNECTOR AND REINSTALL (PUNCH DOWN)TO EXTEND/REROUTE EXISTING COILED CAT 6 CABLE (LOCATED INSIDE EXISTING CLOCK/SPEAKER ENCLOSURE) TO FINISH CEILING ABOVE. PROVIDE AND INSTALL ADDITIONAL 10'-0" CAT 6 PATCH CABLE IN WIREMOLD AS REQUIRED TO TERMINATE TO NEW CLOCK/SPEAKER LOCATION ABOVE DOOR FRAME.

ELECTRICAL NOTES:

1. CONTRACTOR SHALL PROVIDE AND INSTALL A NEW 24-PORT ONT AND 24 PORT PATCH PANEL IN EXISTING RACK. POWER FROM EXISTING UPS. PROVIDE ALL CAT 6 PATCH CABLES AND FIBER ZIP CABLE TO EXISTING FIBER SPLITTER (ABOVE) AS REQUIRED.
2. CONTRACTOR SHALL PROVIDE AND INSTALL A VENTED SHELF (MIDDLE ATLANTIC RACK MODEL #UFA-14.5 OR APPROVED EQUAL), ANALOG SPEAKER GATEWAY (SPEAKER BREAKOUT MODULE), POWER SUPPLIES, AND AMPLIFIERS IN RACK AS REQUIRED TO CIRCUIT HALLWAY SPEAKERS AS SHOWN. POWER FROM EXISTING/NEW UPS. REFER TO DETAIL 1 ON DRAWING E200.00 FOR ADDITIONAL INFORMATION.
3. CONTRACTOR SHALL PROVIDE AND INSTALL NEW PHONE IN THE LOCATION OF THE EXISTING PHONE ATTACHED TO THE PUBLIC ADDRESS CLOCK/ SPEAKER FACEPLATE, UNLESS OTHERWISE NOTED. PROVIDE AND INSTALL ALL MOUNTING HARDWARE AND ACCESSORIES AS REQUIRED.
4. CONTRACTOR SHALL REMOVE, CLEAN AND TURN OVER EXISTING POWER OVER ETHERNET (POE) OPTICAL NETWORK TERMINAL (ONT) (4 PORT) ONT AND BATTERY TO OWNER. EXISTING FIBER TO REMAIN. PROVIDE AND INSTALL NEW POWER OVER ETHERNET (POE) OPTICAL NETWORK TERMINAL (ONT) (8 PORT) AND NEW FLOOR MOUNTED UPS.
5. CONTRACTOR SHALL PROVIDE AND INSTALL MOUNTING HARDWARE AND ACCESSORIES AS REQUIRED TO WALL MOUNT NEW PHONE TO WALL.
6. CONTRACTOR SHALL REMOVE AND DISPOSE OF EXISTING PA SYSTEM IN IT'S ENTIRETY IN THIS AREA ONCE NEW SYSTEM IS INSTALLED. TESTED AND ACCEPTED. REMOVE AND DISPOSE OF INCLUDES ALL WIRING, CONDUIT, CLOCKS, SPEAKERS AND ENCLOSURE. SURFACE BEHIND REMOVED EQUIPMENT SHALL BE PATCH, PRIMES AND PAINTED TO MATCH EXISTING.
7. CONTRACTOR SHALL COORDINATE WITH OWNER FOR THE REMOVAL OF THE EXISTING CABINET ON THIS WALL.

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CONSULTANTS:

MARK	DATE	DESCRIPTION
	12-28-20	SED SUBMISSION

"ALTERATION OF THIS DOCUMENT EXCEPT BY A LICENSED PROFESSIONAL IS ILLEGAL"

DESIGNED BY:	DRAWN BY:	CHECKED BY:	REVIEWED BY:
LK	LK/GT		

PROJECT No.:	DATE:	SCALE:
WPSD 2010	DECEMBER 2020	AS SHOWN

CLIENT

White Plains City School District

Intercom and Public Address System Replacement at the Mamaroneck Avenue Elementary School

7 Nosband Ave
White Plains NY, 10605

66-22-00-01-0-010-016

CONTRACT

CONTRACT E
ELECTRICAL CONSTRUCTION

STATUS

SED - FINAL BID SET

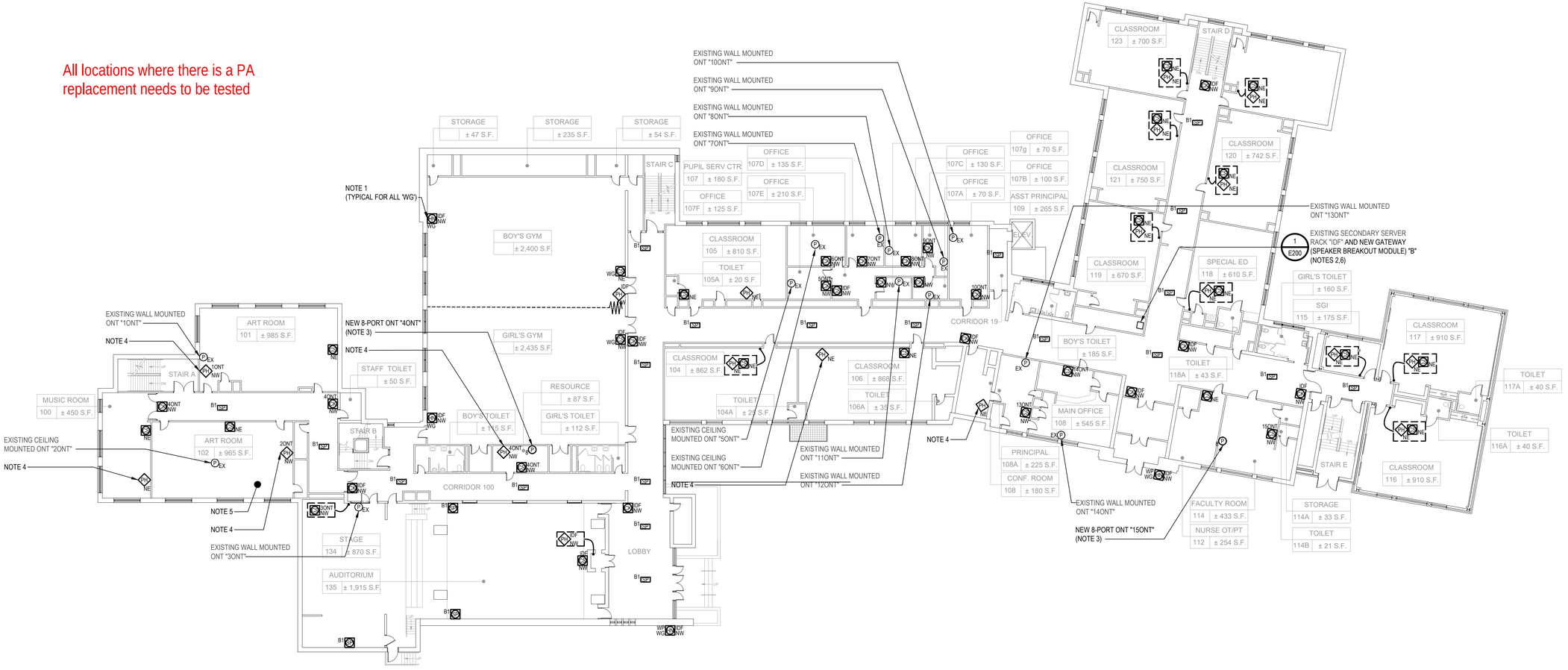
SHEET TITLE

ELECTRICAL GROUND FLOOR SPECIALTY PLAN

DRAWING No.

E100.00

All locations where there is a PA replacement needs to be tested



1 Electrical First Floor Specialty Plan

SCALE: 1/16"=1'-0"

GENERAL ELECTRICAL NOTES:

G1. CONTRACTOR SHALL NOTE THAT THIS DRAWING IS FOR REFERENCE ONLY. CONTRACTOR SHALL COORDINATE WITH THE DISTRICT FOR ALL NEW EQUIPMENTS AND TERMINATION PRIOR TO ORDERING AND INSTALLATION.

G2. FOR BIDDING PURPOSES CONTRACTOR SHALL ASSUME NEW CLOCK/SPEAKER SYSTEM IS 6'-0" AWAY FROM EXISTING LOCATION IN CLASSROOMS, UNLESS OTHERWISE NOTED. PROVIDE PATCH CABLE AND WIREMOLD AS REQUIRED TO EXTEND TO NEW LOCATION.

G3. CONTRACTOR SHALL PROVIDE A 10-1/2" X 10-1/2" METAL PLATE TO COVER EXISTING HOLE CREATED FROM THE REMOVAL OF THE EXISTING CLOCK ON THE EXISTING ENCLOSURE COVER CONTRACTOR SHALL PROVIDE SCREWS TO BE FLUSH WITH EXISTING CLOCK/TELEPHONE SYSTEM ENCLOSURE COVER. PRIME PAINT THE METAL PLATE TO MATCH EXISTING ADJACENT COLOR. REFER TO DETAIL 3 ON DRAWING E200 FOR ADDITIONAL INFORMATION.

G4. CONTRACTOR SHALL REMOVE EXISTING INLINE RJ45 CONNECTOR AND REINSTALL (PUNCH DOWN)TO EXTEND/REROUTE EXISTING COILED CAT 6 CABLE (LOCATED INSIDE EXISTING CLOCK/SPEAKER ENCLOSURE) TO FINISH CEILING ABOVE. PROVIDE AND INSTALL ADDITIONAL 10'-0" CAT 6 PATCH CABLE IN WIREMOLD AS REQUIRED TO TERMINATE TO NEW CLOCK/SPEAKER LOCATION ABOVE DOOR FRAME.

ELECTRICAL NOTES:

1. 'WG' DENOTES WIREGUARD. WIREGUARD SHALL BE PAINTED TO MATCH EXISTING WALL COLOR.
2. CONTRACTOR SHALL PROVIDE AND INSTALL A NEW 24-PORT ONT AND 24 PORT PATCH PANEL IN EXISTING RACK. PROVIDE AND INSTALL A NEW RACK MOUNTED UNINTERRUPTIBLE POWER SUPPLY (UPS) IN EXISTING RACK. POWER UPS FROM EXISTING RECEPTACLE AND POWER ONT FROM NEW UPS. PROVIDE ALL CAT 6 PATCH CABLES AND FIBER ZIP CABLE TO EXISTING FIBER SPLITTER (ABOVE) AS REQUIRED.
3. CONTRACTOR SHALL REMOVE, CLEAN AND TURN OVER EXISTING POWER OVER ETHERNET (POE) OPTICAL NETWORK TERMINAL (ONT) (4 PORT) ONT AND BATTERY TO OWNER. EXISTING FIBER TO REMAIN. PROVIDE AND INSTALL NEW POWER OVER ETHERNET (POE) OPTICAL NETWORK TERMINAL (ONT) (8 PORT) AND NEW FLOOR MOUNTED UPS.
4. CONTRACTOR SHALL PROVIDE AND INSTALL MOUNTING HARDWARE AND ACCESSORIES AS REQUIRED TO WALL MOUNT NEW PHONE TO WALL.
5. CONTRACTOR SHALL REMOVE AND DISPOSE OF EXISTING PA SYSTEM IN IT'S ENTIRETY IN THIS AREA ONCE NEW SYSTEM IS INSTALLED. TESTED AND ACCEPTED. REMOVE AND DISPOSE OF INCLUDES ALL WIRING, CONDUIT, CLOCKS, SPEAKERS AND ENCLOSURE. SURFACE BEHIND REMOVED EQUIPMENT SHALL BE PATCH, PRIMES AND PAINTED TO MATCH EXISTING.
6. CONTRACTOR SHALL PROVIDE AND INSTALL A VENTED SHELF (MIDDLE ATLANTIC RACK MODEL #UFA-14.5 OR APPROVED EQUAL), ANALOG SPEAKER GATEWAY (SPEAKER BREAKOUT MODULE), POWER SUPPLIES, AND AMPLIFIERS IN RACK AS REQUIRED TO CIRCUIT HALLWAY SPEAKERS AS SHOWN. POWER FROM EXISTING/NEW UPS. REFER TO DETAIL 1 ON DRAWING E200.00 FOR ADDITIONAL INFORMATION.

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CONSULTANTS:

MARK	DATE	DESCRIPTION
	12-28-20	SED SUBMISSION

STATE OF NEW YORK — MICHAEL WILLIAM TWITTY — 095854 — LICENSED PROFESSIONAL ENGINEER

DESIGNED BY:	DRAWN BY:	CHECKED BY:	REVIEWED BY:
LK	LK/GT		

PROJECT No.:	DATE:	SCALE:
WPSD 2010	DECEMBER 2020	AS SHOWN

CLIENT

White Plains City School District

Intercom and Public Address System Replacement at the Mamaroneck Avenue Elementary School

7 Nosband Ave
White Plains NY, 10605

66-22-00-01-0-010-016

CONTRACT

CONTRACT E
ELECTRICAL CONSTRUCTION

STATUS

SED - FINAL BID SET

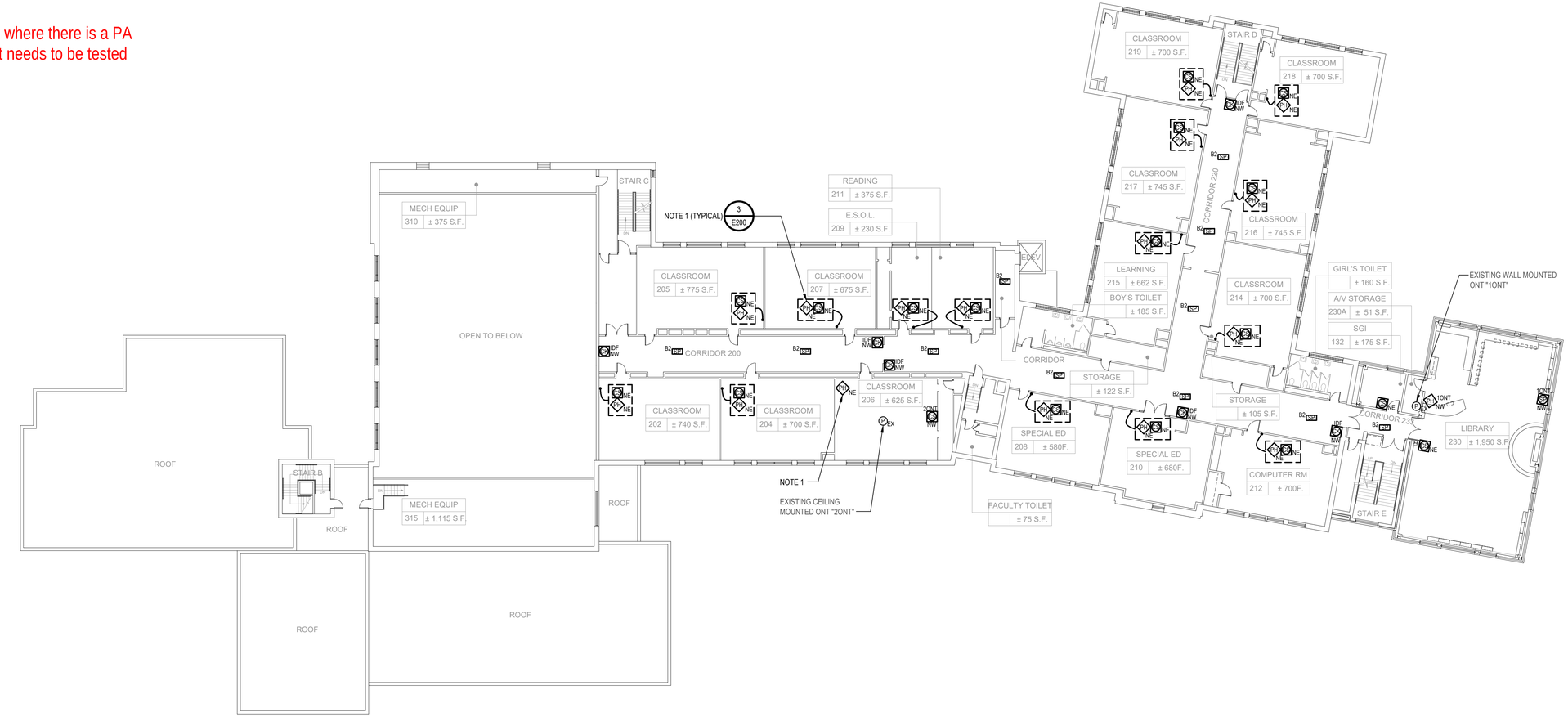
SHEET TITLE

ELECTRICAL FIRST FLOOR SPECIALTY PLAN

DRAWING No.

E101.00

All locations where there is a PA replacement needs to be tested



1 Electrical Second Floor Specialty Plan

SCALE: 1/16"=1'-0"

GENERAL ELECTRICAL NOTES:

G1. CONTRACTOR SHALL NOTE THAT THIS DRAWING IS FOR REFERENCE ONLY. CONTRACTOR SHALL COORDINATE WITH THE DISTRICT FOR ALL NEW EQUIPMENTS AND TERMINATION PRIOR TO ORDERING AND INSTALLATION.

G2. FOR BIDDING PURPOSES CONTRACTOR SHALL ASSUME NEW CLOCK/SPEAKER SYSTEM IS 6'-0" AWAY FROM EXISTING LOCATION, UNLESS OTHERWISE NOTED. PROVIDE PATCH CABLE AND WIREMOLD AS REQUIRED TO EXTEND TO NEW LOCATION.

G3. CONTRACTOR SHALL PROVIDE A 10-1/2" X 10-1/2" METAL PLATE TO COVER EXISTING HOLE CREATED FROM THE REMOVAL OF THE EXISTING CLOCK ON THE EXISTING ENCLOSURE COVER CONTRACTOR SHALL PROVIDE SCREWS TO BE FLUSH WITH EXISTING CLOCK/TELEPHONE SYSTEM ENCLOSURE COVER. PRIME PAINT THE METAL PLATE TO MATCH EXISTING ADJACENT COLOR. REFER TO DETAIL 3 ON DRAWING E200 FOR ADDITIONAL INFORMATION.

G4. CONTRACTOR SHALL REMOVE EXISTING INLINE RJ45 CONNECTOR AND REINSTALL (PUNCH DOWN)TO EXTEND/REROUTE EXISTING COILED CAT 6 CABLE (LOCATED INSIDE EXISTING CLOCK/SPEAKER ENCLOSURE) TO FINISH CEILING ABOVE. PROVIDE AND INSTALL ADDITIONAL 10'-0" CAT 6 PATCH CABLE IN WIREMOLD AS REQUIRED TO TERMINATE TO NEW CLOCK/SPEAKER LOCATION ABOVE DOOR FRAME.

G5. REFER TO DRAWING E101 FOR THE APPROXIMATE LOCATION OF "IDF" AND GATEWAY (SPEAKER BREAKOUT MODULE) "B".

ELECTRICAL NOTES:

1. CONTRACTOR SHALL PROVIDE AND INSTALL NEW PHONE IN THE LOCATION OF THE EXISTING PHONE ATTACHED TO THE PUBLIC ADDRESS CLOCK/ SPEAKER FACEPLATE, UNLESS OTHERWISE NOTED. PROVIDE AND INSTALL ALL MOUNTING HARDWARE AND ACCESSORIES AS REQUIRED.

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CONSULTANTS:

MARK	DATE	DESCRIPTION
	12-28-20	SED SUBMISSION

STATE OF NEW YORK · MICHAEL WILLIAM TWITTY · 095854 · LICENSED PROFESSIONAL ENGINEER

DESIGNED BY:	DRAWN BY:	CHECKED BY:	REVIEWED BY:
LK	LK/GT		

PROJECT No.:	DATE:	SCALE:
WPSD 2010	DECEMBER 2020	AS SHOWN

CLIENT

White Plains City School District

Intercom and Public Address System Replacement at the Mamaroneck Avenue Elementary School

7 Nosband Ave
White Plains NY, 10605

66-22-00-01-0-010-016

CONTRACT

CONTRACT E
ELECTRICAL CONSTRUCTION

STATUS

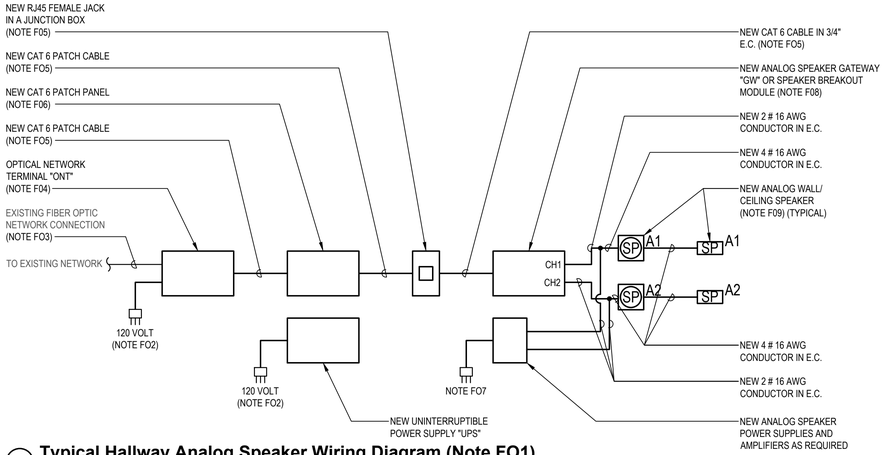
SED - FINAL BID SET

SHEET TITLE

ELECTRICAL SECOND FLOOR SPECIALTY PLAN

DRAWING No.

E102.00



1 Typical Hallway Analog Speaker Wiring Diagram (Note FO1)

SCALE: N.T.S.

SINGLE LINE NOTES:

FO1. REFER TO FLOOR PLANS AND SPECIFICATIONS FOR QUANTITIES, LOCATIONS AND ADDITIONAL INFORMATION. THE CONTRACTOR SHALL PROVIDE AND INSTALL ALL MOUNTING HARDWARE AS REQUIRED FOR A SECURE INSTALLATION AND AS STATED IN THE SPECIFICATIONS AND ON THE DRAWINGS. THE CONTRACTOR SHALL PROVIDE CONDUIT AS STATED IN THE SPECIFICATIONS.

FO2. POWER NEW EQUIPMENT FROM NEW/EXISTING UPS AS SHOWN ON THE FLOOR PLANS. CONTRACTOR SHALL INCLUDE THREE (3) 6-RECEPTACLE SURGE STRIP DEVICES (BELKIN MODEL #: BE-106000-08R OR APPROVED EQUAL) AND INSTALLATION IN BASE BID. ALL UNUSED DEVICES SHALL BE TURNED OVER TO THE DISTRICT AT THE COMPLETION OF THE PROJECT.

FO3. EXISTING DATA CONNECTION, UNLESS OTHERWISE NOTED ON FLOOR PLANS.

FO4. PROVIDE NEW ONT'S AS STATED ON THE FLOOR PLANS AND IN THE SPECIFICATIONS.

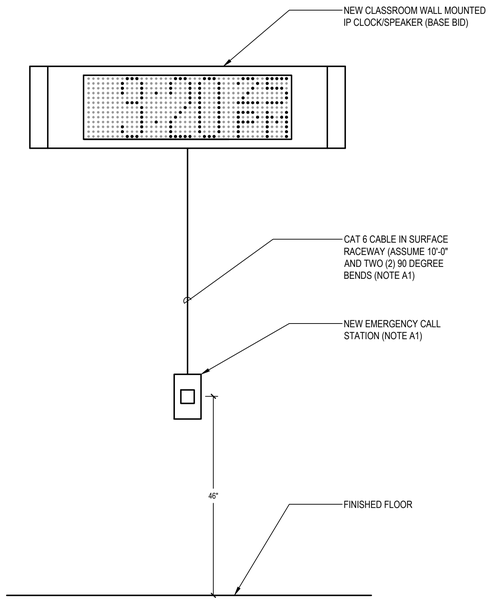
FO5. ALL CAT 6 CABLE SHALL BE TESTED BY THE CONTRACTOR AND SHALL PASS STANDARD TESTS AS STATED IN THE SPECIFICATIONS. CONTRACTOR SHALL PROVIDE AND INSTALL RJ45 JACKS ON ALL CABLES OR TERMINATE TO PATCH PANEL AS REQUIRED. CONTRACTOR SHALL PROVIDE AND INSTALL INLINE PUNCH DOWN RJ45 CONNECTORS (TRIPPLITE MODEL #: N238-001-WH OR APPROVED EQUAL) AND A 6" PATCH CABLE TO EQUIPMENT AS REQUIRED TO PASS ALL TESTS. CONTRACTOR SHALL VERIFY ALL PORT TERMINATION LOCATIONS WITH DISTRICT IT DEPARTMENT.

FO6. PROVIDE NEW PATCH PANELS AS STATED ON THE FLOOR PLANS AND IN THE SPECIFICATIONS.

FO7. PLUG RECEPTACLE INTO NEW/EXISTING UPS AS PER FLOOR PLAN.

FO8. CONTRACTOR SHALL PROVIDE AND INSTALL WALL MOUNTED GATEWAYS (SPEAKER BREAKOUT MODULES). POWER FROM EXISTING/NEW UPS. PROVIDE ALL GATEWAYS (SPEAKER BREAKOUT MODULES), POWER SUPPLIES AND AMPLIFIERS AS REQUIRED TO CIRCUIT HALLWAY SPEAKERS AS SHOWN ON FLOOR PLANS.

FO9. PROVIDE SPEAKERS AS STATED ON THE FLOOR PLANS AND IN THE SPECIFICATIONS.

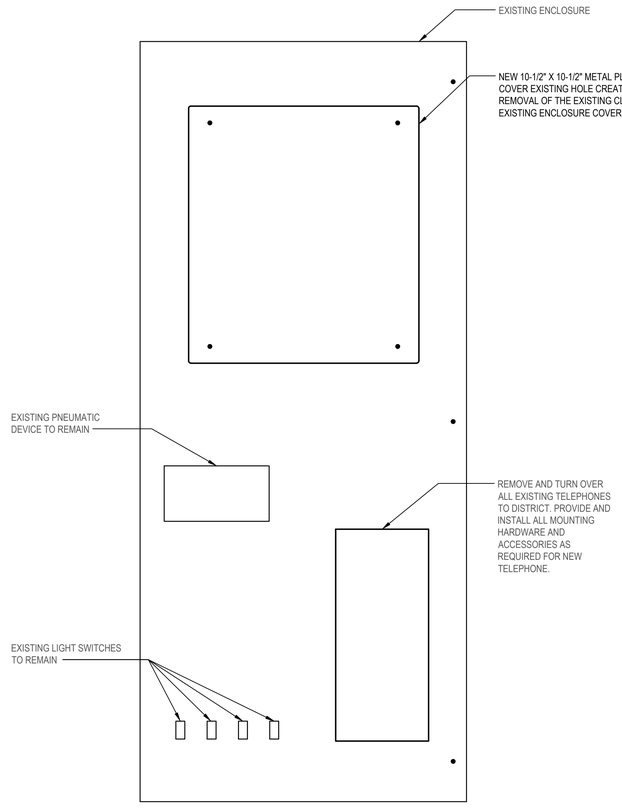


2 Typical Classroom Emergency Call Switch Detail

SCALE: N.T.S.

ADD/ALTERNATE NOTES:

A1. CONTRACTOR SHALL INCLUDE ALL COSTS TO PROVIDE AND INSTALL THE EMERGENCY CALL STATION, IN ALL CLASSROOMS, AS SHOWN IN DETAIL 2 - DRAWING E200.00 (CONSISTENT WITH THE NEMA SB 40-2008 COMMUNICATIONS SYSTEMS FOR LIFE SAFETY IN SCHOOLS) IN ADD/ALTERNATE #E1, ONLY.



3 Clock/Speaker Enclosure Detail

SCALE: NO SCALE

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Purchase, NY 10577
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CONSULTANTS:

MARK	DATE	DESCRIPTION
	12-28-20	SED SUBMISSION

STATE OF NEW YORK · MICHAEL WILLIAM TWITTY · 090954 · LICENSED PROFESSIONAL ENGINEER

DESIGNED BY:	DRAWN BY:	CHECKED BY:	REVIEWED BY:
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PROJECT No.:	DATE:	SCALE:
WPSD 2010	DECEMBER 2020	AS SHOWN

CLIENT

White Plains City School District

Intercom and Public Address System Replacement at the Mamaroneck Avenue Elementary School

7 Nosband Ave
White Plains NY, 10605

66-22-00-01-0-010-016

CONTRACT

CONTRACT E
ELECTRICAL CONSTRUCTION

STATUS

SED - FINAL BID SET

SHEET TITLE

ELECTRICAL DETAILS

DRAWING No.

E200.00

APPENDIX I:
PHOTOGRAPHIC DOCUMENTATION

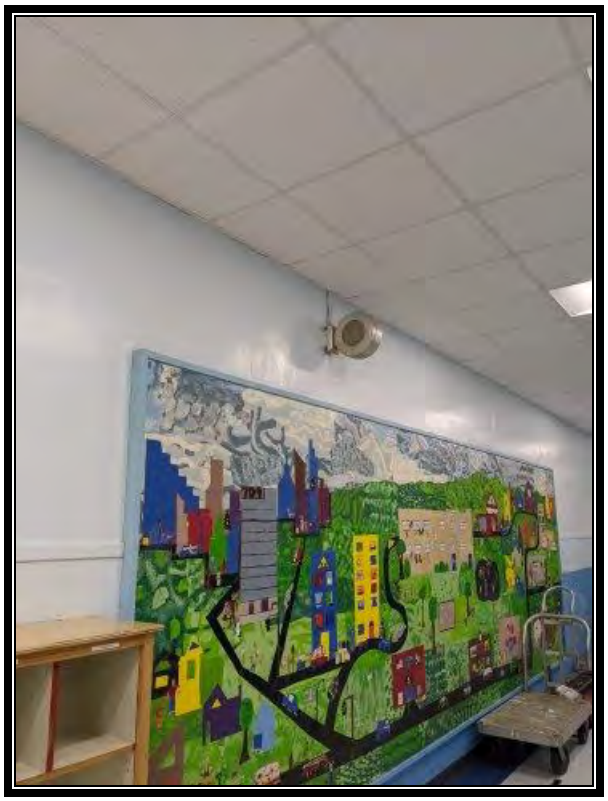

Photo 1: Non-ACM Wall Plaster and 2'x2' Ceiling Tiles (P.A. Speaker)

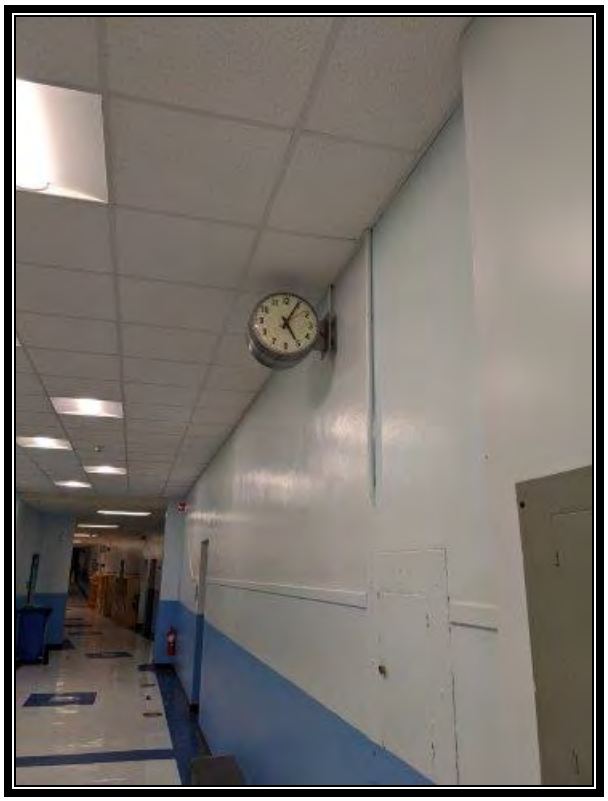

Photo 2: Non-ACM Wall Plaster and 2'x2' Ceiling Tiles (Clock)

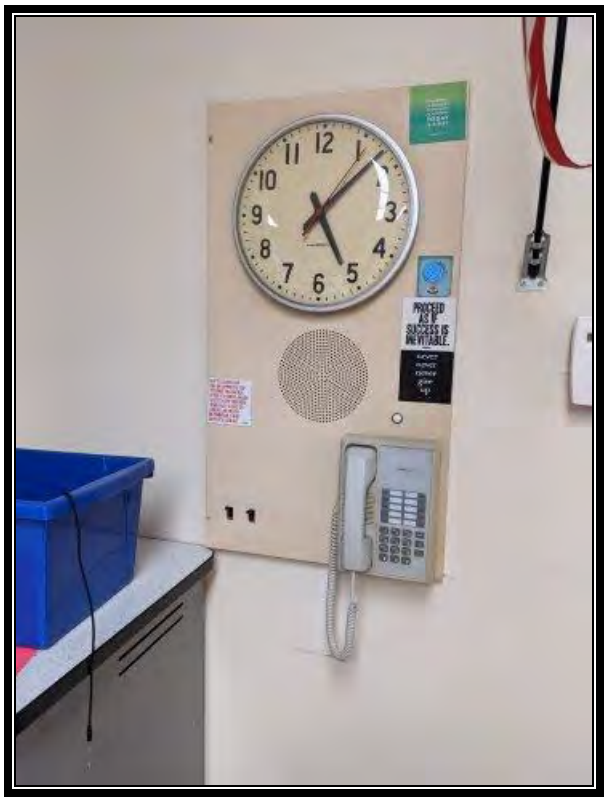

Photo 3: Non-ACM Gypsum Board (P.A. & Clock)

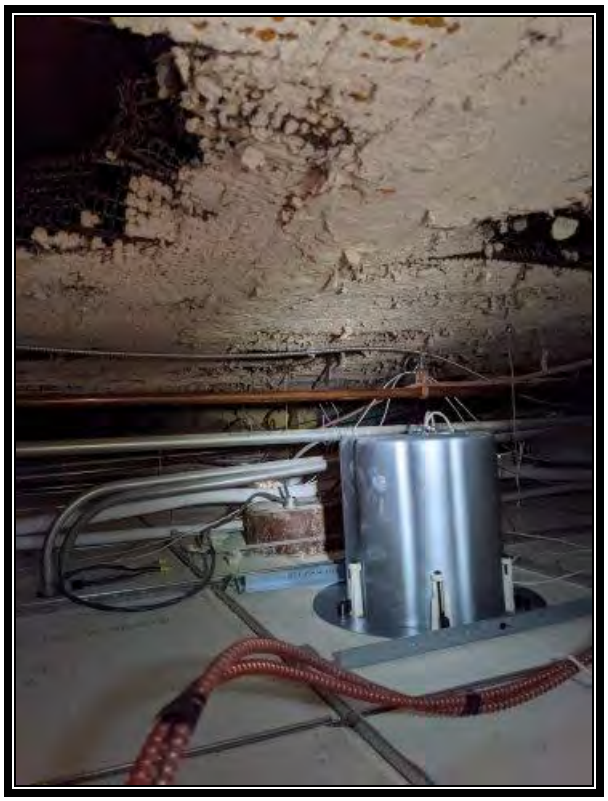

Photo 4: Non-ACM Ceiling Plaster in Ceiling Plenum

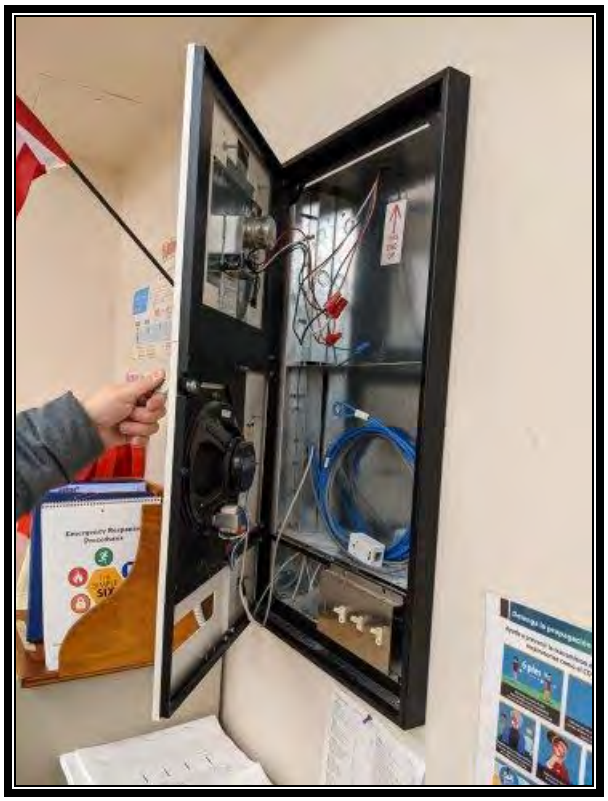

Photo 5: P.A. System

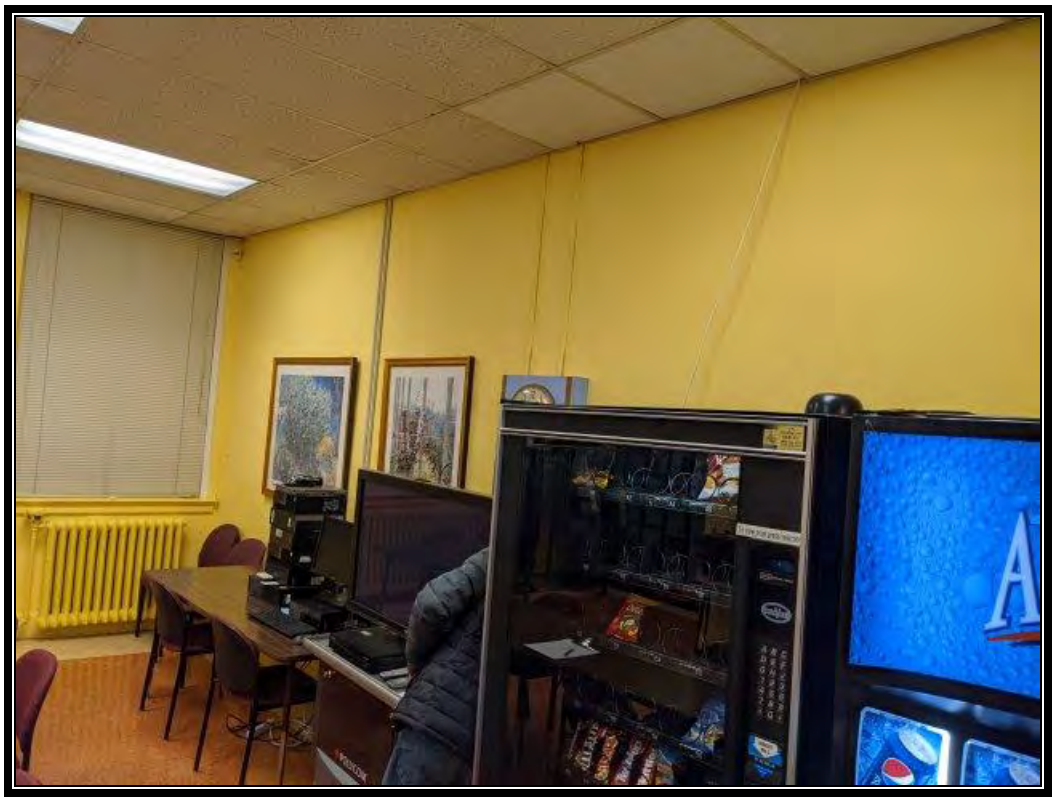

Photo 6: Non-ACM 2’x4’ Ceiling Tile

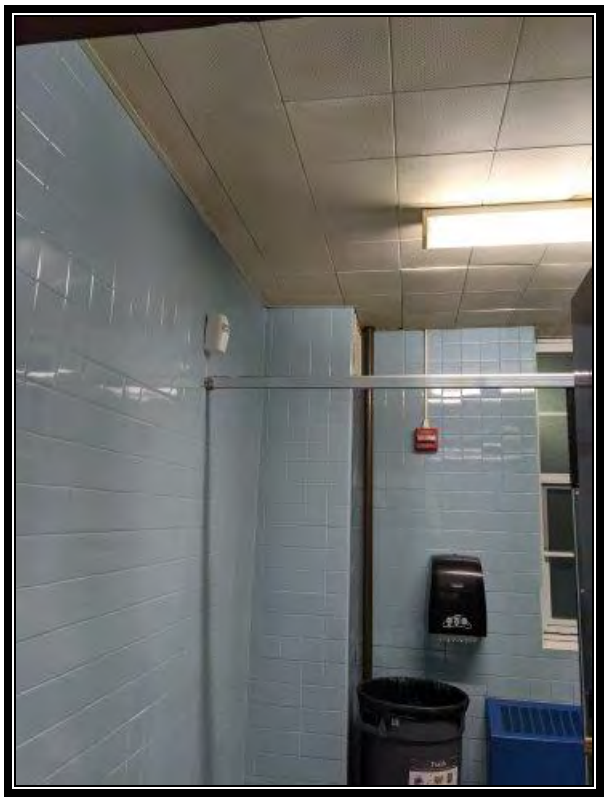

Photo 7: Non-ACM Ceramic Wall Tile and 1’x1’ Ceiling Tile

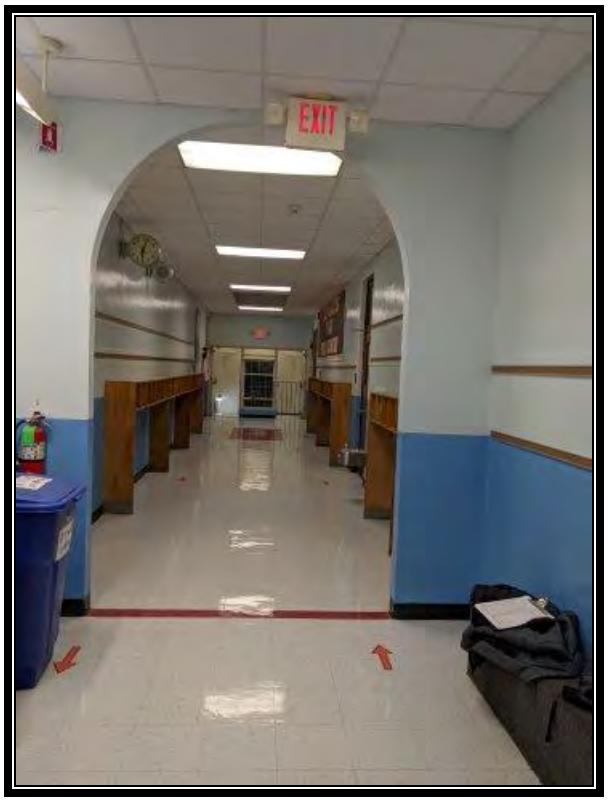

Photo 8: Non-ACM materials in Corridor

APPENDIX J:
FILE SEARCH

AHERA 3-YEAR RE-INSPECTION REPORT
AND MANAGEMENT PLAN UPDATE
of
ASBESTOS CONTAINING MATERIALS

Performed at:

MAMARONECK AVENUE ELEMENTARY SCHOOL

Performed for:

White Plains Public Schools
5 Homeside Lane
White Plains, NY 10605

Prepared by:

565 Taxter Road, Suite 510
Elmsford, New York 10523
Tel. (914) 798-3710
Fax (914) 592-1734

Project No. 2042892.027

Submission: August 2019

565 Taxter Road, Suite 510
Elmsford, New York 10523

HOMOGENEOUS AREA SHEET

Client: White Plains Public Schools **Project Site:** Mamaroneck Avenue Elementary School

Inspector(s): Marvin Luccioni **Man. Planner(s):** Andrew Cheskin **Project #:** 2042892.027

HA #	Homogenous Area Description	Material Type	ACM	Friable
01	**9"x9" Floor Tile/Mastic**	**M**	**YES**	**NO**
02	**Wall Mastic**	**M**	**YES**	**NO**
03	2'x4' Fissured Ceiling Tile, White	M	NO	NO
04	2'x4' Gouged Ceiling Tile, White	M	NO	NO
05	2'x2' Smooth Ceiling Tile, White	M	NO	NO
06	2'x4' Large Gouged Ceiling Tile, White	M	NO	NO
07	**2'x2' (1'x1' Design) Ceiling Tile (First Floor Gym)**	**M**	**Assumed**	**NO**
08	Wall Plaster, White Coat	S	NO	YES
09	Wall Plaster, Brown Coat	S	NO	YES
10	1' x 1' Ceiling Tile	M	NO	NO
11	Glue Dabs to 1' x 1' Ceiling Tile	M	NO	NO
12	Gypsum Above 1' x 1' Ceiling Tile	M	NO	NO
13	12" x 12" Floor Tile – White	M	NO	NO
14	12" x 12" Floor Tile – Green	M	NO	NO
15	12" x 12" Floor Tile – Brown Speckle	M	NO	NO
16	12" x 12" Floor Tile – Beige Speckle	M	NO	NO
17	Mastic to 12" x 12" Floor Tile	M	NO	NO
18	Backing on Ceramic Wall Tile	M	NO	YES
19	Floor Coating	M	NO	YES
20	Grout – Ceramic Wall Tile	M	NO	YES
21	Glue – Ceramic Wall Tile	M	NO	NO
22	Mortar – Ceramic Floor Tile	M	NO	YES
23	Gypsum Board (Auditorium Ceiling)	M	NO	YES

565 Taxter Road, Suite 510
Elmsford, New York 10523

HOMOGENEOUS AREA SHEET

Client: White Plains Public Schools **Project Site:** Mamaroneck Avenue Elementary School

Inspector(s): Marvin Luccioni **Man. Planner(s):** Andrew Cheskin **Project #:** 2042892.027

HA #	Homogenous Area Description	Material Type	ACM	Friable
24	Ceiling Plaster, White Coat (Auditorium)	S	NO	YES
25	Ceiling Plaster, White Coat (Auditorium)	S	NO	YES

TSI = Thermal System Insulation S = Surfacing M = Miscellaneous